Annexure No.	**34 F**
SCAA Dated	**29.02.2008**

BHARATHIAR UNIVERSITY :: COIMBATORE – 641 046

M. Sc. ELECTRONICS AND INSTRUMENTATION DEGREE COURSE WITH COMPULSORY
DIPLOMA IN BIO-MEDICAL INSTRUMENTATION
(For the Candidates admitted during the academic year **2008-2009 onwards**)

ELIGIBILITY CONDITIONS FOR STUDENTS

The Eligibility Conditions for Admission to M. Sc Electronics & Instrumentaion Shall be as follows:

1. A pass in B.Sc. Electronics / Industrial Electronics / Electronic Science / Electronics and Communication Systems / Physics / Applied Science / Computer Science / BCA or B.Sc. Hons / B.Sc. Electrical Equipment Maintenance, Instrumentation / B.E.S.

2. A pass in triple major (Maths, Physics & Electronics) or (Maths, Electronics & Computer Science).

3. A pass in B.Sc. Electronics with Computer Hardware, Technology of Applied Science, B.Sc Computer Technology, B.Sc Information Technology, B.E with ECE, EEE, EIE, CSE, IT and A.M.I.E. In Respective Branches is also eligible for joining the above said course.

All the above shall take effect for the students admitted from the academic year 2008-2009 and onwards.

SCHEME OF EXAMINATION

Sem	Paper Code No.	Subject and Paper	Credit points	Instruction hrs /week	University Examination	
					Dura-tion	Max * Marks
I	Paper I	Sensors and Transducers	4	4	3	100
	Paper II	Linear and Digital Integrated Circuits	4	4	3	100
	Paper III	Embedded systems and RTOS	4	4	3	100
	Paper IV	Elective I	4	4	3	100
	Supportive	Paper I	2	2	3	50
	Practical I	Instrumentation Laboratory	-	4	-	-
	Practical II	Embedded system Laboratory	-	4	-	-
Dip	Paper I	Bioinstrumentation	-	3	3	100
II	Paper V	Control System	4	4	3	100
	Paper VI	Computer aided instrumentation	4	4	3	100
	Paper VII	Signals and systems	4	4	3	100
	Paper VIII	Elective II	4	4	3	100
	Supportive	Paper II	2	2	3	50
	Practical I	Instrumentation Laboratory	3	4	4	75
	Practical II	Embedded system Laboratory	3	4	4	75
Dip	Paper II	Medical Imaging Systems	-	3	3	100
III	Paper IX	Process control	4	4	3	100
	Paper X	Digital Signal Processing	4	4	3	100
	Paper XI	Intelligent Instrumentation	4	4	3	100
	Paper XII	Elective III	4	4	3	100
	Supportive	Paper III	2	2	3	50
	Practical III	Digital Signal Processing Laboratory	3	4	4	75
	Practical IV	Intelligent Instrumentation Laboratory	3	4	4	75
Dip	Paper III	Therapeutic Equipments	-	3	3	100
IV	Paper XIII	Project work & Viva voce	6	10	-	150
Dip	Paper IV Practical	Medical Electronics Laboratory	-	3	4	100

*Continuous internal assessment marks – 40%
Comprehensive examination marks – 60%

List of Electives:

Elective I (Semester I)

1. Electronic Test Instruments
2. Electrical Measurements and Instruments
3. Advanced Measurements Techniques

Elective II (Semester II)

1. Analytical Instrumentation
2. Communication Systems
3. Fiber optics and laser Instrumentation

Elective III (Semester III)

1. Nano Electronics and systems
2. VLSI system design
3. Computer programming in C++

Supportive Papers offered at instrumentation Department for other students.

Paper I : Biomedical Instrumentation
Paper II : Electronic Test Instruments
Paper III : Microprocessor and its applications.

SENSORS AND TRANSDUCERS **Semester I -Paper-I**

UNIT I

SCIENCE OF MEASUREMENTS AND INSTRUMENTATION OF TRANSDUCERS

Units and standards-Calibration methods-Static calibration-classification of errors –Error analysis-Statistical methods-Odds and uncertainty-Classification of transducers-Selection of transducers.

UNIT II

CHARACTERISTICS OF TRANSDUCERS

Static characteristics Accuracy, precision, resolution, sensitivity,
Linearity, threshold resolution, hysterisis and dead space, Dynamic characteristics-Mathematical model of transducer-Zero, II order transducers and I. response to impulse, step, ramp and sinusoidal inputs.

UNIT III

VARIABLE RESISTANCE TRANSDUCERS

Principle of operation, construction details, characteristics and application of resistance potentiometer, strain gauge, resistance thermometer, thermistor, hot-wire anemometer, piezoresistive sensor and humidity sensor.

UNIT IV

VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS

Induction potentiometer-Variable reluctance transducers-EI picks up-LVDT-Capacitive transducer and types-Capacitor microphone-Frequency response

UNIT V

OTHER TRANSDUCERS

Piezoelectric transducer, magnetostrictive-IC sensor-Digital transducers-Smart sensor-Fibre transducer.

TEXT BOOKS

1.E.O.Doebelin, Measurement Systems-Applications and Design Tata McGraw Hill, New Work, 1990
2.A.K.Sawhney"A course in Electrical &Electronic Measurement and Instrumentation' Dhanpat Raj and Co (P) Ltd.2004
3.D.V.S Murthy, 'Transducer and Instrumentation' Prentice Hall of India,1995

REFERENCE BOOKS

1.D.Patranabis,"Sensors and Transducers" Prentice Hall of India, 1999
2.John P.Bentley"Princeples of Measurement Systems" III Edition, Pearson Education, 2000
3.Hermann K.P.Neubert,"Instrument Transducers" Oxford University Press, 2000
4.D.V.S.Murthy"Transducers and Instrumentation" Prentice Hall of India, 2001.
5.S.Ranganathan"Transducer Engineering" Allied Publishers Pvt.Ltd.2003
6.AlSulko and J.D.Fault"Industrial Instrumentation" Vikas Publications, Delhi, 1996

LINEAR AND DIGITAL INTEGRATED CIRCUITS **Semester I Paper II**

UNIT I

CHARACTERISTICS OF OPAMP

Operational amplifier characteristics, DC and AC Characteristics, offset voltage and current voltage series feedback and shunt feedback amplifiers, different amplifier,frequency response of OP-AMP, basic applications of op-amp-summer, differentiator and integrator.

UNIT II

APPLICATIONS OF OPAMP

Instrumentation amplifier, first and second order active filters, V/I,I/V & V/F converters, comparators, multivibrators, waveform generators, Integration, differentiation using RC circuits, clippers, clampers, peak detector, S/H circuit/A converter (R-2R ladder and weighted resistor types) A/D converter-Dual slope, successive approximation and flash types.

UNIT III

APPLICATION ICs

555 Timer circuit- Functional block, characteristics & Applications 566 voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, analog multiplexers and demultiplexers,Analog multiplier Ics.IC voltage regulators-LM317,723 regulators, switching regulator,MA 7840,LM 380 power amplifier,ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic Ics.

UNIT IV

NUMBER SYSTEMS: Introduction to Decimal, Binary, Octal, Hexadecimal Number Systems, BCD Codes, Inter conversions of Decimal, Binary, and BCD Numbers. Parity, Excess-3,Grey and Johnson Code**. LOGIC GATES**: Positive and Negative Logic: Different Logic gates such as AND, OR, NOT, NAND, NOR, EXOR, Symbol and Truth Table, Inverting and Non-Inverting Buffers.**BINARY ARITHMETIC AND BOOLEAN ALGEBRA**: Boolean Axioms, D Morgan's Theorems: Statement, verification and applications, One complaint, Half-adder. Full adder, Half Subtractor.

UNIT V

LOGIC FAMILIES: TTL, ECL & CMOS Parameters Like Power Dissipation, Speed, Supply Requirements, Logic Level, FanIn, fanOut, Noise Immunity**COMBINATIONAL CIRCUITS:** Encoders, Decoders. **SEQUENTIALCIRCUITS:** Flip-Flops (RS, K, D, T, N, S) Shift Registers, Counters,Semiconductor memories

TEXT BOOKS:

1.Ramakant A.Gayakward, "Op-amps and Linear Integrated Circuits: IV edition,Pearson Education, 2003/PHI.
2.Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear Ics' Pearson Education, 4th edition, 2002/PHI
3.David A Bell, "Op-amp & Linear ICs' Prentice Hall of India, 2nd edition, 1997.
4.MILLMAN AND TAUB, " Pulse, Digital and Switching Waveforms" McGraw Hill, 1985
5.BOUWENS, A.J.,"Digital Instrumentation":

REFERENCES:

1.MILLMAN, J, HALKIAS,"Integrated Electronics" Mc Graw Hill, 1972
2.MORRIS MANO,"Digital Logic & Computer Design" Prentice Hall of India, 2001.
3.ANAND KUMAR, A., " Fundamentals of Digital Circuits" Prentice Hall of India, 1994
4.ALI, S.N.,"Digital Electronics"Golotia Publications Pvt.Ltd., 2001

EMBEDDED SYSTEM AND RTOS **Semester I Paper III**

UNIT I
INTRODUCTION TO EMBEDDED SYSTEM

Introduction to functional building blocks of embedded systems-Register, memory devices, ports, timer, interrupt controllers using circuit block diagram representation for each categories.

UNIT II
PROCESSOR AND MEMORY ORGANISATION

Structural units in a processor, selection of processor & memory devices; shared memory; DMA; interfacing processor, memory and I/O units; memory management-Cache mapping techniques, dynamic allocation-Fragmentation.

UNIT III
DEVICES & BUSES FOR DEVICES NETWORK

I/O devices, timer & counting devices; serial communication using 12C,CAN, USB buses; parallel communication using ISA, PCI, PCI/X buses, arm bus; interfacing with devices/ports, device drivers in a system-Serial port & parallel port.

UNIT IV
I/O PROGRAMMING SCHEDULE MECHANISM

Intel I/O instruction- Transfer rate,latency;interrupt driven I/O-Non-maskable interrupts; software interrupts; writing interrupt service routine in C & assembly languages; preventing interrupt overrun; disability interrupts.

Multi threaded programming-Context switching, premature A& non-premature multitasking, semaphores.

Scheduling-Thread states, pending threads, context switching, round robin scheduling, priority based scheduling, assigning priorities, deadlock, and watchdog timers.

UNIT V
REAL TIME OPERATING SYSTEM (RTOS)

Introduction to basic concepts of RTOS,Basics of real time& embedded system operating systems,RTOS-Interrupt handling, task scheduling; embedded system design issues in system development process-Action plan, use of target system,emulator,use of software tools.

TEXT BOOKS

1.Rajkamal,"Embedded System-Architecture, Programming, Design'Tata Mc Graw Hill 2003.
2.Daniel W.Lewis'Fundamentals of Embedded Software' Prentice Hall of India, 2004.

REFERENCE BOOKS

1.David E.Simon,"An embedded Software Primer' Pearson Education, 2004.
2.Frank Vahid, Embedded System Design – A Unified hardware & Software Introduction John Wiley, 2002.
3.SriramV.Iyer,Pankaj Gupte,Embedded Real Time Systems Programming'Tata Mc Graw Hill, 2004.
4.Steve Heath,' Embedded System Design'II edition, Elsevier, 2003.Architecture

INSTRUMENTATION LABORATORY **Semester I (Practical I)**

1. Displacement measurement using LVDT
2. Design of V-F converter
3. Design of F-V converter
4. Characteristics of differential pressure transmitter with zero elevation and zero suppression
5 Analog Multiplexer and Demultiplexer
6. Instrumentation amplifier
7. Microprocessor based stepper motor control
8. Strain gauges.
9. Thermocouple Compensation.
10. Thermistor Linearization transmitter design.
11. Pressure Calibration.
12. Signal conditioning circuit for any resistive pressure, transducer.
13. P.I.D Controller.
14. Signal conditioning circuit for optical encoder.

EMBEDDED SYSTEMS LABORATORY **Semester I (Practical- II)**

8051 BASED EMBEDDED SYSTEMS (ANY 10 EXPERIMENTS)

1. Arithmetic and Logic programs
2. Square wave generation using ports
3. Key interfacing
4. LED Interfacing
5. Seven segment display interfacing

6. Solid state relay interfacing using interrupts
7. Traffic light control system
8. ADC interface
9. DAC interface
10. Stepper miter interface
11. Timer/Counter operation
12. Serial port interfacing using RS232C
13. Digital clock
14. LCD interface
15. Object counter
16. Water level controller
17. Flow measurement
18. Temperature measurement

PIC 16F87X BASED EMBEDDED SYSTEMS & RTOS (ANY 10 EXPERIMENTS)

1. Arithmetic and Logical programs
2. Square wave generation using ports
3. Key & LED interfacing
4. Single digit timer using seven segment display
5. DC motor driving via H bridge
6. DAC interface
7. ADC INTERFACE
8. LCD interface
9. Stepper motor control
10. PWM generation
11. Compare and capture operation program
12. Serial communication using RS232C
13. PIC to PIC communication using I2 C bus

PROGRAMMING WITH RTOS

14. Semaphore & flag related functions
15. Queue & Mailbox related functions
16. Memory related functions
17. Embedded system for an adaptive cruise control system in a car
18. Embedded system for a smart card

BIO-INSTRUMENTATION **Diploma Paper I**

Unit I: Basic concepts of medical instrumentation:

Introduction – Generalized medical instrumentation system – characterizing medical instruments – terminology – measurement systems: signals and noise – electric circuits review – measurement devices: displacement transducers – ohmmeters and bridge circuits – measurement of temperature – potentiometer circuits – use of statistical methods for measurements: statistics and instruments – statistical processing of signals – principles of signals: fundamentals of time and frequency domain analysis – analog and digital signals and converters – data processing systems: data acquisition and storage systems – recording and display systems

Unit II: Transducer for Biomedical application:

Mechanical measurements: measurement of force – pressure transducers – direct measurement of blood pressure – indirect measurement of blood pressure – sensing heart sounds measurement of flow – thermal flow measurement – measurement of volume and flow: electromagnetic flow sensors – Doppler flow measurement plethysmography – electrical impedance of biological tissue – review of concept of electrical impedance – impedance bridge circuits – determining biological events by electrical impedance – determining biological events by electrical impedance –

Unit III: Biopotentials and their measurement:

Measurement of biopotentials: review of physics of electric fields – biological origin of electrical potentials –electrochemical electrodes- biopotential electrodes – microelectrodes – biopotential amplifiers – examples of biopotential electrodes and signals – review of operational amplifier circuits – the instrumentation amplifier – the electrocardiograph – the electromygraph – noise and interference in biopotential measurement – cardiotachometers – biomedical signal processing: filtering – averaging – integrating

Unit IV: Sensors and clinical lab instrumentation:

Optical sensing – review of physics of light – light detecting devices – elementary biomedical applications –electrochemical sensors: - nernst equation – potentiometric sensors – measurement of pH – measurement of CO_2 - aperometric sensors – measurement of oxygen – clinical lab instrumentation: blood gas measurement – bioanalytical sensors – glucose sensors – chemical sensors: colorimetric sensing – the pulse oximeter –

Unit V: Instrumentation in molecular and cell biology:

Measurement of pulmonary variables: measurement of lung volumes- measurement of air flow – breathing and apnea monitoring – instrumentation for biomaterials studies: tissue characterization – viscoelastic properties – biocompatibility – instrumentation in molecular biology: DNA sequencing technologies, molecular diagnostics – polymerase chain reactors, blotting techniques – instrumentation in cellular biology – fluoresnce assisted cell sorting – recombination techniques – bioreactors – instrumentation in critical care medicine: cardiac monitoring – neonatal intensive care – fetal monitoring

References:

1. Handbook of Biomedical Instrumentation – R.S.Khandpur, TMH Publishing company Ltd. New Delhi

2. Introduction to Biomedical Equipment Technology – Joseph J Carr, John M Brown, Pearson Education (Singapore) Pvt. Ltd
3. Biomedical Instrumentation and Measurements – Leslie Cromwell, Prentice Hall of India Pvt.Ltd, New Delhi
4. Bioinstrumentation – John G.Webster, John Wiley & sons, Inc.
5. Medical Instrumentation: application and design - John G.Webster, John Wiley & sons, Inc.
6. Biomedical Instrumentation and Measurements – Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer. Prentice Hall of India 2008

CONTROL SYSTEMS **Semester II PAPER- V**

UNIT I

CONTROL SYSTEM COMPONENTS

Basic elements in control systems – open and closed loop systems, electrical analog of mechanical and thermal systems – Transfer functions –Error detectors-potentiometers and synchronous a.c and d.c servomotors-stepper motors-Tacho generators-Proportional-integral and derivative controllers.

UNIT II

TEST SIGNALS

Response of second order systems - time-domain specifications-Generalised error series - Frequency domain specifications - polar plots - Bode plots.

UNIT III

STABILITY ANALYSIS

Routh-Hurwitz criterion-Nyquist criterion- Stability of systems with transportation lag-Gain margin and phase margin.

UNIT IV

ROOT LOCUS METHOD

Definitions-Root locus diagram-Rules of constructions of root loci -Effect of pole zero additions on the root loci- Root contours.

UNIT V

COMPENSATOR DESIGN

Constant M and N loci - Nichols Chart. Compensator design using Bode plots PID controller design.

1. Katsuhiko Ogata , ‘ Modern control Engineering ‘ , Fourth Edition , Pearson Education , First Indian Reprint 2002.
2.Richard C.Dorf and Robert H.Bishop . ‘Modern control systems ‘, Addison - Wesley, Eigth Edition.
3 Nagrath, I.J., and Gopal, M., 'Control systems Engineering', Wiley EasternLtd.,1992.
Shanmuga Priya publishers, 1998.

COMPUTER AIDED INSTRUMENTATION **Semester II** **PAPER- VI**

UNIT-I

Hardware organization of IBM PC: Motherboard components - Chipset chips, System timer and RTC; Memory: Memory organization, memory-map. Memory techniques; System resources – Interrupts, DMA channels, I/O map. Peripherals: ROM BIOS services – Video, Keyboard, Disk, Printer, RTC, Serial I/O services

UNIT-II

Expansion Buses: 8-bit ISA, 16-bit ISA, EISA buses - pins and signals, features, Interfacing examples. PCI system: PCI bus, features, PCI interrupt handling, PCI Parallel port – Register organization, pins and signals, handshaking and programming of SPP, EPP and ECP. Serial port – Registers, Pins and signals, programming. USB, IEEE1394 interfaces

UNIT-III

Principles of data acquisition - Sampling theorem, aliasing. Sigma-Delta converter principles, signal conditioning, interference problems, shielding, grounding, sequential and simultaneous sampling, triggering, Design of plug-in general-purpose DAQ systems: design rules, bus buffering and address decoding, AI, AO, DIO, Timer functions. Data acquisition through printer port – Interfacing ADC, DAC, application examples.

UNIT-IV

Interfacing actuators: Interfacing stepper motors, DC motors, AC motors, Solenoids, Valves, hydraulic actuators, pneumatic actuators.Remote data acquisition: Techniques, distance consideration – use of repeaters, fiber optic and phone-line modems, Data acquisition using serial interfaces: Serial communication principles; EIA-232, EIA-422, EIA-485 standards; design examples, programming, remote data acquisition modules, USB – Features.

UNIT-V

GPIB interface: Concepts of laboratory automation, overview of GPIB standard, component, signal structure, GPIB handshake protocol, bus operation, GPIB programming. Extending and expanding GPIB, SCPI, HSS-488. Networked data acquisition: Automation networks: Industrial automation hierarchy, LAN technology: OSI model, LAN types, topologies, standards, Network devices, Ethernet, TCP/IP. 4-20 mA current loop, HART communication, Field buses:

REFERENCE BOOKS

1. Bary B. Brey, The INTEL Microprocessors 8086/8088 ....., PHI, 2002.
2. Tariq Ozkul, Data acquisition and process control using personal computers - Marcel Decker, 1996.
3. G.C.Barney, Intelligent instrumentation, Microprocessor applications in measurement and control, PHI, 1992

SIGNALS AND SYSTEMS **Semester-II Paper VII**

UNIT I: INTRODUCTION

Continuous Time (CT) and Discrete Time (DT) signals – classification of CT and DT signals – Basic CT and DT signals – Signal Operations – Representation of signals by impulses

UNI II : CONTINUES TIME & DISCRETE TIME SYSTEMS

Properties – Linear Time Invariant (LTI) system – Linear Shift Invariant(LSI) systems - Properties – Continuous and discrete convolution – CT systems representation by differential equations – DT systems representation by differential equations.

UNIT III: FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS

Fourier series analysis of periodic signals – properties of Continuous Time Fourier series (CTFS)– Convergence of CTFS - Representation of periodic signals by Continuous time Fourier transform (CTFT) – properties of CTFT– Convergence of CTFT – Frequency response of systems characterized by differential equations.

UNIT IV: FOURIER ANALYSIS OF DT SIGNALS AND SYSTEMS

Fourier series representation of DT periodic signals (DTFS) – Properties of DTFS - representation of aperiodic signals by DTFT – properties of the DTFT – Frequency response of systems characterized by differential equations.

UNIT V : SAMPLING, LAPLACE TRANSFORM & Z TRANSFORMS

Sampling: Introduction – sampling theorem – reconstruction of a signal from its samples using interpolation – Aliasing – DT processing of a CT signal – sampling of DT signals

Laplace Transform: Introduction – Laplace transform – region of convergence for LT – Inverse Laplace Transform – properties of Laplace transform

Z Transform: Introduction – z-transform – region of convergence for z-transform – Inverse z-Transform – properties of z-Transform

TEXT BOOK

1. Alen V Oppenheim Alen S. Wilsky and Hamid Nawab S “Signals and Systems”, second Edition, PHI, New Delhi, 1997

REFERENCES:

1.Michael J Roberts, “ Signals and Systems Analysis using transform methods and MATLAB”, Tata McGraw-
Hill, 2003

2.Haykin.S and Barry Van Veen, “Signals and Systems”, John willy and Sons Inc., 2002

3.Samir S Soliman and Srinath MD, “ Continuous and discrete signals and systems” Second Edition, PHI, 2003

4. Lathi B.P., “Linear Systems and Signals”. Oxford University Press Inc., 2003

MEDICAL IMAGING SYSTEMS **Diploma PAPER – II (Sem II)**

Unit I: Medical x-ray equipment

Introduction – properties of x-rays – photoelectric effect – Compton effect – Bremsstrahlung – x-ray tube – x-ray equipment block diagram – fluoroscopic system

Unit II: x-ray computed Tomography

Introduction- Ct scanners and detectors – image processing for computed tomography – spiral/helical computed tomography – multislice spiral computed tomography – radiation dose – clinical applications of computed tomography

Unit III: Nuclear Medical Imaging systems

Introduction – Instrumentation: The gamma camera – image characteristics – clinical applications of nuclear medicine – positron emission tomography – radioisotopes and radiopharmaceuticals – radiation dose

Unit IV: Magnetic Resonance Imaging

Introduction – nuclear magnetism – vector description of magnetic resonance – signal excitation and detection – NMR spectrum – factors affecting image appearance – pulse sequences and image contrast – effect of flow magnetic resonance images

Unit V: Ultrasonic Imaging systems

Introduction – Therapeutic and diagnostic equipment – therapeutic ultrasonic equipment – piezoelectric transducers – ultrasonic imaging equipment – ultrasonic waves – ultrasonic blood flow equipment – safety and bioeffects in ultrasonic imaging – clinical applications of ultrasound – obstetrics and gynecology breast imaging – cardiac disease

References:

1. Handbook of Biomedical Instrumentation – R.S.Khandpur, TMH Publishing company Ltd. New Delhi
2. Introduction to Biomedical Equipment Technology – Joseph J Carr, John M Brown, Pearson Education (Singapore) Pvt. Ltd
3. Biomedical Instrumentation and Measurements – Leslie Cromwell, Prentice Hall of India Pvt.Ltd, New Delhi
4. Bio instrumentation – John G.Webster,John Wiley & sons, Inc.
5. Medical Instrumentation: application and design - John G.Webster, John Wiley & sons, Inc.
6. Biomedical Instrumentation and Measurements – Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer. Prentice Hall of India 2008.

PROCESS CONTROL **SEMESTER III Paper IX**

UNIT I

FINAL CONTROL ELEMENTS

Final control operation: Signal conversion,actuators, control element- signal conversions: analog electrical signals, digital electrical signals, neumatic signals- power electronics, switching devices, controlling devices – actuators: electrical actuators, pneumatic actuators – control elements: mechanical, electrical, fluid walls

UNIT II

DISCRETE STATE PROCESS CONTROL

Definition of Discrete state process control – characteristics of the system: Discrete state variables, process specification, event sequence description – Process characteristics: Process equation, Process load, Process Lag, Self –regulation – Control system parameters: Error, variable range, Control parameter range, Control Lag, Dead time, Cycling, Controller modes- Discontinuous Controller Modes: Two-position Mode, Multiposition Mode, Floating control Mode – Continuous control Modes: Proportional control Mode, Integral control Mode, Derivative –control Mode- Composite Control Mode: Proportional –Integral Control, Proportional –Derivative Control Mode, Three Mode controller (PID)

UNIT III

ANALOG AND LOGIC CONTROLLERS

General features of analog controllers: Physical layout, front panel, side panel – Electronic controllers: Error detector, Single mode, composite controller mode – Pneumatic Controllers: General features, Mode Implementation – Relay controllers: Background, Ladder diagrams- Programme Logic Controllers: Relay sequences, Programmable Logic Controller Design, PLC operation, Programming, Functions of PLC software

UNIT IV

COMPUTER BASED CONTROL

Digital applications: Single and multivariable alarms, Two position control – Computer based controllers: Hardware configuration, Smart sensors, multiloop controllers- Software requirements- algorithms to implement the control equations: errors, proportional mode, integral mode, derivative mode,PID Control mode – Data Loggers – Supervisory control – Process control system networks, field bus operations, General characteristics of buses

UNIT V

CONTROL LOOP CHARACTERISTICS

Control System configurations: Single variable, Cascade Control – Multivariable control system: analog control, supervisory and direct digital control – Control system quality: definition of quality, measure of quality – Stability: Transfer function frequency dependence, stability criteria- Process Loop Tuning: Open Loop Transient Response Method, Ziegler-Nichols Method, Frequency Response Method

TEXT BOOK

1.Curtis D. Johnson, Process control instrumentation Technology, Eight edition, Prentice Hall of India, 2006

DIGITAL SIGNAL PROCESSING **SEMESTER III PAPER -X**

UNIT I INTRODUCTION

Classification of systems: Continuous, discrete, linear, casual stable, dynamic, recursive, time variance, classification of signals: continuous and discrete, energy and power, mathematical representation of signals: spectral density, sampling technique, quantization, quantization error, Nyquist rate, aliasing effect

UNIT II DISCRETE FOURIER TRANSFORM & COMPUTATION

DFT properties, magnetitude and phase representation – computation of DFT using FFT algorithm – DIT & DIF –FFT using radix 2 – Butterfly structure

UNIT III FFT

Introduction of DFT – Efficient Computation of DFT – Properties of DFT – FFT algorithms – Radix – FFT algorithm – Decimation in Time – Decimation in Frequency algorithms – Use of FFT- algorithms in Linear Filtering and correlation.

UNIT IV DIGITAL FILTERS DESIGN

amplitutde and phase response of fir filters – linear phase filters – windowing techniques for design of linear phase FIR filters – rectangular, Haming, Kaiser windows – Frequency sampling techniques – IIR Filters – magnitude response – Phase response – group delay – Design of Low Pass Butterworith filters(low pass)- Bilinear transform – Prewarping.impulse invariant transformation

UNIT V DIGITAL SIGNAL PROCESSORS

Introduction to DSP architecture – Harward architecture- Dedicated MAC unit – Multiple ALUS, Advanced addressing modes, pipelining, Overview of instruction set of TMS320CSX and C54X

TEXT BOOKS

1.J.G.Proakis and D.G.Manollakis,"Digital Signal Processing Principles. Algorithms and Applications" Pearson education, New Delhi 2003/PHI.
2.S.K.Mitra, Digital Signal Processing – A Computer Based Approach Tata Mc Graw Hill, New Delhi, 2001.

REFERENCE BOOKS

1.Alan V.Oppenheim, Ronald W.Schafer and John R.Buck,"Discrete-Time Signal Processing" Pearson Education, New Delhi, 2003.
2.B.Venkataramani, M.Baskar,"Digital Signal Processors, Architecture, Programming and Applications"Tata Mc Graw Hill, New Delhi, 2003.
3.S.Salivahanan, A.Vallavaraj, C.Gnanapriya, Digital Signal Processing'Tata McGraw Hill, New Delhi, 2003.
4.Texas TMS 320C54X user manual (website)
5.J.R.Jhonson, Introduction to Digital Signal Processing Prentice Hall of India, 1989.

INTELLIGENT INSTRUMENTATION **Semester III Paper XI**

UNIT I
REVIEW OF DIGITAL INSTRUMENTATION

Representation of analog signals in the digital domain-Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.

UNIT II
FUNDAMENTALS OF VIRTUAL INSTRUMENTATION

Concept of virtual instrumentation-PC based data acquisition-Typical on board DAQ card-Resolution and sampling frequency Multiplexing of analog inputs-Single-ended and differential inputs-Different strategies for sampling of multi-channel analog inputs. concept of universal DAQ card-Use of timer-counter and analog outputs on the universal DAQ card.

UNIT III
CLUSTER OF INSTRUMENTS IN VI SYSTEM

Interfacing of external instruments to a PC-RS232, RS422, RS485 and USB standards-IEEE 488 standard-ISO-OSI model for serial bus-Introduction to bus protocols of MOD bus and CAN bus.

UNIT IV
GRAPHICAL PROGRAMMING ENVIRONMENT IN VI

Concepts of graphical programming-Lab view software-Concept of Vis and sub VI – Display types-Digital –Analog-Chart-Oscilloscopic types-Loops-Case and sequence structures-Types of data Arrays-Formulae-nodes-Local and global variables-String and file I/O.

UNIT V
ANALYSIS TOOLS AND SIMPLE APPLICATIONS IN VI

Fourier transform-Power spectrum-Correlation-Windowing and filtering tools-Simple temperature indicator-ON/OFF controller-P-I-D controller –CRO emulation-Simulation of a simple second order system-Generation of HTML page.

TEXT BOOKS

1.S.Gupta and J.P.Gupta,"PC Interfacing for Data Acquisition and Process Control" Instrument society of America, 1994.
2.Peter W. Gofton,"Understanding Serial Communications" Sybex International.
3.Robert H.Bishop,"Learning with Lab-View" Prentice Hall, 2003.

REFERNCE BOOKS

1.Kelvin James,"PC Interfacing and Data Acquisition' Techniques for Measurement, Instrumentation and control" Newness,2000.
2.Gray W.Johnson, Richard Jennings, Lab-view Graphical Programming" Mc Graw Hill Professional Publishing 2001.

Note: To offer this elective, multi-user licensed copy of Lab-View software should be available.

DIGITAL SIGNAL PROCESSING LABORATORY **Semester III**
PRACTICAL – III

USING TMS320C5X/TMS320C54XX/TMS320C67XX
(ANY 10 EXPERIMENTS)
1. Study of addressing Modes of DSP using simple examples
2. Arithmetic operations
3. DFT computations
4. FFT Computations
5. Convolution of two discrete signals
6. Correlation of two discrete signals
7. Waveform generation
8. Solving differential equations
9. Solving z-transform
10. Voice storing & Retrieval
11. FIR Filter design
12. IIR filter design

SIMULATION USING MATLAB
13. Generation of signals
14. Amplitude Modulation & FFT response
15. Impulse, Step, Exponential & Ramp functions
16. Frequency sampling method
17. Design of FIR filter
18. Design of IIR filter

INTELLIGENT INSTRUMENTATION LABORATORY **Semester III Practical IV**

(ANY 10 EXPERIMENTS)
1.Creating a simple VI to place a Digital Control
2. Navigation and Editing
3. VI to make a Degree C to Degree F Converter
4. Converting VI in to Sub VI
5. Create a random number generator
6. Create a Boolean Switch Action
7. Wright a programme to count Modulus 32 and display the values in decimal, octal decimal and Binary.
8. Create a Temperature simulator to set up over and under – Temperature LEDs to light up when ever the deviations is $> 5^0C$
9. Built a VI using *while loop* that displays random numbers in to three wave form charts. (Strip, scope & Sweep)
10. Built a VI that displays to random chart in to single chart
11. To check given number is positive or negative.
12. Built a four function calculator
13. Built VI to compute and display $y_2 = mx+b$.

14. Built VI that continues the monitor every 250 ms
15. Built VI to produce sine, square, triangle and saw tooth wave forms.
16. Built a 8 bit binary counter to display the results graphically.
17. Wright a simple programme to generate a voltage at analog out put is zero using knob to select voltage

THERAPEUTIC EQUIPMENTS **Semester III Diploma PAPER – III**

Unit I: Cardiac defibrillators and pacemakers:
Introduction – paddles – defibrillator energy delivery - external defibrillators – implantable defibrillators – pulse generators – arrhythmia therapy – implantable monitoring – troubleshooting defibrillators – external and implantable pacemakers – programmable pacemakers – power sources – design of encapsulation and leads – pacing system analyzer

Electro surgical devices: Introduction – basic ESU – ESU power amplifier – active electrodes – dispersive electrodes – sinusoidal oscillators

Unit II: Biomedical Lasers:
Introduction- CO_2 laser – argon laser surgical unit – interaction and effects of UV – IR laser radiation on biological tissues – penetration and effects of UV-IR laser radiation into biological tissues – effects of Mid – IR laser radiation – effects of near IR laser radiation – effects of visible-range laser radiation – effects of UV laser radiation – general description and operation of lasers – biomedical laser beam delivery systems

Unit III: Ventilators and Humidifiers:
Introduction – negative-pressure ventilators - positive-pressure ventilators – ventilation modes – breath delivery control

Implantable insulin delivery systems: Introduction – drug delivery devices – new techniques of insulin administration – ambulatory and implantable infusion systems- alternate routes – subcutaneous route – peritoneal route for insulin infusion

Unit VI: **Essentials of anesthesia delivery:**
Introduction – anesthesia machines – gases used during anesthesia and their sources – oxygen – nitrous oxide – carbon dioxide – helium – gas blending and vaporization system –breathing circuits – gas scavenging systems – monitoring the function of the anesthesia delivery system – monitoring the patient

Lung, Blood gas and Dialysis machines: Introduction – spirometers – gas measurements – kidney dialysis machines – hemodialysis

Unit V: clinical laboratory: separation,spectral and non-spectral methods:
Introduction – separation methods – chromatographic separations – gas chromatography – high performance liquid chromatography – fluorometry – flame photometry – atomic absorption

spectroscopy – turbidimetry and nephelometry – clinical laboratory: Non-spectral methods and automation –particle counting and identification-electrochemical methods – ion specific electrodes – radioactive methods – automation – trends in laboratory instrumentation

Hospital equipment safety: Introduction – Electrical hazards of medical instruments – devices to protect against electrical hazards – equipment safety programme – preventive maintenance – logical approach to troubleshooting

References:

1. Handbook of Biomedical Instrumentation – R.S.Khandpur, TMH Publishing company Ltd. New Delhi
2. Introduction to Biomedical Equipment Technology – Joseph J Carr, John M Brown, Pearson Education (Singapore) Pvt. Ltd
3. Biomedical Instrumentation and Measurements – Leslie Cromwell, Prentice Hall of India Pvt.Ltd, New Delhi
4. Bio instrumentation – John G.Webster,John Wiley & sons, Inc.
5. Medical Instrumentation: application and design - John G.Webster, John Wiley & sons, Inc.
6. Biomedical Instrumentation and Measurements – Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer. Prentice Hall of India 2008.

LIST OF PRACTICALS — Diploma Paper IV

Minimum of eight practicals to be carried out and one field visit to hospital

1. Operation and function of all the controls of hospital X-Ray machine
2. Operation and function of all the controls of dental X-Ray machine
3. Identification of different block/sub system of circuits in X-Ray machine
4. Measurement of skin contact impedance and technique to reduce it.
5. Observe its wave shape on CRO the output of blood pressure transducers body temperature transducers and pulse sensors
6. Use of sphygrmanometer for measurement of blood pressure
7. Concept of ECG system and placement of electrodes
8. Measurement of leakage currents with the help of safety tester
9. PH measurement of given biological sample
10. Concept of EMG system and placement of electrode
11. Measurement of respiration rate using thermistor
12. Concept of EEG system and placement of electrode
13. Identification of different types of PH electrode

1. ELECTRONIC TEST INSTRUMENTS **Elective (Semester I)**

UNIT I

ANALOG METERS

D.C,A.C voltmeters, ammeters, multimeter,power meter,Q-meter,true RMS meter, vector impedance meter, vector voltmeter, component measuring instrument.

UNIT II

SIGNAL SOURCES

Sine wave generator-Frequency synthesized sine wave generator-Sweep frequency generator, pulse and square wave generator-Function generator-Wave analyzer-Applications-Harmonic distortion analyzer-Spectrum analyzer-Applications-Audio Frequency generator-Noise generator.

UNIT III

OSCILLOSCOPES

General purpose oscilloscope-Screens for CRT graticules-Vertical & horizontal deflection systems- Time base operation, triggers – sweep control, z axis input - Delay line-Multiple trace-Dual beam & dual trace-Probes-Oscilloscope techniques-special oscilloscopes-Storage oscilloscope-sampling oscilloscope-digital CRO.

UNIT IV

DIGITAL INSTRUMENTS

Digital method for measuring frequency, period, phase difference, pulse width, time interval, total count-Digital voltmeter-Types-Automatic polarity indication, automatic ranging, and auto zeroing-DMM-Microprocessor based DMM-DPM-swept – spectrum analyzer-network analyzer-discharge analyzer- logic probes-logic analyzer.

UNIT V

DISPLAY AND RECORDING DEVICES

Bar graph display-Segmental and dot matrix display-X-Y recorders, magnetic tape recorders-Digital recording-Data loggers-Interference and screening-Electrostatic and electromagnetic interference & earth loops.

TEXT BOOKS

1.Albert D. Herlfrick & William D. Cooper, “Modern electronic Instrumentation & Measurement Techniques” Prentice Hall of India,2002.
2.A.J.Bouwens,’Digital Instrumentation” Tata Mc Graw Hill, 1997.
3.RobertA.Witte,’Electronic Test Instruments,Theory and applications’
Prentice Hall, 1993.

REFERENCE BOOKS

1.B.M.Oliver and J.M.Cage,”Electronic Measurements & Instrumentation” Mc Graw Hill International Edition, 1975.
2.Joseph, J.Carr,”Elements of Electronic Instrumentation & Measurements” III edition, Pearson Education,2003.

3.C.S.Rangan, G.R.sarma, V.S.V.Mani,"Instrumentation Devices & systems" Tata Mc Graw Hill, 2002
4.D.A.Bell, "Electronic Instrumentation and Measurements" Prentice Hall of India,2002.
5.Rajendra Prasad,"Electronic Measurements and Instrumentation", Khanna Publishers, Delhi,2003.
6.B.R.Gupta,"Electronics and Instrumentation"S.Chand Co. (P)Ltd., Delhi,2003.

2. ELECTRICAL MEASUREMENTS AND INSTRUMENTS Elective (Semester I)

UNIT I
MEASUREMENT OF VOLTAGE AND CURRENT

Galvanometers - Ballistic, D'Arsonval galvanometer-Theory, calibration, application, Principle, construction, operation and comparison of moving coil, moving iron meters, dynamometer, induction type & thermal type meter, rectifier type-
Extension of range and calibration of voltmeter and ammeter-errors and compensation

UNIT II
MEASUREMENT OF POWER AND ENERGY

Electrodynamometer type wattmeter-Theory & its errors-Methods of correction-LPF wattmeter-Phantom loading-Induction type KWH meter-Calibration of wattmeter, energy meter

UNIT III
POTENTIOMETERS & INSTRUMENT TRANSFORMERS

DC potentiometer-Basic circuit-standardization-Laboratory type (Crompton's)-AC potentiometer-Drysdate (polar type) type-Gall-Tinstey (coordinate) type-Limitations& applications-C. T and V.T construction theory, operation, phasor diagram, characteristics, testing, error elimination-Applications.

UNIT IV
RESISTANCE MEASUREMENT

Measurement of low, medium & high resistance-Ammeter, voltmeter method-Wheatstone bridge-Kelvin double bridge-Ductor ohmmeter-Series and shunt type ohmmeter-High resistance measurement-Megger-Direct deflection methods-Price's guard-wire method-Loss of charge method-Earth resistance measurement.

UNIT V
IMPEDENCE MEASUREMENT

A.C bridges-Measurement of inductance, capacitance-Q of coil-Maxwell Bridge-Wien's Bridge-Hey's bridge-Anderson bridge-Campbell bridge to measure mutual inductance-Errors in A.C.bridge methods and their compensation-Detectors –Excited field-A.C.galvanometer-Vibration galvanometer-Introduction to cable fault and eddy current measurement

TEXT BOOKS

1.E.W.Golding & F.C.Widdis,'Electrical Measurements & Measuring Instruments' A.H.Wheeler & Co.1994
2.A.K.Sawhney, 'Electrical & Electronic Measurements and Instrumentation" Dhanpath Raj & Co (P) Ltd. 2004

REFERENCE BOOKS

1.J.B.Gupta" A Course in Electronic and Electrical Measurements and Instrumentation" S.K. Kataria &Sons, Delhi 2003
2.S.K.Singh,"Industrial Instrumentation and control' Tata Mc Graw Hill, 2003
3.H.S.Kalsi,'Electronic Instrumentation' Tata Mc Graw Hill, 1995
4.Martia U.Reissland, 'Electrical Measurement' New Age International (P) Ltd.2001.

3. ADVANCED MEASUREMENT TECHNIQUES — Elective (Semester I)

UNIT I
REVIEW OF MEASUREMENT SYSTEM

Functional elements of a measuring system - Input – output configuration of instrumentation system - Method of correction for interfering and modifying inputs

UNIT II
MEASUREMENT OF VIBRATION)

Nature of vibration - Quantities involved in vibration measurements - Seismic transducer - Types of accelerometers – potentio-metric type accelero-meter, LVDT accelerometer, Piezo electric accelerometer

UNIT III
HIGH FREQUENCY MEASUREMENT

Resonance methods - Measurement of inductance and capacitance - Measurement of effective resistance by resistance variation method and reactance variation method – T networks – parallel T networks and bridge T networks - Radio frequency measurement – sensitivity and selectivity measurement of radio receiver

UNIT IV
OPTO ELECTRONIC MEASUREMENT

Photo sensitive devices – light emitting diodes, photo diodes, photo conductors - Photo voltaic cell, photo thyristors, photo transistors - Light modulating techniques – light suppression, light attenuation, photometric and radiometric fittings

UNIT V
ULTRASONIC MEASUREMENT

Ultrasonic method of flow measurement, and measurement of thickness, measurement of displacement etc - Ultrasonic digitizer

TEXT BOOKS

1. Measurement systems, Application and Design – E.O Doeblin, McGraw Hill International Editions
2. A Course in Electrical and electronics Measurement and Instrumentation by AK Sawhney; Dhanpat Rai and Co Pvt. Ltd., New Delhi

1. ANALYTICAL INSTRUMENTATION Elective (Semester II)

UNIT I

COLORIMETRY AND SPECTROPHOTOMETRY

Special methods of analysis- Beer-Lambert law-colorimeters-UV-ViS spectrophotometers-Single and double beam instruments-Sources and detectors-IR Spectrophotometers-Types-Attenuated total reflectance flame photometers- Atomic absorption spectrophotometers-sources and detectors-FTIR spectrophotometers-Flame emission photometers.

UNIT II

CHROMOTOGRAPHY

Different techniques-Gas chromatography-Detectors-Liquid chromatographs-Applications-High pressure liquid chromatographs-Applications.

UNIT III

INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS

Types of gas analyzers-Oxygen,NO2 and H2S types, IR analyzers, thermal conductivity analyzers, analysis based on ionization of gases. Air pollution due to carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide estimation-dust and smoke measurements.

UNIT IV

pH METERS AND DISSOLVE COMPONENT ANALYZERS

Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes, selective ion electrodes, ammonia electrodes, biosensors, dissolved oxygen analyzer-sodium analyzer-silicon analyzer.

UNIT V

RADIO CHEMICAL AND MAGNETIC RESONANCE TECHNIQUES

Nuclear radiations-Detectors-GM Counter-Proportional counter-Solid state detector-Gamma cameras-X-ray spectroscopy-Detectors-Diffractometers-Absorption meters-Detectors NMR-Basic principles-NMR spectrometer-Applications. Mass spectrometers-Different types-Applications.

TEXT BOOKS

1.R.S.Khandpur,"Handbook of Analytical Instruments"Tata Mc Graw Hill publishing Co.Ltd.2003.

2.H.H.Willard, L.L.Merrit, J.A.Dean, F.A.Settle,"Instrumental methods of analysis" CBS publishing & distribution, 1995.

REFERENCE BOOKS

1.Robert D.Braun,"Introduction to Instrumental Analysis"Mc Graw Hill, Singapore, 1987.
2.G.W.Ewing,"Instrumental Methods of Analysis" Mc Graw Hill 1992.
3.DA Skoog and D.M.West,"Prinicples of Instrumental Analysis" Harper and Row publishers, 1974.

2. COMMUNICATION SYSTEMS — Elective (Semester II)

UNIT – I

LINEAR MODULATION

Elements of communication systems - need for modulation - amplitude modulation - frequency spectrum - bandwith considerations - power relations - modulators and demodulators - block diagram of superhetrodyne AM broadcast receiver - principle of working - sensitivity, selectivity and fidelity - factors governing choice of I.F - image frequency and image rejection - generation of DSB/SC, SSB, VSB signals.

UNIT – II: ANGLE MODULATION

Basic definition of frequency and phase modulation - mathematical representation of FM - frequency spectrum - narrow band and wide band FM - bandwidth considerations - methods of generation and demodulation - preemphasis and deemphasis - block diagram of FM receiver and its working - comparison of analog modulation systems.

UNIT – III: ANALOG AND DIGITAL PULSE MODULATION

Review of low pass sampling theorem - advantages of pulse modulation schemes - multiplexing types - pulse amplitude modulation (FAM) - pulse width modulation (PWM) and pulse position modulation (PPM) schemes -generation and detection - pulse code modulation (PCM) - quantitation noise - PCM formats - bandwidth and companding - synchronisation - delta modulator - slope overload and adaptive delta modulator - DPCM - comparison of pulse modulation systems.

UNIT – IV: DIGITAL COMMUNICATIONS

Fundamentals of data communication systems - emergence of data communication systems - digital modulation schemes - ASK, FSK, PSK and DPSK - introduction to modems and its applications.

UNIT – V: LINE COMMUNICATION SYSTEMS

Fundamentals of voice transmission - telephoney picture transmission – fascimile – spread – spectrum communications.

REFERENCE BOOKS

1. Electronic Communication systems - George Kennedy 3rd Edition, Tata Mc Grow Hill, 1992.
2. Electronic communications - Dennia Reddy and John Coolen - Printice Hall of India 4th Edn. 1995.
3. Digital Communications, B.Sklar, Prentice Hall of India, 1992

3. FIBRE OPTICS AND LASER INSTRUMENTATION Elective (Semester II)

UNIT I
OPTICAL FIBRES AND THEIR PROPERTIES

Principles of light propagation through a fibre-Different types of fibres and their properties, fibre characteristics-Absorption losses-Scattering losses-Dispersion-Connectors& splicers-Fibre termination-Optical source –Optical detectors.

UNIT II
INDUSTRIAL APPLICATION OF OPTICAL FIBRES

Fibre Optic sensors-Fibre Optic Instrumentation system-Different types of modulators-Interferometric method of measurement of length-More fringes-Measurement of pressure-, temperature, current, voltage, liquid level and strain.

UNIT III
LASER SORUCES, DETECTORS AND CONNECTORS

Laser basic concepts – LED structures – LED characteristics – Optical detection principles – PN photodiode – PIN photodiode – Avalanche photodiode – connectors- splices-connectors – fibre couples

UNIT IV
INDUSTRIAL APPLICATION OF LASERS

Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect-Material processing-Laser heating, welding, melting and trimming of material-Removal and vaporization.

UNIT V
HOLOGRAM AND MEDICAL APPLICATIONS

Holography-Basic principle-Methods-Holographic interferometry and application, Holography for non-destructive testing-Holographic components-Medical applications of lasers, laser and tissue interactive-Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynecology and oncology.

TEXT BOOKS

1.J.M.Senior,'Optical Fibre Communication-Principles and Practice' Prentice Hall of India,1985.
2.J.Wilson and J.F.B.Hawkes,'Introduction to Opto Electronics'Prentice Hall of India,2001.

REFERENCE BOOKS

1.Donald J.Sterling Jr.'Technicians Guide to Fibre Optics'3rd Edition,Vikas Publishing House,2000.
2.M.Arumugam,'Optical Fibre Communication and Sensors'Anuradha Agencies,2002.
3.John F.Read,'Industrial Applications of Lasers'Academic Press,1978.
4.Monte Ross,'Laser Applications,Mc Graw Hill,1968
5.G.Keiser,'Optical Fibre Communication'Mc Graw Hill,1995.
6.Mr.Gupta,'Fibre Optics Communication,'Prentice Hall of India,2004.

1. NANO ELECTRONICS AND SYSTEMS Elective (Semester III)

UNIT I

INTRODUCTION,SURVEY OF MODERN ELECTRONICS

Diode as Basic Element of Electronics,Field Effect of Transistors,Heterostructure transistors,Resonant-Tunneling diodes and transistors Need for New Concepts in Electronics,From Microelctronics towards Biomolecule Electronics

UNIT II

BASIC CONCEPTS OF ELECTROMAGNETIC WAVES AND QUANTUM MECHANICS

Electromagnetic Waves and Maxwell's Equations, Duality of Electron,Schrodinge Equation,Eigenvalue Problem and Electron in Quantum Well,Electrons in Multiple Quantum Wells.Superlattices Artificial Atoms:Quantum Dots,Molecules,Energy Level Splitting,Chemical Bonds,Optical Transitions and Lasers

UNIT III

ROLE OF PATTERN FORMATION IN NANOELECTRONICS

High Resolution Lithography, Dip-Pin Lithography,N EMS,Nano-Electro-mechanical Systems,Self-Assembly structures – Chemically Directed Self-Assembly,Surface-Layer Proteins in monolithography

UNIT IV

TRADITIONAL LOW-DIMENSIONAL SYSTEMS

Quantum Well.cascade Lasers and other Quantum-Well Devices,Quantum Wires,Quantum Dots and Quantum Dot molecules,Quantum Dot Based cellulaaar Automata, Coloumb Effects,Single Electron Devices Nanoscale sensors and Actuators

UNIT V

NEWLY EMERGED NANOSTRUCTURES

Challenges and Potential Applications of Inorganic Heterostructures,Quantum Dots Embedded in organic Matrix,organic light emitting diodes,Quantum Wire Interconnects,DNA and Peptides,Fullerness and carbon nanotubules,Molecular Electronics Materials and Biomolecules,Future Integrated circuits:Quantum computing

Text Books:

1. C.P. Poole and F.J.Owens, " Introduction to nanotechnology",John Wiley & Sons,2003
2. M.A. Ratner and D.Ratner, " Nanotechnology ; a gentle introduction to the next big idea" , Prentice Hall,2002
3. Nanometer structures:theory,modeling and simulation" Editor:Akhlesh Lakhtakia, ASME Press
4. S.E.Lyshevski,"Nano-and micro-electrochemical systems fundamentals of nano and microengineering ,2004.

2. VLSI SYSTEM DESGIN — Elective (Semester III)

UNIT I

VLSI technology- NMOS, CMOS and BICMOS circuit fabrication. Layout design rules. Stick diagram. Latch up.

UNIT II

System design using HDL- circuit and system representation. Hierarchical representation of digital system. An overview of Verilog. Basics of verilog, operators, hierarchy, procedures and assignments. Timing controls, delay, tasks and functions. Control statements. Test benches.

UNIT III

VLSI logic circuits and analysis- MOS and CMOS switches. Implementation of logic circuits using MOS and CMOS technology, multiplexers and memory, MOS transistors, threshold voltage, MOS device design equations. MOS models, small-signal AC analysis. CMOS inverters, propagation delay of inverters, power dissipation.

UNIT IV

Programmable logic devices- antifuse, EPROM and SRAM techniques. Programmable logic cells. Programmable inversion and expander logic. Design flow for VLSI circuits. Computation of interconnect delay.

UNIT V

VLSI testing -need for testing , manufacturing test principles, design strategies for test, chip level and system level test techniques.

REFERENCE BOOKS

N.H.E.Weste etal, CMOS VLSI design, (3/e), Pearson , 2005
J. Smith, Application Specific Integrated Circuits, Addison Wesley, 1997.
Uyemura, Introduction to VLSI Circuits and Systems, Wiley, 2002.

3. COMPUTER PROGRAMMING IN C AND C++ — Elective (Semester III)

UNIT – I

PROGRAMMING IN C

Identifiers and Keywords - Constants, Variables and Data types - Operators and expressions - Data Input and Output - Control Structures - *if* and *switch* statements - *while*, *do-while* and *for* statements – *goto* statement - Arrays - Character strings - Simple programs

UNIT – II

FUNCTIONS AND POINTERS

User defined Functions - Defining and accessing functions - Passing arguments - Function prototypes - Recursion - Storage classes - Pointer Declarations - Passing pointers to functions - Pointers and arrays - Operations on pointers - Arrays of pointers - Dynamic memory allocation

UNIT – III

STRUCTURES, UNIONS AND DATA FILES

User defined data types - Structures - Declaring structures and Accessing members - Array of structures - Structure within structure - Unions - File operations - open, close, reading and writing - Random access files - Linked list - Preprocessor directives - Macros - Command line arguments

UNIT – IV

PROGRAMMING IN C++

Object Oriented Programming (OOP) - Basic concepts and applications - Structure of C++ program - variable declaration - Differences between C and C++ - Functions in C++ - *inline* Functions - Default arguments - Function overloading/polymorphism - Classes and objects - Constructors and destructors - Operator overloading and type conversions - Simple programs

UNIT – V

INHERITANCE, POINTERS AND DATA FILES

Extending classes - Inheritance and its types - Single level, multilevel, multiple and hybrid inheritance - Pointers to objects and derived classes - Virtual functions - C++ stream classes - Console I/O operations - Simple Data File operations

REFERENCE BOOKS

1. Schaum's outline of Theory and Problems of Programming with C, by Byron S. Gottfried, Tata McGraw-Hill, 1991
2. Object-Oriented Programming with C++, by E.Balagurusamy, Tata McGraw-Hill, 1995
   Object-Oriented Programming in Turbo C++, by Robert Lafore, Galgotia Publications, 1991

1. BIO-MEDICAL INSTRUMENTATION **SUPPORTIVE -Paper-I**

UNIT I

PHSYIOLOGY AND TRANSDUCERS

Cell and its structure-Action and resting-Potential propagation of action potential-Sodium pump-Nervous system-CNS-PNS –Nerve cell-Synapse-Cardio pulmonary system-Physiology of heart and lungs Circulation and respiration-Transducers-Different types-Piezo-electric, ultrasonic, resistive, capacitive, inductive transducers-Selection criteria

UNIT II

ELECTRO-PHYSIOLOGICAL MEASUREMENTS

Basic components of biomedical system-Electrodes-Micro, needle and surface electrodes-amplifiers-Preamplifiers, differential amplifiers, chopper amplifiers-isolation amplifier.ECG-EEG-EMG-ERG-Lead systems and recording methods-Typical waveforms.

UNIT III
NON-ELECTRICAL PARAMETER MEASUREMENTS

Measurement of blood pressure-Cardiac output-Cardiac rate-Heart sound-Respiratory rate-Gas volume-Flow rate of Co2, O2 in exhaust air-pH of blood, ESR, GSR measurements-Plethysmography

UNIT IV
MEDICAL INSTRUMENTATION

X-ray machine-Radio graphic and fluoroscopic techniques-Computer tomography-MRI – Ultrasonography-Endoscopy-Thermography-Different types of biotelemetry systems and patient monitoring-Electrical safety.

UNIT V
ASSISTING AND THERAPEUTIC EQUIPMENTS

Pace makers-Defibrillators-Ventilators-Nerve and muscle stimulators-Diathermy-Heart-Lung machine-Audio meters-Dializers.

TEXT BOOKS

1.Lesilie Cromwell, Fred J.Weibell,Erich A.Pfeiffer,"Bio-Medical Instrumentation and Measurements" II edition, Pearson Education,2002/PHI
2.R.S.Khandpur,"Handbook of Bio-Medical Instrumentation"Tata Mc Graw Hill Publishing Co.Ltd.2003.

REFERENCE BOOKS

1.M.Arumugam,Bio-Medical Instrumentation,"Anuradha Agencies,2—3.
2.L.A.Geddes and L.E.Baker,"Principles of Applied Bio-Medical Instrumentation" John Wiley & Sons 1975.

2. ELECTRONIC TEST INSTRUMENTS **SUPPORTIVE Paper II**

UNIT I
ANALOG METERS

D.C,A.C voltmeters, ammeters, multimeter,power meter,Q-meter,true RMS meter, vector impedance meter, vector voltmeter, component measuring instrument.

UNIT II
SIGNAL SOURCES

Sine wave generator-Frequency synthesized sine wave generator-Sweep frequency generator, pulse and square wave generator-Function generator-Wave analyzer-Applications-Harmonic distortion analyzer-Spectrum analyzer-Applications-Audio Frequency generator-Noise generator.

UNIT III

OSCILLOSCOPES

General purpose oscilloscope-Screens for CRT graticules-Vertical & horizontal deflection systems- Time base operation, triggers – sweep control, z axis input - Delay line-Multiple trace-Dual beam & dual trace-Probes-Oscilloscope techniques-special oscilloscopes-Storage oscilloscope-sampling oscilloscope-digital CRO.

UNIT IV

DIGITAL INSTRUMENTS

Digital method for measuring frequency, period, phase difference, pulse width, time interval, total count-Digital voltmeter-Types-Automatic polarity indication, automatic ranging, and auto zeroing-DMM-Microprocessor based DMM-DPM-swept – spectrum analyzer-network analyzer-discharge analyzer- logic probes-logic analyzer.

UNIT V

DISPLAY AND RECORDING DEVICES

Bar graph display-Segmental and dot matrix display-X-Y recorders, magnetic tape recorders-Digital recording-Data loggers-Interference and screening-Electrostatic and electromagnetic interference & earth loops.

TEXT BOOKS

1.Albert D. Herlfrick & William D. Cooper, “Modern electronic Instrumentation & Measurement Techniques” Prentice Hall of India,2002.
2.A.J.Bouwens,’Digital Instrumentation” Tata Mc Graw Hill, 1997.
3.RobertA.Witte,’Electronic Test Instruments,Theory and applications’ Prentice Hall, 1993.

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1.B.M.Oliver and J.M.Cage,”Electronic Measurements & Instrumentation” Mc Graw Hill International Edition, 1975.
2.Joseph, J.Carr,”Elements of Electronic Instrumentation & Measurements” III edition, Pearson Education,2003.
3.C.S.Rangan, G.R.sarma, V.S.V.Mani,”Instrumentation Devices & systems” Tata Mc Graw Hill, 2002
4.D.A.Bell, “Electronic Instrumentation and Measurements” Prentice Hall of India,2002.
5.Rajendra Prasad,”Electronic Measurements and Instrumentation”, Khanna Publishers, Delhi,2003.
6.B.R.Gupta,”Electronics and Instrumentation”S.Chand Co. (P)Ltd., Delhi,2003.

3. MICROPROCESSORS AND ITS APPLICATIONS SUPPORTIVE PAPER - III

UNIT I
INTRODUCTION
Architecture and Programming of 8085 - functional Block diagrams, bus systems,instruction set, addressing modes - timing diagram and assembly level programmes; Interfacing RAM and ROM sections.

UNIT II
PERIPHERAL DEVICES
Programmable peripheral interface (8255); Data transfer schemes-programmed and DMA controller 8257- Interrupts and DMA - Interrupt features, types of interrupts-methods of servicing interrupts programmable interrupt controller, Need for Direct memory access-programmable DMA controller.

UNIT III
8031/8051 MCU FAMILY
Microcontrollers- architecture of 8051- memory organisations, addressing modes - instruction set -simple programs - interrupt structure Interfacing with external ROM and RAM, Typical applications -MCS 51 family features.

UNIT IV
MOTOROLA , PIC MICROCONTROLLERS
Introduction to Motorola MC 68HC 11/12, Microcontroller – Programming model, instruction set, Assembly level programming – PIC series of microcontrollers

UNIT V
INTERFACING APPLICATIONS
Interfacing applications- ADC, DAC, motor control, waveform generation, -interfacing of simple keyboards and LED displays.
Seven segment LED display systems-stepper motor control -speed control of DC motor using thyristor converters.

1. Ramesh Gaonkar, 'Microprocessor Architecture, Programming and applications', With the 8085/8080A,3rd Edition ,Penram International Publishing house, 2002.
2. Muhammad Ali Mazidi , Janice Gillispie Mazidi, “The 8051 Microcontroller and Embedded Systems”, Pearson, 4th edition 2002.
3. Kenneth J.Ayala,’ The 8051 Micro controller’, Penram International Publishing, 1996.
4. Raj kamal, Microcontrollers, Programming, Interfacing and system Design, Peasrson 2005
5. J.Morton,’The PIC Mircrocontroller, ‘Elsevier 2005
6. Peatman J.B. ‘Design with PIC mircrocontrolllers’ Pearon,2003.