

St. PETER'S UNIVERSITY

St. Peter's Institute of Higher Education and Research
(Declared under section 3 of UGC Act 1956)
Avadi, Chennai – 600 054.



DIPLOMA IN BIOMEDICAL INSTRUMENTATION

(I TO IV SEMESTERS - 2 Years)

REGULATIONS AND SYLLABI

REGULATIONS – 2013

(Effective from the Academic Year 2013-'14)

DIPLOMA IN BIOMEDICAL INSTRUMENTATION

Regulations and Syllabi

(Effective from the Academic Year 2013-'14)

- 1. Eligibility:** Candidates who have passed the Higher Secondary Examination conducted by the Government of Tamilnadu with Mathematics, Physics and Chemistry as one of the subjects, or any other examination recognized as by the university equivalent thereto are eligible for admission.
- 2. Duration:** Two Years / 4 Semesters.
- 3. Medium:** English is the medium of instruction and examinations.
- 4. Weightage for Continuous and End Assessment:** The weightage for Continuous Assessment (CA) and End Assessment (EA) be 25:75 unless the ratio is specifically mentioned in the scheme of Examinations.
- 5. Credit System:** Credit system be followed with 18 credits for each semester and each credit is equivalent to 25 hours of effective study provided in the Time Table.
- 6. Scheme of Examinations**

SEMESTER I

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
113DBIT01	Mathematics	2	25	75	100
113DBIT02	Anatomy And Human Physiology	3	25	75	100
113DBIT03	Analog Electronics I	2	25	75	100
113DBIT04	Sensors And Measurement	2	25	75	100
113DBIT05	Biochemistry	3	25	75	100
Practical					
113DBIP01	Bio Chemistry And Physiology Lab	3	25	75	100
113DBIP02	Electronic Circuits Lab I	3	25	75	100
	Total	18	175	525	700

SEMESTER II

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
213DBIT01	Bio Medical Instrumentation	2	25	75	100
213DBIT02	Basics Of Electrical Engineering	1	25	75	100
213DBIT03	Microbiology	2	25	75	100
213DBIT04	Computer Programming	2	25	75	100
213DBIT05	Analog Electronics II	2	25	75	100
Practical					
213DBIP01	Electronic Circuit Lab II	3	25	75	100
213DBIP02	Microbiology Lab	3	25	75	100
213DBIP03	Computer Programming Lab	3	25	75	100
	Total	18	175	525	700

SEMESTER III

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
313DBIT01	Signals And Systems	2	25	75	100
313DBIT02	Diagnostic And Therapeutic Equipments	2	25	75	100
313DBIT03	Microprocessor And Microcontroller	2	25	75	100
313DBIT04	Digital Electronics	2	25	75	100
313DBIT05	Hospital Management	1	25	75	100
Practical					
313DBIP01	Diagnostic And Therapeutic Equipment Lab	3	25	75	100
313DBIP02	Microprocessor And Microcontroller Lab	3	25	75	100
313DBIP03	Digital Electronics Lab	3	25	75	100
Total		18	175	525	700

SEMESTER IV

Code No.	Course Title	Credit	Marks		
			CA	EA	Total
Theory					
413DBIT01	Radiological Equipments	3	25	75	100
413DBIT02	Bio Materials And Artificial Organs	3	25	75	100
Practical					
413DBIP01	PROJECT WORK- VIVA VOCE	12	25	75	100
Total		18	75	225	300

- 7. Passing Requirements:** The minimum pass mark (raw score) be 50% in End Assessment (EA) and 50% in Continuous Assessment (CA) and End Assessment (EA) put together. No minimum mark (raw score) in Continuous Assessment (CA) be prescribed unless it is specifically mentioned in the Scheme of Examination.
- 8. Grading System:** Grading System on a 10 Point Scale be followed with 1 mark = 0.1 Grade point to successful candidates as given below.

CONVERSION TABLE

(1 mark = 0.1 Grade Point on a 10 Point Scale)

Range of Marks	Grade Point	Letter Grade	Classification
90 to 100	9.0 to 10.0	O	First Class
80 to 89	8.0 to 8.9	A	First Class
70 to 79	7.0 to 7.9	B	First Class
60 to 69	6.0 to 6.9	C	First Class
50 to 59	5.0 to 5.9	D	Second Class
0 to 49	0 to 4.9	F	Reappearance

Procedure for Calculation

$$\text{Cumulative Grade Point Average (CGPA)} = \frac{\text{Sum of Weighted Grade Points}}{\text{Total Credits}}$$

$$= \frac{\sum (CA+EA) C}{\sum C}$$

$$\text{Where Weighted Grade Points in each Course} = \text{Grade Points (CA+EA)} \\ \text{multiplied by Credits}$$

$$= (CA+EA)C$$

$$\text{Weighted Cumulative Percentage of Marks(WCPM)} = \text{CGPA} \times 10$$

C- Credit,

CA-Continuous Assessment,

EA- End Assessment

9. Pattern of the Question Paper: The question paper for End Assessment will be set for three hours and for the maximum of 100 marks with following divisions and details.

Part A: 10 questions (with equal distribution to all units in the syllabus).
Each question carries 2 marks.

Part B: 5 questions with either or type (with equal distribution to all
Units in the syllabus). Each question carries 16 marks.

The total marks scored by the candidates will be reduced to the maximum prescribed in the Regulations.

10. Effective Period of Operation for the Arrear Candidates : Two Year grace period is provided for the candidates to complete the arrear examination, if any.

Registrar

11. Syllabus

113DBIT01 - MATHEMATICS

UNIT I TRIGONOMETRY AND MENSURATION

Trigonometric (sine, cosine and tan functions) and exponential functions, De-Moiver's theorem. Area of plane figures, computation of volume of solid figures

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY

Direction cosines and ratio's – Angle between two lines – Equations of a plane – Equations of a straight line – Coplanar lines – Shortest distance between skew lines – Sphere – Tangent plane – Plane section of a sphere.

UNIT III INTEGRATION AND FUNCTIONS OF TWO VARIABLES

Integration of rational, trigonometric and irrational functions, properties of definite integrals, Reductions formulae for trigonometric functions, Taylor's Theorem - Maxima and Minima (Simple Problems).

UNIT IV ORDINARY DIFFERENTIAL EQUATIONS

Linear equations of second order with constant coefficients – Simultaneous first order linear equations with constant coefficients – Homogeneous equation of Euler type – Equations reducible to homogeneous form.

UNIT V BASIC STATISTICS AND PROBABILITY

The arithmetic mean, median, mode, standard deviation and variance - Regression and correlation - Elementary probability - Laws of addition and multiplication of probabilities - Conditional probability – Independent events.

TEXT BOOK:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 41st Edition, 2011.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co.Ltd., New Delhi, 11th Reprint, 2010.
3. Greenberg M.D., "Advanced Engineering Mathematics", Pearson Education, New Delhi, 2nd Edition, 5th Reprint, 2009.
4. Gupta S.C and Kapoor V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 9th Edition, 1996.

113DBIT02 - ANATOMY AND HUMAN PHYSIOLOGY

UNIT I STUDY OF CELLULAR SYSTEM

Cell: Structure and organelles - Functions of each component in the cell. Cell membrane – transport across membrane – origin of cell membrane potential (Nernst and Goldman and Katz equations) – Action potential.

UNIT II HEMATOLOGICAL SYSTEM

Blood composition - functions of blood – functions of RBC. WBC types and their functions. Blood groups –importance of blood groups –identification of blood groups. blood flow factors regulating blood flow such as viscosity, radius , density etc (Fahreus lindqvist effect, Poiseuille's Law)

UNIT III RENAL AND RESPIRATORY SYSTEM

Structure of Kidney and nephron. Mechanism of Urine formation and acid base regulation. Dialysis. Components in of respiratory system. Oxygen and carbon dioxide transport and acid base regulation.

UNIT IV CARDIAC SYSTEM

Structure of heart – Properties of Cardiac muscle – Cardiac muscle and pacemaker potential - Cardiac cycle – ECG - Heart sound - volume and pressure changes and regulation of heart rate.

UNIT V SENSORY SYSTEM

Structure of a Neuron. Synaptic conduction. Conduction of action potential in neuron Parts of brain cortical localization of functions.. EEG. Simple reflexes , withdrawal reflexes. Autonomic nervous system and its functions,Structure of eye ,ear and auditory and visual pathways.

TEXT BOOK:

1. Essential of human Anatomy and Physiology, Elaine.N. Marieb Eight edition, P 1. Essential of human Anatomy and Physiology, Elaine.N. Marieb Eight edition, Pearson Education New Delhi ,2007.
2. Review of Medical Physiology,22nd edition,William F.Ganong Mc Graw Hill New Delhi,
3. Text book of Physiology, Prof. A.K. Jain, Third edition volume I and II Avichal Publishing company, New Delhi

113DBIT03 - ANALOG ELECTRONICS I

UNIT I SEMI CONDUCTOR PHYSICS

Review of basic atomic structure and energy levels, concept of insulators, conductors and semi conductors, atomic structure of Ge and Si, covalent bonds-Concept of intrinsic and extrinsic semi conductor, P and N impurities, doping of impurity -P and N type semiconductors and their conductivity. Effect of temperature on conductivity of intrinsic semi conductor-Energy level diagram of conductors, insulators and semi conductors; minority and majority carriers.

UNIT II SEMI CONDUCTOR DIODE:

PN junction diode, mechanism of current flow in PN junction, Drift and diffusion current, depletion layer, forward and reverse biased PN junction, potential barrier, concept of junction capacitance in forward and reverse bias condition-V-I characteristics, static and dynamic resistance and their calculation from diode characteristics- Diode as half wave, full wave and bridge rectifier. PIV, rectification efficiencies and ripple factor calculations, shunt capacitor filter, series inductor filter, LC filter and filter-Types of diodes, characteristics and applications of Zener diodes. Zener and avalanche breakdown.

UNIT III INTRODUCTION TO BIPOLAR TRANSISTOR:

Concept of bipolar transistor, structure, PNP and NPN transistor, their symbols and mechanism of current flow; Current relations in transistor; concept of leakage current;

CB, CE, CC configuration of the transistor; Input and output characteristics in CB and CE configurations; input and output dynamic resistance in CB and CE configurations; Current amplification factors. Comparison of CB CE and CC Configurations;

Transistors as an amplifier in CE Configurations; d.c load line and calculation of current gain, voltage gain using d.c load line.

UNIT IV FIELD EFFECT TRANSISTORS

Construction, operation and characteristics of FET and its application-Construction, operation and characteristics of MOSFET in depletion and enhancement modes and its applications-C MOS-advantages and applications-Comparison of JFET, MOSFET and BJT-FET amplifier circuit and its working principle. (No analysis).

UNIT V TRANSISTOR BIASING CIRCUITS

Concept of transistor biasing and selection of operating point. Need for stabilization of operating point. Different types of biasing circuits.

BOOKS RECOMMENDED

1. Basic Electronics and Linear Circuit by NN Bhargava and Kulshreshta, Tata McGraw Hill, New Delhi.
2. Principles of Electrical and Electronics Engineering by VK Mehta; S Chand and Co., New Delhi
3. Electronic Components and Materials by SM Dhir, Tata McGraw Hill, New Delhi
4. Electronics Devices and Circuits by Millman and Halkias; McGraw Hill.
5. Principles of Electronics by Albert Paul Malvino; Tata McGraw Hill, New Delhi
6. Electronics Devices and Circuits-I by Naresh Gupta, Jyotesh Malhotra and Harish C Saini, Eagle Prakashan, Jalandhar
7. Electronics Devices and Circuits by Rama Reddy, Narosa Publishing House Pvt. Ltd., New Delhi

113DBIT04 - SENSORS AND MEASUREMENTS

UNIT I SCIENCE OF MEASUREMENT

Measurement System – Instrumentation – Classification and Characteristics of Transducers – Static and Dynamic – Errors in Measurements – Calibration – Primary and secondary standards.

UNIT II DISPLACEMENT, PRESSURE, TEMPERATURE SENSORS

Strain Gauge: Gauge factor, sensing elements, configuration, unbounded strain gage, biomedical applications; strain gauge as displacement & pressure transducers: force summing devices, capacitive transducer, inductive transducer, LVDT, Passive types: RTD materials & range, relative resistance vs. temperature characteristics, thermistor characteristics, biomedical applications of Temperature sensors. Active type: Thermocouple – characteristics,

UNIT III PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS

Phototube, Photo Multiplier Tube (PMT), photovoltaic, photoconductive cells, photo diodes, phototransistor, comparison of photoelectric transducers, spectro-photometric applications of photo electric transducers. Piezoelectric active transducer and biomedical applications as pressure & Ultrasound transducer.

UNIT IV SIGNAL CONDITIONING & SIGNAL ANALYSER

AC and DC Bridges –wheat stone bridge, Kelvin, Maxwell, Hay, Schering -Pre-amplifier – impedance matching circuits – isolation amplifier. Spectrum Analyzer

UNIT V DISPLAY DEVICES

Digital voltmeter – Multi meter – CRO – block diagram, CRT – vertical & horizontal deflection System, DSO, LCD monitor, PMMC writing systems

TEXT BOOK:

1. Principles of Applied Biomedical Instrumentation L.A Geddas and L.E.Baker – John Wiley and sons.
2. Albert D.Helfrick and William D. Cooper. Modern Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, 2007.
3. Ernest o Doebelin and dhanesh N manik, Measuremet systems, Application and design ,5th Edition ,McGraw-Hill, 2007.
4. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 2007.
5. Leslie Cromwell, “Biomedical Instrumentation and measurement”, Prentice hall of India, New Delhi, 2007.
6. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 200446

113DBIT05 - BIOCHEMISTRY

UNIT I

Introduction to biochemistry – Biomolecules, structure of water & its importance – Important noncovalent forces – Hydrogen bonds, electrostatic, hydrophobic & vanderwaals forces – Acid, base & buffers – pH, Henderson Hasselbalch equation. Biological buffers and their significance – Principle of viscosity – surface tension , adsorption, diffusion, osmosis & their applications in biological systems.

UNIT II

Classification, structure & properties of carbohydrates – mono, di , oligo & polysaccharides. Classification, structure & properties of amino acids & proteins. Classification, structure & properties of Lipids – Simple lipids , Phospholipids , glycolipids & steroids . Transport of lipids: Lipoproteins Structure & functions of nucleic acids – Nucleosides,nucleotides – Cyclic AMP , cyclic GMP , ATP , GTP – DNA & RNA.

UNIT III

Classification of Enzymes, Chemical nature, Active Site, Specificity of Enzyme catalyzed reactions, Regulation : Feedback , Allosteric , Covalent modification , Hormonal r regulation, co-enzymes. Assay of enzymes, enzymes in clinical diagnosis of diseases. Introduction to Metabolism: Carbohydrate metabolism, Glycolysis Lipid metabolism : fatty acid, beta oxidation , ketogenesis and cholesterol metabolism. TCA cycle Structure of biological membranes, electron transport & Oxidative phosphorylation.

UNIT IV

Liver function and liver function tests, Kidney function and kidney function tests , normal & abnormal constituents of urine and their clinical significance. General characteristics of hormones. Structure , functions & disorders of thyroid , parathyroid , pituitary ,adrenal and pancreatic hormones. Hormones as chemical messengers: General assay of hormones – Bio assay , chemical assay & immuno assays.

UNIT V

Analytical techniques: Principle and applications of electrophoresis – PAGE , SDS PAGE , Isoelectric focusing , Two Dimensional Electrophoresis. Chromatography: Principle of adsorption & partition chromatography, Size exclusion , Ion exchange & affinity chromatography. Spectro photometry, fluorimetry, flame photometry, manometry , microcalorimetry , electrochemical methods, biosensors , automation in clinical laboratory , use of radio isotopes in biochemistry.

TEXT BOOKS

1. Harper's review of biochemistry By David. W. Martin, Peter. A. Mayes , Victor. W. Rodwell . LANGE medical publications, 2003.
2. Practical Biochemistry – Principles & Techniques,Keith Wilson & John Walker. Oxford university press.

113DBIP01 - BIOCHEMISTRY AND HUMAN PHYSIOLOGY LAB

1. General tests for carbohydrates, proteins and lipids.
2. Preparation of serum and plasma from blood.
3. Estimation of blood glucose.
4. Estimation of serum cholesterol.
5. Assay of SGOT/SGPT.
6. Estimation of creatinine in urine.
7. Electrophoresis of serum proteins.
8. Separation of amino acids using thin layer chromatography.
9. ESR , PCV , MCH, MCV, MCHC, total count of RBCs and Hemoglobin estimation
10. Differential count of different WBCs and Blood group identification
11. Ishihara chart for color blindness and Snellen's chart for myopia and hyperopia – by letters reading and ophthalmoscope to view retina.
12. Weber's and Rinnee's test for auditory conduction

113DBIP02 - ELECTRONIC CIRCUIT LAB I

1. Familiarization with operation of following instruments.
Multi-meter, CRO, Signal generator, Regulated Power Supply by taking readings of relevant electrical quantities with their help.
2. Plot V-I characteristics for PN junction diode
3. Plot V-I characteristics of Zenor diode
4. Observe the wave shape of following rectifier circuit
 - (a) Half wave rectifier
 - (b) Full wave rectifier
 - (c) Bridge rectifier
5. Plot input and output characteristics and calculate parameters of transistors in CE configuration.
6. Plot input and output characteristics and calculate of parameters of transistors in CB configuration.
7. Plot V-I characteristics of FET amplifier.
8. Measure the Q-Point and note the variation of Q-Point.
 - (a) By increasing the base resistance in fixed bias circuit.
 - (b) By changing out of bias resistance in potential divider circuit.
9. Measure the Voltage Gain, input, output impedance in single state CE amplifier circuit.

SEMESTER II

213DBIT01 - BIO MEDICAL INSTRUMENTATION

BIO POTENTIAL ELECTRODES

Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode-skin interface, half cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes.

ELECTRODE CONFIGURATIONS

Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven’s triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG, ERG and EOG – unipolar and bipolar mode.

BIO AMPLIFIER

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference.

MEASUREMENT OF NON-ELECTRICAL PARAMETER

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit.

Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement.

BIO-CHEMICAL MEASUREMENT

Biochemical sensors - pH, pO₂ and pCO₂, Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

TEXT BOOKS:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004
3. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
4. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
5. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGraw-Hill Publisher, 2003.

213DBIT02 - BASICS OF ELECTRICAL ENGINEERING

UNIT I MAGNETIC CIRCUIT

Magnetic effects of electric current, Magnetic circuits, Magnetic materials and B-H relationship, Electromagnetic induction and force, Hysteresis and eddy current losses.

UNIT II DC MOTORS

Parts of DC motors, types of motors, principle of operation of DC motors, Back EMF, circuit model, power balance, calculation of torque and speed, armature and field control, DC motor starting, calculation of efficiency.

UNIT III TRANSFORMERS

Methods of generation of AC voltages, role of transformers in the distribution of electricity, Construction and principle of operation of single phase transformers, Ideal transformer, voltage and current relationships, impedance transformation, definition of voltage regulation, Losses in the transformer, calculation of efficiency of transformer.

UNIT IV AC MACHINES

Synchronous machines, construction, principle of operation, phasor diagram , voltage equation, Open circuit and short circuit characteristics, voltage regulation, induction motor, construction, circuit model, torque slip characteristics, starting , speed control-slip control , frequency control

UNIT V FRACTIONAL -KW MOTORS

Single phase induction motor, principle of operation, torque-speed characteristics, two-phase motors, split phase motor, universal motor, two value capacitance motor, stepper motors - variable reluctance stepper motor-single stack and multistack-permanent magnet stepper motor.

TEXT BOOKS:

1. D P Kothari and I J Nagrath, "Basic Electrical Engineering", TMH, 2ed, 2007.
2. P. C Sen, "Principles of Electric machines and power electronics", John-Wiley & Sons, 2ed, 2007.
3. Muhammad Rashid, "Power electronics circuit, devices and applications", Prentice-Hall of India, 3rd ed, 2004.

213DBIT03 - MICROBIOLOGY

UNIT I

General Structural Organisation of bacterial and viral cell- growth and identification of bacteria, observation of culture.

UNIT II

Microscopy: Light microscopy, dark field microscopy, phase contrast microscopy, fluorescence and electron microscopy.

UNIT III

Genetic disorders, Infection and Immunity-Mutations, Autosomal and X linked disorders, Mendelian disorders, types of immune response, hypersensitivity disorders, Immune deficiency Syndrome

UNIT IV

Viral disease, Chlamydial ,Bacterial, Mycoplasma, Rickettsial, Fungal, protozoal and helminthic disease.

UNIT V

Identification of disease producing organisms, simple stain, Gram stain, AFB stain, Fluorescent techniques, antigen-antibody techniques.

TEXT BOOKS:

1. Ramzi S Cotran, Vinay Kumar & Stanley L Robbins: Pathologic Basis of diseases. WB Saunders Co. 7th edn-2005.
2. Harsh Mohan: Text book of Pathology. Jaypee publishers. 4th edn. 2000.

213DBIT04 - COMPUTER PROGRAMMING

UNIT I INTRODUCTION TO COMPUTERS

Introduction – Characteristics of Computers – Evolution of Computers - Computer Generations – Classification of Computers – Basic Computer organization – Number Systems

UNIT II COMPUTER SOFTWARE

Computer Software –Types of Software – Software Development Steps – Internet Evolution - Basic Internet Terminology – Getting connected to Internet Applications.

UNIT III PROBLEM SOLVING AND OFFICE APPLICATION SOFTWARE

Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudocode -Application Software Packages- Introduction to Office Packages (not detailed commands for examination).

UNIT IV INTRODUCTION TO C

Overview of C – Constants, Variables and Data Types – Operators and Expressions – Managing Input and Output operators – Decision Making - Branching and Looping.

UNIT V FUNCTIONS AND POINTERS

Handling of Character Strings – User-defined Functions – Definitions – Declarations - Call by reference – Call by value – Structures and Unions – Pointers – Arrays – The Preprocessor – Developing a C Program : Some Guidelines

RECOMMENDED BOOKS:

1. Ashok.N.Kamthane, " Computer Programming", Pearson Education (India) (2008).
2. Behrouz A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publications, (2007).
3. Pradip Dey, Manas Ghosh, "Programming in C", Oxford University Press. (2007).
4. Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications, (2006).
5. E.Balagurusamy, "Computing fundamentals and C Programming", Tata McGraw-Hill Publishing Company Limited, (2008).
6. S.Thamarai Selvi and R.Murugan, "C for All", Anuradha Publishers, (2008).

213DBIT05 - ANALOG ELECTRONICS II

UNIT I SINGLE AND MULTISTAGE TRANSISTOR AMPLIFIER

Single stage transistor amplifier circuit, a.c load line and its use in calculation of currents and voltage gain of a single stage amplifier circuit-Multistage Amplifiers-Need for multistage amplifier-Gain of multistage amplifier Different types of multistage amplifier like RC coupled, transformer coupled, direct coupled, and their frequency response and bandwidth

UNIT II LARGE SIGNAL AMPLIFIER

Difference between voltage and power amplifiers-Importance of impedance matching in amplifiers- Class A, Class B, Class AB, and Class C amplifiers-Single ended power amplifiers, push-pull amplifier and complementary-symmetry push-pull amplifier

UNIT III OSCILLATORS AND MULTIVIBRATORS

Basic of feedback system (block diagram approach) – Types of feedback amplifier – Basic principles of oscillator. Audio oscillators – RC phase shift and wein bridge oscillator. RF oscillators – Hartley and Collpit oscillator – Crystal oscillator, Multivibrators- Astable-monostable-bistable and their applications.

UNIT VI OPERATIONAL AMPLIFIERS

Characteristics of an ideal operational amplifier and its block diagram-Definition of differential voltage gain, CMMR, PSRR, slew rate and input offset current -Operational amplifier as an inverter, adder, subtractor, differentiator, and integrator-A/D and D/A Converter .Concept of Schmitt trigger circuit and sample/hold circuit using operational amplifier and their applications

UNIT V REGULATED DC POWER SUPPLIES

Concept of DC power supply. Line and load regulation-Concept of fixed voltage, IC regulators (like 7805, 7905), and variable voltage regulator like (IC 723)- Idea of SMPS

RECOMMENDED BOOKS:

1. Basic Electronics and Linear Circuits by NN Bhargava, Tata McGraw Hills, New Delhi
2. Electronics Principles by Malvino, Tata McGraw Hills, New Delhi
3. Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi
4. Electronic Circuit Theory by Boylestad
5. Electronic Devices and Circuits by BL Theraja, S Chand and Co Ltd. New Delhi
6. Operational Amplifiers and Linear Integrated Circuits by Ramakant A. Gaykwad

213DBIP02 MICROBIOLOGY LAB

1. Urine physical and chemical examination (protein, reducing substances, ketones, bilirubin and blood)
2. Hematoxylin and eosin staining.
3. Study of parts of compound microscope
4. Histopathological slides of benign and malignant tumours.
5. Manual tissue processing and section cutting (demonstration)
6. Simple stain.
7. Gram stain.
8. AFB stain.

(Lab Requirement for a both of Semester)

- 1) Test tubes, Test tube racks, Bunsen burner(gas),(Benedict's solution, Acetic acid,Sulphosalicylic acid), centrifuge, microscope.
- 2) Slides, cover slips,H & E stains
- 3) Microscope
- 4) Beakers,graded alcohols, acetone,Lmoulds(or maling bodies), paradigm wax, water bath, microtone for section cutting,slides,cover slips,hotair oven,refrigerator to store chemical
- 5) whanman filter paper for bleeding time Test tubes.
- 6) Simple Stain test SIMPLE STAIN, Glass Slide Reagents – Methylene blue, Crystal Violet, Cabal Iuschin
- 7) Gram Stain test SIMPLE GRAM STAIN Reagents – Crystal Violet, Gram's Iodine, 95% ethyl alcohol Safran in Urine bacterial count/ml exceeding 100,000(10s) denotes urinary tract infection.
Normal : 0-100 ml Glass Slide
- 8) AFB Strain test ACID FAST STAIN (ZIEHL – NEELSON METHOD) Reagent – Carbal Iushin, Acid Alcohol, Methylene blue, Glass slide

213DBIP03 COMPUTER PROGRAMMING LAB

- a) Word Processing
 1. Document creation, Text manipulation with Scientific notations.
 2. Table creation, Table formatting and Conversion.
 3. Mail merge and Letter preparation.
 4. Drawing - flow Chart
 - b) Spread Sheet
 5. Chart - Line, XY, Bar and Pie.
 6. Formula - formula editor.
 7. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
 8. Sorting and Import / Export features.
- Simple C Programming *
9. Data types, Expression Evaluation, Condition Statements.
 10. Arrays
 1. To measure the gain of push-pull amplifier at 1kHz
 2. To measure the voltage gain of emitter follower circuit and plot its frequency response
 3. Plot the frequency response curve of Hartley and Colpitts Oscillator
 4. Plot the frequency response curve of phase shift and Wein bridge Oscillator
 5. To observe the output waveforms of series and shunt clipping circuits
 6. To observe the output for clamping circuits
 7. To observe the output waveform of a Bistable multivibrator
 8. Use of IC 555 as monostable multivibrator and observe the output for different values of RC
 9. Use of IC 555 as astable multivibrator and observe the output at different duty cycles
 10. To use IC 741 (op-amplifier) as
 - i) Inverter
 - ii) Adder
 - iii) Subtractor
 - iv) Integrator
 11. To realize positive and negative fixed voltage AC power supply using three terminal voltage regulator IC (7805, 7812, 7905)
 12. To realize positive and negative fixed voltage AC power supply using three terminal voltage regulator IC (7805, 7812, 7905)

213DBIP01 - ELECTRONIC CIRCUIT LAB II

1. Plot the frequency response of two stage RC coupled amplifier and calculate the bandwidth and compare it with single stage amplifier
2. To measure the gain of push-pull amplifier at 1kHz
3. To measure the voltage gain of emitter follower circuit and plot its frequency response
4. Plot the frequency response curve of Hartley and Colpitts Oscillator
5. Plot the frequency response curve of phase shift and Wein bridge oscillator
6. To observe the output waveforms of series and shunt clipping circuits
7. To observe the output for clamping circuits
- 8.

SEMESTER III

313DBIT01 - SIGNALS AND SYSTEMS

UNIT 1 Classification of Signals and Systems

Classification of signals – Continuous-time signal and discrete-time signals – periodic and aperiodic signals – even and odd signals – energy and power signals – deterministic and random signal. Basic operations on signals – arithmetic operations – reflections – time shifting – time scaling. Types of signals – exponential, sinusoidal, step, impulse and ramp. System - impulse response of the system. Classification of systems – stable – memory – invertible – time invariant – linear – causal. Sampling theorem.

UNIT II Fourier Transform

Continuous-time Fourier series (CTFS) – Exponential and trigonometric representation of CTFS. Dirichlet condition. Properties of CTFS – linearity, time-shifting, time-reversal, time-scaling, multiplication, Parseval's relation – differentiation – integration. Continuous-time Fourier transform (CTFT) – properties of CTFT – linearity, time shifting, time-reversal, time-scaling, multiplication, convolution, Parseval's relation – differentiation in time and frequency domains – integration. Application to systems - solution to differential equation using CTFT.

UNIT III Laplace Transform

Unilateral and bilateral Laplace transform (LT) – region of convergence (ROC) - properties of LT – linearity, time-shifting, time-reversal, time-scaling, multiplication, convolution, Parseval's relation – differentiation in time and frequency domain – integration – initial value and final value theorem – inversion of LT – solution to differential equation using LT – analysis of passive network using LT.

UNIT IV Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT)

Discrete Fourier transform – properties of DFT – linearity, circular-shifting in time and frequency domains, time-reversal, time-scaling, circular correlation, multiplication, convolution, parseval's relation – circular convolution – circle method, matrix method – sectional convolution – overlap-add method and overlap-save method – radix-2 fast Fourier algorithm – decimation-in-time FFT – decimation-in-frequency FFT – inverse FFT.
5. Z-transform and state matrix Z-transform (ZT) – region of convergence (ROC) - properties of ZT – linearity, time-shifting, time-reversal, time-scaling, multiplication, convolution, parseval's relation – differentiation in time and frequency domain – integration – initial value and final value theorem – inversion of ZT – power series method, partial-fraction method, residual method - solution to difference equation using ZT. State variable description for LTI system – determination of transfer function from state model

UNIT V

Z-transform (ZT) – region of convergence (ROC) - properties of ZT – linearity, time-shifting, time-reversal, time-scaling, multiplication, convolution, parseval's relation – differentiation in time and frequency domain – integration – initial value and final value theorem

RECOMMENDED BOOKS

1. Allan V. Oppenheim et al, "Signals and Systems", Pearson Education, 2007
2. Simon Haykin and Barry Van Veen, "Signals and Systems", John Willey, 1999
3. Roger E. Zeimer et al, "Signals and Systems", McMillan, 2nd Edition, 1999.
4. Douglas K. Linder, "Signals and Systems", McGraw-Hill, 2nd Edition, 1999.

313DBIT02 - DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS

UNIT I CARDIAC EQUIPMENTS

Electrocardiograph, Normal and Abnormal Waves, Heart rate monitor, Phonocardiography, Plethysmography. Cardiac Pacemaker- Internal and External Pacemaker- Batteries, AC and DC Defibrillator- Internal and External.

UNIT II NEUROLOGICAL EQUIPMENTS

Clinical significance of EEG, Multi channel EEG recording system, Epilepsy, Evoked Potential- Visual, Auditory and Somatosensory. EEG Bio Feedback Instrumentation.

UNIT III SKELETAL MUSCULAR SYSTEM

Sliding theory of contraction, recording and analysis of EMG waveforms, fatigue characteristics, Muscle stimulators, nerve stimulators, Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation.

UNIT IV PATIENT MONITORING AND BIOTELEMETRY

ICU/CCU Equipments, Infusion pumps, bed side monitors, Central consoling controls, Ratio Telemetry (single, multi), Portable and Landline Telemetry unit, Applications in ECG and EEG Transmission.

UNIT V PATIENT SAFETY

Physiological effects of electricity – important susceptibility parameters – Macro shock – Micro shock hazards – Patient's electrical environment – Isolated Power system – Conductive surfaces – Electrical safety codes and standards – Basic Approaches to protection against shock, Protection equipment design, Electrical safety analyzer – Testing the Electric system

RECOMMENDED BOOKS:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical equipment technology", Pearson education, 2003.
2. John G. Webster, Medical Instrumentation Application and Design, third edition, Wiley India Edition, 2007.
3. Myer Kutz, "Standard Handbook of Biomedical Engineering & Design", McGraw Hill. 2003.
4. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 2003.
5. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Pearson Education, New Delhi, 2007.

313DBIT03 - MICROPROCESSOR AND MICROCONTROLLER

UNIT I ARCHITECTURE OF 8085

8085- Functional Block Diagram – Description – Addressing Modes, Timing diagrams.

UNIT II 8086 ARCHITECTURE ASSEMBLY LANGUAGE PROGRAMMING

8086-Architecture, Instruction set, Addressing Modes. Simple Assembly Language Programming.

UNIT III PERIPHERAL INTERFACING & APPLICATION

Programmable Peripheral Interface (8255), keyboard display controller (8279), ADC. DAC Interface, Programmable Timer Controller (8254), Programmable interrupt controller (8259), Serial Communication Interface (8251).

UNIT IV MICROCONTROLLER

Architecture of 8051 Microcontroller – Instruction Set – Assembly Language Programming – Branching, I/O and ALU Instructions.

UNIT V 8086 AND 8051 BASED SYSTEM DESIGN

Design and interfacing – LED, LCD & Keyboard Interfacing, ADC, DAC, Sensor Interfacing, External Memory Interface, Traffic light controller, Washing machine, Stepper Motor Multichannel biomedical data acquisition system.

RECOMMENDED BOOKS:

1. Ramesh S. Gaonkar, Microprocessor Architecture Programming and Applications with 8085. Fourth edition, Penram International Publishing 2006.
2. Douglas V.Hall, Microprocessor and Interfacing, Programming and Hardware. Revised second Edition, Indian edition, Tata McGraw Hill, 2007.
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay The 8051 Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008.
4. Kenneth J.Ayala., "The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning, New Delhi, 2007.
5. A.K. Ray, K.M. Bhurchandi " Advanced Microprocessor and Peripherals", Second edition, Tata McGraw-Hill, 2007.

313DBIT04 - DIGITAL ELECTRONICS

UNIT I NUMBER SYSTEMS

Decimal, binary, octal, hexadecimal number systems. Conversion of number from one number system to another including decimal points, Binary addition, subtraction, multiplication, division, 1's and 2's complement method of subtraction. BCD code numbers and their limitations, addition of BCD coded numbers, conversion of BCD to decimal and vice-versa. Excess-3 code, gray code, binary to gray and gray to binary conversion. Concept of parity, single and double parity, error detection and correction using parity.

UNIT II LOGIC GATES AND SIMPLIFICATION

Logic gates, positive and negative logic, pulse waveform, definition, symbols, truth tables, pulsed operation of NOT, OR, AND, NAND, NOR, EX-NOR gates. NAND and NOR as universal logic gates. Rules and laws of Boolean algebra, logic expression, Demorgan's theorems, their proof. Sum of products form (minterm), Product of sum form (maxterms), simplification of Boolean expressions with the help of Rules and laws of Boolean algebra. Karnaugh mapping techniques upto 4 variables and their applications for simplification of Boolean expression.

UNIT III COMBINATIONAL CIRCUITS

Half adder, full adder circuits and their operation, Multiplexers and Demultiplexers (4-inputs and 8-inputs) – Decoders and encoders. Magnitude Comparator. Symbols and logic diagram of 2-bit and 4-bit comparators.

UNIT VI LOGIC FAMILIES AND MEMORIES

Logic family classification. TTL, ECL, MOS, CMOS. Types of integration SSI, MSI, LSI, VLSI. Characteristics of TTL and CMOS and the comparison. Propagation delay. Speed, noise margin. Logic levels. Power dissipation, fan-in, fan-out, power supply requirements. Memory organization, classification of semi conductor memories, ROM, PROM, DROM, EPROM, EEPROM, RAM, expansion of memory, PAL, PLA, FPGA.

UNIT V SEQUENTIAL CIRCUITS

Flip Flops – RS, D, T, JK Flip Flops – Characteristic equations, exciting tables. JK Master – Slave flip-flop. Universal Shift Register. modulo-N-counters.

RECOMMENDED BOOKS

1. Electronics and Applications by Malvino Leach, Tata McGraw Hill, New Delhi.
2. Digital Logic Digital Designs by Morris Mano, Prentice Hall of India, New Delhi.
3. Digital Fundamentals by Thomas Floyds, Universal Book Stall.
4. Digital Systems: Principles and Applications by RJ Tocci, Prentice Hall of India, New Delhi.

313DBIT05 - HOSPITAL MANAGEMENT

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning – Equipment Planning – Functional Planning.

UNIT II HUMAN RESOURCE MANAGEMENT ON HOSPITAL

Principles of HRM – Functions of HRM – Profile of HRD Manager – Tools of HRD – Human Resource Inventory – Manpower Planning.

UNIT III RECRUITMENT AND TRAINING

Different Departments of Hospital, Recruitment, Selection, Training Guidelines – Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

UNIT IV PLANNING SUPPORTIVE SERVICES

Medical Records Department – Central Sterilization and Supply Department – Pharmacy – Food Services - Laundry Services.

UNIT V COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL

Purposes – Planning of Communication, Modes of Communication – Telephone, ISDN, Public Address and Piped Music – CCTV. Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules.

RECOMMENDED BOOKS:

1. R.C.Goyal, "Hospital Administration and Human Resource Management", PHI –Fourth Edition, 2006.
2. G.D.Kunders, "Hospitals – Facilities Planning and Management – TMH, New Delhi –. Fifth Reprint 2007.
3. Cesar A.Caceres and Albert Zara, "The Practice of Clinical Engineering, Academic Press, New York, 1977.

313DBIP01 - DIAGNOSTIC AND THERAPEUTIC EQUIPMENT LAB

1. Design of low noise pre-amplifier for ECG
2. Recording of ECG signals
3. Recording of EEG signals
4. Recording of EMG signals
5. Study of pacemaker stimulator
6. Study of Bio telemetry
7. pH Measurement and conductivity test
8. Electrical safety and measurements

313DBIP02 - MICROPROCESSOR AND MICROCONTROLLER LAB

8085 based experiments

1. Assembly Language Programming of 8085

8086 based experiments

1. Programs for 16 bit Arithmetic, Sorting, Searching and String operations,
2. Programs for Digital clock, Interfacing ADC and DAC
3. Interfacing and Programming 8279, 8259, and 8253.
4. Serial Communication between two Microprocessor Kits using 8251.

8051 based experiments

1. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.
2. Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
3. Interfacing – DAC and ADC and 8051 based temperature measurement
4. Interfacing – LED and LCD
5. Interfacing – stepper motor traffic light control
6. Communication between 8051 Microcontroller kit and PC

313DBIP03 - DIGITAL ELECTRONICS LAB

1. Study of logic breadboard with verification of truth table for AND, OR, NOT, NAND, EX-OR, NOR gate
2. Verification of NAND and NOR gate as universal gates
3. Construction of half-adder and full adder circuits using EX-OR and NAND gate and verification of their operation
4. Verify the operation of
 - a) multiplexer using an IC
 - b) de-multiplexer using an IC
5.
 - a) Verify the operation of BCD to decimal decoder using an IC
 - b) Verify the operation of BCD to 7 segment decoder using an IC
6. Verify operation of SR, JK, D-flip-flop using IC
7. Verify operation of SISO, PISO, SIPO, PIPO shift register. (universal shift register)
8. Study of ring counter, Up/down counter
9. Testing of digital ICs using IC tester

SEMESTER IV

413DBIT01 - RADIOLOGY EQUIPMENTS

UNIT I MEDICAL X-RAY EQUIPMENT

Nature of X-Rays - X-ray Absorption. Types of X-ray machine as per use. X-Ray Equipment (Block Diagram) - X-ray Tube, the collimator, Bucky Grid, power supply. Digital Radiography - discrete digital detectors, storage phosphor and film Scanning.

UNIT II COMPUTER TOMOGRAPHY

Principles of Tomography - Block Diagram of CT Scanner- First to Fourth generation scanners - Spiral CT Scanning - Ultra fast CT Scanners- X-Ray Sources - Collimation - X-Ray Detectors - Viewing System, Application of CT Scanner.

UNIT III MAGNETIC RESONANCE IMAGING

Fundamentals of Magnetic Resonance- Block diagram approach of MRI system- System Magnet (Permanent, Electromagnet and super conductors), generation of Gradient magnetic Fields, Radio Frequency coils (sending and receiving) Shim coils, Electronic components.

UNIT IV ULTRASOUND SCANNER

Introduction of ultrasonic scanners. Specifications and control parameters, principle and working. Generation and detection of ultrasonic signal. Transducers used (probe); sector (mechanical technology). Block diagram of ultrasonic machine and its description. A-Scan and B scan (m Mode) for cardiologist. Basic introduction of color Doppler scanner.

UNIT V RADIATION THERAPY AND RADIATION SAFETY

Radiation therapy-Linear accelerator, betatron, cesium and cobalt. Radiation Protection in Medicine - Radiation Protection principles, Radiation measuring instruments- Dosimeter, film Badges, Thermo luminescent dosimeters - Electronic dosimeter- ICRP regulation Practical reduction of dose to staff and visitors.

RECOMMENDED BOOKS

1. Steve webb, Physics of Medical Imaging, , Taylor and Francis, 1988.
2. R. Hendee and Russell Ritenour "Medical Imaging Physics"-William,Wiley, Fourth Edition 2002.
3. Physics and Radiobiology of Nuclear Medicine -Third edition - Gopal B.Saha - Publisher - Springer, 2006.
4. Medical Physics and Biomedical Engineering -B.H Brown , PV Lawford, R H Small wood , D R Hose , D C Barber , CRC Press, 1999.
5. Standard handbook of Biomedical Engineering and Design - Myer Kutz Publisher - McGraw - Hill, 2003.
6. P.Raghunathan, "Magnetic Resonance Imaging and Spectroscopy in Medicine" Concepts and Techniques, Orient Longman, 2007

413DBIT02 - BIOMATERIALS AND ARTIFICIAL ORGANS

UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY

Definition and classification of bio-materials, mechanical properties, visco elasticity, woundhealing process, body response to implants, blood compatibility.

UNIT II IMPLANT MATERIALS

Metallic implant materials, stainless steels, co-based alloys, Ti-based alloys, ceramic implant materials, aluminum oxides, hydroxyapatite glass ceramics carbons, medical applications.

UNIT III POLYMERIC IMPLANT MATERIALS

Polymerization, polyamides, Acrylic polymers, rubbers, high strength thermoplastics, medical applications. Bio polymers: Collagen and Elastin.

UNIT IV TISSUE REPLACEMENT IMPLANTS

Soft-tissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation, blood interfacing implants, hard tissue replacement implants, internal fracture fixation devices, joint replacements.

UNIT V ARTIFICIAL ORGANS

Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenator), Artificial Kidney (Dialyser membrane) , Dental Implants.

RECOMMENDED BOOKS:

1. Sujata V. Bhatt, Biomaterials Second Edition, Narosa Publishing House, 2005.
2. Joon B. Park Joseph D. Bronzino, Biomaterials - Principles and Applications – CRC Press, 2003
3. Park J.B., "Biomaterials Science and Engineering", Plenum Press, 1984.
4. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGraw-Hill, 2003.
5. Introduction to Biomedical Engineering – John Enderle, Joseph D. Bronzino, Susan M. Blanchard, Elsevier, 2005

Registrar