

# BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ORISSA

## Biomedical Engineering

3rd Semester					4th Semester					
Theory Code	Subject	Contact Hours			Theory Code	Subject	Contact Hours			
		L	T-P	Credit			L	T-P	Credit	
BSCM1205	Mathematics - III	3	1-0	4	BSCM1210	Mathematics - IV	3	1-0	4	
PCBM4203	Human Anatomy-	3	0-0	3	HSSM3205	Organizational Behavior /	3	0-0	3	
					HSSM3204	Engg. Economics & Costing				
BEEE2211	Network Theory	3	1-0	4	PCBM4204	Engineering Physiology	3	0-0	3	
BECS2212	C++ & Object Oriented Programming	3	0-0	3	PCBM4205	Biochemistry & Biophysics	3	0-0	3	
PCEC4201	Analog Electronics Circuits	3	1-0	4	PCEC4202	Digital Electronics circuits	3	1-0	4	
HSSM3204	Engg. Economics & Costing /	3	0-0	3	BECS2208	Database Management System	3	0-0	3	
HSSM3205	Organisational Behaviour									
				<b>Theory Credits</b>					<b>Theory Credits</b>	<b>20</b>
				<b>21</b>					<b>20</b>	
<b>Practical/ Sessional</b>					<b>Practical/ Sessional</b>					
BEEE7211	Network & Devices Lab	1	0-3	2	PCBM7204	Engg Physiology Lab	1	0-3	2	
BEES7212	C++ & Object Oriented Prog. Lab	0	0-3	2	PCEC7202	Digital Electronics Lab	0	0-3	2	
PCEC7201	Analog Electronics Circuits Lab	0	0-3	2	BEEC7208	Data Base Management System Lab	0	0-3	2	
					HSSM7203	Communication & Interpersonal Skills for Corporate Readiness.	0	0-3	2	
				<b>Practical/ Sessional Credits</b>					<b>Practical/ Sessional Credits</b>	<b>8</b>
				<b>6</b>					<b>8</b>	
<b>TOTAL SEMESTER CREDITS</b>					<b>TOTAL SEMESTER CREDITS</b>					
				<b>27</b>					<b>28</b>	

# BSCM1205 **Mathematics - III**

## **Module-I**

**(18 hours)**

Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co-efficient, Cauchy type, Monge's method, Second order partial differential equation The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates, potential.

## **Module-II**

**(12 hours)**

Complex Analysis:

Analytic function, Cauchy-Riemann equations, Laplace equation, Conformal mapping,

Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions

## **Module –III**

**(10 hours)**

Power Series, Taylor's series, Laurent's series, Singularities and zeros, Residue integration method, evaluation of real integrals.

## **Text books:**

1. E. Kreyszig, "Advanced Engineering Mathematics:", Eighth Edition, Wiley India  
Reading Chapters: 11,12(except 12.10),13,14,15
2. B.V. Ramana, "Higher Engineering Mathematics", McGraw Hill Education, 2008  
Reading chapter: 18

## **Reference books:**

1. E.B. Saff, A.D.Snyder, "Fundamental of Complex Analysis", Third Edition, Pearson Education, New Delhi
2. P. V. O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi

# PCBM4203 Human Anatomy

## Module -I (12 hours)

### **Skeletal system:**

Types of bones, classification, Structure of bone , blood supply, Bones of appendicular And axial skeleton. Cartilage : Type, Structure in brief.

### **Joints:**

Classification, structure of synovial joint , major joints of the limbs and Temporomandibular joint- in brief.

### **Muscle tissue:**

Types, structure of skeletal muscle in brief, types of muscles, major muscle of the limbs and their actions.

## Module-II (8 hours)

### **Brain**

Parts, brain stem, ventricles, CSF, meninges, cranial nerves, (Names and functions only).

Spinal cord: Gross feature and structure in brief, spinal nerves, major nerve plexus in the body, and their branches, nerve ending and receptors.

**Respiratory systems :** Parts, Trachea, Lungs.

## Module-III (10 hours)

### **Heart:**

Structure of heart, Pericardium, Chambers, Blood supply (in brief), Major arteries and veins of the body

**Lymphatic systems:** Spleen: Organs in brief.

**G.I.Tract :** Parts. Stomach, Intestine, Liver, Pancreas.

**Urinary system :** Parts. Male and female reproductive organs. Endocrine glands.

## Reference Books:

1. Anatomy and Physiology – Ross & Wilson , Churchill Livigstone publications.
2. CHARLES E.Tobin,Basic Human Anatomy,McGraw Hill,1980
3. Best and Taylor,The Living Body;B.I Publication,1980.
4. C. Tandan & Dr. Chandhramoli;Textbook of physiology for Dental studies.Dorpan Publications.
5. Gorden Sears, W.S & Winwood W.S;Anatomy & Physiology for Nurses,Revised edition.
- 6) Principles of Anatomy & Physiology – Tortora & Grabowski – Harper Collins College Publisher – latest edition

# BEEE2211 Network Theory

## MODULE- I

(14 Hrs)

1. NETWORK TOPOLOGY: Graph of a network, Concept of tree, Incidence matrix, Tie-set matrix, Cut-set matrix, Formulation and solution of network equilibrium equations on loop and node basis.
2. NETWORK THEOREMS & COUPLED CIRCUITS: Substitution theorem, Reciprocity theorem, Maximum power transfer theorem, Tellegen's theorem, Millman's theorem, Compensation theorem, Coupled Circuits, Dot Convention for representing coupled circuits, Coefficient of coupling, Band Width and Q-factor for series and parallel resonant circuits.

## MODULE- II

(13 Hrs)

3. LAPLACE TRANSFORM & ITS APPLICATION: Introduction to Laplace Transform, Laplace transform of some basic functions, Laplace transform of periodic functions, Inverse Laplace transform, Application of Laplace transform: Circuit Analysis (Steady State and Transient).
4. TWO PORT NETWORK FUNCTIONS & RESPONSES:  $z$ ,  $y$ , ABCD and  $h$ -parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port networks, Network Functions, Significance of Poles and Zeros, Restriction on location of Poles and Zeros, Time domain behaviour from Pole-Zero plots.

## MODULE- III

(13 Hrs)

5. FOURIER SERIES & ITS APPLICATION: Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Fourier transform and convergence, Fourier transform of some functions, Brief idea about network filters (Low pass, High pass, Band pass and Band elimination) and their frequency response.
6. NETWORK SYNTHESIS: Hurwitz polynomial, Properties of Hurwitz polynomial, Positive real functions and their properties, Concepts of network synthesis, Realization of simple R-L, R-C and L-C functions in Cauer-I, Cauer-II, Foster-I and Foster-II forms.

### Text Book:

1. Network Theory – P K Satpathy, P Kabisatpathy, S P Ghosh and A K Chakraborty – Tata McGraw Hill, New Delhi.

### Reference Book(s):

2. Network Analysis – M E Van Valkenburg – Pearson Education.
3. Network Synthesis – M E Van Valkenburg – Pearson Education.
4. Network Analysis and Synthesis – Franklin F. Kuo – Wiley Student Edition.
5. Fundamentals of Electric Circuits – Alexander & Sadiku – Tata McGraw Hill.
6. Linear Circuits Analysis and Synthesis – A Ramakalyan – Oxford University Press.
7. Problems & Solutions in Electric Circuit Analysis – Sivananda & Deepa – Jaico Book.
8. Network Theory, Smarajit Ghosh, PHI.

# BECS2212 C++ & Object Oriented Programming

## **Module I (08 hrs)**

Introduction to object oriented programming, user defined types, structures, unions, polymorphism, encapsulation. Getting started with C++ syntax, data-type, variables, strings, functions, default values in functions, recursion, namespaces, operators, flow control, arrays and pointers.

## **Module II (16 hrs)**

Abstraction mechanism: Classes, private, public, constructors, destructors, member data, member functions, inline function, friend functions, static members, and references.

Inheritance: Class hierarchy, derived classes, single inheritance, multiple, multilevel, hybrid inheritance, role of virtual base class, constructor and destructor execution, base initialization using derived class constructors.

Polymorphism: Binding, Static binding, Dynamic binding, Static polymorphism: Function Overloading, Ambiguity in function overloading, Dynamic polymorphism: Base class pointer, object slicing, late binding, method overriding with virtual functions, pure virtual functions, abstract classes.

Operator Overloading: This pointer, applications of this pointer, Operator function, member and non member operator function, operator overloading, I/O operators.

Exception handling: Try, throw, and catch, exceptions and derived classes, function exception declaration.

## **Module III (08 hrs)**

Dynamic memory management, new and delete operators, object copying, copy constructor, assignment operator, virtual destructor.

Template: template classes, template functions.

Namespaces: user defined namespaces, namespaces provided by library.

### **Text Books:**

1. Object Oriented Programming with C++ - E. Balagurusamy, McGraw-Hill Education (India)
2. ANSI and Turbo C++ - Ashoke N. Kamthane, Pearson Education

### **Reference Books:**

1. Big C++ - Wiley India
2. C++: The Complete Reference- Schildt, McGraw-Hill Education (India)
3. "C++ and Object Oriented Programming" – Jana, PHI Learning.
4. "Object Oriented Programming with C++ "- Rajiv Sahay, Oxford
5. Mastering C++ - Venugopal, McGraw-Hill Education (India)
6. "Object Oriented Programming with C++", David Parsons, Cengage Learning.

# PCBM4201 Analogue Electronics Circuit

## MODULE – I (12 Hours)

1. **MOS Field-Effect Transistor:** Principle and Physical Operation of FETs and MOSFETs. P-Channel and N-Channel MOSFET, Complimentary MOS, V-I Characteristics of E- MOSFETS and D-MOSFETS, MOSFETS as an Amplifier and a Switch (4 Hours)
2. **Biasing of BJTs:** Load lines (AC and DC), Operating Points, Fixed Bias and Self Bias, DC Bias with Voltage Feedback, Bias Stabilization, Design Operation. (4 Hours)
3. **Biasing of FETs and MOSFETs:** Fixed Bias Configuration and Self Bias Configuration, Voltage Divider Bias and Design (4 Hours)

## MODULE – II (17 Hours)

4. **Small Signal Analysis of BJTs:** Small-Signal Equivalent-Circuit Model, Graphical Determination of h-parameters Small Signal Analysis of CE, CC, CB Amplifier with and without  $R_E$ . Effect of  $R_S$  and  $R_L$  on CE Amplifier, Emitter Follower, Analysis of Cascade, Darlington Connection and Current Mirror Circuits using BJTs. (6 Hours)
5. **Small Signal Analysis of FETs:** Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifier with and without  $R_S$ . Effect of  $R_{SIG}$  and  $R_L$  on CS Amplifier, Analysis of Source Follower and Cascaded System using FETs. (6 Hours)
6. **High Frequency Response of FETs and BJTs:** Low and High Frequency Response of BJTs and FETs, The Unit gain – frequency ( $f_t$ ), Frequency Response of CS Amplifier, Frequency Response of CE Amplifier, Multistage Frequency Effects, Miller Effect Capacitance, Square Wave Testing. (5 Hours)

## MODULE – III (12 hours)

7. **Feedback and Oscillators:** Feedback Concepts, Four Basic Feedback Topologies, Practical Feedback Circuits, Feedback Amplifier Stability using Nyquist Plot, Basic Principle of Sinusoidal Oscillator, Wein-Bridge, Phase Shift and Crystal Oscillator Circuits. (4 Hours)
8. **Operational Amplifier:** Ideal Op-Amp, Differential Amplifier, Op-Amp Parameters, Slew rate, Non-inverting Configurations, Effect of Finite Open-loop and Closed-loop Gain, Differentiator and Integrator, Instrumentation amplifier,  $\mu A$  741-Op-Amp . (5 Hours)
9. **Power Amplifier:** Classifications, Class-A and Class-B Amplifier Circuits, Transfer Characteristics, Power Dissipation and Conversion Efficiency of Power Amplifiers. (3 Hours)

## Text Books:

1. Electronic Devices and Circuits theory, 9<sup>th</sup>/10<sup>th</sup> Edition, R.L. Boylestad and L.Nashelsky (Selected portions of Chapter 4, 5, 6, 7, 8, 9, 10, 11, 12, and 14), Pearson Education, New Delhi.
2. Microelectronics Circuits, 5<sup>th</sup> Edition, International Student Edition Sedra and Smith (Selected portion of Chapter 2,4, 5, 6, 8, 13, and 14), Oxford University Press, New Delhi.

3. Electronic Devices and Circuits, 3<sup>rd</sup> Edition, Jimmie J. Cathey adapted by Ajay Kumar Singh, Tata McGraw Hill Publishing Company Ltd., New Delhi. (*For Problem Solving*)

**Reference Books:**

1. Electronics Circuits Analysis and Design, 3<sup>rd</sup> Edition, Donald A. Neamen, Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Milliman's Electronics Devices and Circuits, 2<sup>nd</sup> Edition, J. Milliman, C. Halkias, S. Jit., Tata McGraw Hill Education Pvt. Ltd., New Delhi
3. Integrated Electronics: Analog and Digital Circuits and Systems, J. Milliman, C. Halkias, Tata McGraw Hill Publishing Company Ltd., New Delhi.
4. Microelectronic Circuits: Analysis and Design, India Edition, M.H. Rashid, PWS Publishing Company, a division of Thomson Learning Inc.

## HSSM3204 **Engineering Economics & Costing**

**Module-I: (12 hours)**

Engineering Economics – Nature and scope, General concepts on micro & macro economics. The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply. Determination of equilibrium price under perfect competition ([Simple numerical problems to be solved](#)). Theory of production, Law of variable proportion, Law of returns to scale.

**Module-II: (12 hours)**

Time value of money – Simple and compound interest, Cash flow diagram, Principle of economic equivalence. Evaluation of engineering projects – Present worth method, Future worth method, Annual worth method, internal rate of return method, Cost-benefit analysis in public projects. Depreciation policy, Depreciation of capital assets, Causes of depreciation, Straight line method and declining balance method.

**Module-III: (12 hours)**

Cost concepts, Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Break-even analysis-Linear approach. (Simple numerical problems to be solved) Banking: Meaning and functions of commercial banks; functions of Reserve Bank of India. Overview of Indian Financial system.

**Text Books:**

1. Riggs, Bedworth and Randhwa, "Engineering Economics", McGraw Hill Education India.
2. M.D. Mithani, Principles of Economics.

**Reference Books :**

1. Sasmita Mishra, "Engineering Economics & Costing ", PHI
2. Sullivan and Wicks, " Engineering Economy", Pearson

3. R.Paneer Seelvan, "Engineering Economics", PHI
4. Gupta, "Managerial Economics", TMH
5. Lal and Srivastav, "Cost Accounting", TMH

## HSSM 3205 **Organizational Behaviour**

### **Module I :**

The study of Organizational Behaviour : Defination and Meaning, Why Study OB  
Learning – Nature of Learning, How Learning occurs, Learning and OB.

Foundations of Individual Behaviour : Personality – Meaning and Defination, Determinants of Personality, Personality Traits, Personality and OB.

Perception – Meaning and Definition, Perceptual Process, Importance of Perception in OB. Motivation – Nature and Importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory, Evaluations.

### **Module II :**

Organizational Behaviour Process : Communication – Importance, Types, Gateways and Barriers to Communication, Communication as a tool for improving Interpersonal Effectiveness, Groups in Organizations – Nature, Types, Why do people join groups, Group Cohesiveness and Group Decision-making Managerial Implications, Effective Team Building. Leadership-Leadership & Management, Theories of Leadership-Trait theory, Leader Behaviour theory, Contingency Theory, Leadership and Followership, How to be an effective Leader, Conflict-Nature of Conflict and Conflict Resolution. An Introduction to Transactional Analysis (TA).

### **Module-III :**

Organization : Organizational Culture – Meaning and Definition, Culture and Organizational Effectiveness. Introduction to Human Resource Management-Selection, Orientation, Training and Development, Performance Appraisal, Incentives Organizational Change – Importance of Change, Planned Change and OB techniques. International Organisational Behaviour – Trends in International Business, Cultural Differences and Similarities, Individual and Interpersonal Behaviour in Global Perspective.

### **Text Books :**

1. Keith Davis, Organisational Behaviour, McGraw-Hill.
2. K.Aswhathappa, Organisational Behaviour, Himalaya Publishing House.

### **Reference Books :**

1. Stephen P. Robbins, Organisational Behaviour, Prentice Hall of India
2. Pradip N. Khandelwal, Organizational Behaviour, McGraw-Hill, New Delhi.
3. Uma Sekaran, "Organizational Behaviour", TATA McGraw-Hill, New Delhi.
4. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma" Organizational Behaviour" , TATA McGraw- Hill.
5. D.K. Bhattachayya, "Organizational Behaviour", Oxford University Press
6. K.B.L.Srivastava & A.K.Samantaray, "Organizational Behaviour" India Tech

## BEEE7211 **Network and Devices Lab**

### Select any 8 experiments from the list of 10 experiments

1. Verification of Network Theorems (Superposition, Thevenin, Norton, Maximum Power Transfer).
  2. Study of DC and AC Transients.
  3. Determination of circuit parameters: Open Circuit and Short Circuit parameters.
  4. Determination of circuit parameters: Hybrid and Transmission parameters.
  5. Frequency response of Low pass and High Pass Filters.
  6. Frequency response of Band pass and Band Elimination Filters.
  7. Determination of self inductance, mutual inductance and coupling coefficient of a single phase two winding transformer representing a coupled circuit.
  8. Study of resonance in R-L-C series circuit.
  9. Study of resonance in R-L-C parallel circuit.
  10. Spectral analysis of a non-sinusoidal waveform.
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## BECS7212 **C++ & Object Oriented Programming Lab**

1. Programs on concept of classes and objects.(1 class)
2. Programs using inheritance.(1 class)
3. Programs using static polymorphism.(1 class)
4. Programs on dynamic polymorphism.(1 class)
5. Programs on operator overloading.(1 class)
6. Programs on dynamic memory management using new, delete operators.(1 class)
7. Programs on copy constructor and usage of assignment operator.(1 class)
8. Programs on exception handling .(1 class)
9. Programs on generic programming using template function & template class.(1 class)
10. Programs on file handling.(1 class)

## PCBM7201 **Analog Electronics Circuit Lab**

### List of Experiments

**(At least 10 out of 13 experiments should be done)**

1. BJT bias circuit – Design, assemble and test.
2. JEET/MOSFET bias circuits – Design, assemble and test.
3. Design, assemble and test of BJT common-emitter circuit – D.C and A.C performance: Voltage gain, input impedance and output impedance with bypassed and un-bypassed emitter resistor.
4. Design, assemble and test of BJT emitter-follower – D.C and A.C performance: A.C. voltage gain, input impedance and output impedance.
5. Design, assemble and Test of JFET/MOSFET common-source and common-drain amplifiers – D.C and A.C performance: Voltage gain, input impedance and output impedance.
6. Frequency response of a common-emitter amplifier: low frequency, high frequency and mid frequency response.
7. Differential amplifiers circuits: D.C bias and A.C operation without and with current source.
8. Study of Darlington connection and current mirror circuits.
9. OP-Amp Frequency Response and Compensation.
10. Application of Op-Amp as differentiator, integrator, square wave generator.
11. Square wave testing of an amplifier.
12. R.C phase shift oscillator/Wien-Bridge Oscillator using OP-Amp/Crystal Oscillator.
13. Class A and Class B Power Amplifier.

# BSCM1210 Mathematics – IV

## Module-I

(20 hours)

### Numerical methods:

Approximation and round of errors, Truncation error and Taylor's series

Roots of equation: The bisection method, the false-position method, fixed point iteration, the Newton-Raphson method, Muller's method

Linear algebraic equation: LU decomposition, the matrix inverse, Gauss-Seidel method

Interpolation: Newton divided difference interpolation, Lagrange Interpolation, Newton's forward and backward interpolation.

Numerical integration: The trapezoidal rule, The Simpson's rules, Gauss quadrature

Ordinary differential equation: Euler's method, Improvement of Euler's method, Runge-Kutta methods

## Module-II

(10 Hours)

### Probability:

Probability, Random variables, Probability distributions, Mean and variance of distribution,

Binomial, Poisson and Hypergeometric distributions, Normal distribution, Distribution of several random variables.

## Module-III

(10 Hours)

### Mathematical Statistics:

Random sampling, Estimation of Parameters, Confidence Intervals, Testing of hypothesis,

Acceptance sampling, Chi square test for goodness of fit, Regression Analysis, Fitting Straight Lines, Correlation analysis.

### Text books:

1. S. C. Chapra and R. P. Canale, "Numerical methods for Engineers", Fifth Edition, McGraw Hill Education  
Reading Chapters : 2, 3(3.1, 3.2), 4(4.2, 4.3), 5(5.1, 5.2, 5.3), 6(6.4), 9(9.1, 9.2), 10(10.2), 13(13.1,13.2,13.5), 16(16.1, 16.2), 17(17.3), 20(20.1, 20.2, 20.3)
2. E. Kreyszig, "Advanced Engineering Mathematics:", Eighth Edition, Wiley India  
Reading Chapters: 22, 23( except 23.5 and 23.8)

### Reference books:

1. Jay L. Devore, "Probability and Statistics for Engineering and Sciences", Seventh Edition, Thomson/CENGAGE Learning India Pvt. Ltd
2. P. V.O'Neil, "Advanced Engineering Mathematics", CENGAGE Learning, New Delhi

# PCBM4204 **Engineering Physiology**

## **Module-1 :( 12 HOURS ) Introductory Lecture :-( 1 HOUR)**

1. Basic functional concept of the body as whole & contribution of individual systems & their inter-dependence for achieving the goal.
2. Electrical properties of the Neurons. Electrical potentials, their nature, origin and propagation of AP and Non- propagatory potentials (Generator Potential, Receptor Potential).
3. Ionic currents, conductance and capacitance properties of excitable membranes. Basic idea on cable properties and core conductor theory. Velocity of conduction of Action Potential and factors influencing it. Compound Action Potentials. Equivalent electrical circuit diagram for neural membranes.
4. Muscle physiology in general. Functional difference between smooth, cardiac and skeletal muscle types. Muscles as energy transducer. Force-velocity and Load-Tension relationships. EPPs and EPSP, IPSP and MEPPs. Excitation, contraction coupling mechanism, Role of  $Ca^{++}$ .

## **Module – 2: (12 Hours)**

1. Respiratory pathways (upper and lower). Mechanism of respiration, feedback control mechanism of respiration.
2. Nephron structure and functions, counter current exchange mechanism. Voiding of urine, Reflex Control, Bladder Plasticity and Urine Volume relationship.
3. Body Temperature Regulation and role of Hypothalamic Thermostat. Responses to cold and warm environment. Thermo neutral range & Lethal Temperature concepts.
4. Blood as Newtonian fluid –Its physical properties. Haemodynamics, Blood pressure and its measuring techniques.
5. Feedback control of BP. Role of heart as pump. Regulation of cardiac pump – Extrinsic, Intrinsic factors, Auto regulation. Starling's Law. Pacemaker potentials. ECG – Its gross normal features. Means of recording.

## **Module -3: (12 Hours)**

1. Hormones: classification, second messenger hypothesis, sources, half life, effective concentration, feed back control, & molecular mechanism of peptide & steroids hormones.
2. Receptors. The role of transducers. General and specific functional characteristics of Receptors Classification, Receptor Potential, Amplification and Propagation to CNS. Sound as stimulus. Quality of Sound.
3. Pitch, Loudness, SPL, Auditory receptor, genesis of potential change in the Internal ear. Mechanism of Hearing.
4. Optics of the EYE. Camera principles applied to the eye. Accommodation, Purkinje Shift, Electroretinogram (ERG), Electrooculogram (EOG).
5. Electroencephalography (EEG) – its basic principles. Electro-corticogram (ECOG). Neuro-physiological and Bioelectrical basis of Learning and Memory.

## **Reference Books:**

- 1) Concise Medical Physiology By Chauduri
- 2) Anatomy and Physiology – Ross & Wilson, Churchill Livigstone publications.
- 3) Principles of Anatomy & Physiology – Tortora & Grabowski – Harper Collins College Publisher – latest edition

- 4) J Gibson, Modern Physiology & Anatomy for Nurses; Black-well Scientific Publishers, 1981

## PCBM4205 **Biochemistry & Biophysics**

### **Part A- Biochemistry**

#### **Module I (10 Hours):**

Chemical Nature, Properties, Structure and classification of different classes of Biomacromolecules like Proteins, Nucleic Acid & Lipids.

Composition & properties of the cell membrane, membrane transports, Kinetics and energetics of active transport, permeability Coefficient & partition coefficient & transport enzymes.

Enzymes: Chemical nature, Broad classification, M-M-Kinetics, Isozymes and Allosteric enzymes, Isolation techniques & Spectrophotometric assay of enzyme activity.

#### **Module II (10 Hours):**

Intermolecular bonds, weak & strong bonds, bond energies, structural stability of macromolecules. Temperature & reaction rates, Q<sub>10</sub>, & Arrhenius equation, Glycolysis, TCA cycle, ATP Synthesis. Recombinant DNA, Transcription & Translation, Reverse Transcription, Replication.

### **Part B – Biophysics**

#### **Module III (16 Hours):**

**Bioelectrical Phenomena:** Membrane Potential, Local and propagator types, Diffusion potential, phase boundary potentials, Generator Potentials, Monophasic as Biphasic Action Potentials (AP). Properties & Propagation of AP, factors influencing propagation of AP. Electrical properties of excitable membranes, Membrane Capacitance, Resistance, conductance, equivalent electrical circuit diagram for excitable membranes & pacemaker potentials.

Electrical activity of brain (EEG) different wave forms, & their characteristics, Electrical Activity of Heart (ECG), Electro-RetinoGram(ERG), Electro-Occulogram (EOG), Receptor potentials, Stimuli, Electrical stimulus, strength-duration relationship, Dielectric properties of Bio-membrane, Space Constant & Time Constant for excitable membrane.

Ionizing radiations, U-V & I-R radiations, radioisotopes & their use in biomedical research, Radioactive decays, Half life period, Half Value Layer, Linear Energy Transfers (LET), Relative Biological Efficiency (RBE) and Interaction of radiation with-matter.

#### **Reference Books:**

##### **Biophysics:**

- 1) Radiation Biophysics, Second Edition - by Edward L. Alpen - Academic Press; 2 edition (January 15, 1998)
- 2) Bio-Physics – Roland Glaser- Springer; 2nd printing edition (November 23, 2004)
- 3) The Biomedical Engineering Hand Book- 3<sup>rd</sup> Ed- (Biomedical Engineering Fundamentals) - Joseph D. Bronzino – CRC –Tylor-Francis – 2006 (Section- III – Bio-Electrical Phenomena)

##### **Biochemistry:**

- 4) Lehninger Principles of Biochemistry, Fourth Edition - by David L. Nelson & Michael M.Cox, - W. H. Freeman; 4 edition (April 23, 2004)
- 5) Fundamentals of Biochemistry: Life at the Molecular Level - by Donald J. Voet, Judith G. Voet & Charlotte W. Pratt. - Wiley; 2 edition (March 31, 2005)

# PCBM4202 **DIGITAL ELECTRONICS CIRCUITS**

## **MODULE – I (11 Hours)**

1. **Number System:** Introduction to Binary Numbers, Data Representation, Binary, Octal, Hexadecimal and Decimal Number System and their Conversion. (2 Hours)
2. **Boolean Algebra and Logic Gates:** Basic Logic Operation and Identities, Algebraic Laws, NOR and NAND Gates, Useful Boolean Identities, Algebraic Reduction, Complete Logic Sets, Arithmetic Operation using 1's and 2's Compliments, Signed Binary and Floating Point Number Representation. (4 Hours)
3. **Combinational Logic Design:** Specifying the Problem, Canonical Logic Forms, Extracting Canonical Forms, EX-OR Equivalence Operations, Logic Array, K-Maps: Two, Three and Four variable K-maps, NAND and NOR Logic Implementations. (5 Hours)

## **MODULE – II (15 Hours)**

4. **Concepts in VHDL:** Basic Concepts, Using a Hardware Description Language, Defining Module in VHDL, Structural and Combinational Modelling, Binary Words, Libraries, Learning VHDL. (4 Hours)
5. **CMOS Logic Circuits:** Voltages as Logic Variables, Logic Delay Times: Output Switching Times, Propagation Delay, Fan-In and Fan-out, Extension to other Logic Gate.  
C-MOS Electronics, MOSFETS, The NOT Function in C-MOS: Complimentary Pairs and the C-MOS Invertors, Logic Formation Using MOSFETS: the NAND and NOR Gate, C-MOS Logic Connection, Complex Logic Gates in C-MOS: 3-input Logic Gates, A general 4-input Logic Gate, Logic Cascades. (6 Hours)
6. **Introduction to VLSI:** Introduction, Lithography and Patterning, MOSFET Design Rules, Basic Circuit Layout, MOSFET Arrays and AOI Gates, Cells, Libraries, and Hierarchical Design, Floor Plans and Interconnect Wiring. (5 Hours)

## **MODULE – III (16 hours)**

7. **Logic Components:** Concept of Digital Components, An Equality Detector, Line Decoder, Multiplexers and De-multiplexers, Binary Adders, Subtraction and Multiplication. (5 Hours)
8. **Memory Elements and Arrays:** General Properties, Latches, Clock and Synchronization, Master-Slave and Edge-triggered Flip-flops, Registers, RAM and ROMs, C-MOS Memories. (6 Hours)
9. **Sequential Network:** Concepts of Sequential Networks, Analysis of Sequential Networks: Single State and Multivariable Networks, Sequential Network Design, Binary Counters, Importance of state machine. (5 Hours)

### **Text Books:**

1. A First Course in Digital System Design: An Integrated Approach, India Edition, John P. Uyemura, PWS Publishing Company, a division of Thomson Learning Inc.
2. Digital Systems – Principles and Applications, 10<sup>th</sup> Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.
3. Digital Design, Robert K. Dueck, CENGAGE Learning.

### **Reference Books:**

1. Digital Principles and Applications, 6<sup>th</sup> Edition, Donald P. Leach, Albert Paul Malvino and Goutam Saha, Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Digital Fundamentals, 5<sup>th</sup> Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.

3. Digital Electronics, Principles and Integrated Circuit, Anil K. Jain, Wiley India Edition.
4. Digital Design, 3<sup>rd</sup> Edition, Moris M. Mano, Pearson Education.

## BECS2208 **Database Management System**

### **Module I :** (10 hours)

Database System Architecture - Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages. Data models - Entity Relationship(ER), Mapping ER Model to Relational Model, Network .Relational and Object Oriented Data Models, Integrity Constraints and Data Manipulation Operations.

### **Module II :** (12 hours)

Relation Query Languages, Relational Algebra and Relational Calculus, SQL.

Relational Database Design: Domain and Data dependency, Armstrong's Axioms, Normal Forms, Dependency Preservation, Lossless design.

Query Processing Strategy.

### **Module III:** (10 hours)

Transaction processing: Recovery and Concurrency Control. Locking and Timestamp based Schedulers.

Database Recovery System: Types of Data Base failure & Types of Database Recovery, Recovery techniques

### **Text Books:**

1. Database System Concepts by Sudarshan, Korth (McGraw-Hill Education )
2. Fundamentals of Database System By Elmasari & Navathe- Pearson Education

### **References Books:**

- (1) An introduction to Database System – Bipin Desai, Galgotia Publications
- (2) Database System: concept, Design & Application by S.K.Singh (Pearson Education)
- (3) Database management system by leon &leon (Vikas publishing House).
- (4) Fundamentals of Database Management System – Gillenson, Wiley India
- (5) Database Modeling and Design: Logical Design by Toby J. Teorey, Sam S. Lightstone, and Tom Nadeau, "", 4<sup>th</sup> Edition, 2005, Elsevier India Publications, New Delhi

# PCBM7204 Engineering Physiology Lab

## Experiment No. 1

### 1) Recording of skeletal muscle response to induced electrical stimulus.

- a. Determination of muscle Threshold for muscle.
- b. Twitch, Summation, Incomplete & complete Tetanus.

## Experiment No. 2

### 1) Recording of the heart beat in Toad using Kymograph.

- a. Normal beats.
- b. Effects of Temperature.
- c. Effects of extracellular  $\text{Na}^+$ ,  $\text{K}^+$  and  $\text{Ca}^{++}$ .

### 2) Test for Myogenicity in isolated (denervated) heart.

## Experiment No. 3

### 1) Quantitative estimation of glucose from blood using :

- a. Spectrophotometer.
- b. Colorimeter.

## Experiment No. 4

### 1) Quantitative estimation of proteins using:

- a. Spectrophotometer.
- b. Colorimeter.

## Experiment No. 5

### 1) Qualitative determinations:

- |  |   |                     |
|--|---|---------------------|
| <ol style="list-style-type: none"><li>a. Proteins.</li><li>b. Fructose.</li><li>c. Glucose.</li><li>d. Starch.</li></ol> | } | <i>(From urine)</i> |
|--|---|---------------------|

## Experiment No. 6

### 1) Testing of hearing using tuning forks.

## Experiment No. 7

### 1) Measurement of Blood Pressure using Sphygmomanometer(s) (Hg type, Annuroid and Electronic types).

### 2) Effects of exercise on BP.

## Experiment No. 8:

- 1) Hemoglobin Estimation
- 2) Study of Microscopes , its types & applications

## Experiment No. 9

- 3) Blood Grouping

## PCBM7202 **Digital Electronics Circuits Lab**

### List of Experiments:

*(Atleast 10 experiments should be done, Experiment No. 1 and 2 are compulsory and out of the balance 8 experiments atleast 3 experiments has to be implemented through both Verilog/VHDL and hardware implementation as per choice of the student totaling to 6 and the rest 2 can be either through Verilog/VHDL or hardware implementation.)*

1. Digital Logic Gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, EX-NOR, Invert and Buffer gates, use of Universal NAND Gate.
2. Gate-level minimization: Two level and multi level implementation of Boolean functions.
3. Combinational Circuits: design, assemble and test: adders and subtractors, code converters, gray code to binary and 7 segment display.
4. Design, implement and test a given design example with (i) NAND Gates only (ii) NOR Gates only and (iii) using minimum number of Gates.
5. Design with multiplexers and de-multiplexers.
6. Flip-Flop: assemble, test and investigate operation of SR, D & J-K flip-flops.
7. Shift Registers: Design and investigate the operation of all types of shift registers with parallel load.
8. Counters: Design, assemble and test various ripple and synchronous counters - decimal counter, Binary counter with parallel load.
9. Memory Unit: Investigate the behaviour of RAM unit and its storage capacity – 16 X 4 RAM: testing, simulating and memory expansion.
10. Clock-pulse generator: design, implement and test.
11. Parallel adder and accumulator: design, implement and test.
12. Binary Multiplier: design and implement a circuit that multiplies 4-bit unsigned numbers to produce a 8-bit product.
13. Verilog /VHDL simulation and implementation of Experiments listed at Sl. No. 3 to 12.

## BECS7208 **Database Managements System Lab**

1. Use of SQL syntax: insertion, deletion, join, updation using SQL. (1 class)
2. Programs on join statements and SQL queries including where clause. (1 class)
3. Programs on procedures and functions. (1 class)
4. Programs on database triggers. (1 class)
5. Programs on packages. (1 class)
6. Programs on data recovery using check point technique. (1 class)
7. Concurrency control problem using lock operations. (1 class)
8. Programs on ODBC using either VB or VC++. (1 class)

9. Programs on JDBC. (1 class)
10. Programs on embedded SQL using C / C++ as host language. (1 class)

## HSSM7203 **Communication & Interpersonal skills for Corporate Readiness Lab.**

**Lab**

**30 hours**

This course will focus on communication in professional (work-related) situations of the kind that BPUT graduates may expect to encounter on entering the professional domain.

Some typical forms of work-related communication, oral or written, are listed below. Practice activities for all four skills can be designed around these or similar situations.

1. Gaining entry into an organization
  - i. Preparing job-applications and CVs
  - ii. Facing an interview
  - iii. Participating in group discussion (as part of the recruitment process)
- 2 In-house communication
  - a. Superior/ Senior → subordinate / junior (individual → individual / group)
    - i. Welcoming new entrants to the organization, introducing the workplace culture etc.
    - ii. Briefing subordinates / juniors : explaining duties and responsibilities etc.
    - ii. Motivating subordinates / juniors ('pep talk')
    - iii. Instructing/ directing subordinates/ juniors
    - iv. Expressing / recording appreciation, praising / rewarding a subordinate or junior
    - v Reprimanding / correcting / disciplining a subordinate/junior (for a lapse) ; asking for an explanation etc.
  - b. Subordinate / Junior → Superior / Senior
    - i. Responding to the above
    - ii. Reporting problems / difficulties / deficiencies
    - iii. Offering suggestions

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