Goa University

P.O. Goa University, Taleigao Plateau, Goa 403 206, India

Syllabus of B.Sc. (Electronics) Programme
Approved by the Board of Studies on April 07th 2010

A brief description of the course.

- **Purpose**: Program curriculum is designed to train the graduate students in the area of Electronics and Instrumentation which can augment the human resource requirements for embedded hardware programmers and also to start small scale entrepreneurship.
- **Prerequisites**: XII in Science, Technical Vocational Subjects.
- **Number of semesters**: Six
- **Dissertation**: Students are encouraged to design working prototypes of electronics systems in area of Embedded Systems and Instrumentation. To name few dissertations Automatic Irrigation Water Deep System, PLC design, Prepaid Energy meter etc.

The tables starting on the next page list the courses under the programme. The recommended semester-wise distribution of the courses is also given. Description of each of the courses is given in subsequent pages.

B.Sc. (Electronics) List of Courses

In the following tables, at the first and second year student has to opt for additional two papers in each semester in the subject of Physics, Math's and Computer Science.

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			
1.	V	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:

Atomic Structure, Covalent Bonds, Conduction in Semiconductors, P type & N-type **9** 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.   **7**

POSITIVE FEEDBACK:

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   **10**
Laplace transforms.

NETWORK FUNCTION:

Singularity functions, Unit functions, Shifter functions, Gate functions, Network functions,
Transfer function of two-port network, Poles & Zeros, Necessary conditions for driving point   **10**
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:
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:
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.   **8**

GATES:

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.   **10**

LOGIC TECHNIQUES:

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.   **7**

OPAMP CHARACTERISTICS:
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   **4**
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: **5**
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.   **5**

OPAMP APPLICATIONS:
Comparator, zero crossing detectors, voltage limiter, small signal half wave rectifier, peak   **4**
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:
NE 555 timer, working principles, 555 timers as Astable, Monostable and voltage controlled oscillator, PLL.

Regulated IC:
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:

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

6

SHIFT REGISTERS:

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

4

COUNTERS:

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.

7

CODE CONVERTERS:

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

3

DECODERS:

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.

5

DATA CONVERTER:

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.

7

SEQUENTIAL MACHINE:

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

5

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   **10**

SCR Control Techniques:
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   **4**

Converters:
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.   **9**

INVERTERS, DUAL CONVERTERS, CYCLOCONVERTERS
Line commutated inverter (single phase), forced commutated inverters, Single-phase Dual
Converter, Single phase cycloconverter (mid-point and bridge configuration), Advantages and **9**
disadvantages of cycloconverter

MOTOR CONTROL:
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 **7** transmitter, Servomechanism, Positioning Servo System Using Control Synchro

Power supplies and Conditioner:
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 :
History of microprocessor, calculators, semiconductor technologies, from large **5** 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. **4**

Stack and subroutine: **5**

PUSH, POP, CALL and RET instruction, use of stack and subroutine.

6

Basic of Interrupts: 8085

INTR, RST 5.5, RST 6.5, RST 7.5 & TRAP, their Priorities and implementation, important of **8** SIM and RIM instruction, DMA transfer- HOLD and HLDA

Memory and basic Interfacing concept:

Classification of memory and recent advances, memory map and addresses, basic concept in **3** 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:

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:

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

5

INTRODUCTION TO COMMUNICATION SYSTEMS:
Information, Transmitter, Channel, Noise, Receiver, Modulation, Need of Modulation, Bandwidth Requirements, Frequency Spectra of Non-Sinuisoidal waves.

8

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

10

AMPLITUDE MODULATION SYSTEMS:
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.

8

ANGLE MODULATION SYSTEMS:
 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.

5

TRANSMISSION LINES:
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 **4** propagation, Extraterrestrial communication.

ANTENNA SYSTEM:

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

5

Introduction to software 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. 4

Data types, Operators and expressions 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 7 types, macro functions, operator precedence and associativity.

Control flow

Introduction, statements ad block, if statements, if-else statements, nested if-else statements, 4 for loop, while loop, do-while loop, break statement, switch statement, continue statement, goto statement. 7

Arrays and Strings

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

Functions 3

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. 4

Structures and Unions

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. **8**

Pointers
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. **8**

Classes and Objects
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
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. **08**

SIGNAL CONDITIONING:

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. **06**

DATA DISPLAY AND RECORDING SYSTEM:

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. **09**

TEST & MEASURING:

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.

      5

Peripherals:

Keyboard, mouse, modem, Scanners, printers, SCSI drives.   **5**

FIRMWARE: **4**

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

PC assembling: Maintenance and troubleshooting   **10**

Operating systems:

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.   **10**

Basics of Computer Networking:

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,   **4**

Disk management: **8**

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

User management:

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,   **1**

Networks:

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   **5**

implementing an OU structure, implementing server roles, restoring active directory,

Security Policy:
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.

12

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

PLC(programmable logic Controller)
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

8

SCADA (supervisory Control and Data Acquisition)

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

10

HMI

10

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

AC DRIVES

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

6

Pulse Communication

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

6

Digital Technology

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.

5

Information Theory

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.

6

Data Communication System:

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.

4

Modem

7

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.

14

MOBILE COMMUNICATIONS:

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

NETWORKS AND CONTROL CONSIDERATION:

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

10

10

Operating Systems Overview:

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

10

Processes: **Process Description and Control:**

10

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

8

Concurrency : Mutual Exclusion and Synchronization:
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.

8

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

Embedded/ Real Time Operating systems:

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

MicroC/OS – II, The Real Time Kernel:
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   **07**

Transducers for Biomedical Applications.

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, **09** Microelectrodes.

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

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)