SCHEME OF TEACHING AND EXAMINATION

B.E. INSTRUMENTATION TECHNOLOGY

V SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination Scheme			Total Marks
				Theory	Practical	Duration	IA	External Marks	
1	06AL51	Management and Entrepreneurship	@	04	-	03	25	100	125
2	06IT52	8086 Microprocessor & Peripherals	IT	04	-	03	25	100	125
3	06IT53	Digital Signal Processing	IT	04	-	03	25	100	125
4	06IT54	Process Instrumentation	IT	04	-	03	25	100	125
5	06IT55	Biomedical Instrumentation	IT	04	-	03	25	100	125
6	06IT56	C++ & Data Structures	IT	04	-	03	25	100	125
7	06ITL57	Analog IC Lab	IT	-	03	03	25	50	75
8	06ITL58	8086 Microprocessor Lab	IT	-	03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

@ Any Engineering Department or Department of Business Studies.

SCHEME OF TEACHING AND EXAMINATION

B.E. INSTRUMENTATION TECHNOLOGY

VI SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination Scheme			Total Marks
				Theory	Practical	Duration	IA	External Marks	
1	06IT61	Communication Systems	IT	04	-	03	25	100	125
2	06IT62	Advanced Control Systems	IT	04	-	03	25	100	125
3	06IT63	Digital Image Processing	IT	04	-	03	25	100	125
4	06IT64	Process Control Systems	IT	04	-	03	25	100	125
5	06IT65	Analytical Instrumentation	IT	04	-	03	25	100	125
6	06IT66x	**Elective-I (Group A)**	IT	04	-	03	25	100	125
7	06ITL67	Control System & Data Converters Lab	IT	-	03	03	25	50	75
8	06ITL68	Instrumentation Lab	IT	-	03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

ELECTIVES-I (GROUP A)

06IT661 - Power Electronics
06IT662 - PIC Microcontroller
06IT663 - Computer Architecture
06IT664 - Operating Systems

SCHEME OF TEACHING AND EXAMINATION

B.E. INSTRUMENTATION TECHNOLOGY

VII SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination Scheme			Total Marks
				Theory	Practical	Duration	IA	External Marks	
1	06IT71	VLSI Design	IT	04	-	03	25	100	125
2	06IT72	DSP Architecture	IT	04	-	03	25	100	125
3	06IT73	Neural Networks & Fuzzy Logic	IT	04	-	03	25	100	125
4	06IT74	Automation in Process Control	IT	04	-	03	25	100	125
5	06IT75x	**Elective-II (Group B)**	IT	04	-	03	25	100	125
6	06IT76x	**Elective-III (Group C)**	IT	04	-	03	25	100	125
7	06ITL77	DSP Lab	IT	-	03	03	25	50	75
8	06ITL78	Process Control Lab	IT	-	03	03	25	50	75
TOTAL				**24**	**06**	**24**	**200**	**700**	**900**

ELECTIVES-II (GROUP B)

06IT751 - ARM Processor
06IT752 - Computer Networks
06IT753 - Product Design Technology
06IT754 - Medical Imaging Systems

ELECTIVES-III (GROUP C)

06IT761 - Embedded System & RTOS
06IT762 - Distributed Sensor Network
06IT763 - Applied Numerical Methods
06MS769 - Micro and Smart Systems Technology

SCHEME OF TEACHING AND EXAMINATION

B.E. INSTRUMENTATION TECHNOLOGY

VIII SEMESTER

Sl. No.	Subject Code	Title of the Subject	Teaching Dept.	Teaching Hrs / Week		Examination Scheme			Total Marks
				Theory	Practical	Duration	IA	Marks	
1	06IT81	Lasers & Opticals Instrumentation	IT	04	-	03	25	100	125
2	06IT82	Aircraft Instrumentation	IT	04	-	03	25	100	125
3	06IT83x	**Elective-IV (Group D)**	IT	04	-	03	25	100	125
4	06IT84x	**Elective-V (Group E)**	IT	04	-	03	25	100	125
5	06IT85	Project Work	IT	-	06	03	100	100	200
6	06IT86	Seminar	IT	-	03	-	50	-	50
TOTAL				**16**	**09**	**15**	**250**	**500**	**750**

Electives-IV (Group D)

06IT831 - Wavelet Transforms
06IT832 - Speech Signal Processing
06IT833 - Industrial Instrumentation
06IT834 - Robotics

Electives-V (Group E)

06IT841 - Low Power VLSI Design
06IT842 - Biomedical DSP
06IT843 - Mobile Communication
06IT844 - Smart Sensors

SCHEME OF TEACHING AND EXAMINATION

V SEMESTER **B.E., INSTRUMENTATION TECHNOLOGY**

Sl No	Subject Code	Title	Teaching Dept.	Hours/week		Examination Scheme			Total Marks
				Theory	Practical	Duration	IA	External Marks	
1	06AL51	Management and Entrepreneurship	@	04	-	03	25	100	125
2	06IT52	8086 Microprocessor & Peripherals	IT	04	-	03	25	100	125
3	06IT53	Digital Signal Processing	IT	04	-	03	25	100	125
4	06IT54	Process Instrumentation	IT	04	-	03	25	100	125
5	06IT55	Biomedical Instrumentation	IT	04	-	03	25	100	125
6	06IT56	C++ & Data Structures	IT	04	-	03	25	100	125
7	06ITL57	Analog IC Lab	IT	-	03	03	25	50	75
8	06ITL58	8086 Microprocessor Lab	IT	-	03	03	25	50	75
Total				**24**	**06**	**24**	**200**	**700**	**900**

@ Any Engineering Department or Department of Business Studies.

SCHEME OF TEACHING AND EXAMINATION

VI SEMESTER **B.E., INSTRUMENTATION TECHNOLOGY**

Sl No	Subject Code	Title	Teaching Dept.	Hours/week		Examination Scheme			Total Marks
				Theory	Practical	Duration	IA	External Marks	
1	06IT61	Communication Systems	IT	04	-	03	25	100	125
2	06IT62	Advanced Control Systems	IT	04	-	03	25	100	125
3	06IT63	Digital Image Processing	IT	04	-	03	25	100	125
4	06IT64	Process Control Systems	IT	04	-	03	25	100	125
5	06IT65	Analytical Instrumentation	IT	04	-	03	25	100	125
6	06IT66x	Elective-I (Group–A)	IT	04	-	03	25	100	125
7	06ITL67	Control System & Data Converters Lab	IT	-	03	03	25	50	75
8	06ITL68	Instrumentation Lab	IT	-	03	03	25	50	75
Total				**24**	**06**	**24**	**200**	**700**	**900**

Electives – I (Group – A)		
Sl.No.	**Subject Code**	**Title of the Subject**
1	06IT661	Power Electronics
2	06IT662	PIC Microcontroller
3	06IT663	Computer Architecture
4	06IT664	Operating Systems

SCHEME OF TEACHING AND EXAMINATION

VII SEMESTER **B.E., INSTRUMENTATION TECHNOLOGY**

Sl. No	Subject Code	Title	Teaching Dept.	Hours/week		Examination Scheme			Total Marks
				Theory	Practical	Duration	IA	External Marks	
1	06IT71	VLSI Design	IT	04	-	03	25	100	125
2	06IT72	DSP Architecture	IT	04	-	03	25	100	125
3	06IT73	Neural Networks&FuzzyLogic	IT	04	-	03	25	100	125
4	06IT74	Automation in Process Control	IT	04	-	03	25	100	125
5	06IT75x	Elective-2 (Group-B)	IT	04	-	03	25	100	125
6	06IT76x	Elective-3 (Group-C)	IT	04	-	03	25	100	125
7	06ITL77	DSP Lab	IT	-	03	03	25	50	75
8	06ITL78	Process Control Lab	IT	-	03	03	25	50	75
Total				**24**	**06**	**24**	**200**	**700**	**900**

Electives-2 (Group- B)			Electives-3 (Group- C)		
Sl. No	**Subject Code**	**Title of the Subject**	**Sl. No**	**Subject Code**	**Title of the Subject**
1	06IT751	ARM Processor	1	06IT761	Embedded System & RTOS
2	06IT752	Computer Networks	2	06IT762	Distributed Sensor Network
3	06IT753	Product Design Technology	3	06IT763	Applied Numerical Methods
4	06IT754	Medical Imaging Systems	4	06MS769	Micro and Smart Systems Technology

SCHEME OF TEACHING AND EXAMINATION

VIII SEMESTER **B.E., INSTRUMENTATION TECHNOLOGY**

Sl. No	Subject Code	Title	Teaching Dept.	Hours/week		Examination Scheme			Total Marks
				Theory	Practical	Duration	IA	Marks	
1	06IT81	Lasers & Opticals Instrumentation	IT	04	-	03	25	100	125
2	06IT82	Aircraft Instrumentation	IT	04	-	03	25	100	125
3	06IT83x	Elective-4 (Group-D)	IT	04	-	03	25	100	125
4	06IT84x	Elective-5 (Group-E)	IT	04	-	03	25	100	125
5	06IT85	Project Work	IT	-	06	03	100	100	200
6	06IT86	Seminar	IT	-	03	-	50	-	50
Total				**16**	**09**	**15**	**250**	**500**	**750**

Electives-4 (Group- D)			Electives-5 (Group- E)		
Sl. No	**Subject Code**	**Title of the Subject**	**Sl. No**	**Subject Code**	**Title of the Subject**
1	06IT831	Wavelet Transforms	1	06IT841	Low Power VLSI Design
2	06IT832	Speech Signal Processing	2	06IT842	Biomedical DSP
3	06IT833	Industrial Instrumentation	3	06IT843	Mobile Communication
4	06IT834	Robotics	4	06IT844	Smart Sensors

V SEMESTER

MANAGEMENT AND ENTERPRENEURSHIP

Subject Code	:	**06AL51**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

MANAGEMENT

UNIT - 1

MANAGEMENT: Introduction – Meaning – nature and characteristics of Management, Scope and Functional areas of management – Management as a science, art of profession – Management & Administration – Roles of Management, Levels of Management, Development of Management Thought – early management approaches – Modern management approaches.

7 Hours

UNIT - 2

PLANNING: Nature, importance and purpose of planning process – Objectives – Types of plans (Meaning Only) – Decision making – Importance of planning – steps in planning & planning premises – Hierarchy of plans.

6 Hours

UNIT - 3

ORGANIZING AND STAFFING: Nature and purpose of organization – Principles of organization – Types of organization – Departmentation – Committees- Centralization Vs Decentralization of authority and responsibility – Span of control – MBO and MBE (Meaning Only) Nature and importance of staffing–Process of Selection & Recruitment (in brief).

6 Hours

UNIT - 4

DIRECTING & CONTROLLING: Meaning and nature of directing – Leadership styles, Motivation Theories, Communication – Meaning and importance – coordination, meaning and importance and Techniques of Co – Ordination. Meaning and steps in controlling – Essentials of a sound control system – Methods of establishing control (in brief).

7 Hours

PART - B

ENTREPRENEURSHIP

UNIT - 5

ENTREPRENEUR: Meaning of Entrepreneur; Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneur, Intrapreneur - an emerging Class. Concept of Entrepreneurship – Evolution of

Entrepreneurship, Development of Entrepreneurship; Stages in entrepreneurial process; Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship – its Barriers.

6 Hours

UNIT - 6

SMALL SCALE INDUSTRIES: Definition; Characteristics; Need and rationale; Objectives; Scope; role of SSI in Economic Development. Advantages of SSI Steps to start and SSI – Government policy towards SSI; Different Policies of SSI; Government Support for SSI during 5 year plans. Impact of Liberalization, Privatization, Globalization on SSI Effect of WTO/GATT Supporting Agencies of Government for SSI, Meaning, Nature of support; Objectives; Functions; Types of Help; Ancillary Industry and Tiny Industry (Definition Only)

7 Hours

UNIT - 7

INSTITUTIONAL SUPPORT: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency; SISI; NSIC; SIDBI; KSFC.

7 Hours

UNIT - 8

PREPARATION OF PROJECT: Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; Formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. **Identification of business opportunities:** Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study.

7 Hours

TEXT BOOKS:

1. **Principles of Management** – P.C.Tripathi, P.N.Reddy – Tata McGraw Hill,
2. **Dynamics of Entrepreneurial Development & Management** – Vasant Desai – Himalaya Publishing House
3. **Entrepreneurship Development** – Poornima.M.Charantimath – Small Business Enterprises – Pearson Education – 2006 (2 & 4).

REFERENCE BOOKS:

1. **Management Fundamentals** – Concepts, Application, Skill Development – Robers Lusier – Thomson –
2. **Entrepreneurship Development** – S.S.Khanka – S.Chand & Co.
3. **Management** – Stephen Robbins – Pearson Education/PHI – 17th Edition, 2003.

8086 MICROPROCESSOR & PERIPHERALS

Subject Code	:	**06IT52**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

Introduction, Microprocessor based computer system, Architecture of 8086 Microprocessor, Pin functions, Clock generator, Minimum /Maximum mode of operation.

7 Hours

UNIT - 2

Read /Write Timing diagrams, 8086 instruction set, Instruction template for data transfer instruction, addressing modes.

7 Hours

UNIT - 3

Assembler directives, Programming examples.

6 Hours

UNIT - 4

Linking and relocation, Stacks, Procedures, Interrupt and Interrupt routines, Macros.

6 Hours

PART - B

UNIT - 5

DOS interrupt 21H function to read a character from keyboard, Write character to console, Creation of a new file, read/write from/ to file, Serial/parallel communication.

Interfacing devices, Memory devices and Interfacing

7 Hours

UNIT - 6

8255PPI device and interfacing, Keyboard, display, ADC, DAC, Stepper motor and Printer interfacing using 8255.

7 Hours

UNIT - 7

8279 programmable keyboard/display controller and interfacing, 8253 and interfacing, 8259 programmable interrupt controller and interfacing

6 Hours

UNIT - 8

8257 DMA controller and interfacing, serial communication using 8251 & 8087 Numeric data processor and interfacing, RS 232 serial communication standards.

6 Hours

TEXTBOOKS:

1 **Advanced Microprocessor and Peripherals**- A.K.Ray and K.M. Bhurchandi, Tata McGraw Hill.

2 **Microcomputer systems 8086/8088 family, Architecture, Programming and Design -** Yu-Cheng Liu & Glenn A Gibson, 2nd Edition- July 2003, Prentice Hall of India.

REFERENCE BOOKS:

1. **Microprocessor and Interfacing, Programming & Hardware-** Douglas V Hall, 2nd Edition, Tata McGraw Hill
2. **Microprocessor Architecture, Programming and Applications with the 8085-** Ramesh S Gaonkar, 4th Edition, Penram International.

DIGITAL SIGNAL PROCESSING

Subject Code	:	**06IT53**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

Review of discrete signal and systems, DFT, Properties of DFT, and IDFT.

6 Hours

UNIT - 2

Circular Convolution, Correlation, Linear-filtering methods based on the DFT

6 Hours

UNIT - 3

COMPUTATION OF FFT: Decimation in Time FFT, Decimation in Frequency FFT, FFT Algorithm for a composite numbers.

7 Hours

UNIT - 4

FILTER REALIZATION: Direct, Parallel and Cascade form for FIR & IIR Systems

7 Hours

PART - B

UNIT - 5

FIR FILTERS: Properties, Filter Design using Windows (Rectangular, Hamming, Hanning and Kaiser Window), Filter design using Frequency sampling technique

7 Hours

UNIT - 6 & 7

IIR FILTERS: Specification and design techniques, Impulse Invariant and Bilinear Transformation techniques. Design of digital Butterworth and Chebyshev low pass filters using Analog filter design techniques, Transform of Low pass to High pass, Band pass and Band rejection filters, Comparison of IIR and FIR filters

12 Hours

UNIT - 8

ANALYSIS OF FINITE WORD LENGTH EFFECTS: Quantization process or errors, Analysis of co-efficient quantization effects, Analysis of co-efficient of quantization effects in FIR filters, Analysis of Arithmetic round off errors, Reduction of product round off errors, round off errors in FFT Algorithm.

4 Hours

APPLICATIONS: Dual tone Multi frequency signal detection, Spectral analysis using DFT, Musical Sound Processing, and Digital FM Stereo generation.

3 Hours

TEXT BOOKS:

1. **Digital Signal Processing-** PROAKIS and MANOLAKIS, 3rd Edition, Prentice Hall of India / Pearson.
2. **Digital Signal Processing**- S K MITRA, 4th Edition, Mc Graw-Hill.

REFERENCE BOOKS:

1. **Theory and Application of DSP**- RABINAR L R and GOLD B, Prentice Hall of India, 1999.
2. **Introduction to digital signal processing-** JOHNSON, Prentice Hall of India 1999.
3. **Digital Signal Processing-**ALAN V OPPENHEIM, Prentice Hall of India.

PROCESS INSTRUMENTATION

Subject Code	:	**06IT54**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

GENERALIZED CONFIGURATION, FUNCTIONAL DESCRIPTION & PERFORMANCE CHARACTERISTICS OF MEASURING INSTRUMENTS: Functional elements of an instrument: analog & digital modes of operation: null & deflection methods: I/O configuration of measuring instruments & instrument system- methods of correction for interfering & modifying inputs. Measurement Of Displacement: Principle of measurement of displacement, resistive potentiometers, variable inductance & variable reluctance pickups, LVDT, capacitance pickup.

7 Hours

UNIT - 2

MEASUREMENT OF FORCE, TORQUE & SHAFT POWER: Principle of measurement of Force, Torque, Shaft power standards and calibration: basic methods of force measurement; characteristics of elastic force transducer- Bonded strain gauge, differential transformer, piezo electric transducer, variable reluctance/ FM- Oscillator digital systems, loading effects; torque measurement on rotating shafts, shaft power measurement (dynamometers).

6 Hours

UNIT - 3

TEMPERATURE MEASUREMENT: Standards & calibration: thermal expansion methods-bimetallic thermometers, liquid-in-glass thermometers, pressure thermometers; thermoelectric sensor (thermocouple)- common thermocouples, reference junction consideration, special materials, configuration & techniques; electrical resistance sensors- conductive sensor (resistance thermometers), bulk semiconductors sensors (thermistors); junction semiconductor sensors; digital thermometers.

6 Hours

UNIT - 4

RADIATION METHODS: radiation fundamentals, radiation detectors, unchopped (DC) broadband radiation thermometers, Chopped (AC) selective band (photon) radiation thermometers, automatic null balance radiation thermometers (optical pyrometers). Two colour radiation thermometers, Black body-tipper fiber optic radiation thermometer. IR imaging systems. Fluroptic temperature measurement.

7 Hours

PART - B

UNIT - 5

PRESSURE MEASUREMENT: Standards & calibration: basic methods of pressure measurement; dead weight gauges & manometer, manometer dynamics; elastic transducers, high pressure measurement; low pressure (vacuum) measurement- McLeod gauge, Knudsen gauge, momentum-transfer (viscosity) gauges, thermal conductivity gauges, ionization gauges, dual gauge technique.

7 Hours

UNIT - 6

FLOW MEASUREMENT: Local flow velocity, magnitude and direction. Flow visualization. Velocity magnitude from pitot static tube. Velocity direction from yaw tube, pivoted vane, servoed sphere, dynamic wind vector indicator. Hot wire and hot film anemometer. Hot film shock-tube velocity sensors.

6 Hours

UNIT - 7

LASER DOPPLER VELOCIMETER; gross volume flow rate; calibration and standards. Constant-area, variable-pressure-drop meters (obstruction meters). Averaging pitot tubes. Constant pressure-drop, variable area meters (Rotameters), turbine meters, positive displacement meters. Metering pumps. Electromagnetic flow meters. Drag force flow meters. Ultrasonic flow meters, vortex-shedding flow meters.

6 Hours

UNIT - 8

LEVEL MEASUREMENT: Capacitance probe; conductivity probes; diaphragm level detector, differential pressure level detector, radiation level sensors, level transmitter, ultrasonic level detector.

7 Hours

TEXT BOOKS:

1. **Measurement systems application and design-** ERNEST O DOEBELIN, 5th Edition Tata McGraw Hill.
2. **Instrument Engineers Hand book**-(process measurement) B G LIPTAK, Chilton book Company.

REFERENCE BOOKS:

1. **Instrumentation Devices & Systems**- Rangan, Mani and Sharma 2nd Edition, Tata McGraw Hill.
2. **Process Instruments & Controls Hand Book Considine-** D.M. Mc Graw Hill.
3. **Transducers & Instrumentation**- DVS Murthy, Prentice Hall of India.
4. **Instrumentation & Process Measurements-** W.Bolton, Universities Press.

BIOMEDICAL INSTRUMENTATION

Subject Code	:	**06IT55**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

FUNDAMENTALS: Sources of biomedical signals, Basic instrumentation system, General constraints in design of biomedical instrumentation systems

BIOELECTRIC SIGNALS AND ELECTRODES: Origin of bioelectric signals, Types of bioelectric signals, Recording electrodes, Electrode-Tissue interface, Polarization, Skin contact impedance, Silver-silver chloride electrodes, Electrodes for ECG, EEG, EMG, Microelectrodes.

7 Hours

UNIT - 2

ELECTROCARDIOGRAPH: Electrical activity of the heart, Genesis & characteristics of Electrocardiogram (ECG), Block diagram description of an Electrocardiograph, ECG lead system, Multi-channel ECG machine

ELECTROENCEPHALOGRAPH: Genesis of Electroencephalogram (EEG), Block diagram description of an Electroencephalograph, 10-20 electrode systems, and computerized analysis of EEG.

7 Hours

UNIT - 3

PATIENT MONITORING SYSTEM: Bedside patient monitoring systems, Central monitors, Measurement of heart rate – Average heart rate meter, Instantaneous heart rate meter (cardio tachometer), Measurement of pulse rate.

6 Hours

UNIT - 4

BLOOD PRESSURE MEASUREMENT : Direct & Indirect method, Automatic blood pressure measuring apparatus using Korotkoff's method, Rheographic method, Oscillometric method, Ultrasonic Doppler shift method, Measurement of Respiration rate – Thermistor method, Impedance pnuemography, CO2 method, Apnea detectors

6 Hours

PART - B

UNIT - 5

BLOOD FLOW METERS: Electromagnetic blood flow meters, Ultrasonic blood flow meters, NMR blood flow meters, Laser Doppler blood flow meters.

6 Hours

UNIT - 6

CARDIAC OUTPUT MEASUREMENT: Indicator dilution method, Dye dilution method, Thermal dilution techniques, Measurement of continuous cardiac output derived from the aortic pressure waveform, Impedance technique.

6 Hours

UNIT - 7

CARDIAC PACEMAKERS AND DEFIBRILLATORS: Need for cardiac pacemaker, External pacemaker, Implantable pacemaker, Types of Implantable pacemakers, Programmable pacemaker, Rate-responsive pacemakers, AC & DC defibrillators.

7 Hours

UNIT - 8

PULMONARY FUNCTION ANALYZER: Pulmonary function measurement, Spirometry, Pneumotachometer, Measurement of volume by Nitrogen washout technique. Patient Safety: Electric shock hazards, Leakage currents

7 Hours

TEXT BOOK:

1. **Handbook of Biomedical Instrumentation**-R. S. Khandpur, 2nd Edition, 2003, Tata McGraw-Hill.

REFERENCE BOOKS:

1. **Principles of applied biomedical instrumentation-** Lesely Cromwell & others. 2nd Edition, John Wiley and sons.
2. **Encyclopedia of medical devices and instrumentation**-J. G. Webster, John Wiley, 1999.

C++ AND DATA STRUCTURES

Subject Code	:	**06IT56**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

C++ PROGRAMMING BASICS: Need for object oriented programming, procedural languages, characteristics of OOP, preprocessor directives, data types, manipulators.

6 Hours

UNIT - 2

STRUCTURES: Structures, enumerated data types, Boolean type, Functions: passing arguments, returning values, reference arguments, overloaded functions, inline functions, variable and storage classes.

7 Hours

UNIT - 3

OBJECTS AND CLASSES: objects as data types, constructors, destructors, overloaded constructors. Arrays: Arrays as class member data types, passing arrays, arrays as objects, strings, arrays of strings.

7 Hours

UNIT - 4

OPERATOR OVERLOADING: over loading of unary operators, binary operators, data conversion.

6 Hours

PART - B

UNIT - 5

INHERITANCE: Inheritance, derived class and base class, overriding member functions, scope resolution, levels of inheritance, multiple inheritances.

7 Hours

UNIT - 6

Pointers, pointers to objects, linked list, virtual functions, static functions, files and streams, input/output operations.

7 Hours

UNITS - 7 & 8

DATA STRUCTURES: data representation, matrices, stacks, Queues, skip lists and Hashing, binary trees.

12 Hours

TEXT BOOKS:

1. **Object oriented programming in TURBO C++** -Robert Lafore, Galgotia Publications.2002.
2. **Data Structures, Algorithms and Applications in C++:** Sartaj Sahni, Tata McGrawHill.

REFERENCE BOOKS:

1. **Object Oriented Programming with C++,** E Balaguruswamy, 3rd Edition, Tata McGraw Hill 2006.
2. **C++ the complete reference**, Herbert Schildt, 4th Edition, Tata McGraw Hill, 2003.
3. **Data Structures using C++,** D.S.Malik, Thomson, 2003.

ANALOG IC'S LAB

Subject Code	:	**06ITL57**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Measurement of Opamp parameters (input offset current, input bias current, slew rate, input offset voltage, PSRR, CMRR) & offset nulling.
2. Inverting amplifier & attenuator, noninverting amplifier& voltage follower.
3. Adder, subtractor, integrator, differentiator,
4. I to V converter & V to I converter.
5. Half wave & full wave precision rectifiers.
6. Design of low-pass filters (Butterworth I & II order).
7. Design of high-pass filters (Butterworth I & II order).
8. Instrumentation amplifier- Design for different gains.
9. RC phase-shift and Wein bridge Oscillators.
10. ZCD, positive voltage level & negative voltage level detectors.
11. Schmitt trigger- design for different hystersis.
12. Design of astable and monostable multivibrator using 555 timer.
13. Low voltage and high voltage regulators using LM723.

Note:

i. Standard design procedure to be adopted.

ii. Students should build the circuit using discrete components and IC's (models are not to be used)

8086 MICROPROCESSOR LAB

Subject Code	:	**06ITL58**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

PART - A

1. Write an assembly language program to find the average of N 16 bit unsigned integers.
2. Write an ALP to find the GCD of two 16 bit unsigned integers.
3. Write an ALP to convert a BCD number to 7-segment code using look-up table.
4. Write an ALP to sort a set of N 16 bit unsigned integers in ascending/ descending order using bubble sort algorithm. Length of numbers N is in location X and the integers start from word location X+1.
5. Write an ALP to read a 4-digit hexadecimal number from keyboard and display on the screen using INT 21H. Implement the same using two PUBLIC procedures.
6. Write an ALP to multiply 2 16 bit number in location in X, X+1 and Y, Y+1 respectively using.
   - Successive addition.
   - Shift method
7. Write an ALP to perform the following.
   - If contents of X=1, then determine Z=(Y+W)/V.
   - If contents of X=0, then determine Z=(Y*W)-V.
   - For other values of X store 00 in location Z, where Y, W, V location contains 16 bit unsigned integers.
8. Write an ALP to check whether the code word is valid or not. The code word is stored in location X. (Example: The code word is valid if 3 MSB's are 0 and two 1's in the remaining bits).
9. Develop and execute an ALP to read a digit hexadecimal number from keyboard and store the corresponding value in a word location.
10. Using conditional assembly develop and execute an ALP with the features. It uses one input value, an unsigned 16 bit integer called X. If EQNI is true, it assembles code which computes 3*X*X+4*X+5 and places 32 bit result in double word memory. Otherwise it assembles code which computes 7*[X**2] +8 and places 32 bit result in double word memory location.

11. Develop and execute ALP that implements Binary search algorithm. The data consists of Sorted 16 bit unsigned integers. The search key is also a 16 bit unsigned integer.

12. Develop and execute an assembly language program to compute factorial of a positive integer number using recursive procedure.

PART - B

1. Generate a square wave using sub port of port C: 8255.

2. Interface a stepper motor and write program to rotate in clock-wise and anti-clock wise direction.

3. Interface a 4×4-matrix keypad and write a program to identify the key.

4. Generate a sine wave of programmable amplitude using DAC interface.

5. Interface an 8-bit ADC and write program to store the converted data in memory location.

6. Using the 8255 in the ADD-ON card realize an 8 to 1 multiplexer.

7. Generate a triangular wave using DAC interface.

8. Implement a programmable up/down 4-bit binary/decade counter using the I/O lines in the add-on card. Provision for selecting up or down, binary or decade counting and loading an initial value is to be provided.

9. Develop and execute an ALP to display 4 digit BCD number on multiplexed display.

10. Interface a 7-segment display and write program to display number from 0 to 9 in succession at regular interval.

11. Interface a printer and write program to print characters.

12. Develop and execute ALP to realize ALU. A&B are n bit input binary to ALU and Y is output. Two control lines X1, X2 decide the operation to be performed.

X1	X2	operation
0	0	ADD
0	1	SUB
1	0	AND
1	1	XOR

VI SEMESTER

COMMUNICATION SYSTEMS

Subject Code	:	**06IT61**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNITS - 1 & 2

AMPLITUDE MODULATION: Time-Domain Description, Frequency domain description, Generation of AM waves, Detection of AM waves, AM/DSB, Time-Domain Description, Frequency domain description Generation of DSBSC waves, Coherent Detection of DSBSC Modulated waves. Costas loop, Quadrature Carrier multiplexing, AM-SSB/SC generation, Frequency-Domain Description, Frequency discrimination method for generation an SSB Modulated wave, time domain description, phase discrimination method for generating an SSB modulated wave, Demodulation of SSB waves, Comparison of amplitude modulation techniques, frequency translation, FDM.

12 Hours

UNIT - 3

ANGLE MODULATION: Basic Concepts, Frequency Modulation, Spectrum Analysis Of sinusoidal FM wave, NBFM, WBFM, Constant Average power, Transmission bandwidth of FM waves, Generation of FM waves, Direct FM, demodulation of FM waves, frequency discriminator, ZCD, phase locked loop (1^{st} order) of AM and FM

7 Hours

UNIT - 4

NOISE IN ANALOG MODULATION SYSTEMS: Signal-to-noise ratios, AM receiver model, Signal-to -noise ratios for coherent reception, DSBSC receiver, SSB receiver, noise in AM receivers using envelope detection, threshold effect, FM receiver model, noise in FM reception, FM threshold effect, pre-emphasis and de-emphasis in FM systems

7 Hours

PART - B

UNITS 5 & 6

PULSE MODULATION: Sampling theorem for low-pass and band-pass signal, statement and proof, PAM, Channel bandwidth for a PAM signal, natural sampling, flat-top sampling, signal recovery though holding, quantization of signals, quantization error, PCM, electrical representations of

binary digits, PCM systems, DPCM, delta Modulation, Adaptive delta modulation.

12 Hours

UNITS - 7 & 8

DIGITAL MODULATION: Introduction, Binary Shift Keying, DPSK, QPSK, Type D flip-flop, QPSK transmitter, non-offset QPSK, QPSK receiver, signal - space representation, BFSK, spectrum, receiver for BFSK, geometrical representation of orthogonal BFSK, line codes, TDM.

14 Hours

TEXTBOOKS:

1. **Analog and Digital communication**- Simon Haykin, John Willey.
2. **Principles of communication systems**-Taub and Schilling, Tata McGraw Hill.

REFERENCE BOOKS:

1. **Electronic Communication Systems**- 2nd Edition, Blake, Thomson publishers.
2. **Electronic Communication Systems**-George Kennedy.

ADVANCED CONTROL SYSTEMS

Subject Code	:	**06IT62**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

REVIEW OF VECTOR MATRIX ANALYSIS. DISCRETE TIME CONTROL SYSTEMS, Z-TRANSFORM METHOD: Introduction to discrete systems, pulse transfer function, stability analysis in the Z-plane.

7 Hours

UNITS - 2 & 3

STATE SPACE ANALYSIS OF CONTROL SYSTEMS: State space representation of systems, solving the time invariant state equations, transfer matrix, linear time invariant systems, state space representation of discrete time systems and solving discrete time state equation.

12 Hours

UNIT - 4

POLE PLACEMENT: Controllability, Observability for continuous time systems, pole placement design and state observers.

7 Hours

PART - B

UNIT - 5

OPTIMAL AND ADAPTIVE CONTROL SYSTEMS: optimal control system based on quadratic performance index, adaptive control system.

6 Hours

UNIT - 6

DESCRIBING FUNCTION ANALYSIS OF NONLINEAR CONTROL SYSTEMS: Introduction to nonlinear systems, describing function analysis of nonlinear control systems, stability of nonlinear control system.

7 Hours

UNITS - 7 & 8

COMPENSATION TECHNIQUES: Lead, lag, lead lag network and compensator design using Bode/Root locus techniques.

13 Hours

TEXT BOOKS:

1. **Modern Control Engineering**-K. Ogata, Prentice 3rd Edition, Hall of India publication.
2. **Discrete time Control Systems**-K.Ogata, 2nd Edition, Prentice Hall of India publication.

REFERENCE BOOKS:

1. **Digital control and state variable methods**-Madan Gopal, 2nd Edition, Prentice Hall of India.
2. **Modern Control Engineering-**Roy Choudhury, Prentice Hall of India.

DIGITAL IMAGE PROCESSING

Subject Code	:	**06IT63**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

FUNDAMENTALS: Introduction, Fundamental steps in digital image processing (DIP), components of DIP system, A simple image formation model, Image sampling and quantization, Basic relationship between pixels, Color image processing fundamentals and models.

6 Hours

UNIT - 2

IMAGE TRANSFORMS: Basic theory, Fourier transforms, Hadamard transform, Discrete cosines transform, Applications of discrete image transforms.

6 Hours

UNIT - 3

IMAGE ENHANCEMENT IN SPATIAL DOMAIN: Background, Point processing – Image negatives, Log transformations, Power law transformations, Contrast stretching, Gray level slicing, Bit plane slicing, Histogram processing – Histogram equalization, Histogram matching (specification), Local enhancement, Arithmetic/Logic operations – Image subtraction, Image averaging, Basics of spatial filtering, Smoothing spatial filters – Smoothing linear filters, order statistics filters, Sharpening spatial filters – Foundation, Laplacian and gradient.

7 Hours

UNIT - 4

IMAGE ENHANCEMENT IN FREQUENCY DOMAIN: Background, Basic properties of the frequency domain, Basic filtering in the frequency domain, Basic filters and their properties, Smoothing frequency domain filters – Ideal low-pass filters, Butterworth low-pass filters, Gaussian low-pass filters, Sharpening frequency domain filters – Ideal high-pass filters, Butterworth high-pass filters, Gaussian high-pass filters, Homo morphic filtering.

7 Hours

PART - B

UNIT - 5

IMAGE RESTORATION: Image degradation and restoration models, noise models, restoration using spatial filtering – mean filter, geometric mean filter, harmonic mean filter, median filter, max & min filters, midpoint filter.

6 Hours

UNIT - 6

NOISE FILTERING BY FREQUENCY DOMAIN FILTERING – band reject filter, band pass filter, notch filter, inverse filtering, minimum mean square error (Wiener) filtering.

6 Hours

UNIT - 7

IMAGE COMPRESSION: Fundamentals, variable length coding, LZW coding, bit plane coding, constant area coding, run length coding, lossless predictive coding, lossy predictive coding, transform coding, image compression standards :basic, JPEG.

7 Hours

UNIT - 8

IMAGE SEGMENTATION: Introduction, thresholding: threshold detection methods, optimal thresholding, multi-spectral thresholding, edge-based segmentation: edge image thresholding, border tracing, Hough transform, region-based segmentation: region merging, region splitting, splitting & merging. Matching: matching criteria.

7 Hours

TEXT BOOKS:

1. **Digital Image Processing** - Rafael C. Gonzalez & Richard E. Woods, Second Edition. Pearson Education Inc.
2. **Image Processing, analysis and machine Vision**- Milan Sonka, Vaclav Hlavac & Roger Boyle.

REFERENCE BOOK:

1. **Fundamentals of Digital Image Processing**- Anil K. Jain, 2nd Edition, Prentice Hall of India.

PROCESS CONTROL SYSTEM

Subject Code	:	**06IT64**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNITS - 1 & 2

INTRODUCTION TO PROCESS CONTROL: process control block diagram, control system evolution. Final control**:** introduction to final control operation, signal conversions, actuators, control elements.

12 Hours

UNIT - 3

CONTROLLER PRINCIPLES: Introduction, process characteristics, control system parameters, discontinuous control modes, continuous control modes, and composite control modes.

7 Hours

UNIT - 4

ANALOG CONTROLLERS: Introduction, general features, electronic controllers, pneumatic controllers, designs considerations.

7 Hours

PART - B

UNIT - 5

DISCRETE-STATE PROCESS CONTROL: Introduction, definition and characteristics of discrete state process control. Control-loop characteristics: Introduction, control system configuration, multivariable control systems, control system quality, stability, and process loop tuning.

7 Hours

UNIT - 6

ALARM AND ANNUNCIATORS, CONTROL DRAWINGS: P & ID symbols and diagrams: flow sheet symbols, inter logic symbols, graphic symbols.

7 Hours

UNIT - 7

DIGITAL–TO-ANALOG CONVERTERS: V-F, and F-V converters, performance specifications, D-A conversion techniques (R-2R & binary weighted) multiplying DAC applications.

6 Hours

UNIT - 8

A-D conversion techniques (flash, successive approximation, single slope, dual slope), over sampling converters.

6 Hours

TEXT BOOKS:

1. **Process Control Instrumentation Technology**-C D Johnson.
2. **Instrument Engineers Handbook-(Vol 1 & 2)-**B G Liptak,Chilton Book Company
3. **Design with operational amplifiers and analog integrated circuits**-3rd Edition, SERGIO FRANCO, Tata McGraw Hill

REFERENCE BOOKS:

1. **Chemical process control an introduction to theory and practice-**Stephanopoulos
2. **A Users Handbook of D/A and A/D converters-**.E.R.HNATEK, Wiley publications
3. **Computer Aided Process Control-** S K Singh, Prentice Hall of India.

ANALYTICAL INSTRUMENTATION

Subject Code	:	**06IT65**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNITS - 1 & 2

INTRODUCTION: Types of instrumental methods for analysis, electromagnetic spectrum, properties of electromagnetic radiation and its interaction with matter, emission of radiation.

MOLECULAR SPECTROSCOPY: Measurement of transmittance and absorbance, Beer Lambert's law, instrumentation, single and double beam spectrometers, application of UV-Visible spectroscopy for qualitative and quantitative analysis. IR absorption spectrometry, IR instruments, application for quantitative analysis.

14 Hours

UNIT - 3

ATOMIC ABSORPTION SPECTROSCOPY: Principles, sample atomization techniques, atomic absorption instrumentation, interferences in atomic spectroscopy, standard addition and internal standard methods of evaluation.

6 Hours

UNIT - 4

ATOMIC EMISSION SPECTROSCOPY: Principles, arc, spark and plasma sources, emission based on plasma sources, emission spectroscopy based on arc and spark sources, applications, atomic fluorescence spectroscopy and comparison.

6 Hours

PART - B

UNIT - 5

X-RAY SPECTROSCOPY: Fundamentals, instrumentation, X-ray absorption methods, X-ray fluorescence methods, X-ray diffraction, applications.

7 Hours

UNIT - 6

MASS SPECTROSCOPY: Features of mass spectroscopy, ion sources, sample inlet systems, mass analyzers – single beam, double beam and quadruple instruments, applications.

7 Hours

UNITS - 7 & 8

CHROMATOGRAPHIC TECHNIQUES: Classifications, chromatographic behaviour of solutes, column efficiency and band broadening, column performance, gas and liquid chromatography, applications of chromatography.

12 Hours

TEXT BOOK:

1. **Principles of Instrumental Analysis-6th Edition:** Douglas A. Skoog, James Holler, Stanley R. Crounch. Thomson Learning

REFERENCE BOOKS:

1. **Instrumental Methods of Analysis-** Willard H.W Merritt, L.L Dean J A Settie FA, 7th Edition, CBS Publishers.
2. **Fundamentals of Analytical Chemistry**- Douglas A Skoog, Donald M West Holler Thomson.
3. **Instrumental Methods of Chemical Analysis-** Galen W. Ewing, Mc GrawHill.

ELECTIVE-I (GROUP A)

POWER ELECTRONICS

Subject Code	:	**06IT661**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Power semiconductor devices, applications of power electronics, power semiconductor devices, control characteristics, types of power electronic circuits, peripheral effects, Power BJTs, switching characteristics, switching limits, base-drive control, introduction to IGBTs, isolation of gate and base drives.

7 Hours

UNIT - 2

THYRISTORS: Introduction, characteristics, two transistor model, turn-on and turn off, di/dt and dv/dt protection, thyristor types, series and parallel operation of thyristors, thyristor firing circuits.

7 Hours

UNIT - 3

COMMUTATION TECHNIQUES: Introduction, natural commutation, forced commutation: self-commutation, impulse commutation, resonant pulse commutation and complementary commutation.

6 Hours

UNIT - 4

AC VOLTAGE CONTROLLERS: Introduction, principle of ON-OFF and phase control, single-phase bidirectional controllers with resistive loads.

6 Hours

PART - B

UNIT - 5

CONTROLLED RECTIFIERS: Introduction, principle of phase controlled converter operation, single-phase semi converters, full converters and dual converters.

7 Hours

UNIT - 6

DC CHOPPERS: Introduction, principle of step-down and step-up choppers, step-down chopper with RL loads, performance parameters.

6 Hours

UNIT - 7

Chopper classification, analysis of impulse commutated thyristor chopper (only qualitative analysis).

6 Hours

UNIT - 8

INVERTERS: Introduction, principle of operation, performance parameters, single phase bridge inverters, Three phase inverters, voltage control of single phase inverters, current source inverter, variable DC link inverter, principles of switched mode power supply (SMPS).

7 Hours

TEXT BOOK:

1. **Power Electronics** - M. H. Rashid, 2nd Edition, Prentice Hall of India Pvt. Ltd., (Pearson (Singapore -Asia)) New Delhi, 2002.

REFERENCE BOOKS:

1. **Thyristorized Power Controllers**- G. K. Dubey, S. R. Doradla, A. Joshi & R.M.K. Sinha, New Age International (P) Ltd. Publishers, 9th Reprint, 1999.
2. **Power Electronics**- M. D. Sing and Khanchandani K. B., Tata McGraw Hill Publishing Company Limited, Reprint 2001.
3. **Power Electronics** - Cyril W.Lander, 3rd Edition, McGraw Hill.

PIC MICROCONTROLLER

Subject Code	:	**06IT662**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO MICROCONTROLLERS: Architecture, RISC and CISC processors. Harvard and Von Neumann architecture. PIC16F877 Architecture.

6 Hours

UNIT - 2

PIC16F877Instructions Set, addressing modes, Assembly language Programs.

7 Hours

UNIT - 3

Memory organization, ports, Interrupts.

6 Hours

UNIT - 4

PIC16F877 PERIPHERALS: Timers, CCP modules, ADC modules, configuration word and programming.

7 Hours

PART - B

UNIT - 5

SERIAL COMMUNICATION MODULES: UART, I^2C, PSP, EEPROM, Reset, Oscillator modes, configuration word and programming

7 Hours

UNIT - 6

INTERFACING: Interfacing of keys, Display - LEDs, 7-segment LED (multiplexed display) & LCDs, (Programs in assembly and C)**.**

6 Hours

UNIT - 7

DAC and ADC, generation of PWM with PIC microcontroller. (Programs in assembly and C)

6 Hours

UNIT - 8

APPLICATIONS OF MICROCONTROLLERS. EX : RPM meter, event counter, temperature controller**.** (Programs in assembly and C)**.** Development

Tools**:** Simulators, debuggers, cross compilers, in-circuit Emulators for the microcontrollers.

7 Hours

TEXT BOOKS:

1. **Design with PIC microcontrollers-** J.B.PEATMAN, PH Engg, 1998.
2. **Embedded C programming and the microchip PIC-**Barrnett Cox & Cull, Thomson Publications 2004.

REFERENCE BOOKS:

1. **PICs in practice-**F P VOLPE & S VOLPE, Elector Electronics.
2. **Embedded control handbook**- MICROCHIP (Vol 1& 2).
3. **PIC micro mid-range MCU family reference manual**-MICROCHIP
4. **Microcontrollers; Architecture implementation and programming**- HINTZ, McGraw-Hill

COMPUTER ARCHITECTURE

Subject Code	:	**06IT663**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

BASIC STRUCTURES OF COMPUTERS AND ADDRESSING METHODS, BUS STRUCTURES: performance: processor clock, basic performance equations, pipelining & super scalar operation, clock rate, performance measurement; multiprocessor & multi-computer: number systems, arithmetic operations characters, memory locations & addresses: byte addressability big-endian & little-endian assignments, word alignment, accessing numbers, characters & character strings.

7 Hours

UNIT - 2

MACHINE PROGRAM SEQUENCING: Memory operations, instruction & instruction sequencing, register transfer notation, assembly language notation, basic instruction types, instruction execution & straight line sequencing branching, condition codes, generating memory addresses; addressing modes, implementation of variables & constants, indirection & pointers indexing & arrays, relative addressing, additional modes.

7 Hours

UNIT - 3

ASSEMBLY LANGUAGE: assembler directives, number notation, basic input/output operations; stack & queues; subroutines, subroutine nesting & processor stack, parameter passing, stack frame, additional instructions, logic instruction, shift & rotate instructions, multiplication & division; encoding of machine instruction, general features of CISC & RISC.

6 Hours

UNIT - 4

INPUT AND OUTPUT ORGANIZATION: accessing I/O devices, interrupts, interrupt hardware, enabling & disabling interrupts, handling multiple devices, controlling device requests, exceptions, direct memory access.

6 Hours

PART - B

UNIT - 5

BUS ARBITRATION: buses, synchronous bus, interface circuits, parallel port, serial port, standard I/O interfaces, PCI bus, SCSI bus, USB.

6 Hours

UNIT - 6

MEMORY SYSTEMS: some basic concepts, semiconductor RAM memories, internal organization of memory chips, static memories, asynchronous DRAMS, synchronous DRAM, structure of larger memories, memory system considerations, ram bus memory, read only memories ROM, PROM, EPROM, EEPROM, flash memory, speed size & cost, cache memories mapping functions, performance considerations, interleaving, hit rate & miss penalty, virtual memories, address translations, secondary storage, magnetic hard disks, optical disks.

7 Hours

UNIT - 7

BASIC PROCESSING UNIT: fundamental concepts, register transfers, arithmetic and logic operations, fetching a word from memory, storing a word in memory, execution of a complete instruction, branch instruction, multiple-bus organization, hardwired control, a complete processor, micro programmed control, microinstruction, micro program sequencing, microinstruction with next-address field.

7 Hours

UNIT - 8

PIPELINING: Basic concepts, instruction queue, branching, data dependency, influence of pipelining on instruction set design, multiple execution units, performance considerations.

6 Hours

TEXT BOOK:

1. **Computer Organization**-Carl Hamacher Z Vranesic & S Zaky 5th Edition, Tata McGrawHill.

REFERENCE BOOKS:

1. **Computer system Architecture**- Morris Mano 3rd Edition, Prentice Hall of India.
2. **Computer System Design & Architecture**-V Heuring & H Jordan, 2nd Edition, Addison-wesley.

OPERATING SYSTEMS

Subject Code	:	**06IT664**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO OPERATING SYSTEMS AND CLASSIFICATION: What is an operating system, Mainframe systems, Desktop systems, multiprocessor system, Distributed system, Clustered system, Real time system, Handled system, Feature migration, computing environments. Operating system structures: System components, OS Services, System calls, System programs, System structure, Virtual machines.

7 Hours

UNIT - 2

PROCESS, INTER PROCESS COMMUNICATION, THREADS & CPU SCHEDULING: Process concept, Process scheduling, Operation on processes, Co-operating processes, Inter process communication. Threads – overview, Multithreading models, Threading issues, P threads, Java threads. CPU scheduling – Basic concepts, Scheduling criteria, Scheduling algorithms, multiple processors scheduling, real time scheduling.

7 Hours

UNIT - 3

PROCESS SYNCHRONIZATION AND HANDLING DEADLOCKS: The critical section problem, Synchronization hardware, Semaphores, Classical problems of synchronization, critical regions, monitors.

6 Hours

UNIT - 4

DEADLOCK – System model, Deadlock characterization, Methods for handling deadlocks – deadlock prevention, deadlock avoidance, deadlock detection and recovery from deadlock.

6 Hours

PART - B

UNIT - 5

STORAGE MANAGEMENT: Main memory management – Background, Swapping, Contiguous, allocation, Paging, Segmentation, Segmentation with paging Virtual memory – Background, Demand paging, Process creation, Page replacement algorithms, Allocation of frames, Thrashing

7 Hours

UNIT - 6

FILE SYSTEM INTERFACE – File concept, Access methods, Directory structure, File system mounting, File system implementation, Directory implementation, Allocation methods, free space management. Mass storage structures – Disk structure, Disk scheduling methods, Disk management, Swap space management.

7 Hours

UNITS - 7 & 8

PROTECTION AND SECURITY: Goals of protection, domain of protection, access matrix, implementation of access matrix, Revocation of access rights, The security problem, Authentication, Program threats, System threats, Security systems and facilities, Intrusion detection, introduction to cryptography, basics of Linux operating system.

12 Hours

TEXT BOOK:

1. **Operating System Concepts**-by Abraham silberschatz, Peter Baer Galvin, Greg Gagne, 6th edition, John wiley & sons 2003.

REFERENCE BOOKS:

1. **Operating system concepts and design**- Milan Milankovic 2nd Edition, McGraw Hill 1992.
2. **Operating systems-** Harvey M Deital Addison Wesley 1990
3. **Operating Systems concepts based approach**, D.M Dhamdhere, Tata Mc Graw Hill 2002.

CONTROL SYSTEM & DATA CONVERTERS LAB

Subject Code	:	**06ITL67**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Sample and Hold circuits using discrete components and IC.
2. Analog multiplexer & programmable gain amplifier using analog mux.
3. 4 Bit Binary weighted & R-2R DAC (using Discrete components)
4. 3 bit flash ADC.
5. 8 Bit DAC using IC (DAC 0800)
6. 8 Bit ADC using IC (Successive approximation method)
7. To determine the step response of 1^{st} order system using RC circuit and to measure 'τ' for different values of R & C.
8. To determine the step response of 2^{nd} order system using RLC circuit and to determine rise time, peak time, overshoot, settling time for over damped, under damped and critically damped conditions. Verification using theoretically calculated values.
9. To determine the response of lead, lag & lead-lag circuits.
10. To design relay driving circuits using photo devices (LDR & Optocouplers).
11. To determine the response of P, PI and PID controller for step input.
12. Using MATLAB/LAB VIEW software, plot the Bode-plot, Nyquist diagram & Root locus with and without compensation for a given transfer function & specifications. Verification using theoretical values.

INSTRUMENTATION LAB

Subject Code	:	**06ITL68**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Characteristics of potentiometric transducer.
2. Characteristics of LVDT.
3. Characteristics of capacitive transducer: variable area type, variable distance type
4. Characteristics of thermistor, RTD, AD590, thermocouple.
5. Characteristics of LDR, Photo Diode & phototransistor: Variable illumination, variable distance.
6. Wheatstone bridge -measurement of bridge sensitivity.
7. Measurement of low resistance using Kelvin double bridge.
8. Measurement of self- inductance using Maxwell bridge and Anderson's bridge.
9. Measurement of unknown capacitance using Desauty's bridge and Schering's bridge.
10. Calibration of voltmeter and ammeter using DC potentiometer.
11. Characteristics of pressure transducer
12. Characteristics of load cell & cantilever using strain gauge (quarter, half and full bridge)

VII SEMESTER

VLSI DESIGN

Subject Code	:	**06IT71**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO MOS TECHNOLOGY: Moores law, speed –power performance, nMOS fabrication, CMOS fabrication: nwell, pwell processes, BiCMOS, comparison of bipolar & CMOS.

6 Hours

UNIT - 2

BASIC ELECTRICAL PROPERTIES OF MOS & BICMOS CIRCUITS: Drain to source current versus voltage characteristics, threshold voltage, transconductance, nMOS inverter, Determination of pull up to pull down ratio, nMOS inverter driven through one or more pass transistors, alternative forms of pull-up, CMOS inverter, MOS transistor circuit model, BiCMOS inverters, latch up.

7 Hours

UNIT - 3

BASIC CIRCUIT CONCEPTS: Sheet resistance, area capacitance calculation. Delay unit, inverter delay, estimation of CMOS inverter delay, driving of large capacitance loads, super buffers, BiCMOS drivers, propagation delays & wiring capacitances.

7 Hours

UNIT - 4

MOS AND BICMOS CIRCUIT DESIGN PROCESSES: MOS layers, stick diagrams, nMOS design style; CMOS design style, Design rules and layout, λ based design. Scaling of MOS circuits: Scaling factors for device parameters, limitations of scaling**.**

6 Hours

PART - B

UNIT - 5

SUBSYSTEM DESIGN & LAYOUT: Switch logic pass transistor, gate logic inverter, Nand gates, Nor gates, pseudo nMOS, dynamic CMOS example of structured design, parity generator, Bus arbitration, Multiplexers, logic function block, code converter.

6 Hours

UNIT - 6

Clocked sequential circuits, dynamic shift registers, bus lines. Subsystem design processes General considerations, 4 bit arithmetic processor, 4-bit shifter.

6 Hours

UNIT - 7

DESIGN PROCESS- COMPUTATIONAL ELEMENTS: Regularity, design of ALU subsystem, ALU using adders, Carry look ahead adders, Multipliers, serial parallel multipliers, Braun array, Bough-wooley multiplier. Pipelined multiplier array, modified Booth's algorithm, Wallace tree multiplier.

7 Hours

UNIT - 8

MEMORY, REGISTER & ASPECTS OF TIMING: 3 TRANSISTOR DYNAMIC RAM CELL, DYNAMIC MEMORY CELL, PSEUDO-static RAM, JK FF, D FF circuits, RAM arrays. Practical aspects and testability: Some thoughts of performance, optimization, and CAD tools for design & Simulation.

7 Hours

TEXT BOOK:

1. **Basic VLSI design**-3rd Edition Douglas A Pucknell, Kamaran Eshraghian, Prentice Hall of India publication, 2005.

REFERENCE BOOKS:

1. **CMOS Digital Integrated Circuits, Analysis and design**, 3rd Edition, Sung-Mo (steve) Kang, Yusuf Leblbici, Tata Mcgraw Hill.
2. **VLSI Technology,** 2nd Edition, S.M .Sze, Tata Mcgraw Hill.

DSP ARCHITECTURE

Subject Code	:	**06IT72**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO DIGITAL SIGNAL PROCESSING: Introduction, A digital signal processing system, the sampling process, discrete time sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), linear time invariant systems, Digital filters, Decimation and Interpolation, Analysis and Design tool for DSP systems. Digital Signal Processing Devices: Introduction, Basic architectural features, DSP computational building blocks.

7 Hours

UNIT - 2

Bus architecture and memory, Data addressing capabilities, Address generation unit, Programmability and Program execution, Speed issues, Features for external interfacing.

6 Hours

UNIT - 3

PROGRAMMABLE DIGITAL SIGNAL PROCESSORS: Introduction, Commercial digital signal processing devices, Data addressing modes of TMS320C54xx digital signal processors, Memory space of TMS320C54xx processors, Program control.

6 Hours

UNIT - 4

TMS320C54xx Instructions and programming, On-chip peripherals, Interrupts of TMS320C54xx processors, Pipeline operation of TMS320C54xx processors.

7 Hours

PART - B

UNIT - 5

IMPLEMENTATION OF BASIC DSP ALGORITHMS: Introduction, The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID controller, Adaptive Filters, 2-D Signal processing.

6 Hours

UNIT - 6

IMPLEMENTATION FFT ALGORITHMS: Introduction, An FFT algorithm for DFT computation, A butterfly computation, Overflow and Scaling, Bit Reversed index generation, FFT implementation on the TMS320C54xx, Computation of the signal spectrum.

7 Hours

UNIT - 7

INTERFACING MEMORY AND PARALLEL I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES: Introduction, Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). Interfacing Serial Converters to a Programmable DSP device: Introduction, Synchronous Serial Interface (SSI), A multi channel buffered serial port (McBSP), McBSP programming.

7 Hours

UNIT - 8

A CODEC INTERFACE CIRCUIT: CODEC programming, A CODEC-DSP interface example. Applications of programmable DSP devices**:** Introduction, A DSP system, DSP-based Biotelemetry receiver, A speech processing system, An image processing system.

6 Hours

TEXT BOOK:

1. **Digital Signal Processing**-Avtar Singh and S. Srinivasan, Thomson Publishing, 2004, Singapore.

REFERENCE BOOKS:

1. **Digital Signal Processing-** A Practical Approach, Emmanuel C Ifeachor and B W Jervis, Pearson Education, New Delhi.
2. **Digital Signal Processors**- B Venkataramani and M Bhaskar, Tata-McGraw Hill, New Delhi, 2002.

NEURAL NETWORKS AND FUZZY LOGIC

Subject Code	:	**06IT73**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: What is neural network? Human Brain, Models of a Neuron, Neural Networks viewed as directed graphs, Feedback, Network architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.

6 Hours

UNIT - 2

LEARNING PROCESSES: Introduction, Error correction algorithm, Memory based learning, Hebbian Learning, Competitive learning, Boltzmann learning, learning with a teacher, learning without a teacher, Learning tasks, Memory, adaptation.

6 Hours

UNIT - 3

SINGLE LAYER PERCEPTIONS: Introduction, Perceptron, and perception convergence theorem, Examples. Multilayer perceptron: Introduction, Some preliminaries.

7 Hours

UNIT - 4

Back Propagation Algorithm, Summary of the Back Propagation Algorithm, XOR Problem, and Heuristics for making the Back propagation algorithm to perform better.

7 Hours

PART - B

UNIT - 5

RADIAL BASIS FUNCTION NETWORKS: Architecture, learning algorithms, Applications. Hopfield Networks – Architecture, Capacity of Hopfield models, Energy analysis of Hopfield networks.

7 Hours

UNIT - 6

INTRODUCTION: Uncertainty and Imprecision, state and random processes, Uncertainty in information, fuzzy sets and classical sets, properties, mapping of classical sets to function, fuzzy set operation, properties of Fuzzy sets, Sets as points in Hypercubes.

6 Hours

UNIT - 7

CLASSICAL RELATIONS AND FUZZY RELATIONS: Cartesian product, crisp relations, fuzzy relations, tolerance and equivalence relations, fuzzy tolerance, value assignments.

6 Hours

UNIT - 8

MEMBERSHIP FUNCTIONS: Features of membership functions, standard forms and boundaries, fuzzification, membership value assignment. Fuzzy to crisp conversions: lambda cuts for fuzzy sets, lambda cuts for fuzzy relations, defuzzification methods**.**

7 Hours

TEXT BOOKS:

1. **Simon Haykin, Neural Networks A comprehensive foundation-** McMillan College public company, Newyork 1994.
2. **Artificial neural networks**-B. Yegnanarayana Prentice Hall of India 1999.
3. **Fuzzy logic with engineering applications**-Timothy. J. Ross, McGraw Hill International Edition, 1997.

REFERENCE BOOKS:

1. **Introduction to Artificial Neural Systems-** Jacek M. Zurada Jaico Publishing House
2. **Neural Network Fundamentals with Graphs, Algorithms, and applications**-N.K. Bose, P.Liang, Tata McGraw Hill Edition.1998
3. **Artificial Neural networks-**Robert J Schalkoff, McGraw Hill international Edition,1997
4. **Neural networks and Fuzzy Systems, A Dynamical systems approach to machine intelligence**- Bart Kosko, Prentice Hall of India Publications, 2006
5. **Fuzzy Logic, Intelligence, Control, and Information-**John Yen, Rena Langari, Pearson Education 2005.

AUTOMATION IN PROCESS CONTROL

Subject Code	:	**06IT74**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO PROGRAMMABLE LOGIC CONTROLLERS, INTRODUCTION TO PLC OPERATION: The digital concept, Analog Signals, The input status file, the output status file, Input and output status files, sixteen point I/O modules, PLC memory.

7 Hours

UNIT - 2

INTRODUCTION TO LOGIC: What is logic, Conventional Ladder v/s LPLC ladder, series and parallel function of OR, AND, NOT logic, XOR logic, Analysis of rung. Input modules: Discrete input modules, Discrete AC and DC input modules. Output Modules: Discrete output modules, solid-state output module switching, relay output modules.

7 Hours

UNITS - 3 & 4

PLC INSTRUCTIONS: The basic relay instructions, Normally open and normally closed instructions, output latching instructions, Understanding Relay instructions and the programmable controller input modules-interfacing start stop pushbutton and motor to PLC, developing ladder diagram with analytical problems.

12 Hours

PART - B

UNIT - 5

TIMER AND COUNTER INSTRUCTIONS: On delay and off delay and retentive timer instructions, PLC counter up and down instructions, combining counters and timers.

6 Hours

UNIT - 6

COMPARISON AND DATA HANDLING INSTRUCTIONS: Data handling instructions, Sequencer instructions: Programming sequence output instructions, developing ladder diagram with analytical.

6 Hours

UNIT - 7

INTRODUCTION TO SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) AS APPLIED TO PROCESS CONTROL SYSTEMS. DISTRIBUTED CONTROL SYSTEM (DCS): Evolution of

digital controllers, advantages of digital control, process control requirements of digital control, computer network, interconnection of networks, communication in DCS.

7 Hours

UNIT - 8

DIFFERENT BUS CONFIGURATIONS USED FOR INDUSTRIAL AUTOMATION -RS232, UART, RS485, GPIB, CAN, USB, I2C, TCP/IP, HART and OLE protocol, Industrial field bus- FIP (Factory Instrumentation protocol), PROFIBUS (Processfieldbus), Bitbus.

7 Hours

TEXT BOOKS:

1. **Introduction to Programmable Logic Controllers-** Garry Dunning, 2nd Edition, Thomson, ISBN: 981-240-625-5.
2. **Computer control of processes** - M.Chidambaram, Narosa publishing,
3. **Computer Based Industrial control**- Krishna Kant, Prentice Hall of India.

REFERENCE BOOKS:

1. **Process Control Instrumentation Technology -** Curtis Johnson, Prentice Hall of India.
2. **Instrumentation Engineers Hand Book** – Process Control, Bela G Liptak, Chilton Book Company, Pennsylvania.
3. **Industrial Control and Instrumentation**, W.Bolton, Universities Press.

ELECTIVE-II (GROUP B)
ARM PROCESSORS

Subject Code	:	**06IT751**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

An introduction to processor design, The ARM architecture.

7 Hours

UNIT - 2

ARM assembly language programming. ARM organization and implementation.

6 Hours

UNIT - 3
The ARM instruction set, Architectural support for high-level languages.

7 Hours

UNIT - 4
Architectural support for system development.

6 Hours

PART - B

UNIT - 5
ARM processor cores, Memory Hierarchy

6 Hours

UNIT - 6
Architectural support for operating systems

6 Hours

UNIT - 7
ARM CPU cores

7 Hours

UNIT - 8
Embedded ARM applications, Introduction to new processors -micro controller family, ARM 11

7 Hours

TEXT BOOK:

1. **Arm-System-On-Chip- Architecture**: By Steve Furber-Pearson.

COMPUTER NETWORKS

Subject Code	:	**06IT752**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1
INTRODUCTION: Uses of Computer Networks, Network Hardware, Network Software, Reference Models, Example Networks, Network Standardization

6 Hours

UNIT - 2
THE PHYSICAL LAYER: The Theoretical Basis for Data Communication, Guided Transmission Media, Wireless Transmission, Communication Satellites, The Public Switched Telephone Network, The Mobile Telephone System, Cable Television.

7 Hours

UNIT - 3

THE DATA LINK LAYER: Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols, Protocol Verification, Data Link Protocols.

6 Hours

UNIT - 4

THE MEDIUM ACCESS CONTROL SUB LAYER: The Channel Allocation Problem, Multiple Access Protocols, Ethernet, Wireless LANS, Broadband Wireless, Bluetooth, Data Link Layer Switching.

7 Hours

PART - B

UNIT - 5

THE NETWORK LAYER: Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, and Quality of Service.

6 Hours

UNIT - 6

INTERNET WORKING, THE NETWORK LAYER IN THE INTERNET, THE TRANSPORT LAYER: The Transport Service.

7 Hours

UNIT - 7

A Simple Transport Protocol, the Internet Transport Protocols (TCP and UDP), Performance Issues.

7 Hours

UNIT - 8

THE APPLICATION LAYER: Domain Name System (DNS), electronic mail, worldwide web, multimedia.

6 Hours

TEXT BOOK:

1. **Computer Networks :** Andrews S. Tanenbaum, 4th Edition, Pearson Education.

REFERENCE BOOKS:

1. **ATM Protocol concepts-** HONDEL AND FLUBER, Addison Wesley.
2. **Data and computer networks**- W STALLINGS 5th Edition, Prentice Hall of India 1998.

PRODUCT DESIGN TECHNOLOGY

Subject Code	:	**06IT753**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION, DEVELOPMENT PROCESS AND ORGANIZATIONS: characteristics of successful product development, duration and cost of product development, challenges of product development.

7 Hours

UNIT - 2

GENERIC DEVELOPMENT PROCESS, CONCEPT DEVELOPMENT – Front-end process, adapting the generic product development process

6 Hours

UNIT - 3

IDENTIFYING CUSTOMER NEEDS AND ESTABLISHING PRODUCT SPECIFICATIONS: defining scope, gathering data from customers, establishing relative importance of needs. Target specifications & refining specifications.

7 Hours

UNIT - 4

CONCEPT GENERATION: five-step methodology of concept generation, with a case study of any electronic instrument

6 Hours

PART - B

UNIT - 5

HUMAN ENGINEERING CONSIDERATIONS IN PRODUCT DESIGN: anthropometry, the design of controls, and the design of displays, man/machine information exchange.

7 Hours

UNIT - 6

CONCEPT EMBODIMENT: overview, basic methods, advanced methods, case study-computer monitor with reference to ergonomics and esthetics.

7 Hours

UNITS - 7 & 8

PCB TECHNOLOGY: introduction, types, applications, base materials, design methods and fabrication processes.

12 Hours

TEXT BOOKS:

1. **Product Design and Development**- Karl T Ulrich, Steven D Eppinger, Tata McGraw Hill -3rd Edition.
2. **Printed Circuit board Design and Technology**- Walter C Boshart, McGraw Hill International.

REFERENCE BOOKS:

1. **Product design and manufacturing**- AK. Chitale and RC Gupta – Prentice Hall.
2. **Product Design-** Kevin Otto, Kristin Wood, 2nd Edition, Pearson Education.

MEDICAL IMAGING SYSTEMS

Subject Code	:	**06IT754**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

X-RAYS: Interaction between X-Rays and matter, Intensity of an X-Ray, Attenuation, X-Ray Generation and Generators, Beam Restrictors and Grids, Intensifying screens, fluorescent screens and Image intensifiers.

6 Hours

UNIT - 2

X-Ray detectors, Conventional X-Ray radiography, Fluoroscopy, Angiography, Digital radiography, Dynamic spatial reconstructor, X-Ray image characteristics, Biological effects of ionizing radiation.

6 Hours

UNIT - 3

COMPUTED TOMOGRAPHY: Conventional tomography, Computed tomography principle, Projection function Generations of CT machines, Electron beam CT, Reconstruction algorithms, Helical CT.

7 Hours

UNIT - 4

ULTRASOUND IMAGING: Acoustic propagation, Attenuation, Absorption and Scattering, Ultrasonic transducers, Arrays, A mode, B mode, M mode scanners, Tissue characterization, Color Doppler flow imaging.

7 Hours

PART - B

UNIT - 5

MAGNETIC RESONANCE IMAGING: Angular momentum, Magnetic dipole moment, Magnetization, Larmor frequency, Rotating frame of

reference, Free induction decay, Relaxation times, Pulse sequences. Introduction to functional MRI.

7 Hours

UNIT - 6

BLOCK OF A MAGNETIC RESONANCE IMAGER: Slice selection, Frequency encoding, Phase encoding, Spin-Echo imaging, Gradient-Echo imaging, Imaging safety.

6 Hours

UNIT - 7

RADIONUCLIDE IMAGING: Interaction of nuclear particles and matter, Nuclear sources, Radionuclide generators, Nuclear radiation detectors, Rectilinear scanner, scintillation camera, SPECT, PET.

6 Hours

UNIT - 8

THERMAL IMAGING: Medical thermography, Infrared detectors, Thermographic equipment, Pyroelectric vidicon camera.

7 Hours

TEXT BOOKS:

1. **Principles of Medical Imaging**- Kirk shung, Academic Press.
2. **Handbook of Biomedical Instrumentation**- Khandpur, Tata McGraw-Hill Publishing Company Ltd., 2nd Edition, 2003.

REFERENCE BOOKS:

1. **Medical Imaging Signals and Systems**- Jerry L Prince and Jonathan M Links, Prentice Hall of India/Pearson Education.
2. **Fundamentals of medical Imaging**- Zhong Hicho and Manbir singh, John Wiley.

ELECTIVE-III (GROUP C)

EMBEDDED SYSTEM & RTOS

Subject Code	:	**06IT761**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: An Embedded System; Characteristics of Embedded Systems; Software embedded into a system; Real Time Definitions, Events and Determinism, Synchronous & Asynchronous Events, Determinism.

6 Hours

UNIT - 2

EMBEDDED MICROCONTROLLER CORE AND ARCHITECTURE: 8051 micro controller; Architecture; Instruction sets; Assembly language programming.

6 Hours

UNIT - 3

I/O PORT PROGRAMMING: Timer / counter programming, Serial Communication; Interrupts, programming.

7 Hours

UNIT - 4

REAL TIME SPECIFICATIONS AND DESIGN TECHNIQUE: Mathematical specifications, flow charts, structure charts, Finite state automata, data flow diagrams, Petri Nets, Warnier Orr Notation, State charts.

7 Hours

PART - B

UNIT - 5

PROCESSOR AND MEMORY ORGANIZATION: Structural Units in a Processor; Memory Devices, Memory selection for an embedded system; Direct Memory Access, DMA controllers; Interfacing Processor, Memory and I/O Devices.

6 Hours

UNIT - 6

INTERRUPT SERVICING (HANDLING) MECHANISM: Context and the periods for context switching; Deadline and interrupt latency. Language Features: Parameter passing, Recursion, Dynamic allocation, Typing, exception handling, abstract data typing.

6 Hours

UNIT - 7

REAL TIME KERNELS: Real Time and Embedded Operating Systems; Interrupt Routines in RTOS environment; co routines, Interrupt driven systems, Foreground/background systems, Full-featured Real Time Operating Systems.

INTER-PROCESS COMMUNICATION AND SYNCHRONIZATION OF PROCESSES: Multiple processes in an application; Problem of sharing data by multiple tasks and routines; Inter Process Communication, Mailboxes, Critical Regions, Semaphores, Deadlock.

7 Hours

UNIT - 8

PROGRAMMING LANGUAGES AND TOOLS: DESIRED LANGUAGE CHARACTERISTICS: Data typing; Control Structures;

Packages; Exception Handling; Overloading; Multitasking; Task Scheduling; Timing specification; Programming environments; Runtime support.

7 Hours

TEXT BOOKS:

1. **Embedded Systems Architecture; Programming and Design**-Rajkamal; Tata McGraw Hill Publications.
2. **Real–Time Systems Design and Analysis–-**3rd Edition, Phillip A. Laplante. Apr 2004. Wiley-IEEE Press.

REFERENCE BOOKS:

1. **Real Time Systems**- C.M. Krishna, Kang G.Shin McGraw-Hill, 1997.
2. **The 8051 Microcontroller and Embedded Systems-**Mohammed Ali Mazidi, Janice Gillispie Mazidi Pearson Education Asia 2002.
3. **An Embedded software primer**-David E Simon; Addison Wesley; 2000.
4. **An Introduction to Real Time Systems**-Raymond J.A. Buhr; Donald L. Bailey; Prentice Hall International; 1999.
5. **Embedded Real Time system**-Concepts, Design and Programming, Dr. K. V. K. K. Prasad Dream Tech Pres, New Delhi 2003.

DISTRIBUTED SENSOR NETWORKS

Subject Code	:	**06IT762**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Challenges, Sensor Network Architectures, Sensor Node Deployment, Energy-Efficient Information Processing, Data Dissemination, Self-Configuration Methods.

6 Hours

UNIT - 2

SENSOR NODE DEPLOYMENT: Sensor Node Detection Models, Virtual Force Algorithm, Virtual Forces, Overlapped Sensor Detection Areas, Energy Constraint on the VFA Algorithm, Procedural Description. VFA Simulation Results, Case Studies. Uncertainty Modeling, Modeling of Non-Deterministic Placement, Uncertainty-Aware Placement Algorithms, Procedural Description, Simulation Results, Case Study.

6 Hours

UNIT - 3

ENERGY-AWARE TARGET LOCALIZATION: Detection, Probability Table, Score-Based Ranking Selection of Sensors to Query, 3Energy Evaluation Model, Primitive Energy Evaluation Model, Refined Energy Evaluation Model, Procedural Description, Simulation Results, Case Study.

7 Hours

UNIT - 4

ENERGY-EFFICIENT SELF-ORGANIZATION: Introduction, Relevant Prior Outline of SCARE Basic Scheme, Network Partitioning Problem, Details of SCARE. Time Relationships Ensuring Network, Connectivity Message, Complexity, Optimal Centralized Algorithm, average Comparisons, Performance Evaluation, Simulation Methodology, Simulation Results, Effect of Location, Estimation Error, Conclusion.

7 Hours

PART - B

UNIT - 5

ENERGY-AWARE INFORMATION DISSEMINATION: Introduction, Related Prior Work Location-Aided Flooding, Modified Flooding, Location Information, Virtual Grids, Packet Header Format, LAF Node Types. Information Dissemination using LAF, Resource Management in LAF, Completeness of the Data Dissemination Procedure, Analysis Errors in Location Estimates, Performance Evaluation Energy Model, Simulation Model, Conclusion.

7 Hours

UNIT - 6

OPTIMAL ENERGY EQUIVALENCE ROUTING IN WIRELESS SENSOR NETWORKS : Related Work, Networking Characteristics of WSN, WSN Protocol, Stack Classification of Energy Equivalence Routing, Energy Saving Routing Protocols, Comparison to Flooding, Family Comparison to Sensor-Centric Paradigm

6 Hours

UNIT - 7

DATA-CENTRIC ROUTING AND DIRECTED DIFFUSION: Energy Equivalence Approach, Basics, Neighbor Switching Path, Rerouting EER Algorithms, and Assumptions. Procedures and Functions Formats of Packets EER, Common Entry Algorithm, Common Neighbor Switching EER Algorithm (CNS), Shortest Rerouting EER Algorithm (EERS), Longest Rerouting EER Algorithm (EERL), Simulation Analysis. Basic Procedure, Lifetime and End Condition, Density of Network, Conclusion.

6 Hours

UNIT - 8

TIME SYNCHRONIZATION IN WIRELESS SENSOR NETWORKS: Introduction, Synchronized Time in a WSN, Traditional Network, Time

Synchronization, Energy Awareness, Infrastructure Supported Vs. Ad Hoc, Static Topology vs. Dynamics, Connected vs. Disconnected. Design Principles for WSN Time Synchronization, Computer Clocks, Clock Synchronization in DSN, Synchronization Algorithm. The Idea, Time Transformation Message, Delay Time, Stamp Calculation, Improvement

7 Hours

TEXT BOOKS:

1. **Scalable Infrastructure for Distributed Sensor**-Krishnendu Chakrabarty and S. S. Iyengar, Springer 2005.
2. **Networks, ISBN-10: 1852339519-** Springer -Verlag London Limited 2005.

REFERENCE BOOKS:

1. **Distributed sensor Networks**- a Multi-agent perspective, VICTOR LESSER, CHARLES ORITIZ, TAMBE, Kluwer academic publishing/2003.
2. **Distributed Sensor N/W**- By Sundararaja S. Iyengar, Richard R.Brooks, CRC Press.
3. **Wireless Sensor networks**- Freng Zhao, Leonidas Guibas, Morgan Kaufmann Publishers, New Delhi.

APPLIED NUMERICAL METHODS

Subject Code	:	**06IT763**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

NUMERICAL COMPUTATION: Motivation and objectives / Number Representation/ Machine Precision/ / Round off Error /Truncation Error / Random Number Generation.

6 Hours

UNITS - 2 & 3

LINEAR ALGEBRAIC SYSTEMS: Motivation and objectives / Gauss-Jordan Elimination/ Gaussian Elimination/LU Decomposition/ III-Conditioned systems/ Iterative Methods.

13 Hours

UNIT - 4

EIGENVALUES AND EIGENVECTORS: Motivation and objectives/ The Characteristic polynomial/ Power methods/ Jacobs's method/ householder transformation/ QR method/ Danilevskys Method/ Polynomial Roots.

7 Hours

PART - B

UNIT - 5

CURVE FITTING: Motivation and objectives/ Interpolation/ Newtons Difference Formula/ Cubic Splines/ Least square/ Two- Dimensional Interpolation.

7 Hours

UNIT - 6 & 7

ROOT FINDING: Motivation and objectives/ Bracketing methods/ contraction mapping method/ secant Method/ Mullers Method/ Newton's Method/ polynomial roots/ Nonlinear systems of equations.

12 Hours

UNIT - 8

OPTIMIZATION: motivation and objectives/ Local and Global minima/ Line searches/ steepest Descent method/ Conjugate- Gradient Method/ quasi-Newton Methods/ Penalty Functions / Simulated Annealing

7 Hours

TEXT BOOK:

1. **Applied Numerical Methods for Engineers using MATLAB and C-**ROBERT J.SCHILING & SANDRA HARRIS, Thomson Publishing, Singapore / Bangalore, 2002.

REFERENCE BOOKS:

1. **Applied Numerical Analysis-** GERALD AND WHETELY, Pearson Education, New Delhi, 2002.
2. **Numerical Receipies in C-** WILLIM PRESS ET.AL, Cambridge publishers, New Delhi.

MICRO AND SMART SYSTEMS TECHNOLOGY

Subject Code	:	**06MS769**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO MICRO AND SMART SYSTEMS

a) What are smart-material systems? Evolution of smart materials, structures and systems. Components of a smart system. Application areas. Commercial products.

b) What are microsystems? Feynman's vision. Micromachined transducers. Evolution of micro-manufacturing. Multi-disciplinary aspects. Applications areas. Commercial products.

6 Hours

UNIT - 2

MICRO AND SMART DEVICES AND SYSTEMS: PRINCIPLES AND MATERIALS

a) Definitions and salient features of sensors, actuators, and systems.
b) **SENSORS**: silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conductometric gas sensor, fiber-optic gyroscope and surface-acoustic-wave based wireless strain sensor.
c) **ACTUATORS**: silicon micro-mirror arrays, piezo-electric based inkjet print-head, electrostatic comb-drive and micromotor, magnetic micro relay, shape-memory-alloy based actuator, electro-thermal actuator
d) **SYSTEMS**: micro gas turbine, portable clinical analyzer, active noise control in a helicopter cabin

7 Hours

UNIT - 3

MICROMANUFACTURING AND MATERIAL PROCESSING:

a) Silicon wafer processing, lithography, thin-film deposition, etching (wet and dry), wafer bonding, and metallization.
b) Silicon micromachining: surface, bulk, moulding, bonding based process flows.
c) Thick-film processing:
d) Smart material processing:
e) Processing of other materials: ceramics, polymers and metals
f) Emerging trends

7 Hours

UNIT - 4

MODELLING:

a) Scaling issues.
b) Elastic deformation and stress analysis of beams and plates. Residual stresses and stress gradients. Thermal loading. Heat transfer issues. Basic fluids issues.
c) Electrostatics. Coupled electromechanics. Electromagnetic actuation. Capillary electro-phoresis. Piezoresistive modeling. Piezoelectric modeling. Magnetostrictive actuators.

6 Hours

PART - B

UNIT - 5

COMPUTER-AIDED SIMULATION AND DESIGN: Background to the finite element element method. Coupled-domain simulations using Matlab. Commercial software.

6 Hours

UNIT - 6

ELECTRONICS CIRCUITS AND CONTROL: Carrier concentrations, semiconductor diodes, transistors, MOSFET amplifiers, operational

amplifiers. Basic Op-Amp circuits. Charge-measuring circuits. Examples from microsystems. Transfer function, state-space modeling, stability, PID controllers, and model order reduction. Examples from smart systems and micromachined accelerometer or a thermal cycler.

7 Hours

UNIT - 7

INTEGRATION AND PACKAGING OF MICRO ELECTRO-MECHANICAL SYSTEMS: Integration of microelectronics and micro devices at wafer and chip levels. Microelectronic packaging: wire and ball bonding, flip-chip. Low-temperature-cofired-ceramic (LTCC) multi-chip-module technology. Microsystem packaging examples.

7 Hours

UNIT - 8

CASE STUDIES: BEL pressure sensor, thermal cycler for DNA amplification, and active vibration control of a beam.

6 Hours

PART - C

UNIT - 9

MINI-PROJECTS AND CLASS-DEMONSTRATIONS (Not For Examination)

a) CAD lab (coupled field simulation of electrostatic-elastic actuation with fluid effect)

b) BEL pressure sensor

c) Thermal-cycler for PCR

d) Active control of a cantilever beam

TEXT BOOK:

1. **MEMS & Microsystems: Design and Manufacture-** Tai-Ran Tsu, Tata Mc-Graw-Hill.

REFERENCE BOOKS:

1. **Animations of working principles, process flows and processing techniques**- A CD-supplement with Matlab codes, photographs and movie clips of processing machinery and working devices.
2. **Laboratory hardware kits for-** (i) BEL pressure sensor, (ii) thermal-cycler and (iii) active control of a cantilever beam.
3. **Microsystems Design-** S. D. Senturia, 2001, Kluwer Academic Publishers, Boston, USA. ISBN 0-7923-7246-8.
4. **Analysis and Design Principles of MEMS Devices-**Minhang Bao, Elsevier, Amsterdam, The Netherlands, ISBN 0-444-51616-6.
5. **Design and Development Methodologies-**Smart Material Systems and MEMS: V. Varadan, K. J. Vinoy, S. Gopalakrishnan, Wiley.
6. **MEMS-** Nitaigour Premchand Mahalik, Tata McGraw Hill 2007.

DSP LAB

Subject Code	:	**06ITL77**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Verify the Sampling theorem.

2. Determine linear convolution, Circular convolution and Correlation of two given sequences. Verify the result using theoretical computations.

3. Determine the linear convolution of two given point sequences using FFT algorithm.

4. Determine the correlation using FFT algorithm.

5. Determine the spectrum of the given sequence using FFT.

6. Design and test FIR filter using Windowing method (Hamming window and Kaiser window) for the given order and cut-off frequency.

7. Design and test FIR filter using frequency sampling method.

8. Design and test Butterworth 1^{st} and 2^{nd} order low pass filter.

9. Design and test Butterworth 1^{st} and 2^{nd} order high pass filter.

10. Design and test Chebyshev 1^{st} and 2^{nd} order low pass filter.

11. Design and test Chebyshev 1st and 2^{nd} order high pass filter.

12. Generate and detect DTMF signal using MATLAB software only.

PROCESS CONTROL LAB

Subject Code	:	**06ITL78**	IA Marks	:	25
No. of Practical Hrs./ Week	:	03	Exam Hours	:	03
Total No. of Practical Hrs.	:	42	Exam Marks	:	50

1. Rig up and test the circuit to display the temperature using RTD with suitable signal conditioning circuit.

2. Rig up and test the circuit to display the temperature using Thermocouple with suitable signal conditioning circuit

3. Rig up and test the circuit to display the temperature using AD590 with suitable signal conditioning circuit.

4. Rig up and test the circuit to display the load using load cell with suitable signal conditioning circuits.

5. Using different controllers obtain the optimum response of the given temperature controller.

6. Using different controllers obtain the optimum response of the given flow controller.

7. Using different controllers obtain the optimum response of the given level controller.

8. Sequential Control experiments using PLC. The logic should be solved using ladder diagram technique.

9. Bottle filling process using PLC. The logic should be solved using ladder diagram technique.

10. Elevator using PLC. The logic should be solved using ladder diagram technique

11. Conduct experiment to plot the control valve characteristics

12. Simulation experiments on Virtual Instrumentation.

VIII SEMESTER

LASERS & OPTICAL INSTRUMENTATION

Subject Code	:	**06IT81**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

LASERS: Principles, classification, construction of Ruby, He-Ne, Nd-YAG, semiconductor, Argon and Carbon dioxide lasers.

7 Hours

UNIT - 2

Characteristics of stabilization, Q-switching and mode locking, frequency stabilization,

6 Hours

UNIT - 3

Line shape function, lasing threshold, application of lasers in engineering and medicine, safety with lasers.

6 Hours

UNIT - 4

LASER INSTRUMENTS: Laser interferometry, laser strain gauges, velocimetry, pulse echo technique, beam modulation telemetry and holography, application of holography, laser welding, laser machining and laser spectroscopy

7 Hours

PART - B

UNIT - 5

OPTOELECTRONIC DEVICES AND COMPONENTS: Photo diodes, PIN diodes, solar cells, LED's phototransistors, opto-isolators, photo-couplers.

6 Hours

UNIT - 6

FIBER OPTICS: Light Modulation schemes, optical fibers, intermodal dispersion, graded index fiber, low dispersive fibers

7 Hours

UNIT - 7

Fiber losses, fiber materials, integrated optics, optical bistability, laser printing, optical multiplexers.

6 Hours

UNIT - 8

OPTICAL FIBER SENSORS: Multimode passive and active fiber sensors, phasemodulated sensors, fiber optic gyroscope, Polarization: polarimetric sensors, polarization, and rotation sensors

7 Hours

TEXT BOOKS:

1. **Optoelectronics-**Wilson & Hawkes, Prentice Hall of India.
2. **Laser principles and applications**-Wilson and Hawkes, Prentice Hall of India.

REFERENCE BOOKS:

1. **Essentials of Opto Electronics with Applications**- A.J.Rogers, CRC Press.
2. **Principles of Optical Communication & Opto Electronics-** I.Ravikuamar, Bala N.Saraswathi, Lakshmi Publications.

AIRCRAFT INSTRUMENTATION

Subject Code	:	**06IT82**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

AIRCRAFT INSTRUMENTS: Introduction-Qualitative and quantitative displays, basic T grouping of instruments, basics of Attitude Director Indicator (ADI) & Horizontal Situation Indicator, flight deck of modern aircraft (glass cockpit).

6 Hours

UNIT - 2

AIR DATA INSTRUMENTS: pneumatic type and air data computers, International Standard Atmosphere (ISA), basic pneumatic air data system, combined pitot-static probe, separate static probe, air speed indicator, altimeters, instantaneous vertical speed indicator.

7 Hours

UNIT - 3

AIR DATA WARNING SYSTEM: Mach warning system, altitude alerts system, airspeed warning system.

6 Hours

UNIT - 4

Directional Systems: Earth's total magnetic field, horizontal and vertical components of total field direct reading compass and its limitations, fluxgate detector units. gyro stabilized direction indicating systems.

7 Hours

PART - B

UNIT - 5

GYROSCOPIC FLIGHT INSTRUMENTS: types of gyros-mechanical, ring laser gyros, fiber optic gyros and their limitations, basic mechanical gyro and its properties namely rigidity and precision, gyro horizon, direction indicator, turn and bank indicator.

7 Hours

UNITS - 6 & 7

ENGINE INSTRUMENTS: pressure measurement (EPR), Temperature measurement (EGT), capacitance type volumetric fuel quantity indicator, densitometer, fuel quantity indicator by weight. Engine speed measurement, torque measurement, integrated impellor type flow meter.

12 Hours

UNIT - 8

AIRCRAFT SAFETY AND WARNING SYSTEMS: basic principles and block schematic descriptions of stall warning system, ground proximity warning systems, traffic collision avoidance system.

7 Hours

TEXT BOOK:

1. **Aircraft Instruments and Integrated Systems**- EHJ Pallet, Longman Scientific & Technical, 1992.

REFERENCE BOOKS:

1. **Aircraft Instruments**- C A Williams Galgotia Publications, New Delhi.
2. **Aircraft Propulsion-** Bhaskar Roy, Elsevier publications, New Delhi.

ELECTIVE-IV (GROUP D)

WAVELET TRANSFORMS

Subject Code	:	**06IT831**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

MATHEMATICAL PRELIMINARIES: Linear spaces, Vector and vector spaces, basic functions, matrix algebra & linear transformations, Fourier series, properties And examples of Fourier transforms

6 Hours

UNIT - 2

TIME FREQUENCY ANALYSIS: Window function, STFT, Discrete STFT, discrete Gabor representation, Continuous wavelet transform, discrete wavelet transform, wavelet series, WVD and its properties.

7 Hours

UNIT - 3

CONTINUOUS WAVELET TRANSFORMS: Continuous time wavelets, CWT as correlation, filter and time resolution operation. Inverse CWT.

7 Hours

UNIT - 4

DISCRETE WAVELET TRANSFORM: Introduction, vector approximations in nested linear vector subspaces, multi resolution analysis.

6 Hours

PART - B

UNIT - 5

MRA, ORTHONORMAL WAVELETS: Introduction, Definition of MRA, Construction of orthonormal MRA, wavelet basics for MRA, digital filter interpretation, examples of orthogonal basics generating wavelets, MRA interpretation for discrete time signals.

7 Hours

UNIT - 6

WAVELET APPLICATIONS: Data compression; introduction, transform coding, DTWT for image compression, Audio compression.

7 Hours

UNIT - 7

WAVELET DENOISING: speckle removal, edge detection & object isolation, image fusion.

6 Hours

UNIT - 8

WAVELET PACKETS: Wavelet packet algorithms, Thresholding, 2D wavelets, wavelet packet algorithms for 2D signals, 3D medical image visualization.

6 Hours

TEXT BOOKS:

1. **Fundamentals of Wavelets: theory**-algorithms & applications Goswami and Chan, John Wiley & Sons, 1999.
2. **Introduction to theory and applications** – Wavelet transforms Raghuveer M Rao, Ajit S Bopardikar, Pearson LPE, 2006.

REFERENCE BOOKS:

1. **Introduction to wavelets and wavelet transforms-**A Primer – C Sidney Burrus, Ramesh A Gopinath, Guo, Prentice Hall Inc, 1998.
2. **Wavelet Theory and its applications**-Randy K Young, Kluwer publications, 1963.

SPEECH SIGNAL PROCESSING

Subject Code	:	**06IT832**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

DIGITAL MODELS FOR SPEECH SIGNALS: Process of Speech Production, Lossless tube models, Digital models for Speech signals.

7 Hours

UNIT - 2

TIME DOMAIN MODELS FOR SPEECH PROCESSING: Time dependent processing of speech, Short time Energy and average magnitude, Short time average zero crossing rate, Speech Vs silence discrimination using energy and zero crossing.

6 Hours

UNIT - 3

Pitch period estimation, Short time autocorrelation function, Short time average magnitude difference function, Pitch period estimation using autocorrelation function.

6 Hours

UNIT - 4

SHORT TIME FOURIER ANALYSIS: Linear filtering interpretation, Filter bank summation method, Design of digital filter banks, Implementation using FFT, Spectrographic displays.

7 Hours

PART - B

UNIT - 5

DIGITAL REPRESENTATIONS OF THE SPEECH WAVEFORM: Sampling speech signals, Review of the statistical model for speech, Instantaneous quantization, Adaptive Quantization, General theory of differential quantization, Delta modulation.

7 Hours

UNIT - 6

LINEAR PREDICTIVE CODING OF SPEECH: Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Applications of LPC parameters**.**

7 Hours

UNIT - 7

SPEECH SYNTHESIS: Principles of Speech synthesis, Synthesis based on waveform coding, analysis synthesis method, speech production mechanism, Synthesis by rule, Text to speech conversion.

6 Hours

UNIT - 8

SPEECH RECOGNITION: Principles of Speech recognition, Speech period detection, Spectral distance measures, Structure of word recognition systems, Dynamic time warping (DTW), Word recognition using phoneme units.

6 Hours

TEXT BOOKS:

1. **Digital Processing of Speech Signals-** L R Rabiner and R W Schafer, Pearson Education 2004.
2. **Digital Speech Processing-** Synthesis and Recognition, Sadoaki Furui, 2nd Edition, Mercel Dekker 2002.

REFERENCE BOOKS:

1. **Introduction to Data Compression**- Khalid Sayood, 3rd Edition, Elsivier Publications.
2. **Digital Speech**-A M Kondoz, 2nd Edition, Wiley Publications.

INDUSTRIAL INSTRUMENTATION

Subject Code	:	**06IT833**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INSTRUMENTATION PRACTICES IN PROCESS INDUSTRIES: Department functions and responsibilities, development, process analysis, maintenance, standardization, economics of process instrumentation.

6 Hours

UNIT - 2

Steel production instrumentation, Selection of instruments, black furnace instrumentation, open-hearth process instrument, End product measurement, continuous casting of steel

7 Hours

UNIT - 3

Food industry instrumentation, Instrumentation in brewing, canning industry, baking, dairy industries.

7 Hours

UNIT - 4

Steam power plant instrumentation, Instrument selection, primary and secondary plant measurement

6 Hours

PART - B

UNIT - 5

ELECTRIC POWER GENERATION & DISTRIBUTION: General characteristics of interconnected systems, classification of economy dispatch control systems, Digital computer for economy dispatch applications.

7 Hours

UNIT - 6

PAPER AND PULP INSTRUMENTATION: Different types of pulping, pulp bleaching, pulp blending, wet end and drier instrumentation

6 Hours

UNIT - 7

NUCLEAR REACTOR INSTRUMENTATION: Nuclear reactor dynamics, reactor instrumentation, reliability aspects of protective systems

7 Hours

UNIT - 8

AIR SPACE INSTRUMENTATION: Air crafts and aerospace vehicle instrumentation, air flight simulation instrumentation.

6 Hours

TEXT BOOK:

1. **Hand book of applied instrumentation**-CONSIDINE and ROSS, Publisher McGraw-Hill.

REFERENCE BOOKS:

1. **Industrial instrumentation-** by DONALD P. ECKMAN, Wiley
2. **Industrial Instruments**- by K.Krishnaswamy, S.Vijayachitra, New age International publishers.
3. **Food Processing Principles & Applications**- J.S.Smith, University press (US) 2004.
4. **Process Control Fundamentals for the pulpe**-paper Industry.- Nancy Jean Sell, Tappi(June 1997) ISBN-978-0898522945.

ROBOTICS

Subject Code	:	**06IT834**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

ROBOT ARM KINEMATICS: Introduction, The direct Kinematics Problem, Rotation Matrices, Composite Rotation Matrix, Rotation matrix about an arbitrary axis, Rotation matrix with Euler angle representation, Geometric interpretation of Homogeneous transformation matrices, composite homogeneous transformation matrix, Links joints and their parameters. The Denavit Hartenberg representation.

7 Hours

UNIT - 2

Kinematic equations for manipulators, Other specifications of the locations of the End-Effector, Classification of Manipulators, The inverse Kinematics problem, Inverse Transform Technique for Euler Angles Solution

7 Hours

UNIT - 3

Planning of Manipulator Trajectories: Introduction, General considerations on Trajectory planning, joint-interpolated Trajectories, calculation of a 4-3-4

Joint trajectory, Cubic Spline Trajectory. Sensing: Range sensing, Triangulation, Structured Lighting Approach, Time-of-Flight range finders.

6 Hours

UNIT - 4

Proximity sensing, Inductive sensors, Hall effect sensors, Capacitive Sensors, Ultrasonic sensors, Optical Proximity Sensors, Touch sensors, Binary sensors, Analog sensors, Force and Torque sensing, Elements of a Wrist sensor.

6 Hours

PART - B

UNIT - 5

LOW-LEVEL VISION: Image acquisition, illumination Techniques, imaging geometry, some basic transformations, perspective transformations.

7 Hours

UNIT - 6

Camera model, camera calibration, stereo imaging, some basic relationships between pixels, Neighbours of a Pixel, connectivity, distance measures, Preprocessing, Spatial-Domain methods, Frequency-Domain methods, Smoothing, Enhancement, Edge detection, Thresholding.

7 Hours

UNIT - 7

Higher-Level Vision: Segmentation, Edge Linking and Boundary detection, Thresholding.

6 Hours

UNIT - 8

Region-oriented segmentation, the use of motion, description, Boundary descriptors, Regional descriptors.

6 Hours

TEXT BOOK:

1. **Robotics control sensing Vision and Intelligence**- K.S.Fu, R.C.Gonzalez, C.S.G. Lee, McGraw Hill, 1987.

REFERENCE BOOK:

1. **Introduction to Robotics Mechanics and control**– John J. Craig, 2nd Edition, Pearson education, 2003.

ELECTIVE-V (GROUP E)

LOW POWER VLSI DESIGN

Subject Code	:	**06IT841**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION: Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches, Physics of power dissipation in CMOS devices.

6 Hours

UNIT - 2

DEVICE & TECHNOLOGY IMPACT ON LOW POWER: Dynamic dissipation in CMOS, Transistor sizing & gate oxide thickness, Impact of technology Scaling, Technology & Device innovation.

7 Hours

UNIT - 3

POWER ESTIMATION, SIMULATION POWER ANALYSIS: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems, Monte Carlo simulation.

7 Hours

UNIT - 4

PROBABILISTIC POWER ANALYSIS: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy. Circuit level: Power consumption in circuits. Flip Flops & Latches design, high capacitance nodes, low power digital cells library.

6 Hours

PART - B

UNIT - 5

LOGIC LEVEL: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic.

6 Hours

UNIT - 6

LOW POWER ARCHITECTURE & SYSTEMS: Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, low power arithmetic components, low power memory design.

7 Hours

UNIT - 7

LOW POWER CLOCK DISTRIBUTION: Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co-design of clock network

7 Hours

UNIT - 8

ALGORITHM & ARCHITECTURAL LEVEL METHODOLOGIES: Introduction, design flow, Algorithmic level analysis & optimization, Architectural level estimation & synthesis.

6 Hours

TEXT BOOKS:

1. **Practical Low Power Digital VLSI Design**-Gary K. Yeap, KAP, 2002
2. **Low power design methodologies Rabaey, Pedram**-Kluwer Academic, 1997.

REFERENCE BOOK:

1. **Low-Power CMOS VLSI Circuit Design**-Kaushik Roy, Sharat Prasad, Wiley, 2000.

BIOMEDICAL DSP

Subject Code	:	**06IT842**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

INTRODUCTION TO BIOMEDICAL SIGNALS: The nature of biomedical signals, The action potential, objectives of biomedical signal analysis, Difficulties in biomedical signal analysis, computer aided diagnosis.

7 Hours

UNIT - 2

NEUROLOGICAL SIGNAL PROCESSING: The brain and its potentials, The electrophysiological origin of brain waves, The EEG signal and its characteristics, EEG analysis.

6 Hours

UNIT - 3

LINEAR PREDICTION THEORY: The Autoregressive (AR) method, Recursive estimation of AR parameters, Spectral error measure, Adaptive

segmentation, Transient detection and elimination- the case of epileptic patients, overall performance.

7 Hours

UNIT - 4

SLEEP EEG: Data acquisition and classification of sleep stages, The Markov model and Markov chains, Dynamics of sleep-wake transitions, Hypnogram model parameters, Event history analysis for modeling sleep.

6 Hours

PART - B

UNIT - 5

ADAPTIVE INTERFERENCE/NOISE CANCELLATION : A review of Wiener filtering problem, Principle of an Adaptive filter, The steepest-descent algorithm, the Widrow-Hoff least mean square adaptive algorithm, Adaptive noise canceller, Cancellation of 60Hz interference in ECG, Canceling Donor-heart interference in Heart-transplant electrocardiography, Cancellation of ECG signal from the electrical activity of the chest muscles, canceling of maternal ECG in fetal ECG, Cancellation of High frequency noise in Electro-surgery.

7 Hours

UNIT - 6

CARDIOLOGICAL SIGNAL PROCESSING: Basic Electrocardiography, ECG data acquisition, ECG lead system, ECG parameters and their estimation, The use of multi-scale analysis for parameter estimation of ECG waveforms, Arrhythmia analysis monitoring, long term continuous ECG recording.

6 Hours

UNIT - 7

ECG DATA REDUCTION TECHNIQUES: Direct data compression techniques, Direct ECG data compression techniques, Transformation compression techniques, Transformation compression techniques, other data compression techniques, Data compression techniques comparison.

7 Hours

UNIT - 8

PRONY'S METHOD: Exponential modeling, Exponential parameter estimation, The original Prony problem, Least squares prony method, The covariance method of linear prediction, Prony's method in the presence of noise, clinical application of prony's method.

6 Hours

TEXT BOOKS:

1. **Biomedical Signal Processing Principles and Techniques-** by D C Reddy, The McGraw-Hill publications.
2. **Biomedical Signal Analysis a case study approaches**- by Rangaraj M. Rangayyan The John Wiley publications.

REFERENCE BOOK:

1. **Biomedical Digital Signal Processing-**by Willis J. Tompkins, The Prentice Hall of India publications.

MOBILE COMMUNICATIONS

Subject Code	:	**06IT843**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

WIRELESS TRANSMISSION: Frequencies for radio transmission, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum.

6 Hours

UNIT - 2

MEDIUM ACCESS CONTROL: Motivation for a specialized MAC, SDMA, FDMA, TDMA, fixed TDM, Classical aloha, slotted aloha carrier sense multiple access, PRMS packet reservation multiple access, Reservation TDMA, multiple access with collision avoidance, polling inhibit sense multiple access, CDMA, spread aloha multiple access, Comparison.

7 Hours

UNIT - 3

TELECOMMUNICATIONS SYSTEMS: GSM, mobile services, system architecture, radio interface, protocols, localization and calling, handover, security, new data services, DECT, system architecture TETRA, UMTS and IMT-2000, UMTS releases and standardization, architecture, radiointerface, UTRAN, corenetwork

7 Hours

UNIT - 4

SATELLITE SYSTEMS: Basics GEO, LEO, MEO, Routing, localization, handover.

BROADCAST SYSTEMS: Cyclic repetition of data, digital audio broadcasting, digital video broadcasting, convergence of broadcasting and mobile communications.

6 Hours

PART - B

UNIT - 5

WIRELESS LAN: Infrared Vs radio transmission, infrastructure and ad-hoc network, IEEE802.11, HIPERLSN, Blue tooth.

6 Hours

UNIT - 6

MOBILE NETWORK LAYER: Mobile IP, Goals, assumptions and requirements, entities and terminology, IP packet delivery, agent discovery, registration, tunneling and encapsulation, optimizations, reverse tunneling, PIV6 343, IP micro- mobility support.

7 Hours

UNIT - 7

Dynamic host configuration, protocol, mobile ad-hoc networks Routing, destination sequence distance vector, Dynamic source routing, alternative metrics, overview.

6 Hours

UNIT - 8

MOBILE TRANSPORT LAYER: Traditional TCP, Congestion control, slow start, fast retransmit/ fast recovery, implications of mobility, Classical TCP in improvements, indirect TCP, Snooping, mobile, Fast retransmit/ fast recovery, Transmission/time-out freezing, selective retransmission, Transaction-oriented TCP, TCP over 2.5/3G wireless networks.

7 Hours

TEXT BOOK:

1. **Mobile Communications**-2nd Edition, JOCHEN SCHILER, Pearson Education. 2003

REFERENCE BOOKS:

1. **Mobile Communications engineering, Theory and applications**-2nd Edition, WILLIM C.Y. LEE, McGraw-Hill, 1997, Singapore.
2. **Introduction to Wireless and Mobile Systems**-Second edition, Dharma Prakash Agarwal, Qing An Zeng, 2nd Edition, THOMSON, 2007.
3. **Electronic Communications systems Fundamentals through advanced**-5th Edition, Wayne Tomasi, Pearson education 2007.

SMART SENSORS

Subject Code	:	**06IT844**	IA Marks	:	25
No. of Lecture Hrs./ Week	:	04	Exam Hours	:	03
Total No. of Lecture Hrs.	:	52	Exam Marks	:	100

PART - A

UNIT - 1

BASICS OF SMART SENSORS & MICROMACHINING: Introduction, Mechanical-Electronic transitions in sensing, nature of sensors, overview of smart sensing and control systems, integration of micromachining and microelectronics, introduction to micromachining, bulk micromachining, wafer bonding, surface micromachining, other micromachining techniques.

7 Hours

UNIT - 2

SENSOR INFORMATION TO MCU: Introduction, amplification and signal conditioning, separate versus integrated signal conditioning, digital conversion.

6 Hours

UNIT - 3

MCUS AND DSPS TO INCREASE SENSOR IQ: Introduction, MCU control, MCUs for sensor interface, DSP control, Software, tools and support, sensor integration.

6 Hours

UNIT - 4

COMMUNICATIONS FOR SMART SENSORS : Introduction, definitions and background, sources and standards, automotive protocols, industrial networks, office & building automation, home automation, protocols in silicon, other aspects of network communications.

7 Hours

PART - B

UNIT - 5

CONTROL TECHNIQUES: Introduction, state machines, fuzzy logic, neural networks, combined fuzzy logic and neural networks, adaptive control, other control areas.

6 Hours

UNIT - 6

SENSOR COMMUNICATION & MEMS: Wireless zone sensing, surface acoustical wave devices, intelligent transportation system, RF-ID, Microoptics, microgrippers, microprobes, micromirrors, FEDs.

7 Hours

UNIT - 7

PACKAGING, TESTING AND RELIABILITY OF SMART SENSORS: Introduction, Semiconductor packaging applied to sensors, hybrid packaging, packaging for monolithic sensors, reliability implications, testing smart sensors. Unit Standards for Smart Sensors: Introduction, setting the standards for smart sensors and systems, IEEE 1451.1, IEEE 1451.2, IEEE P1451.3, IEEE 1451.4, extending the systems to network**.**

7 Hours

UNIT - 8

IMPLICATIONS OF SMART SENSOR STANDARDS AND RECENT TRENDS: Introduction, sensor plug-and-play, communicating sensor data via existing wiring, automated/remote sensing and web, process control over the internet, alternative standards, HVAC sensor chip, MCU with integrated pressure sensors, alternative views of smart sensing, smart loop.

6 Hours

TEXT BOOK:

1. **Understanding Smart Sensors**- Randy Frank, 2nd Edition. Artech House Publications, 2000.

REFERENCE BOOK:

1. **Smart Sensors**- Paul W. Chapman, ISA Press.