ANNEXURE I

BACHELOR OF SCIENCE IN ELECTRONICS

NO	SEM	PAPER	TITLES
F. Y. B. Sc. IN ELECTRONICS			
	I		
1.		PAPER 1	SEMICONDUCTOR DEVICES
2.		PAPER 2	NETWORKS ANALYSIS
	II		
3.		PAPER 1	SEMICONDUCTOR CIRCUITS
4.		PAPER 2	NETWORKS SYNTHESIS
S. Y. B. Sc. IN ELECTRONICS			
	III		
1.		PAPER 1	LOGIC GATES
2.		PAPER 2	LINEAR INTEGRATED CIRCUITS
	IV		
3.		PAPER 1	DIGITAL ELECTRONICS
4.		PAPER 2	INDUSTRIAL ELECTRONICS
T. Y. B. Sc. IN ELECTRONICS			
	V		
1.		PAPER 1	MICROPROCESSOR AND ITS APPLICATIONS
2.		PAPER 2	ANALOG COMMUNICATION
3.		PAPER 3	OBJECT ORIENTED PROGRAMMING
4.		PAPER 4	TRANSDUCERS AND INSTRUMENTATION
5.		PAPER 5	PRACTICAL-I
6.		PAPER 6	PRACTICAL-II
7.		SKILLBASED PAPERS (ANY TWO)	PAPERT - I: COMPUTER HARDWARE AND MAINTAINANCE PAPER - II: MICROSOFT WINDOWS 2003 SERVER PAPER - III: INDUSTRIAL AUTOMATION (SCADA, PLC & HMI)
	VI		
1.		PAPER 1	MICROCONTROLLERS: THEORY AND APPLICATIONS
2.		PAPER 2	DIGITAL COMMUNICATION & COMPUTER NETWORKS
3.		PAPER 3	OPERATING SYSTEMS
4.		PAPER 4	PHARMACEUTICAL AND BIO-MEDICAL INSTRUMENTATION
5.		PAPER 5	PRACTICAL-I
6.		PAPER 6	PRACTICAL-II
7.		PROJECT	ELECTRONICS PROJECT

First Year B. Sc
SEMESTER I

PAPER 1: SEMICONDUCTOR DEVICES

INTRODUCTION TO SEMICONDUCTORS: **9**

Atomic Structure, Covalent Bonds, Conduction in Semiconductors, P type & N-type Semiconductor, P-N Junctions, Forward and Reverse Bias, V-I Characteristics, Diode Curve, Idea diode, Diode as a switch, Second Approximation, Reverse Resistance, Diode Capacitance, Charge Storage

SPECIAL PURPOSE DIODE: **6**

Zener Diode, V-I Characteristics, Zener Diode Regulator, Schottky Diode, Reverse Recovery Time, Varactor Diode, Tunnel Diode, PIN Diode, LASER Diode.

DIODE AS A RECTIFIER: **8**

Half wave, Full wave & Bridge Rectifier, Load Regulation, Serial Inductor Filter, Shunt Capacitor filter, LC, RC, RLC filter, Ripple Factor, Bleeder Resistor, Voltage Multipliers (up to Quadruple), Clippers and Clampers, Peak to Peak Detector

BIPOLAR JUNCTION TRANSISTOR: **8**

BJT Construction and Operation (Alloying and Epitaxial), Basic Modes of operation, Transistor Characteristics and Parameters, Alpha and Beta Gain, Cut-off and Saturation stage and voltages, Transistor as switch.

UNIJUNCTION TRANSISTOR **5**

Construction, Static characteristics curves, Equivalent circuit, application of UJT as a relaxation oscillator

FIELD EFFECT TRANSISTOR: **12**

Construction, Operation, Characteristics and Parameters of JFETS and MOSFETS, JFET Amplifiers, Small Signal Model, Self-Biasing, Common Source Amplifier, Common Gate Amplifier. Application of FET as AGC and Switch

Tutorials:

1. Study of Rectifier, High Frequency, Fast recovery Diodes.
2. Study of Switching Transistor.
3. Study of Medium power transistor.
4. Study of Low power transistor.
5. Study of High Current Switching MOSFETS
6. Use of instruments: millimeters (Analog & Digital) CRO, Power Supply, Function Generators, Soldering Iron etc.

Text Book:

1. Electronic Devices --Thomas Floyd, 5th Edition, Pearson Education Publication

Reference Books:

1. Electronic Principles -- Albert Paul Malvino, 3rd Edition Tata McGraw-Hill Publ.
2. Electrical Technology -- B.L Theraja, Vol IV

Practical List: (Minimum 5)

1. V-I characteristics of Rectifier diode, signal diode and Zener diode.
2. Half wave, Full wave and Bridge rectifiers: Ripple factor and load regulation,
3. Rectifier filters circuits.
4. BJT characteristics.
5. Simple voltage regulator using Zener diode.
6. FET Characteristics.

7. UJT Characteristics.
8. Clipper and Clampers.
9. Peak detector and voltage doublers.
10. UJT relaxation oscillator

PAPER 2: NETWORKS ANALYSIS

PASSIVE ELEMENTS AND KIRCHHOFF'S LAWS: **12**

Voltage, Current, Power and Energy, The Resistance, Inductance & Capacitance Parameter, Energy Sources, Inductors in Series, Inductors in Parallel, Capacitor ratings, Effects of frequency in a capacitive circuit, Serial and Parallel connection of capacitors, Kirchhoff's Voltage Law, Voltage Division, Power in series circuit, Kirchhoff's Current Law, Current Division, Power in Parallel Circuit.

CIRCUIT ANALYSIS AND NETWORK THEOREMS: **10**

Mesh analysis, Mesh equations by inspection method, Super Mesh analysis, Nodal analysis, Node equation's by Inspection method, Super Node analysis, Superposition Theorem, Thevinin's Theorem, Norton Theorem Maximum power transfer Theorem, Millman's Theorem.

ALTERNATING CURRENTS AND VOLTAGES: **6**

The Sine wave, Angular relation of the Sine wave, Voltage and current of a Sine wave, Phase relation in Pure resistor, Pure inductor & Pure capacitor, Skin effect in AC circuit

COMPLEX IMPEDANCE, POWER AND POWER FACTOR: **10**

Impedance diagram, Phase diagram, Series circuits, Parallel circuits, Compound circuits, Instantaneous power, Average power, Apparent power and Power factor, Reactive power, Power triangle, Power in an inductive circuit, Power in a pure capacitive circuit.

RESONANCE: **10**

Series resonance, Impedance and Phase angle of a series resonance circuit, Bandwidth of a RLC circuit, Parallel resonance, the quality factor (Q) and it's effect on Bandwidth, Magnification in resonance with frequency, Q factor of parallel resonance, Magnification, Reactance curve in Parallel resonance.

Tutorials:
1. Identification and testing of components: Resistors, capacitors, Diodes, Transistors and Transformers.
2. Design of 1mHenry inductor.
3. Know how of R, L, C various ranges, specifications and manufacturing processes.
4. Study of AC line regulation in India.
5. Study of loss of resonance in practical oscillator circuits.
6. Analysis of resonance in Tank circuit.

Text Book:
1. Circuits and Networks Analysis and Synthesis By A. Sudhakar, S.P Shyammohan Tata Mc Graw Hill publication.

Reference Books:
1. Network Analysis and Synthesis By M.E Van Valkanberg, Prentice Hall Inc.
2. A Text of Electrical Technology By B.LTheraja, A.K Theraja (VoII)

Practical list: (Minimum 5)
1. Verification of Thevenin's theorem for ladder network.
2. Verification of Norton's theorem for ladder network.
3. Study of series and parallel combination of the Capacitors.
4. Impedance Matching: Maximum power transfer theorem.
5. RC network as differentiator
6. RC network as integrator.
7. Series resonance Circuit.
8. Parallel resonance circuit.

9. Lissajous figures study.

SEMESTER II
PAPER 1: SEMICONDUCTOR CIRCUITS

TRANSISTOR BIASING: **8**

Transistor current component, Transistor as an Amplifier, Operating points, Fixed bias circuit, Voltage divider bias, Collector feedback bias, Emitter bias, Bias stability and Component, Thermal runaway and Thermal instability

TRANSISTOR MODELS AND AMPLIFIERS: **9**

Transistor Model : Ebers- Moll Model of a Transistor, Low frequency small signal model of a transistor, Hybrid _model of a transistor. Amplifier: AC Equivalent circuits for CE, CC, CB, Coupling and Bypass Capacitors, the Ideal transistor approximation, CB, CC, CE amplifiers, input impedance of CE amplifiers, Bandwidth, Distortion, Darlington Pair, Types of Coupling – Direct, RC, Transformer Coupling.

HYBIRD (H) PARAMETERS: **6**

Definition, Transistor hybrid model, exact and approximate h-formula, Conversion of H formula for three Transistor Configurations, Qualitative Treatment of Parameters

TRANSISTOR MULTIVIBRATORS: **6**

Astable Multivibrator (Design & Working), Monostable Multivibrator (Working Principle), Bistable Multivibrator) Working Principle), Schmitt Trigger (Working Principle), Hysterisis Loop.

POWER AMPLIFIER: **4**

Class A large signal amplifier, Class B, Class AB Push Pull and Class C Amplifier operation.

POWER AMPLIFIER: **4**

Class A large signal amplifier, Class B, Class AB Push Pull and Class C Amplifier operation.

NEGATIVE FEEDBACK: **8**

Feedback concepts, Transfer Gain with Feedback, General Characteristics of negative feedback, I/O resistance, Bandwidth, Gain, Bandwidth Product, Voltage Shunt, Current Series, Current Shunt Feedback.

POSITIVE FEEDBACK: **7**

Conditions for Oscillations, Operating Principles, Phase Shift Oscillation, Wien Bridge Oscillator, Hartley and Colpitt's Oscillator.

Tutorials:

1. Design of Temperature compensation circuit.
2. Design of Self biased CE Amplifier.
3. Design of CLASS A Power amplifier for 50 Watts.
4. Comparison of various oscillators.
5. Design of 1000Hz Phase Shift Oscillator.

Text Book:

1. Electronic Devices By Thomas Floyd, 5th Edition, Pearson Education Publication.

Reference Books:

1. Electrical Technology By B.L Theraja, Vol IV
2. Electronic Principles By Albert Paul Malvino, 5th Edition Tata McGraw-Hill Publ.
3. Electronic Devices & Circuits By Allan Mottershead, EEE Publication

Practical List: (Minimum Five)

1. CE amplifier with and without bypass capacitor.
2. Transistor amplifier CE type, Frequency response, Band width and 3 dB points.
3. FET as a voltage amplifier and its frequency response.
4. Design of class AB push pull amplifier.
5. Construction of Class A amplifier.

6. Construction Class C amplifier.
7. Design of Hartley Oscillator
8. Design of Colpitts Oscillator
9. Design of Wien's Bridge Oscillator
10. Design of Phase shift oscillator.

PAPER 2: NETWORKS SYNTHESIS

TRANSIENTS: **8** **8**

Steady state and Transient response, DC response of RL, RC, RLC circuits, Sinusoidal response of RL, RC, RLC circuit.

LAPLACE TRANSFORM: **8**

Definition of Laplace transform, Properties of Laplace transform, Laplace transforms of some useful functions, Laplace transform theorems (only statements), the inverse transformation, Laplace transform of periodic functions, Statement of the convolution integral, applications of Laplace transforms.

NETWORK FUNCTION: **10**

Singularity functions, Unit functions, Shifter functions, Gate functions, Network functions, Transfer function of two-port network, Poles & Zeros, Necessary conditions for driving point and transfer functions, Time domain response from Pole-Zero plot, amplitude and phase relation from pole zero plot, Stability criterion for the active network, routh criteria.

TWO-PORT NETWORK: **10**

Two-port networks, open circuit impedance (Z) parameters, Short circuit admittance (Y) parameter, Hybrid (h) parameter, Interrelationship of different parameters, T & II representation, Terminated two port networks, Lattice networks.

POLYPHASE CIRCUIT AND COUPLED CIRCUIT: **12**

Poly-phase system, Advantages of three-phase system, generation of three phase voltages, phase sequence, inter-connection of three-phase sources and loads, star to delta and delta to star transformation, Voltage current and power in a star connected system, Voltage coupling, ideal transformer, Series connection of coupled inductors, Tuned circuits, Double tuned coupled circuits.

Tutorials:

1. Understanding of transformation.
2. History of Laplace Transform.
3. Application of Laplace Transform.
4. RLC circuit simulation in Electronics Workbench.
5. Star to Delta conversion simulation.

Text Book:

1. Circuits and Networks Analysis and Synthesis By A. Sudhakar, S.P Shyammohan
Tata Mc Graw Hill publication.

Reference Books:

1. Network Analysis and Synthesis By M.E Van Valkanberg, Prentice Hall Inc.
2. A Text of Electrical Technology By B.L Theraja, A.K Theraja (Vol 1)

Practical List: (Minimum Five; * compulsory)

1. High pass filter frequency response and Bode plots.
2. Low pass filter frequency response and Bode plots
3. Design of Band pass filter.
4. Design of Notch filter.
5. Astable Multivibrator.
6. Monostable mutlivibrator.
7. Bistable Multivibrator.
8. Schmitt Trigger and study of hysterisis.
9. RC and RL time constants.
10*. Resistance divider, RC & RLC Simulation with p-Spice.

Second Year B. Sc
SEMESTER III
PAPER 1: LOGIC GATES

NUMBER SYSTEMS: **6**

Decimal, Binary, Octal, and Hexadecimal number systems, Binary-Decimal-Octal- Hexadecimal Inter conversions, Signed Binary numbers, 1's and 2's complement representation, Binary arithmetic (Addition, Subtraction, Multiplication and Division).

CODES: **6**

Natural BCD code, Excess- 3 code, Gray code, alphanumeric codes (BCD, EBCDIC, ASCII codes), Parity bit, Hamming code, Error codes, CRC 16 & 32 & checksum computation.

DIGITAL LOGIC FAMILIES: **8**

Transistor- transistor Logic (TTL):- Standard TTL NAND gate, active pull up open collector output, unconnected inputs, Schottky TTL, 5400/7400 TTL series, Emitter Coupled Logic (ECL), ECL OR/NOR gate, Fan-out, wired OR logic, Open emitter outputs, Unconnected inputs. MOS logic, MOS inverter, MOSFET NAND and NOR gates, Fan-out, Propagation delay time, Power dissipation, Unconnected inputs, CMOS logic:- CMOS inverter, CMOS NAND & NOR gates, Noise margin, Unconnected inputs, Wired logic, 54C00/74C00 CMOS series, interfacing CMOS and TTL, Tristate logic, TSL inverter.

GATES: **8**

AND, OR, NOT, NAND, NOR, EXOR gates, NAND and NOR as Universal building blocks, Laws of Boolean Algebra, Evaluation of Logical expressions, Proof by perfect induction, Half and Full adder, Half and Full subtractor, DeMorgans Theorem.

LOGIC TECHNIQUES: **10**

Standard representation for logical functions (SOP & POS), K-map representation of logic functions (upto 4 variables), Simplification of logical functions using K-maps, Don't care condition.

Tutorials:

1. Study of basic Gates
2. Comparison of logic families.
3. Specification of logic like Fan-in, Fan-out, Voh, Vol, Vih, Vil, Current, Voltages.
4. Applications of Gray code.
5. Study of LS, H, HC 7400, 7406 specifications.
6. Study of 40 series CMOS.
7. Understanding open collector Inverter.

Text Book:

1. Modern Digital Electronics (4th Edition) R.P Jain (TMH)

Reference Books:

1. Digital Principles and Applications Malvino and Leach (TMH)
2. Digital Circuits Theodare Bogart Tata McGraw Hill
3. Digital Electronics William Gothman
4. Introduction to Digital Electronics Naschelsky

Practical List

1. NAND and NOR as universal building blocks
2. Implementation of K-Map for 3-variable
3. Implementation of K-Map for 4-variable
4. Implementation of Logic Circuits using Boolean Algebra.
5. Study of EX-OR & EX-NOR gates.
6. Verification of De-Morgans theorems and its applications.
7. Half adder and Full adder circuit,
8. Subtraction by two's complement method.

PAPER 2: LINEAR INTERGRATED CIRCUITS

IC FABRICATION: **5**

Types of IC's, steps involved in fabrication of monolithic IC's, Fabrication of transistor, diode, resistor and capacitor using monolithic techniques, SSI, MSI, LSI & VLSI IC's.

OPERATIONAL AMPLIFIER: **7**

Differential amplifier, four configurations of differential amplifier, DC and AC analysis of Dual input-Balance output differential amplifier with emitter resistance, Differential amplifier with emitter resistance, Differential amplifier with constant current bias, current mirror, level transistor, block diagram representation of a typical op-amp, power supplies for IC's.

OPAMP CHARACTERISTICS: **7**

Input offset voltage and current, input bias current, difference input resistance, output offset voltage, PSRR, CMRR, Slew rate, large signal voltage gain, output voltage swing, output resistance, input offset voltage drift, input offset current drift, measurement of Op amp parameters (CMRR, Input bias current, Input offset voltage, slew rate, offset current), equivalent circuit of OPAMP, ideal voltage transfer curves, offset balancing techniques.

OPAMP BASIC CIRCUITS: **4**

Inverting, Non inverting, voltage follower, adder, difference amplifier, V-I and I-V converter, Integrator, differentiator, Log and antilog amplifier, instrumentation Opamp, Active filters- first order low pass and high pass filters, twin –T filters.

OPAMP APPLICATIONS: **5**

Comparator, zero crossing detectors, voltage limiter, small signal half wave rectifier, peak detector, sample and hold circuit, Schmitt trigger, phase shift and Wien's bridge oscillator, square wave generator, triangular wave generator, saw-tooth wave generator.

TIMERS: **5**

NE 555 timer, working principles, 555 timers as Astable, Monostable and voltage controlled oscillator, PLL.

Regulated IC: **4**

78XX & 79XX series, IC723, LM317, Line regulation, Load regulation, Crowbar protection.

Tutorial:

1. Specification of 741, 356, 308, 311.
2. Fabrication of IC's using thin film techniques.
3. Fabrication of IC's using VLSI techniques.
4. Simulation of Band Pass filter using Electronics workbench.
5. Study of different OP AMP's.

Text Book:

1. Op-Amps and Liner Integrated circuits Ramakant Gayakwad.

Reference Books:

1. Integrated electronics Millimann and Halkias
2. Integrated Circuits K. R Botkar
3. Linear Integrated Circuits-Analysis Design and Applications, By B. Somanathan Nair,Wiley

PRACTICAL LIST (Minimum 5)

1. Design of regulated Dual power supply with IC 7815 & 7915 and external pass transistor.
2. Measurement of Op Amp parameters (Input bias current, Input offset current, Input offset voltage, slew rate and band width).
3. Op Amp as Differentiator and Integrator.
4. Op Amp as active filter (LPF, HPF & Twin T filter)
5. Wave shaping circuits using Op Amps (Sine Square Triangular Saw tooth).
6. Use of Op Amp as comparator and Schmitt trigger.
7. NE555 Astable operation.
8. NE 555 Monostable operation.
9. PLL capture and lock range design.

SEMESTER IV

PAPER 1: DIGITAL ELECTRONICS

FLIP-FLOPS: **6**

RS, Clocked RS, D- Flip-Flop, T- Flip-Flop, Edge Triggered D- FF, JK FF, Race around condition, JK/MS FF, Switch Debouncer.

SHIFT REGISTERS: **4**

SISO, SIPO, PISO, PIPO, Shift left, Shift right, Ring Counter, Twisted ring Counter (Johnson Counter).

COUNTERS: **7**

Asynchronous Counter, Up counter, Down counter, Up-Down counter, Three stage and Four stage counters with decoding gates, Decade counter, Modulus of a counter Design of Mod 3, Mod 5 and Mod 10 (2 X 5) counter, Synchronous counters, Up counter, Down counter, Updown counter, illegal states, Synchronous decade counter, Digital Clock.

CODE CONVERTERS: **3**

Binary to Gray, Gray to Binary, Binary to BCD, BCD to 7-segment decoder.

DECODERS: **5**

1-16 Decoder, BCD-Decimal Decoder, Seven Segment decoder, Decimal- BCD Encoder, Multiplexer / Demultiplexer 16-1 Multiplexer, Nibble Multiplexer, 1 to 16 Demultiplexer, Standard IC Multiplexer / Demultiplexer.

DATA CONVERTER: **7**

D/A converter, weighted resistor, R-2R ladder, , A/D converters, Successive approximation counting, Dual slope, Parallel comparator, Standard ADC & DAC converters, ADC 08, ADC 0801, DAC 0808, AD570.

SEQUENTIAL MACHINE: **5**

Basic model of sequential machine. Minimization, General procedure for analysis and synthesis of synchronous sequential circuits.

Tutorial:

1. Advantage of Asynchronous.
2. Design of Mod-9 Down counter.
3. Analysis of Digital clock Accuracy.
4. Difference between Sequential and Combinational circuit.
5. Study of Flash AD converters.

Text Book:

1. Modern Digital Electronics (4th Edition) R.P Jain (TMH)

Reference Books:

1. Digital Principles and Applications Marivo and Leach (TMH)
2. Digital Circuits Theodare Bogart McGraw Hill
3. Introduction to Logic Design Allan B. Marcowitz., (TMH).
4. Introduction to Digital Electronics Naschelsky

LIST OF PRACTICAL (Minimum 5)

1. Study of DA converter with R2R Ladder network.
2. Study of AD converter (counter type)
3. Study of Encoders and Decoders.
4. Study of Multiplexer and Demultiplexer.
5. Study of RS & JK flip flops, Converting JK to D and T flip flops.
6. Study of JK MS FF.
7. Decade Synchronous UP counter.
8. Study of shift register (4 modes) and Johnson counter.

PAPER 2: INDUSTRIAL ELECTRONICS

Introduction SCR: **6**

Constructional Features, Two Transistor Analogy, Physical Operation of SCRs, SCR Terminology, DIAC and TRIAC (Construction, working principle and I-V characteristics), choice between TRIAC and SCR

SCR Control Techniques: **10**

Methods of Turning On of SCRs, Methods of Turning Off of SCRs, Methods of Triggering SCR Circuits, Methods of Forced Commutation, Comparison of SCRs and Transistors, Causes of Damage to SCRs, Preventing Damage to SCRs, SCR Crowbar Protection Circuit, Series and Parallel connections of SCRs, Triggering of series and Parallel Connected SCRs

Converters: **4**

Line-commutated Converter Circuits: Single phase half & Full wave converters for resistive and inductive load, Single phase Full wave half and full controlled bridge rectifier.

INVERTERS, DUAL CONVERTERS, CYCLOCONVERTERS **9**

Line commutated inverter (single phase), forced commutated inverters, Single-phase Dual Converter, Single phase cycloconverter (mid-point and bridge configuration), Advantages and disadvantages of cycloconverter

MOTOR CONTROL: **9**

Phase Control of DC motors (shunt wound and series DC motors), Stepper motors- Variable Reluctance (VR) Stepper Motor, Bipolar Stepper Motor, PMH Stepper Motor, Synchro transmitter, Servomechanism, Positioning Servo System Using Control Synchro

Power supplies and Conditioner: **7**

Principle of Buck-boost Control, Servo-controlled Voltage Stabiliser, CVT (principles and operation), UPS (Offline, online and line interactive) , principles and operation, SMPS principles and operation.

Tutorials:

1. Study of SCR Trigger dimmer circuit.
2. Study of SCR as Rectifier.
3. Study of Stepper motors details.
4. Study of online UPS.
5. Study of CVT.

Text Books:

1. Power electronics by M.D. Singh and K.B. Khanchandani TMH
2. Industrial Electronics and Control by Biswanath Paul PHI

References:

1. Power Electronics by Rashid and Rashid PHI
2. Power control by P.S Bhimbhra**,** Khanna Pub.
3. Control systems by A. Nagoor Kani , RBA publications

LIST OF PRACTICAL **(Minimum 5)**

1. Design of regulated power supply using IC 317 with pass PNP transistor.
2. Characteristics of SCR.
3. Power controller with SCR.
4. Characteristics of TRIAC & DIAC.
5. Use of UJT for Power control.
6. Study of SMPS.
7. Illumination control using TRIAC.
8. Stepper Motor Control using Shift register.
9. Assembling of UPS modules

Third Year B. Sc.
SEMESTER V

PAPER 1: MICROPROCESSOR AND ITS APPLICATIONS

Introduction : **5**
History of microprocessor, calculators, semiconductor technologies, from large computers to single-chip microcontrollers, block diagram of a microprocessor based and its description.

Organization 8085: **8**
Pin layout of 8085 and the function of each pin, internal architecture, demultiplexing of the bus, generating control signals, registers, modes of addressing, timing diagram for MOV and MVI instructions, 8085 serial I/O lines: SOD and SID.

Assembly Programming: **8**
Instruction classification, instruction format, programming techniques- looping counting and indexing, simple programs based on data transfer, sorting arithmetic operations, counters and time delays.

Stack and subroutine: **4**
PUSH, POP, CALL and RET instruction, use of stack and subroutine.

Basic of Interrupts: 8085 **5**
INTR, RST 5.5, RST 6.5, RST 7.5 & TRAP, their Priorities and implementation, important of SIM and RIM instruction, DMA transfer- HOLD and HLDA

Memory and basic Interfacing concept: **6**
Classification of memory and recent advances, memory map and addresses, basic concept in memory interfacing, interfacing I/P and O/P devices using decoders, memory mapped I/O and peripheral mapped I/O, bus contention.

General Purpose programmable devices: **8**
IC 8255 A, Block diagram, control words, programming only in BSR mode, MODE 0 and MODE 1, IC 8254, Block diagram, control words, programming only in BSR mode, MODE 0 and MODE 3, Block diagram and application of IC 8259, 8257 and 8279.

Trends in microprocessor technology: **3**
Advance version of INTEL Microprocessors, RISC processors,

Tutorials:

1. History of Intel microprocessor till 8085.
2. Study of co-processor.
3. Study of static memory chip.
4. Difference between microprocessor and microcontrollers.
5. Study of RISC and CISC Processors

Text Book:

1. Intro to Architecture, Hardware and programming with 8085 -R. Gaonkar,3rd Ed (PHI).

References:

1. Microprocessor Architecture, programming and Applications Tawade & Borole Technova pub
2. Microprocessor interfacing Douglas Hall (TMG)

PAPER 2: ANALOG COMMUNICATION

INTRODUCTION TO COMMUNICATION SYSTEMS: **5**

Information, Transmitter, Channel, Noise, Receiver, Modulation, Need of Modulation, Bandwidth Requirements, Frequency Spectra of Non-Sinuisoidal waves.

NOISE: **8**

Thermal Noise and Noise Calculation, Shot Noise, Partition Noise, Flicker Noise, S/N Ratio, Noise Factor and Noise Temperature.

AMPLITUDE MODULATION SYSTEMS: **10**

Basic Principles, Mathematical Representation, Frequency Spectrum, Power & Current Relation Generation of AM- Transistor modulator, Demodulation- Diode Detection.

SIDEBAND TECHNIQUES:

DSB, DSBSC, SSB, Supression of carrier, balanced modulator, unwanted side-band suppression- Filter Method and Phase Shift Method.

ANGLE MODULATION SYSTEMS: **8**

Frequency Modulation: Basic concept, Mathematical representation, Frequency spectrum, Average Power relation, Phase modulation: basic concepts, comparison between FM and PM, Comparison between AM & FM, FM Generation, FM Methods: DIRECT METHOD- Basic Reactance modulator, Varactor diode modulator, INDIRECT METHOD: Armstrong FM System, Phase Locked Loop FM Demodulator, Pre-Emphasis and De-Emphasis.

TRANSMISSION LINES: **5**

Introduction, Transmission line, Constants, Characteristic impedance, propagation constant, Sstanding waves & SWR.

PROPAGATION OF WAVES: **4**

Ground waves, Sky wave propagation – Ionosphere, Space waves, Troposphere scatter propagation, Extraterrestrial communication.

ANTENNA SYSTEM: **4**

Principles of Radiation, Isotropic radiator, Hertzian dipole, Antenna gain, Directivity, Antenna Array- Broad-Side and End-Fire, Yagi-Uda Antenna, Radiation resistance.

Tutorials:

1. Study of Akashwani Panaji Modulations and spectrums.
2. Case study of Radio Mirchi Channel.
3. Study of MW region of Power transmission station of Goa.
4. Frequency spectrum of Education transponder in India.
5. Study of DTH and advantages.

Text Book:

1. Electronics Communication Systems, George Keneddy TMH

Reference Books:

1. Taub and Schilling, ' Principles of Communication System ', Tata McGraw Hill, New Delhi, 1995.
2. A.Bruce Carlson et al, 'Communication Systems, McGraw-Hill Int., 4th Edition, 2002.
3. Roddy and Coolen, ' Electronic Communication ', Prentice Hall of India, New Delhi, 4th Edition, 1998.
4. Simon Haykins, ' Communication Systems ', John Wiley, 4th Edition 2001.
5. B.P Lathi, "Modern Digital and analog communication systems", 3rd Edition, Oxford University press 1998.
6. B.P lathi, " Communication systems", BPB publication 1968. reprint 2001.

PAPER 3: OBJECT ORIENTED PROGRAMMING

Introduction to software **5** **5**

Problem solving approach, flowcharts, algorithm, program development cycle. Evolution of programming paradigms: monolithic programming, structured programming, object oriented programming, structured v/s object oriented development.

Data types, Operators and expressions **4** **4**

Introduction, character set, tokens, identifiers and keywords, variables, data types and sizes, variable definition, variable initialization, characters and character strings, operators and expressions, qualifiers, arithmetic operators, relational operators, logical operators, bitwise operators, compound assignment operators, increment and decrement operators, conditional operator(ternary operator), special operators, typedef statement, constants, enumerated data types, macro functions, operator precedence and associativity.

Control flow **7**

Introduction, statements ad block, if statements, if-else statements, nested if-else statements, for loop, while loop, do-while loop, break statement, switch statement, continue statement, goto statement.

Arrays and Strings **4**

Introduction, operations on arrays, multidimensional arrays, strings, string manipulators, arrays of strings.

Functions **7**

Function components, passing data to functions, function return data type, library functions, parameter passing, return by reference, default arguments, inline functions, function overloading, function templates, arrays and functions, scope and extent of variables, storage class, recursive functions.

Structures and Unions **3**

Structure declaration, structure definition, accessing structure members, structure initialization, nesting of structures, array of structures, structures and functions, structures and encapsulation, unions, differences between structures and unions, Bit fields in structures.

Pointers **4**

Pointers and their binding, declaration, address operator &, pointer variable, void pointers, pointer arithmetic, pointers to pointers, array of pointers, pointers to functions, pointers to structures.

Classes and Objects **8**

Introduction, Class specification, Accessing class members, defining member functions, making an outside function inline, nesting of member functions, private member functions, arrays within a class, memory allocation for objects, static data members, static member functions, array of objects, objects as function arguments, friendly functions, returning objects, constant member functions, pointers to members.

Concepts of **8**

1. **Constructors and destructors:** Constructors, Parameterized constructors, multiple constructors in a class, constructors with default arguments, copy constructors, destructors.
2. **Operator overloading:** Defining operator overloading, overloading unary operators, overloading binary operators.
3. **Inheritance:** Defining derived classes, single inheritance, making a private member inheritable, multilevel inheritance, hierarchical inheritance, hybrid inheritance, virtual base classes, and abstract classes.
4. **Pointers, Virtual Functions and Polymorphism:** pointers to objects, this pointer, pointers to derived classes, virtual functions.

Tutorials:

1. Identify the reasons for popularity of C & C++ Language.
2. Write C++ a program to demonstrate polymorphism.
3. Write C++ a program to demonstrate overloading.
4. Write C++ a program to demonstrate inheritance
5. Write C++ a program to demonstrate Array multiplication.

Text Book:

1. Object oriented programming with C++ E. Balaguruswamy TMH
2. **REFERENCE BOOKS:**

1. Mastering C++ K. R. Venugopal, Rajkumar, T. Ravishankar TMH
2. Programming with C++ D. Ravichandran TMH

PAPER 4: TRANSDUCERS AND INSTRUMENTATION

QUATITIES OF MEASUREMENTS: **06**

Introduction, Performance Characteristics, Static characteristics, Error in measurement, Types of Error, Sources of Error, Dynamic characteristics, Statistical analysis, Standard, Atomic frequency and time standards.

TRANSDUCER: **15**

Electrical transducer: Characteristics, advantages, Selecting a Transducer, **Resistive Transducer:** Potentiometer, Resistance pressure transducer, Resistive Position Transducer, Resistance thermometer. **Strain Gauges:** Resistance wire Gauge (Unbonded and Bonded), Foil strain Gauge, semiconductor strain Gauge. **Inductive transducer:** Change in self inductance with number of turns and with change in permeability, Variable reluctance type transducer, Differential output Transducer, LVDT, Pressure inductive transducer, Capacitive Transducer (pressure), Load cell (Pressure Cell), Piezo Electric Transducer, **Photoelectric transducer:** Photomultiplier tube, Photocells, Photo-Voltaic cell, Semiconductor Photodiode, Phototransistor. **Temperature Transducer:** Thermocouple, Thermistor, RTD. Magnetic flow meters.

SIGNAL CONDITIONING: **08**

Introduction, **Basic Instrumentation amplifier:** Instrumentation amplifier, Instrumentation system, Instrumentation amplifier using Transducer Bridge. Chopped and Modulated DC Amplifier. **Modulators:** Synchronous Modulator and Demodulator, Solid state Modulator/ Demodulator Circuit. **Types of Active filters:** Butterworth, Chebyschev, Bessel & Elliptic.

DATA DISPLAY AND RECORDING SYSTEM: **06**

Oscilloscope: Basic principle, Block diagram of oscilloscope, **Types of CRO:** Principles of Dual beam and Dual trace Oscilloscope, Analog storage Oscilloscope, DSO, Q meter, LCR Bridge.

TEST & MEASURING: **09**

Signal Generator and Signal Analyzers: A.F Sine & Square Wave Generator, Function generator, Pulse Generator, Sweep Frequency generator.

Wave Analyzers: Basic wave analyzer, Frequency Selective Wave Analyzer, Heterodyne Wave Analyzers. Harmonic Distortion Analyzers, Spectrum Analyzers, Logic Analyzer.

Digital Instruments: Digital Voltmeters: Ramp type DVM, Dual Slope integrating type DVM, Staircase Ramp Type, Successive Approximation DVM, $3^{1/2}$ Digit, Resolution & Sensitivity of Digital Meters, Digital Multimeters.

Text Book:

1. Electronics Instrumentation by H. S. Kalsi , 2nd Edition, Tata Mc Graw Hill, 2nd Edition

Reference Books:

1. Industrial Instrumentation by K. Krishnaswami and S. Vijayachitra, New Age Int. Pub.
2. Measurement, Instrumentation and Experiment Design in Physics and Engineering by Michael Sayer and Abhai Mansingh, PHI Ltd, 2008

Paper 5: PRACTICAL – I
(N.B. : 1.There shall be minimum five experiments in hardware and 5 in software; 2. Practical's from Paper 1+ Paper 2; 3. *indicate the hardware experiment.)

1. Multiplication of two one-byte numbers.
2. Division of 2 sixteen-bit numbers.
3. Multi-byte BCD addition.
4. Subtraction by two's complement.
5. Addition of 16 bit numbers.
6. Conversion of Hexadecimal to decimal numbers
7. Program to sort out numbers (Ascending & Descending).
8. 8253 counter in mode 0 & mode 3.
9. Digital clock display on up kit.
10. Amplitude modulation and Demodulation*.
11. Frequency modulation and Demodulation*.
12. Programming 8255 for control of Stepper motor*.
13. Interfacing of traffic light controller using 8255*.
14. Analog multiplexer*
15. Sample and Hold Circuit*.
16. Waveform generator using 8255 Triangle and Square*.

Paper 6: PRACTICAL – II
(N.B: 1.There shall be minimum 5 experiments in hardware and 5 experiments in software. *indicate the hardware experiment.)

1. Programming for polymorphism.
2. Programming for Inheritance.
3. Programming for Overloading.
4. Programming for Functions and Subroutines (simple arithmetic operation such as additions, subtractions, multiplication's, and division.)
5. Sine function computation.
6. Keyword searching in a Text.
7. A program to find the number of characters in a given string using pointer method.
8. A program to demonstrate how a private data of a base class is accessed by the public member functions of the derived class through friend class declaration.
9. A program to display the message of constructors/destructors of a base and a derived class.
10. Instrumentation amplifiers*
11. Temperature control using thermistor*
12. LVDT displacement sensor*
13. Ultrasonic sensor for ranging*
14. Sound transmission using optical technique*
15. Street Light control using LDR.*
16. Application of Solar cells.*

SKILLED BASED COURSE IN ELECTRONIC
Paper I: COMPUTER HARDWARE AND MAINTENANCE

Block diagram of a computer: **6**

Types of Computers, mother board, Power supply, various connectors, floppy disk drive, hard disk drive, CDROM, CDWRITER, DVD drives, I/O ports and devices.

Peripherals: **5**

Keyboard, mouse, modem, Scanners, printers, SCSI drives.

FIRMWARE: **5**

BIOS/ CMOS settings, Disk manager, partition magic, NDD, Antivirus. **4**

PC assembling: Maintenance and troubleshooting

Operating systems: **10**

Operating system basics, DOS fundamentals and basic commands, creating startup disk using DOS, FDISK Command, FAT and NTFS Partitions, FORMAT Command, Installing and configuring windows XP, Disk and storage management, Overview of Linux, Installing and configuring LINUX, configuring and installation of hardware devices.

Basics of Computer Networking: **10**

Overview of networking, Networking components, Networking hardware, Transmission Media, LAN Topologies, Installing cabling, Ethernet, TCP/IP, IP addresses, TCP/IP services.

Reference:

1. Troubleshooting, Maintaning and Repairing PC's – Bigelows

Paper II: MICROSOFT WINDOWS 2003 SERVE

Introduction: **8**

Introduction to windows 2003 server, installation and configuration of windows 2003 server, user and group management, NTFS & share permissions, using device manager, drivers signing and signature verification, Managing ports, Installing and managing and configuring printers,

Disk management: **4**

Disk management tools and tasks, file system user management, installing active directory,

User management: **8**

Domain user account, configuring user account properties, domain groups, viewing a user's effective permissions, creating and managing shares, implementing files and folder NTFS and share permissions, special permission, inheritance, implementing shadows copies, implementing and managing the distributed file system, auditing access to resources,

Networks: **1**

Installing and configuring terminal services, managing servers remotely, using terminal services, backup restoring data, installing DNS, implementing DNS in windows 2003 networks, installing and configuring DHCP, monitoring and Managing internet information services(IIS 6.0), remote access and VPN overview, remote access services, routing services, ICS, active directory services, implementing active directory services forest, planning implementing an OU structure, implementing server roles, restoring active directory,

Security Policy: **5**

Local and domain security policy, configuring the user environment by using group policy, deploying software through group policy.

Reference:

1.Windows Server 2003 Network Infrastructure. J.C. Makin and Ian Mclean PHI
2. Windows Server 2003-A beginners Guide. Don jones Wiley publishing Inc.

Paper III: INDUSTRIAL AUTOMATION (SCADA, PLC & HMI)

PLC(programmable logic Controller) **12**

Introduction to PLC hardware, Architectural evolution of PLC, Role of PLC in Automation, Introduction to field devices attached to PLC, PLC fundamentals (block diagram), Details about PLC components, Power supply, CPU, I/O modules, Various range available in PLC, Types of I/O, Addressing concepts, Hands on experience on writing programs

SCADA (supervisory Control and Data Acquisition) **8**

Creating a new SCADA application, Creating database of tags, Creating and editing graphic display with animation, Creating real time and historical trend, Creating Alarms and events, Writing logic through script, Alarm management

HMI **10**

Programming techniques for Text display, Variable parameter display, Setting Alarm messages, Pages generation, Sequence of pages, Graphic display

AC DRIVES **10**

Basic principle of AC drives, Programming of AC drives, Configuration of parameters Communication with PLC,HMI, Study of different operation methods, Case study of different application drives in industry, Trouble shooting

Reference:

1. Programmable Logic Controllers and Industrial Automation-An introduction Madhuchhanda mitra & Samarjit sen Gupta. Pernem International publishing (india) Pvt. Ltd.

SEMESTER VI

PAPER 1: Microcontrollers: Theory and Applications

1. Introduction to Microcontrollers — 3

Introduction, Microcontrollers and microprocessors, History of microcontrollers, CISC and RISC processors, Harvard and Von Neumann architecture, Commercial microcontroller devices, An overview of Embedded system

2. MCS 51 Microcontroller — 5

Features of 8051, 8051 architecture, pin description, Memory organization, External Memory interfacing, Stacks, 8052 Microcontroller.

3. MCS 51 Addressing Modes and Instructions — 7

Instruction Syntax, Data types, Subroutines, addressing modes, Instruction timings, 8051 instructions.

4. MCS 51 Assembly Programming — 5

Assembly language programs, Assembler directives, Time delay calculations

5. Software Development Tools for 8051 — 2

Integrated development environment, A51 Assembler, SC51 C Compiler and Simulator, µVision C Compiler and Simulator, Burning the Hex File to Program Memory.

6. MCS 51 Parallel I/O Ports — 15

Basic I/O Concepts, Port Operation, Interfacing Push Button Switches and LED's, Interfacing Matrix Keyboard, Seven-Segment Display, Liquid Crystal Display(LCD), Interfacing D/A and A/D Converter using Parallel Ports, Interfacing Serial A/D Converter, Interfacing Stepper Motor and DC Motor.

7. MCS 51 Interrupts and Timer/counters — 8

Basics of Interrupts, 8051 Interrupt Structure, timers and counters, 8051 Timers/Counters, Timer/Counter Operation Modes, Programming 8051 Timers.

8. MCS 51 Serial Communication — 5

Data Communication, Basics of Serial Data Communication, 8051 Serial Communication, Serial Communication Modes, Serial Communication Programming, RS232 interface.

Text Book :

1. 8051 Microcontroller Hardware Software and Applications- V Udayashankara and M S Mallikarjunaswamy- TMH

Reference Books :

1. The 8051 Microcontroller and Embedded systems- M.A.Mazadi, J.G.Mazadi & R.D.McKinlay - pearson PHI.
2. The 8051 Microcontroller – K.J.Ayala – Thomson.
3. Microcontrollers : Theory and Applications – Ajay Deshmukh –TMH

4. Exploring C by Parab Et al Springer 2007.

Software Platform:

SC51 C compiler or Kiel µVision C Compiler and Simulator.

PAPER 2: DIGITAL COMMUNICATIONS AND COMPUTER NETWORKS

Pulse Communication **6**

Basic Principle of generation and detection of pulse modulated signal-PAM, PTM, PWM,PPM and definition of sampling theorem.

Digital Technology **6**

Pulse code modulation principle, PCM generation, Quantization and Noise consideration, Pre & De Companding , Advantage's and Applications of PCM , Delta Modulation, Differential PCM , Binary ASK, FSK, BPSK-Principles and Techniques.

Information Theory **5**

Fundamentals, measurements of information, Binary digits (bit), Coding, Baudot code, Hartley Law, Noise in an information caring channel, Capacity of noisy channel-Shannon theorem, redundancy.

Data Communication System: **6**

Comparison of analog and digital signal, Basic digital Communication system, Synchronous and Asynchronous transmission, Emergency of data communication system, characteristics of data, transmission circuits, BW requirements, data transmission speech, Noise, crosstalk.

Modem **4**

Introduction, modes of modem operation – Simplex, Half Duplex, Full Duplex, Modem interconnection, data Transmission speed, Modem interfacing, RS232 interface, Information about RS 422, 423, 488.

MOBILE COMMUNICATIONS: **7**

GSM, GPRS, CDMA, WLL, GPS, Hopping Techniques.

NETWORKS AND CONTROL CONSIDERATION: **14**

OSI – Physical layer : Transmission Media, Datalink Layer: Data link layer design issues & Error detection and correction, Medium Access Sublayer ; Multiple Access protocols, Network Layer : Network layer design issues, Routing Algorithm, Transport Layer: Transport Service & Elements of transport Protocol, Application Layer – Network Security. TCP/IP Layers. Centralized switching, store and forward, circuit switching, packet switching, network protocols- protocol phases, poling protocols, contention protocols, character insertion.

Tutorials:

1. Compare the OSI and TCP /IP Model.
2. Sampling theorem analysis for 0Hz – 100Hz Base band signal.
3. Study of Internal and External Modem.
4. Simulation of PWM by Electronics Workbench.
5. Simulation of ASK by Electronics Workbench.

Text Book :

1. Electronics Communication Systems, George Keneddy TMH
2. Computer Networks By A. Tennaunbaum.

Reference Books:

1. Simon Haykins, "Digital Communications", John Wiley, 1988
2. Electronic Communication, Dennis Roddy & John Coolen
3. John.G .Proakis, 'Digital Communication', Mc Graw Hill Inc., Third edition, Malaysia, 1995.
4. M.K.Simen, 'Digital Communication Techniques, Signal Design&Detection', Prentice Hall of India, 1999

PAPER 3: OPERATING SYSTEMS

Operating Systems Overview: **10**
Operating System Objectives and Functions, Evolution of operating systems, Major Achievements, characteristics of Modern Operating Systems.

Processes: **Process Description and Control:** **10**
Process states, Process description, Process control. **Threads, SMP and Microkernels**: Processes and Threads, Symmetric Multiprocessing, Microkernels.

Concurrency : Mutual Exclusion and Synchronization: **10**
Principles of Concurrency, **Mutual Exclusion:** Hardware support, Semaphores, message passing. **Concurrency : Deadlock and Starvation:** Principles of Deadlock, Deadlock Prevention, Deadlock avoidance, Deadlock detection, dining philosophers problem.

Scheduling: Uniprocessor Scheduling : **10**
Types of Processor Scheduling, Scheduling Algorithms**. Multiprocessor and Real Time Scheduling:** Multiprocessor Scheduling, Real Time Scheduling.

Embedded/ Real Time Operating systems: **8**
Categories of Embedded Operating systems (Chapter 1), Overview of Embedded/ Real Time Operating systems concepts.(Chapter 7)

MicroC/OS – II, The Real Time Kernel: **8**
Kernel Structure , Task Management.

Textbook:
1.Operating Systems – William Stallings – Fourth Edition, Pearson Education(Chp 1 to 4)
2. Embedded / Real Time System – Dr. K.V.K.K Prasad , DreamTech Pub (Chp 5)
3. MicroC/OS – II, The Real Time kernel – Jean J. Labrosse ,Second Edition, CMP Books (Chp 6)
Reference:
1.Operating Systems Principles : Silberchatz, Galvin- Fifth Edition, Addison Wesley

PAPER 4: PHARMACEUTICAL & BIO-MEDICAL INSTRUMENTATION

PHARMACEUTICAL INSTRUMENTRATION:
Ph-meter: Analog & Digital Ph- meter, **Chromatography:** Gas Chromatograph, Liquid Chromatography, IR Spectrophotometer, Mass Spectrophotometer. **06**

CHEMICAL SENSORS:
Field Effect Transducers (ISFET, IMFET), **Blood Glucose Sensor:** Glucose Oxidase Enzyme, Optical Approach, **Oxi meter:** In Vitro & In Vivo Oximetry. **06**

FUNDAMENTALS OF BIOMEDICAL INSTRUMENTATION:

Physiology system of body: Cardiovascular System, Respiratory System, Nervous system, Basic transducer principles, Sources of biomedical signals, Basic medical instrumentation system, General constraints in design of medical instrumentation system, Various types of Transducers for Biomedical Applications. **07**

BIOELECTRIC SIGNALS & ELECTRODES:

Sources of Bioelectric Signals, ECG, EEG, EMG. Skin contact impedance, Electrodes for ECG,EEG and EMG, Electrical conductivity of electrode jellies and creams, Microelectrodes. **09**

BIO- MEDICAL INSTRUMENTS:

Bio-Medical Recorders: Block Diagram of Electrocardiography, Electroencephalography & Electromyograpy, Concepts & Principles of In-direct blood pressure Measurement, Chamber plethysmography, Cardiac Pace Maker. **10**

NON-INVASIVE DIAGNOSTIC IMAGING:

Block diagrams of X-Ray & Computed Tomography, Concepts & Principles of Magnetic Resonance Imaging, Nuclear Magnetic Resonance and Ultrasound. **06**

Text Books:

1. Handbook of Analytical Instruments by R.S. Khandpur, TMH, 2nd Edition.
2. Handbook of Biomedical Instrumentation by R.S. Khandpur, TMH, 2nd Edition.
3. Medical Instrumentation- Application & Design, By John Webster, 3rd Edition.

Reference Books:

1. Biomedical Instrumentation and Measurements By Leslie Cromwell, Fred J. Weibell Erich A. Pfeiffer PHI (2nd Edition)
2. Instrumental methods of Chemical Analysis by E.W. Ewing.
3. principles of applied biomedical instrumentation by Goddes & Baker, John Wiley
4. Medical Electronics and Instrumentation by sanjay Guha, university publication
5. Biomedical Instrumentation by M. Arumugam, Anuradha agencies

Paper 5: PRACTICAL - I

(N.B. : 1.There shall be minimum 5 experiments in each category)

Software

Assembly Language Practicals.

1. Write a Program to generate a square wave of 50 Hz frequency on pin P1.2 using interrupt for timer.

2. Write a Program to connect INT 1 pin to a switch that is normally high whenever it goes low LED should turn ON which is connected to P3.2 & LED is normally OFF. LED should be ON as long as switch is pressed.

C Language Practicals

1. To develop and execute the program to interface 16X2 LCD display to the Microcontroller 8051

2. To develop and execute the program to demonstrate serial communication, using RS-232C standard, for the Microcontroller 8051.

3. To develop and execute the program to interface stepper motor to the Microcontroller 8051.

4. To develop and execute the program to interface ADC 0809 to the Microcontroller 8051

5. Assume 1 Hz. Frequency pulse is connected to I/P P3.4 Write a Program to display count on LCD
Hardware
6. PWM *
7. PPM*
8. PAM / PCM*
9. ASK *
10. FSK*
11.Study of Network topology and network components*
12. Study of Mobile Communications.*
13.NS 2.0 Simulator-I*

Paper 6: PRACTICAL – II
(N.B: 1.There shall be minimum 5 experiments in hardware and 5 experiments in software. *indicate the hardware experiment.)

1. Shell Programming 1
2. Shell Programming 2
3. Shell Programming 3
4. Socket Programming 1
5. Socket Programming 2
6. RTOS-1
7. RTOS-2
8. Study of Bio-Medical ECG*
9. Study of Bio-Medical EEG*
10. Study of Bio-Medical EMG*
11. Study of Bio-Medical Electronics Pressure meter*
12. Study of Bio-Medical Glucometer*.
13. Generation of Sine and Triangle using XR 2206*.
14. Use of Monoshot using 555 for pulse generation*.
15. Construction of Analog Ph Meter using Opamp.*
16. Construction of Heart beat Monitor.*

PAPER 7: ELECTRONICS PROJECT: PROJECT TITLE IS EXPECTED TO BE FINALIZED AT THE BEGINNING OF THE FIFTH SEMESTER TO BE COMPLETED AT THE END OF SIX SEMESTERS . PROJECT SHOULD CONSIST OF EITHER DEVELOPMENT / SIMULATION OF ELECTRONICS SYSTEMS WHEREIN STUDENTS HAVE SCOPE TO UNDERSTAND, ANALYZE AND HAVE HANDS ON TRAINING IN THE FIELD OF ELECTRONICS. THE PROJECT MAY BE UNDERTAKEN IN ASSOCIATION WITH LOCAL INDUSTRIES.

Guideline for scheme of Evaluation at T.Y.B.Sc :

1. CIA – 20Marks: This could be a class test, quiz, Seminar, tutorials, Problem solving
2. ESA-80 Marks: Objectives(10 short questions of 2 marks each to test the understanding of subject from entire syllabus, four out of six long answer type questions of 15 marks each. Each 15 marks question is further split into 10marks theory and 5 marks problem)

ANNEXURE II

GOA UNIVERSITY
ELECTRONICS PROGRAM
CREDIT BASED SYSTEM

Semester I				
Sr. No	**Course code**	**Title**	**Credits**	
1	ELC101	MICROELECTRONICS AND VLSI DESIGN	4	
2	ELC102	NUMERICAL COMPUTATION AND ALGORITHMS	4	
3	ELC103	EDA TOOLS-I	4	
4	ELC104	ELECTRONICS PRACTICALS – I		
5	UEL101	ADVANCED DIGITAL COMMUNICATION SYSTEMS	4	
		Total	20	
Semester II				
1	ELC201	EMBEDDED SYSTEMS DESIGNS	4	
2	ELC105	OPERATING SYSTEM AND RTOS	4	
3	ELC202	OPTICAL COMMUNICATION SYSTEMS	4	
4	ELC203	ELECTRONICS PRACTICALS- II	4	
5	UEL102	MICROPROCESSORS ARCHITECTURES AND PROGRAMMING	4	
		Total	20	
Semester III				
1	ELC204	INSTRUMENTATION & CONTROL THEORY	4	
2	ELC301	ELECTRONICS PRACTICALS - III	4	
3	ELD201	SIGNALS AND SYSTEMS	4	
4	ELD202	DIGITAL SIGNAL PROCESSING	4	
5	ELD301	DIGITAL SYSTEM DESIGN USING HDL	4	
6	ELD302	EDA TOOLS-II	4	
7	UEL103	INDUSTRIAL TRAINING, MINI-PROJECT AND SEMINAR	4	
		Total	20	
Semester IV				
1	ELD401	ELECTRONICS PRACTICALS - IV	4	
2	ELD203	NANOELECTRONICS & NANOSYSTEMS	4	
3	ELD303	LASER SYSTEM ENGINEERING	4	
4	ELD402	PROJECT	8	
5	UEL104	PHARMACEUTICAL INSTRUMENTATION	4	
6	UEL105	COMMUNICATION AND TECHNICAL SKILLS	4	
		Total	20	

Semester I

ELC 101: MICROELECTRONICS AND VLSI DESIGN

An overview of VLSI, Modern CMOS Technology	**4**
Silicon Logic, Logic design with MOSFET.	5
Physical structure of CMOS Integrated circuits	4
Fabrication Technologies of CMOS Integrated Circuits	7
Elements of Physical Design	3
Electrical characteristics of MOSFETS	6
Electronic analysis of CMOS Logic gates	5
Advanced Techniques in CMOS Logic Circuits	6
System specifications using HDL, General VLSI components	4
Memories and Programmable Logic	4
VLSI Clocking and System Design	4
Reliability and Testing of VLSI circuits	4

Tutorials:

1. 2^{nd} order Butterworth filter using P-Spice student version.
2. Current Mirrors using P-Spice student version.
3. CMOS based Op-Amp using P-Spice student version.
4. Study of Lithography.
5. Compares various Static memories.

Reference Books:

1. Introduction to VLSI Circuits and Systems, John P. Uyemura, WILLEY.
2. Principles of CMOS VLSI Design, N.H.E. W. & Eshahiraghian, Addison Wesley
3. Modern VLSI Design System on Silicon, Pearson Education Asia. By W. Wolf.
4. VLSI Technology, S.M. Sze, McGraw-Hill (1995).
5. Basic VLSI Design, Douglas Pucknell, K. Eshraghian, Prentice Hall India.

ELC 102: NUMERICAL COMPUTATION AND ALGORITHMS

Computer Programming: **08**

Introduction to Algorithms, Elements of Computer Programming language Basics of algorithm design, general model, Dynamic programming model, principle of optimality, backtracking models.

- Algorithm order and complexity
- Backtracking example.

Data Structures:

Introduction to Data Structures, Vectors and Lists, Binary Trees, Graphs, Hashing. **10**

- Implementation of Shortest path algorithm
- Implementation of binary tree

Theory of Numerical programming: 25

Theory of numerical errors, Numerical Integration: Trapezoidal & Simpsons rule, Romberg

method, Improper integrals; Numerical Solution of linear equations: Guass-Jordon elimination and Lu decomposition, Numerical Solutions of nonlinear equations: Bracketting, bisection,Secant & Regulafalsi method, Newton-Ralphson method; Numerical Solutions to Ordinary differential equations: Runge-Kutta method, Modified midpoint method, Richardson extrapolation.

- Trapezoid methods, Newtons Raphson methods
- Bisection and Regular falsi methods
- Runge Kutta

Database: 06

Basic Concepts, Relational Data Model, Database Design, DBMS storage structures and access methods, Query Processing, Transaction Processing, Security & Integrity, Distributed Databases, Client Server Computing.

- SQL for database
- Client Server data base query

Tutorials:

1. Implementation of Vector in C++.
2. Implementation of List in C++.
3. Implementation of minimum path algorithms in C++.
4. Simple Example of Database querying in C++.
5. Case study on the Emerging Trends in databases (Datamining).

Reference Books:

1. Data structures using C and C++ by Yedidyah Langsam, Moshe J Augenstein, Aaron M Tenenbaum, Prentice Hall of India, 1995
2. Data Abstraction and Problem solving in Java by Frank M Carrano, Janet J Prichard ,Addison-Wesley, 2001
3. Numerical Recipes in C, William H. Press, Brain P. Flannery, William T. Vetterling, Saul A. Teulosky, Cambridge University Press, 1990.
4. Numerical Mathematical Analysis, J. B. Scarborough, Oxford and IBM Publishing Company (1979).
5. Numerical Recipes in C: The Art of Scientific Computing by William H Press, Brian P Flannery, Saul A Teukolsky - Mathematics – 1992.
6. Fundamentals of Database Systems, 4th Edition by R Elmasri, S Navathe Addison-Wesley, 2003

ELC103: EDA TOOLS-I

Study of EDA tools, EDA Structure; Various EDA tools in VLSI technologies; Bottom up (Full custom), Top Down (Standard Cell) approach; Various Simulations in VLSI EDA; Layout format (CIF, GDS), p-Spice code examples. 10

1. **Microwind /Cadence** 25
    a. 4:1 multiplexure.
    b. 3:8 decoder

c. Design Shift Registers
d. Design of Counters for digital clock
e. Memory design using 6T cell.
f. Dynamic Memory design.
g. Radiofrequency circuit.
h. Resistive circuit
i. Differential amplifier

2. p-Spice 20

a. 2nd order Butter-worth Notch Filter.
b. Clipper Circuit.
c. Buffer design using SPICE.

Ref. Book:

1. Electronic Design Automation For Integrated Circuits Handbook, by Lavagno, Martin, and Scheffer, CRC.
2. The Electronic Design Automation Handbook, by Dirk Jansen et al., Kluwer Academic Publishers
3. p-Spice manual.
4. http://www.ecircuitcenter.com/index.htm

ELC 104: ELECTRONICS PRACTICALS –I

1. Design of 4-bit UP-DOWN Counter.
2. Design of variable voltage supply @ 2 Amps.
3. Temperature Controller using 741.
4. Design of Power Amplifier 10 Watts.
5. Design of Stepper driver using Monoshot & 555 Timer.
6. Design of Function Generator.
7. DS-CDMA simulation.
8. Error detection and correction Algorithm
   a. CRC
   b. Hamming code
9. Channel Coding methods.
   a. Convolution b. Block code
10. Implementation of MSK modulation and demodulation.
11. ASK, FSK, QPSK, modulation & demodulation.
12. QPSK, modulation & demodulation.

UEL101: ADVANCED DIGITAL COMMUNICATION SYSTEMS

Introduction to Mobile and Cellular Communication Systems: Main Definitions, impact of Mobile and Cellular Radio Communication Historical overview. Fundamental of Radio Mobile and Cellular Practices Radio mobile links and cells, Frequency re-use, Principles of Cellular Com. Mobile Telephone Switching Subsystem, The mobile frequency spectrum, Hand-off, Cochannel and adjacent channel interference limitations, Near-far problem, Power Control. 6

Mobile Communication Channel including antennas: The mobile wireless propagation channel, Notions on antennas especially the near and far field concept, Line of Sight (LOS) propagation, Multipath fading and shadowing and over the horizon propagation, outdoor and Indoor Propagation, Flat and selective fading, Special antennas for base stations and

headsets, Deterministic, Empirical and Statistical Methods for propagation link computations. 12

Overview of Mobile and Cellular Radio Communication Modulation and Detection Techniques: Analog modulations and detection: AM, FM, PM, ACSB, Hybrid and Digital modulation: PCM, ASK, FSK, QPSK, QAM, MSK, etc, Coherent and noncoherent detection, C/N, S/N, Eb/No and BER relations, Probability concepts, Mobile Radio links parameters. 11

Overview of Multiple Accesses Techniques: Simplex, Duplex TDD and Time Division Duplex, Time division multiple access (TDMA) FDMA and OFDM, Code Division multiple access (CDMA), Hybrid multiple access, Management of voice, Data and Video (Multimedia) information. 08

Modern Digital Radio Systems: standards, proposals and comparisons GSM (Europe and all over the world) - TDMA, IS-54 (U.S.A.)- TDMA, IS-95 (U.S.A., Korea) CDMA-, PHS (Japan) - TDMA, Frequency Hopping (FH) (U.S.A.) - CDMA, Short Range Distance Nanocells and Picocells Systems, PCS, PCS Cordless telephone 2nd generation (CT-2), Cellular digital packet data (CDPD), and Wireless LAN, New standard trends Edge, 3rd and 4th generation beginning. 05

Mitigation Techniques for Mobile System: Overview of Natural and manmade external noise sources, Radiation hazards effects from base stations, Mobile and portable equipments. 04

Diversity Techniques for Mobile Radio Systems: Dispersive channels, Space diversity, Frequency diversity, Polarization diversity, Hybrid and quadruple diversity, Equalizer techniques 04

Trends in Mobile and Cellular Communications Multimedia: 3rd and 4th Generation. Global Mobile systems using GEO and LEO. SQSP Platforms and Terrestriel links. Novel Localization Techniques. 04

Tutorials:

1. Study of Global Positioning system working principle.
2. Study of mobile Service providers in Goa Region.
3. Study of AIR station Bambolim, Goa.
4. Study of Distance Education Infrastructure Setup (DEITE) at Goa University.
5. Study of various interfacing of mobile set eg. Bluetooth.

Reference Books:

1. Steele, R., Hanzo, L., "Mobile Radio Communication" 2nd Edition Wiley 1999.
2. Hess G.C., "Land Mobile Radio System Engineering", Artech 1997.
3. Rappaport, T.S., "Wireless Communications", J. Wiley 2nd edition, 1998.
4. Jakes WC., "Microwave Mobile Communications", J. Wiley 2nd edition 1998.
5. Vaughan, R., Bach - Anderson, J., "Propagation and Antennas for Mobile Communication" IEE Publishers 2002.

Gibson, E., "The Mobile Communications Handbook" CRC Press 2ndEdition 1999

Semester II

ELC 201: EMBEDDED SYSTEMS DESIGNS

Architectures: RISC/CISC and Harvard/Princeton Architectures(4); Types of Memories (3), Introduction to 8-bit Micro controllers (4), Timers/Counters, UART, SPI, PWM, WDT,(6)

Input Capture, Output Compare Modes,(3) I2C, CAN, Interfacing LED, Switches, ADC, DAC, LCD, RTC,(8) Emerging Bus Standards (USB, Compact PCI) ,(4) Programming in Assembly and C (GNU Tools),(5) Introduction to 16/32-bit Processors,(4) ARM Architecture & Organization, (5)ARM/THUMB Programming Model, ARM/THUMB Instruction Set, ARM Exception Handling, ARM/THUMB Assembly & C Programming (GNU Tools)(8) .

Tutorials

1. Programming of EEPROM memory.
2. Subsystem SBI.
3. Communication of SPI with RTC Chip
4. ST Series Microcontrollers study.
5. Motorola Series Microcontrollers study.

Reference Books:

1. Jivan Parab etal., Exploring C for microcontroller (Springer 2007)
2. Lipovski G. J. Single and multiple Chip Microcontroller interfacing. Prentice Hall, USA 1998.
3. Malvano W. J. Embedded microcomputer system, Brooks / Cole, USA, 1999.
4. Embedded Systems Handbook Edited by: Richard Zurawski CRC Taylor & Francis Group.
5. Embedded Systems: Architecture, Programming and Design By Raj Kamal, McGraw Hill
6. Building Embedded Linux Systems, by Karim Yaghmour, O'Reilly

ELC 105: OPERATING SYSTEM AND RTOS

6

Introduction to Computer Organization and Architecture: hardware vs software - the virtual machine concept, concept of von Neumann architecture, hardware components and functions, trends in hardware development, system configurations and classifications.

5

Process Description and Control: Processes, process states, processor modes, context switching, CPU scheduling algorithms, threads. 5

5

Concurrency Control: Concurrent processes, critical section problem and solutions, mutual exclusion solution requirements, semaphores and monitors. 3

Deadlocks: Characterization, detection and recovery, avoidance, prevention. 6

Inter Process Communication: classical IPC problems and solutions, IPC techniques.

The Input/Output and File Subsystem: I/O devices, controllers and channels, bus structures, 1/0 techniques (programmed, interrupt driven and DMA), I/O subsystem layers. Concepts of files and directories, issues and techniques for efficient storage and access of data. I/O and file system support for graphics, multimedia, databases, transaction processing and networking. 8

The Memory Subsystem : Memory types and hierarchy, module level Organization, cache memory. Memory partitioning, swapping, paging, segmentation, virtual memory. 6

The Central Processing Unit: CPU components, register sets, instruction cycles, addressing

modes, instruction sets, concept of micro-programming ,Basics of RISC approach, pipelined and super-scalar approaches, vector processors and parallel processors, hardware support for the OS. 3 4

µCOS case study

Tutorial

1. Implementing Lower Level Shell
2. Implementing Signal in Unix
3. Hard disk partitioning in Linux

Text/Reference Books:

1. Operating system principles, 3rd Edition,by Willian Stallings –PHI(1998)
2. Operating system concepts by Silberchatz and Galvin -Addision wesley
3. Operating system by Tanaumbuam, PHI New Delhi

ELC207: OPTICAL COMMUNICATION SYSTEMS

Light Propagation in Optical Fiber: Geometric picture, Pulse spread due to material dispersion, loss mechanism, Theory of Optical waveguides, methods of waveguides analyses , modes in steps and graded index fiber, new types of optical fibers 12

Fiber Optics Technology: Glass fiber fabrication, cable design, coupling, splicing and connectors, splicing methods, connectors, fiber measurements. 5

Optical Sources: LED and LDs, development of Laser diodes structures, transmitter circuits, Coupling efficiency of source to fiber. 6

Optical detectors: Photodiodes, Avalanche diodes and other detectors. 8

Receiver sensitivity and BER: Receiver design, Noise in detectors. 7

Communication System design: System requirement, System design, Link analyses, Power budgeting. 7

Voice Transmission: Characteristics of Voice signals, TDM, Undersea fiber optics communication system , fibers in telephone network. 8

Tutorials:

1. Goa University network of Optical Fiber in LAN.
2. Coupling Efficiency in connectors.
3. Optical fiber as Sensor
4. Power budget calculation
5. Study of different detectors and comparison.

Reference Books:

1. Optical Fiber Communication by A. Selvarajan and etal TMH, 2002.
2. Optical Fiber Communication by Gerd Keiser , MGH , 1998.
3. Optical Electronics, 4th Edition by A. Yariv, HRW publication, 1991.
4. Optical Communication Systems, By J. Senior, Printice Hall India, (1992).

Optical Communication Systems, J. Franz and V. K. Jain, Narosa Publications

ELC 203: ELECTRONICS PRACTICALS II

1. LCD & LED Interfacing to ATMEL 89C52
2. 7-segment Interfacing to ATMEL 89C52 (BCD counter)
3. Display Temperature using ATMEL 89C52
4. Serial Transmission and reception PIC16F877
5. Configuring On-chip ADC PIC16F877
6. Waveform generation using I2C based Max5822 interfaced to PIC 16F877
7. Hex Keypad Interfaced to ARM controller
8. LCD & LED Interfacing using ARM controller
9. Switching of tasks using ARM controller
10. OS-I using ARM
11. OS-II using ARM
12. Coping the memory segment using 8086 Assembler
13. Sorting of numbers using 8086 Assembler
14. Multiplication & Division using 8086 Assembler
15. Shell programming -I
16. Shell programming -II
17. Shell programming -III

UEL102: MICROPROCESSOR ARCHITECTURE AND PROGRAMMING

Introduction and Historical Perspectives: Architecture basics, Complex Instruction Set Computers (CISC) and Reduced Instruction Set Computers (RISC) processors, Advantages and Drawbacks of CISC & RISC, Logical Similarity with example of a typical microprocessor, Short Chronology of Microprocessor Development with reference to CISC families such as INTEL, AMD and MOTOROLA, RISC families development of POWER PC, Alpha, Sparc. 15

Fundamental Architectures: Defining a Computer Architecture e.g. degree of pipelining, basic topology, technology used etc., Neumann and Haward Architectures, Single Processor Systems, Parallelism Implementation using pipelines and multiple units, Super-pipelining, Superscalar, Very Long Instruction Word (VLIW) architectures, Building multithreaded processors, Multiple Processor Systems - SIMD, MIMD and multi-computer approaches. 15

Implementation Considerations: Memory Hierarchy, pre-fetching techniques, coherent caches, pipelining, ternary logic, packaging considerations, wafer scale integration.

Implementation of Functional Units: Memory Management, Arithmetic Logic Unit, Floating Point Unit, Branch Unit, Vector Unit, Load/Store Unit. 5

Development Tools: Microcomputer Development Systems (MDS), In Circuit Emulator (ICE), Assembler, Editors, Logic Analyser 5

Case Study of INTEL X 86 families: Overview and Features in brief. 5

Tutorials:

1. Memory test problem.
2. Study of Z-80 microprocessor.
3. Study of Motorola Microprocessor family.
4. Coprocessor studies.
5. Cache memory and importance.

Reference Books:

1. Microprocessors and Interfacing, D.V. Hall, McGraw Hill (1986)
2. The Intel Microprocessors: Barry B. Brey, Prentice Hall Of India Ltd. (1997)
3. Microprocessors and Microcomputer Based Systems: M. Rafiqzzuman, Universal Book Stall (1990)
4. The Electronics Handbook Edited by Jerry C. Whitaker, Published by CRC, Press and IEEE Press (1996), Section VII: Microelectronics and Section XIX: Computer Systems

Semester III

ELC 204: INSTRUMENTATION & CONTROL THEORY

Introduction: Basic Concepts of measurements, calibrations and standards. 4

Transducers (Types and parameters) and Sensors: Displacement, strain, vibration, Pressure, Flow, Temperature, Force and Torque (linearity, accuracy, precision, bandwidth, repeatability) 6

Amplification: Simple ended, Differential and Instrumentation amplifier. 6

Sampling: An Anti-aliasing, Multiplexers, Sample and Hold, Track and Hold. 4

Computer Interfaces: Serial (RS-232), Parallel, GPIB (IEEE-488), Universal Serial Bus (USB) 6

Display Devices: Review of LED, LCD, CRT devices, segmental and dot matrix displays. 2

General purpose test equipments: CRO, Digital storage oscilloscope, Digital voltmeter, Wave Spectrum analysis, Lock-in-amplifiers, Pulse generators and waveform generators, Box-car averager. 8

Control System: Types of control system - open loop, closed loop, linear, non-linear, continuous, discrete, time invariant, modes of linear systems, frequency and time response, sampled data system, open loop motor control, DC motor phase control. 14

Tutorials:

1. Study of Open loops control System.
2. Electronics Chocks.
3. Design of On/Off temperature controller using thermistor sensor.
4. Study of SEM.
5. Study of Scanning Probe technique.

Reference Books:

1. Industrial Control Electronics – John Webb, Kevin Greshok, Merrill Publications, 1990.
2. Elements of Electronic Instrumentation and Measurement, Joseph J. Carr, Prentice Hall India, (1996).
3. Modern Electronic Instrumentation and Measurement Techniques, Albert D. Helfnick, William D. Cooper, Prentice Hall of India, 1996.
4. Instrumentation Measurement by Northrop CRC 2001

ELC301: ELECTRONICS PRACTICALS – III

Hardware.

1. Design of S/C circuit for Strain gauge /Glucose strip @ 3.3V.
2. Design of S/C circuit for Thermistor sensor @ 3.3 V and interfacing with ARM.
3. Serial (Rs232) implementation with 89C52.
4. EO to OE Convector for Analog Signal.
5. EO to OE converter for PWM Signal.
6. Implementation of FIR BP using Xilinx XC3S400Cyclone II.
7. FFT using TMS 320.
8. Convolution using TMS 320.
9. Analysis of frequency components using Spectrum Analyzer

Software.

10. Simulink HPF & BPF Simulation
11. VHDL implementation for the Multiplexer & Demultiplexer
12. VHDL Implementation for Encoder & Decoder
13. VHDL implementation for the Counter.
14. Verilog implementation for the Memory Module.
15. Verilog implementation for the Latch.
16. Display Hello world and blinking Led's using NiosII soft core
17. Matrix Manipulation on NIOS II core (Multiplication, determinant, Inverse, Transpose)

ELD 201: SIGNAL AND SYSTEMS

Signal And Signal Processing: Characterization and classification of signal, Typical signal Operations. 4

Discrete time signal and Systems: Time Signal , Sequence representation, Sampling process, Simple Interconnection schemes, Correlation of Signal, Ramdom Signal. 6

Discrete Time Fourier Transform: Continuous Discrete-time FT, Energy Density Spectrum, Phase and Group Delays, Sampling of continuous tie signal, Low pass & Band pass Signal, Anti-Alising Filter design, Sample and Hold, A to D, D to A convertors, Effects of sample and hold. 12

Z- Tranform: Defination and properties, inverse Z-Tranform, The transfer function 5

Digital Filter Structure: Block diagram representation, FIR , IIR filter, Allpass filter, Tunable IIR Digital filter, Digital Sin-Cosine generator. Computational complexity. 7

FIR Digital Filter Design: Prelimnary considerations, FIR Design based on windowed FS, Design of minimum phase. 7

DSP Algorithm implementaion: Stucture simulation, Computation of DFT, DFT & IDFT using MATAB, Sliding DFT, Number represenation, Handling verflow, Tunable digital filters. 8

Application od Digital Signal Processing: Dual tone multifrequency tone signal Detection, Spectral analysis of sinusoidal Signal, nonstationary signal, random signal, Musical sound processing, Signal compression, Transmultiplexers. 6

Tutorials:

1. History of Fourier Transform.
2. Understanding Speech Spectral Analysis Problem.
3. Understanding FFT.
4. Study of TMS Series of processors.
5. MALAB program for generation of complex exponential sequence.

Reference books:

1. Sanjit K Mitra, Digital Signal Processing: A computer Based Approach
2. Discrete Time Signal Processing, Steven A. Tretter, Wiley(1976),
3. Digital Signal Processing, Johnny Johnson, PHI.
4. Digital Signal Processing, Prokis, PHI.
5. Boaz Porat, “A course in Digital signal Processing” First Edition, John Wiley & Sons 1996

ELD202: DIGITAL SIGNAL PROCESSING

Students have to design the following experiments in Matlab and Simulink and plot the characteristics of the signal processing system under design.

1. Filters 8
   a. Lp norm
   b. Ensemble averaging Filters
   c. Exponential moving average systems
   d. Median filter
   e. FIR
2. Demonstration of aliasing effect. 5
3. Oscillators 10
   a. Design using Van der Pol's equation
   b. Lorentz oscillators systems
   c. Gaussian oscillators systems
4. FFT 5
5. Image processing 15
   a. Interpolations
   b. Pattern recognition using PCA
6. Simulink 10
   a. Transfer function design and study for impulse and finite sequence.
   b. Convolution

ELD301: DIGITAL SYSTEMS DESIGNS WITH HDL

Introduction: About Digital Design, Analog versus Digital, Electronic Aspects of Digital Design, PLD's, ASIC, Digital Design level. 03

Digital Concept and Number System: General Positional number system conversions, Operation, BCD, Gray Code, Character Codes, Codes for Actions, Conditions, and States n-Cubes and Distance, Codes for Detecting and Correcting Errors, Error-Detecting Codes, Error-Correcting and Multiple-Error-Detecting Codes, Hamming Codes, CRC Codes, Two-Dimensional Codes, Checksum Codes, m-out-of-n Codes, Codes for Serial Data Transmission and Storage, Parallel and Serial Data, Serial Line Codes, 12

COMBINATIONAL LOGIC DESIGN PRINCIPLES: Switching Algebra, Combinational-Circuit Analysis, Combinational-Circuit Synthesis, and Timing Hazards. 05

HARDWARE DESCRIPTION LANGUAGES: HDL-Based Digital Design, ABEL Hardware Description Language, The VHDL Hardware Description Language, The Verilog Hardware Description Language, 06

COMBINATIONAL LOGIC DESIGN PRACTICES: Documentation Standards, Circuit Timing, Combinational PLDs , Decoders , Encoders , Three-State Devices , Multiplexers , Exclusive-OR Gates and Parity Circuits , Comparators , Adders, Subtractors, and ALUs , Combinational Multipliers . 08

SEQUENTIAL LOGIC DESIGN PRINCIPLES & PRACTICES: Bistable Elements, Latches and Flip-Flops, Clocked Synchronous State-Machine Analysis, Clocked Synchronous State-

Machine Design, Designing State Machines Using State Diagrams, State-Machine Synthesis Using Transition Lists, Another State-Machine Design Example, Decomposing State Machines, Feedback Sequential-Circuit Analysis, Feedback Sequential-Circuit Design, ABEL Sequential-Circuit Design Features ,Sequential-Circuit Design with VHDL , Sequential-Circuit Design with Verilog, Sequential-Circuit Documentation Standards , Latches and Flip-Flops ,Sequential PLDs , Counters, Shift Registers, Iterative versus Sequential Circuits , Synchronous Design Methodology , Impediments to Synchronous Design , Synchronizer Failure and Metastability 12

MEMORY, CPLDS, AND FPGAS

Read-Only Memory, Read/Write Memory, Static RAM, Dynamic RAM, Complex Programmable Logic Devices, Field-Programmable Gate Arrays

Tutorials: 06

1. Design flow for the simple microprocessor in HDL
2. Study and compares types of RAMS.
3. Design of GRAY code circuit.
4. Study of ALTERA PLD's
5. Study of XYLINX PLD's.
6. Studying WEB Pack Xylynx tool.

Reference Books:

1. Digital Design Principles and Practices, by John F. Wakerly, Prentice Hall's Fourth Edition.
2. Digital Logic Applications & Designs by John M. Yarbough, CWS Publishing Co. Division of Thomson Learning,
3. Giovanni De Micheli, "Synthesis and Optimization of Digital Circuits," Tata McGraw-Hill, 2003.
4. Srinivas Devadas, Abhijit Ghosh, and Kurt Keutzer, "Logic Synthesis," McGraw-Hill, USA, 1994.
5. Neil Weste and K. Eshragian,"Principles of CMOS VLSI Design: A System Perspective,2nd edition, Pearson Education, 2000.
6. Kevin Skahill, "VHDL for Programmable Logic," Pearson Education, 2000.

M.N.O. Sadiku, Elements of Electromagnetics 2nd Edition) , Oxford University press, 1995.

ELD302: EDA TOOLS-II

Study of JTAG, Modelsim Syntax study.

1. Study of Phases of Quartus compilations.
2. Study of phases of ISE compilations
3. Testing logic using ChipScope-I.
4. Testing logic using ChipScope-II
5. Parrallel implementation of CRC.
6. Serial implementation of CRC.
7. FIFO implementation
8. pulse stretcher
9. Test bench using Modelsim-I
10. Test bench using Modelsim-I
11. Test bench using Modelsim-I

12. Test bench using Modelsim-I

Reference Books:

1. Design through Verilog HDL By T. R> Padmanabhan & Sundari. IEEE press, Wiley Interscience.
2. http://www.xilinx.com/itp/xilinx7/help/iseguide/html/ise_fpga_design_flow_overview.htm
3. http//www.altera.com/

UEL103: INDUSTRIAL TRAINING, MINI-PROJECT AND SEMINAR

Industrial training: A student has to undergo Industrial training equivalent to one credit for the period of minimum 1 month in the respective Electronics industries / Research Laboratory anywhere in India.

Mini-Project: A student has to carry out a mini-project equivalent to 2 credit in the areas of embedded system design.

Seminar: Each student has to present a power point presentation for total 20 minutes in the title suggested by DC equivalent to 1 credit. The participating students should participate in Q&A.

Semester IV

ELD401: ELECTRONICS PRACTICALS – IV

1. Reading from flash using DE2 board
2. LCD and 7 segment Interfacing using DE2 board
3. PS/2 Mouse Interface on DE2 board
4. UART Interface using DE2 board
5. Task switching LCD and 7 segments with uCOS.
6. RTOS-I with RTLINUX
7. RTOS-II with RTLINUX
8. Video processing on Altera DSP kit
9. Audio processing on Altera DSP kit
10. Multirate signal processing using Xilinx Spartan XC3S400
11. Echo implementation on Xilinx Spartan XC3S400
12. Obstacle detection for varying range using 89C52 based Robot
13. Line follower using 89C52 based Robot

ELD203: NANOELECTRONICS & NANOSYSTEMS

Introduction: Development of microelectronics; 5
Potentials of Silicon Technology; Basics of Nanoelectronics, some physical fundamentals,basics ofinformation theory; 6
Biology Inspired Concepts.- Biological networks, Biology Inspired Concepts; 6
Bio-chemical and Quantum-Mechanical Computers.- DNA computer ,Quantum computer; **Parallel Architectures for Nanosystems**.- Architectural principles, Architectures for parallel processing; 7
Softcomputing and Nan electronics.- methods of soft computing, characteristics of neural networks in nanoelectronics; 6
Quantum Electronics; Bio and Molecular Electronics.- Bio electronics ,molecular electronics; **Nanoelectronics with Tunneling Devices**; 10
Single Electron Transistor (SET); Nanoelectronics with Superconducting Devices; 5
The Limits of Integrated Electronics 3

Tutorials:

5. Laser tweezers.
6. Study of AFM.
7. Study of STM.

Reference Books:

1. NANOELECTRONICS AND NANOSYSTEM BY K. GOSER , P GLOSEKOTTER & J. DIENSTUHL SPRINGER
2. Introduction to Nanoelectronics Science, Nanotechnology, Engineering, and Applications By Vladimir V. Mitin etal ; From Cambridge
3. Handbook of Nanoscience, Engineering, and Technology, Second Edition by William A. Goddard CRC.

ELD303: LASER SYSTEM ENGINEERING

Wave Propagation: Wave Propagation in Isotropic and An-Isotropic media, Index Ellipsoid , Normal Index Surfaces, Half and Quarter wave Retardation Plates, Intensity transmission Using retardation plates, Circular Polarization. 7
Optical Resonators: Energies in resonator, Febry-Perot Etalon , Febry-Perot Etalon as Optical Spectrum Analyzer, Mode Stability Criteria , Resonance Frequency of Optical Resonator, Unstable Resonator. 9
Interaction of Radiation with Atomic System: Spontaneous transmission between Atomic layer, Homogenous and In-Homogeneous broadening , Line shape functions, Stimulated transmission , Absorption and amplification , gain saturation in Homogenous media . 8

Theory of Laser Oscillator: Febry Perot Laser , Three and Four Level Laser , Power in Laser Oscillator, Optimum Light coupling , Multimode Laser Oscillator and Mode Locking Methods of Mode locking , Pulse length Measurements , Q-Switching , methods of Q-Switching . 8
Laser Systems: Pumping and laser Efficiency, Ruby Laser, Flash Pumping ,Nd-YAG Laser , Nd-Glass Laser , Threshold for CW and Pulse operation , He-Ne Laser , CO2 Laser , Ar-Ion

Laser , Excimer Laser , Dye Laser. 6

Non –Linear Optics: Origins of Non-Linear Polarization , relation between induced Polarization and Electric Field , Non – Linear Optical Coefficient , SHG , Phase Matching Experimental verification. 8

Interaction of Light and Sound: Scattering of Light by Sound, RamanNath and Bragg diffraction , Defration of light by Sound , Intensity modulation . 6

Optical Communication: Advances in optical Communication, Optical Network. 6

Tutorials:

1. Understanding Diffraction of Laser Light using grating
2. Comparison of resolving power of Prism and Grating.
3. Focusing of Laser Light.
4. Collimation of Laser Light.
5. Study of Raman Laser system.

Reference Books:

1. Optical Electronics, 4th Edition by A. Yariv, HRW publication, 1991.
2. OptoElectronbics , by Ghatak and Tyagarajan TMH Publication 1994.

ELD404: PROJECT

Student project of 200 marks of duration 6 months in the area of electronics hardware/software. Normally students are encouraged to undertake these projects in industrial/research organizations. In such case the student/batch of student will have one external guide and one internal guide

UEL104: PHARMACEUTICAL INSTRUMENTATION

Introduction to Chemical Instrumental Analysis, advantages over classical methods, classification, various units used in chemical analysis. Introduction to Electroanalytical methods, potentiometry, voltametry, coulometry. 5

Spectrometric Methods-I: A. Laws of Photometry, Instrument components, UV-visible instrument component, photocolorimeters, single and double beam instruments, various types of UV-visible spectrophotometers. 8

B. Atomic absorption spectrophotometer: Principle, working, hollow cathode lamp, atomizer, back-ground correction.

Spectrometric Methods-II: IR spectroscopy: Principle, IR sources, IR detectors, dispersive and Fourier , Transform IR spectroscopy. Atomic Emission Spectroscopy: Principle, types, Flame photometer, DC arc and AC arc excitation, plasma excitation. 8

Spectrometric Methods-III and Miscellaneous Instruments: Fluorimeters and Phosphorimeters: Principle, spectrofluorimeters, spectrophosporimeter, Raman effect, Raman spectrometer

Nuclear Magnetic Resonance (NMR) spectrometry: Chemical shift, principle, working of NMR, FT-NMR Gas analysers: CO, CO2, Hydrocarbons, O2, NOx 8

Separative Methods: Chromatography: Classification, Gas chromatography: principle,

constructional details, GC detectors, High Performance Liquid Chromatography (HPLC): principle, constructional details, HPLC detectors 8

Radioactive instrumentation and Refractometry: X-ray spectrometry: Instrumentation for X-ray spectrometry, X-ray diffractometer: Bragg's law, Auger emission spectroscopy, Electron spectroscopy for chemical analysis(ESCA). Radiation detectors: Ionisation chamber, Geiger-Muller counter, proportional counter, scintillation counters, 6
Refractometry: Principle, Abbe and Differential refractometer.

Electron microscopy:TEM & SEM- principles, instrumentation and analysis, scanning tunneling microscopy, atomic force microscopy, principles, instrumentation and analysis-applications 10

Tutorial:

1. Study of filter photometer.
2. Study of UV-visible spectrophotometer.
3. Study of ESR

Reference Books:

1. Instrumental Methods of Analysis, Willard, Merritt, Dean, Settle, CBS Publishers & Distributors, New Delhi, Seventh edition.
2. Instrumental Methods of Chemical Analysis, Galen W. Ewing, McGraw-Hill Book Company, Fifth edition
3. Introduction to Instrumental Analysis, Robert D. Braun, McGraw-Hill Book Company.
4. Principles of Instrumental Analysis, Skoog, Holler, Nieman, Thomsonbrooks-cole publications, 5th edition

UEL105: COMMUNICATION TECHNICAL SKILLS

This will be self study module where students will be assigned case studies reading material in the areas of technical writing, Group discussion, Management & Communication Skills. Here Students has to participate in the

- Group discussion in topic related to electronics (25%)
- Answer paper in the area of management and communication skills(25%)
- Has to write /compile technical papers & present (25%)
- Modeling of electronics systems (25%)

Reference Books

1. Essentials of Technical Communication Sunil Gokhale
2. Communication Skills By Leena, Sen, Prentice Hall of India.
3. http://owl.english.purdue.edu/;
4. http://owl.english.purdue.edu/workshops/hypertext/

ANNEXURE III

PAPER I: RESEARCH METHODOLOGY: EXPERIMENTAL

Methods of material Preparation: crystal growth, single crystal, zone melting, Epitaxy, compaction and sintering, methods of quenching, sol-gel process, deposition technique, chemical analysis. 8

Vacuum Technique: production and measurement of vacuum, Different types of vacuum systems and gauges, their working, limitation and leak Detection. 8

Methods of characterization: X-ray and neutron Diffraction, Raman, IR, Ultraviolet, Mossbauer Spectroscopy, Transport and Magnetic Measurement Techniques, NMR and ESR, Transmission Electron Microscopy, Differential Scanning Calorimetric etc. Principles and Applications. 8

Computer programming and Numerical Techniques: C/Fortran programming, error definition, Error propagation, Finite difference calculus, Interpolation and extrapolation, Roots of equations, solutions of simultaneous linear Algebraic equation, Linear and non linear least square curve fitting, Numerical differentiation and integration, Fourier transform techniques, numerical solutions of ordinary differential Equations, Matrix Eigen Value Problem, Monte Carlo and maximum entropy methods 30

References:

1. Numerical Receipes in fortan/C, W. Press, S.A.Teukolsky,W.T.Vetterling and B.P.Flannery, 2nd Edn., Cambridge University Press (1992).
2. Preparative method son solid state chemistry, P.Hagenmuller, Academic Press, London
3. Crystal growth, C.H.L.Goodman, Plenum press, New York
4. Elements of X-ray diffraction, B.D.Cullity, Addison-Wesley Publishing Co.Inc. London (1959)
5. Vaccum Technology ,A.Routh, North Holland, Amsterdam(1990)
6. Thin film phenomena, K.L.Chopra, Mcgraw- Hill, Newyork (1979)
7. Introduction to numerical analysis, F.B.Hilderband, 2nd, Tata Mcgraw-Hill Publishing co.ltd
8. Nuclear magnetic spectroscopy, R.M.Lynden-Bell and R.k.harries, nelson and sons ltd(1969)
9. Electron spin Resonance,C.P.Rolle, Interscience (1967)
10. Mossbauer effects: Principles and Applications, G.K.Wertheim, Academic press , London.

PAPER II-1: BOMEDICAL INSTRUMENTAION & MESUREMENTS

INTRODUCTION TO BIOMEDICAL INSTRUMENTATION 8

Biometrics, Components of Man-Measurement system, Physiological system of body,

problems encountered in measuring a living System, Basic transducer principle, Source of Bioelectric Potential, Skin contact Impedance, Electrodes: ECG, EEG, EMG, Microelectrodes 6

CARDIOVASCULAR MESUREMENTS.
Heart and cardiovascular system, characteristics of blood flow, Electrocardiography, measurement for Blood Pressure, Plethysmography. 8

NON-INVASIVE DIAGNOSTIC IMAGING
X-Ray, CT, MRI, fMRI, PET and SPECT, ULTRASOUND, Optical Tomography 8

BIOTELEMETRY
Introduction to Biotelemetry, Physiological parameters Adaptable to Biotelemetry, The components of Biotelemetry System, Implantable Units, Applications of telemetry in-Patient care. 7

INSTRUMENTATION FOR CLINICAL LABORATORY
The Blood, Test for Blood cells, chemical Tests, Automation of chemical Test 6

THE LASER APLLICATION IN BIOMEDICAL FIELD:
Pulse Ruby, ND-YAG, Helium-Neon, Argon, CO2 LASER. 10

NOISE REDUCTION TECHNIQUE IN ELECTRONICS SYSTEMS
Introduction, cabling, grounding, balancing and filtering, shielding, contact protection, Intrinsic Niose Source, Active device Noise, and Electrostatic discharge.

References:

3. Biomedical instrumentation and Measurements By Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer PHI (2nd Edition)
4. Handbook of Biomedical instrumentation, R .S. Khandpur, Tata Mc GRAW Hill.
5. Noise reduction Technique in Electronic systems, By Henry W. Ott Wiley & sons (2nd edition)
6. Biomedical Instrumentation by Cromwell-Prentice Hall of India, New Delhi
7. Foundation of Medical Imaging, By Z.H.Cho, J.P. Jones, M.singh, john and Wiley & sons

PAPER II-2: SYSTEM DESIGN USING ADVANCED MICROCONTROLLERS

- Architecture of 80C196 Family of Microcontrollers 6
- Programming of 80C196 Family of Microcontrollers 8
- Peripherals of 80C196 Family of Microcontrollers 6
- Architecture of ARM Family of Microcontrollers 10
- Programming of ARM Family of Microcontrollers 8
- Peripherals of ARM Family of Microcontrollers 10

Device Platform implementation : Kiel and ARM based IDE Development Board & Windows based Wise-96 Software, ARM9TDMI boards and software development tools (Arm Developer Suite, ADS). 12

Programming Language: Assembly Language & 'C' 6

Reference

1. Microcontrollers: Architecture, Implementation, and Programming – Kenneth J Hintz, Daniel Tabak
2. Design with Microcontrollers – John B Peatman
3. Embedded Microcontrollers – Intel Hand Book

PAPER II-3: MODELING OF DIGITAL SYSTEMS USING HDL

Introduction to PLDs & FPGAs :ROMs, Logic array (PLA), Programmable array logic, GAL, bipolar PLA, NMOS PLA, PAL 14L4, Altera logic cell array (LCA) – I/O Block – Programmable interconnect – Xilinx – 3000 series and 4000 series FPGAs. Altera CPLDs altera FLEX 10K series PLDs, Cyclone , Startix. 10

Placement and routing : Mincut based placement – iterative improvement placement– Routing: Segmented channel routing – Maze routing – Routability and routing resources – Net delays. 10

Introduction to VHDL: Digital system design process – Hardware simulation – Levels of abstraction – VHDL requirements – Elements of VHDL – Top down design VHDL operators – Timing – Concurrency – Objects and classes – Signal assignments – Concurrent and sequential assignments. 12

Structural, Data flow & Behavioral description of hardware in VHDL :Parts library – Wiring of primitives – Wiring of iterative networks – Modeling a test bench – Top down wiring components – Subprograms. Multiplexing and data selection – State machine descriptions – Open collector gates – Three state bussing. - Process statement – Assertion statement – Sequential wait statements – Formatted ASCII I/O operations MSI based design. 12

Introduction to Verilog HDL :Lexical conventions – Data types – System tasks and Compiler Directives- Modules and Ports- Gate Level Modeling with Examples. 8

References Books:

1. P.K. Chan & S. Mourad, "Digital Design sing Field Programmable Gate Array" 1st Edition, Prentice Hall, 1994.
2. J. V. Old Field & R.C. Dorf, " Field Programmable Gate Array", John Wiley, 1995.
3. M. Bolton, " Digital System Design with Programmable Logic", Addison Wesley, 1990.
4. Thomas E. Dillinger, " VLSI Engineering", Prentice Hall, 1st Edition, 1998.
5. Douglas Perry, "VHDL", 3rd Edition, McGraw Hill 2001.
6. J. Bhasker, "VHDL", 3rd Edition, Addison Wesley, 1999.