

## **BM- 601 – Digital Signal Processing**

### **Unit I**

The Discrete Fourier Transform: Discrete Fourier series, Discrete Fourier Transform (DFT), properties of DFT, linear convolution using the DFT, two dimensional DFT

### **Unit II**

Flow Graph and Matrix Representation of Digital Filters :Signal flow graph representation of digital network, matrix representation, basic network structures for IIR and FIR systems, Telligen's theorem for digital filters and its applications.

### **Unit III**

Digital filters Design Techniques: Design of IIR and FIR digital filters, computer aided design of IIR and FIR filters, comparison of IIR and FIR digital filters.

### **Unit IV**

Computation of the Discrete Fourier Transform: Goertzel algorithm, FT algorithms, decimation in time and frequency, FFT algorithm for N a composite number, Chirp Z transform (CZT).

### **Unit V**

Discrete Random Signals: Discrete time random process ,averages spectrum representations of infinite energy signals, response of linear system to random signals. Power Spectrum Estimation: Basic principles of spectrum estimation, estimates of the auto covariance, power spectrum, cross covariance and cross spectrum.

### **Reference Books:**

1. A.V. Oppenheim and R. W. Schaffer, " Digital Signal Processing", Prentice Hall, 1975
2. L.R. Rabiner and B. Gold, " Theory and Application of Digital Signal Processing", PHI 1989
3. Salivahanan, Vallavaraj, Digital Signal Processing, TMH
4. S. K. Mitra, Digital Signal Processing, TMH
5. Ifeachor Jarvis, Digital Signal Processing Asea Pearson

### **List of Experiments:**

1. Calculate Linear convolution of given two sequences.
2. To calculate cross correlation of given sequences.
3. Compute the DFT of the given sequence and plot magnitude and phase response.
4. Find circular convolution of given sequences using twiddle matrix.
5. Design IIR low pass filter for given specification.
6. Design IIR High pass filter for given specification.
7. Design IIR band pass filter for given specification.
8. Design FIR low pass filter using windowing method for given specification.
9. Design FIR band pass filter using windowing method for given specification.
10. Design FIR high pass filter using windowing method for given specification.
11. Design Notch filter for given specification.

## **BM- 602 – Industrial Electronics**

### **Unit I**

Power, Semiconductor Devices: Classification of Power semiconductor devices, characteristics, construction, application and theory of operation of power diode, power transistor, thyristors. Device specifications and ratings, working of Diac, Triac, IGBT, GTO and other power semiconductor devices. Turn-on / Turn-off methods and their circuits.

### **Unit II**

Rectifiers: Review of uncontrolled rectification and its limitations, controlled rectifiers, half wave, Full wave configurations, multiphase rectification system, use of flywheel diode in controlled rectifier configurations.

### **Unit III**

Inverters and Choppers: Classification of inverters, Transistor inverters, Thyristor inverters, Voltage and Current Commutated inverters, PWM inverters, Principle of Chopper, Chopper classification and types of regulators.

### **Unit IV**

A. C. Voltage Controllers and Cyclo-converters: Classification and operation of a.c. voltage and cyclo-converters, their circuit analysis for different type of load.

### **Unit V**

Industrial Applications: Solid-state switching circuits, Relays, Electronic Timer, battery charger, sawtooth generator, applications in Industrial process control, Motor drive applications, Electronic regulators, etc., Induction heating, Dielectric Heating, Resistance welding and welding cycle.

### **Reference Books:**

1. Power electronics, converters, applications & design - Ned Mohan et.al.
2. Power Electronics Circuits, devices & applications - M.H. Rashid
3. Power Electronics -P.C.Sen
4. An introduction Thyristors & their applications - M. Rammurthy
5. Power Electronics & its applications, Alok Jain, Penram Publication
6. Semiconductor Power Electronics- CM Paudyal

### **List of Experiments:**

1. Draw the V-I characteristics of S.C.R.
2. Draw the V-I characteristics of Diac.
3. Draw the V-I characteristics of Triac.
4. To study of light dimmer using Diac and Triac.
5. To study the operation of S.C.R. as automatic Speed control circuit.
6. UJT as a relaxation oscillator.
7. To study of various commutating circuits.
8. Study of single phase half wave controlled rectifier.
9. Study of single phase center tapped full wave controlled rectifier.
10. Study of single phase fully controlled bridge rectifier.
11. Study of various SCR triggering circuits.

## **BM- 603 – Advanced Microprocessor and Microcontrollers**

### **Unit I**

16-bit microprocessor (one well known processor 8086 instruction set, assembly language programming. Interrupt structure, interfacing memory and I/O devices. memory organizations. Salient features of other processors (80286/386/486) and digital signal processors. I/O processors and arithmetic coprocessors.

### **Unit II**

Architecture of 8051 Micro controller, registers, timers, counters, flags, special function registers. .

### **Unit III**

8051 Assembly language programming-1: Addressing modes, Data types and directives, Jump, loop and call instructions, arithmetic instructions, and their simple programming.

### **Unit IV**

8051 Assembly language programming-2: Logic instructions,, single bit instructions, timer and counter programming, serial communication, memory accessing and their simple programming applications.

### **Unit V**

Hardware interfacing: I/O port programming, interrupt programming, Bit manipulation, interfacing to LED, LCD, keyboard, ADC, DAC, Stepper motors and sensors.

### **Reference Books:**

1. K.J. Ayala, The 8086 microprocessor: programming and interfacing the PC, Penram Intl Pub..
2. K.J. Ayala, The 8051 microcontroller: Architecture, programming and applications, Penram Int.
3. Raj Kamal, The concepts and features of microcontrollers (68H11, 8051 & 8096), Wheeler publishing.
4. Bhurchandi and Ray : Advance Microprocessor and peripherals, TMH.
5. D. Hall , Microprocessor and Interfacing, TMH.

### **List of Experiments:**

1. Familiarization with 16 bit, 32 bit, Microprocessor, Instruction sets, and architecture.
2. Assembly language program examples using 8086.
3. Realization of programmable time delay circuit using 8253, 8254.
4. Interfacing of ADC, DAC with 8086/8051 system.
5. Design of Hardware interrupts system.
6. Design and fabrication of fixing circuit for single phase controlled converter.
7. Assembly language program examples for micro controller 8051.
8. Serial communication using 8051.
9. Steeper motor controller design using 8051.
10. Programming of 8051 as event counter.
11. Timer programming of 8051.

## **BM- 604 – Clinical Laboratory Equipment**

### **Unit I**

Difference between analytical and other instruments. Gas Analysis: Gas chromatography, Thermal conductivity method, Heat of reaction method. Estimation of oxygen, hydrogen, methane, carbon dioxide, CO, etc. in binary or complex gas mixtures. Zirconia-probe oxygen analyser. Paramagnetic oxygen meters, Electrochemical reaction method.

### **Unit II**

Ultraviolet and visible spectro photometry : Radiation sources, detectors, readout modules, filters, monochromators. Instruments for absorption photometry. Fundamental laws of photometry. infrared Spectrophotometry : Basic components of IR spectrophotometers, sample handling, Types of spectrophotometers, Fourier transform infrared spectroscopy.

### **Unit III**

Mass spectrometry: Basic mass spectrometer, components of mass spectrometers, types of mass spectrometers resolution and applications. X-Ray methods. Production of X-Rays & X-Ray spectra, Instrumental units, detectors for the measurement of radiation, direct X-Ray methods, XRay absorption methods, X-Ray fluorescence methods, X-Ray diffraction, Applications Spectroscopy, ESR Spectroscopy.

### **Unit IV**

Clinical Laboratory equipments: Measurement of pH value of blood, ESR measurements, Hemoglobin measurement, oxygen and carbon dioxide concentration in blood, GSR measurement, polar graphic measurements, blood cell counter, blood gas analyzer, principle of transmission & scanning electron microscopy, principle of simple, compound and phase contrast microscopes.

### **Unit V**

Fundamentals of X-ray generation: Basics of radiography & fluoroscopy system – H/TV chains. Basics of nuclear medicine – radio chemical uses. Nuclear Instruments – detectors and counters.

### **Reference Books:**

1. RS Khandpur, "Hand Book of Biomedical Instrumentation. TMH
2. RS Khandpur, "Analytical & Industrial Instrumentation. TMH
3. Chatwal Anand,"Instrumental methods of chemical Analysis, Himalaya publication.
4. D. Patranbis, "Industrial Instrumentation,TMH.

## **BM- 605 – Biomedical Equipments**

### **Unit I**

Fundamental of Medical Instrumentation: Sources of Biomedical Signals, Basic Medical Instrumentation System, Performance Requirement of Medical Instrumentation System, General Constrains in Design of Medical Instrumentation System, Regulation of Medical Devices.

Bioelectric Signals and Electrodes: Origin of bioelectric Signals, Recording Electrodes, Silver-silver Chloride Electrodes, Electrodes for ECG, Electrodes for EEG, Electrodes for EMG, Electrical Conductivity of Electrode jellies & creams, Microelectrodes.

Recording System: Basic recording System, General Consideration for Signal conditioner, Sources of noise in low level measurement, Writing System, Direct writing recorders, The ink jet recorder, Potentiometer recorder, Digital Recorders, Instrumentation tape recorder.

### **Unit II**

Biomedical Recorders: Electrocardiograph, vector cardiograph, Phonocardiograph, Electroencephalograph, Electromyograph.

Patient Monitoring System: System Concept, Cardiac monitor, Bad side Patient Monitoring System, Central monitors, Measurement of heart rate, measurement of pulse rate, Blood pressure measurement, measurement of temperature, measurement of respiration rate. Catheriazation Laboratory Instrumentation,.

Arrhythmia & Ambulatory Monitoring Instruments: Cardiac Arrhythmia, Arrhythmia Monitor, QRS detection techniques, Exercise detection technique, exercise stress testing, Ambulatory Monitoring Instruments.

Foetal Monitoring Instruments: Cardiotocograph, Methods of Monitoring Foetal heart rate, Monitoring labour activity, Recording System

### **Unit III**

Biomedical Telemetry & Telemedicine: Wireless Telemetry, Single Channel Telemetry Channel, Multi-channel Wireless Telemetry System, Multi-patient Telemetry, Implantable Telemetry Systems, Transmission of analog physiological Signal over telephone, Telemedicine. Patient Safety: Electric Shocks Hazards, Leakage Currents, Safety Codes for Electromedical Equipment, Electrical Safety Analyzer. Testing of biomedical Equipments.

### **Unit IV**

Oximeters Oximetry, Ear Oximetry, Pulse Oximeter, Skin Reflectance Oximeters, Intravascular Oximeter.

Blood Flow Meter: Electromagnetic Blood flow meter, Types of Electromagnetic Flow meters, Ultrasonic Blood Flow meters, NMR Blood Flow meter, Laser Doppler Blood Flow meter.

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, Ultrasound Method.

### **Unit V**

Pulmonary Function Analysers Pulmonary Function Measurement, Spirometry

Pneumotachometer, Measurement of Volume , Pulmonary Function Analyzers, Respiratory Gas Analyzer.

Audiometers and Hearing Aids: Mechanism of Hearing Measurement of Sound, Basic Audiometer, Pure Tone Audiometer, Speed Audiometer System Bekesy, Evoked Response Audiometry System, Calibration of Audiometers, Hearing Aids.

**Reference Books:**

1. RS Khandpur, "Hand Book of Biomedical Instrumentation. TMH
2. Carr JJ, Brown JM, "Introduction to Biomedical Equipment Technology" Asea Parson
3. Chromwell, Weibell & Pfeiffer, "Biomedical Instrumentation and Measurements" PHI
4. Togawa, Tamura & Oberg – Biomedical Transducers & Instruments – CRC Press Boca Raton, New York
5. R. Aston principle of Biomedical Instrumentation and Measurement.
6. J.G. Wabster, Encyclopedia of Medical Devices Vol I, II and III, Wiley Interscience publication, 1988.
7. Geddes and Baker "Principles of applied Biomedical instrumentation" John Wiley & Sons

**List of Experiments:-**

1. To measure blood pressure by sphygmomanometer.
2. Record ECG of patient using limb leads.
3. Record ECG of patient using chest leads.
4. To find blood oxygen saturation level using finger plethysmograph.
5. Study of PCG.
6. To measure various respiratory capacity & volume using Spiro meter.
7. Study of EEG.
8. To find EPR or ERP using EEG.
9. Study of blood flow meter.
10. to measure nerve conduction velocity.