Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

Programme : B.Tech (Biomedical) Sem – III (2014 Course)

Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)						Total Marks	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			TW & PR	TW & OR				
						Unit Test	Attendance	Assignments				Theory	TW	Total Credits
1	Engineering Mathematics-III	3	0	1	60	20	10	10	-	-	100	3	1	4
2	Analog Electronics	4	2	0	60	20	10	10	50	-	150	4	1	5
3	Signals & Systems	3	0	1	60	20	10	10	-	50	150	3	1	4
4	Human Biology	3	2	0	60	20	10	10	50	-	150	3	1	4
5	Circuit theory	3	2	0	60	20	10	10	50	-	150	3	1	4
6	Professional Skill Development-III	4	0	0	100	0	00	0	-	-	100	4	0	4
	Total	**20**	**6**	**2**	**400**	**100**	**50**	**50**	**150**	**50**	**800**	**20**	**05**	**25**

Bharati Vidyapeeth University, Pune

Faculty of Engineering & Technology

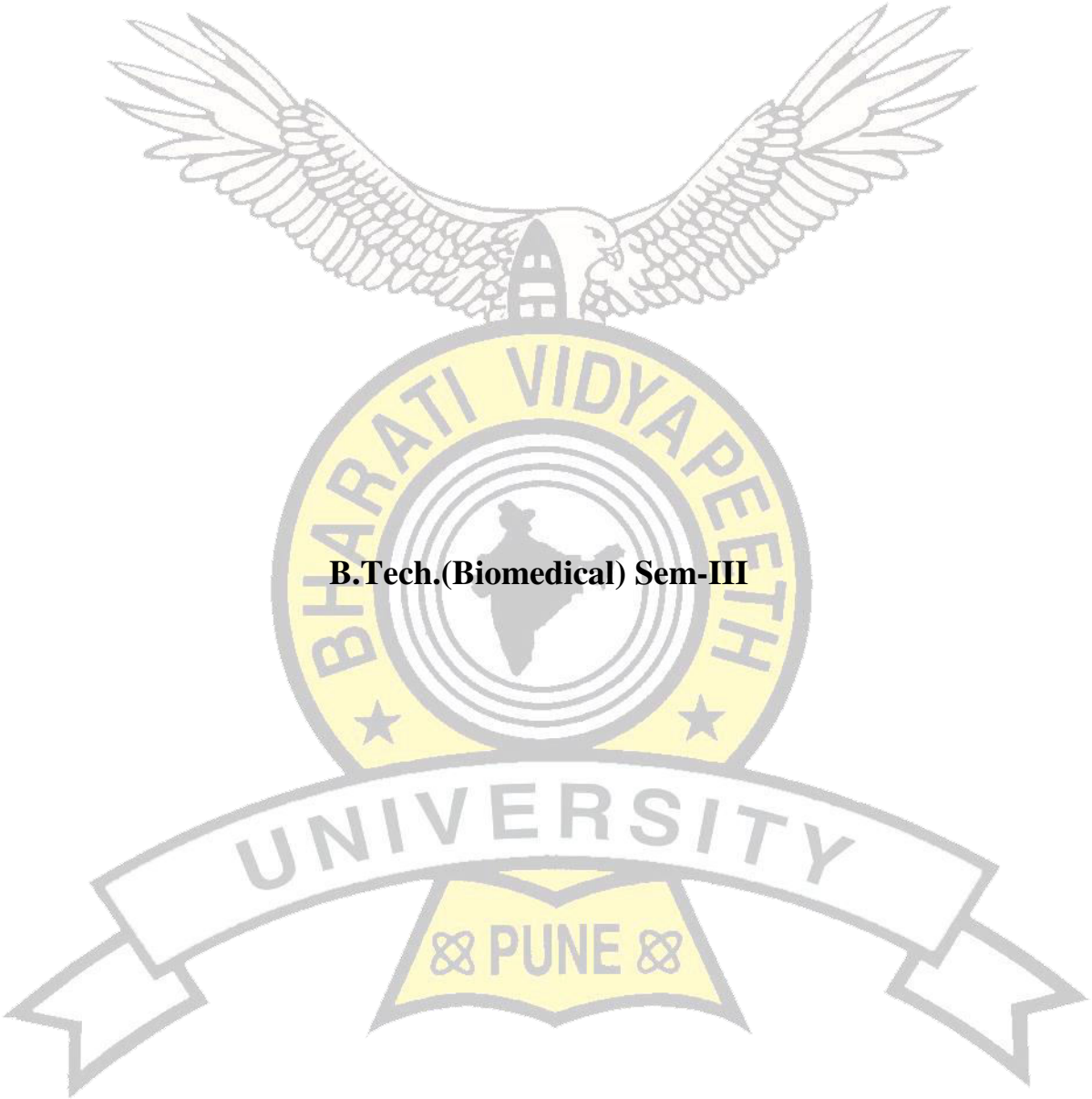
Programme : B.Tech (Biomedical) Sem – IV (2014 Course)

Sr. No.	Name of the course	Teaching Scheme Hrs. / Week			Examination Scheme (Marks)						Total Marks	Credits		
		L	P	T	End Semester Exam	Continuous Assessment			TW & PR	TW & OR		Theory	TW	Total Credits
						Unit Test	Attendance	Assignments						
7	Analog integrated circuits	3	2	0	60	20	10	10	50	-	150	3	1	4
8	Electronic Circuits and Applications	4	2	0	60	20	10	10	50	-	150	4	1	5
9	Electronic Instruments & Measurement System	3	2	1	60	20	10	10	-	-	100	3	2	5
10	Digital Logic Circuits	3	2	0	60	20	10	10	-	50	150	3	1	4
11	Rehabilitation Engineering	2	2	0	60	20	10	10	-	50	150	2	1	3
12	Professional Skill Development-IV	4	0	0	100	-	--	-	-	-	50	4	0	4
	Total	**19**	**10**	**1**	**400**	**100**	**50**	**50**	**100**	**100**	**800**	**19**	**6**	**25**

Total Credits Sem – III : 25

Total Credits Sem – IV : 25

Grant total : 50



B.Tech.(Biomedical) Sem-III

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Class: B.Tech (Biomedical) Sem:- III

SUBJECT: - Engineering Mathematics-III

Lecture: 3 hours/week
Tutorial: 1 hours/week

Theory: 60 marks
Unit Test: 20marks
Attendance: 10 marks
Assignments: 10 marks

Course prerequisites:

Students should have basic knowledge of:

- Differential calculus
- Integral calculus
- Complex numbers
- Vector algebra

Course objective:

To develop ability to use the mathematical techniques, skills, and tools necessary for engineering practice.

Course Outcomes: On successful completion of this course, students will be able to

1. Form mathematical modeling of systems using differential equations and ability to solve linear differential equations with constant coefficient.
2. Apply basics of analytic functions and the basics in complex integration which is used to evaluate complicated real integrals.
3. Apply theorems to compute the Laplace transform, inverse Laplace transforms.
4. Solve difference equation by Z-transform.
5. Calculate the gradients and directional derivatives of functions of several variables.
6. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.

Contents:

Unit-I

Linear Differential Equations (LDE) **(08Hours)**

Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's &Legendre's DE, Solution of Simultaneous & Symmetric Simultaneous DE, Modeling of Electrical Circuits.

Unit-II

Complex Variables **(08Hours)**

Functions of Complex Variables, Analytic Functions, C-R Equations, Conformal Mapping, Bilinear Transformation, Cauchy's Theorem, Cauchy's Integral Formula, Laurent's Series, Residue Theorem

Unit-III

Transforms **(08Hours)**

Fourier Transform (FT): Complex Exponential Form of Fourier Series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit-IV

Laplace Transform (LT) **(08Hours)**

Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump, . Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit -V

Vector Differential Calculus **(08Hours)**

Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

Unit-VI

Vector Integral Calculus **(08Hours)**

Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem, Applications to Problems in Electro-Magnetic Fields.

Assignments:

1. Solve the problem based on Linear Differential Equations
2. Solve the problem based on Complex Variables
3. Solve the problem based on Fourier and Z -Transforms
4. Solve the problem based on Laplace Transform
5. Solve the problem based on Vector Differential Calculus
6. Solve the problem based on Vector Integral Calculus

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books:

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Class: B.Tech (Biomedical) Sem:- III

SUBJECT: - Analog Electronics

Lecture: 4 hours/week
Practical: 2 hours/week

Theory: 60 marks
Unit Test: 20marks
Attendance: 10 marks
Assignments: 10 marks
TW & Practical.: 50 marks

Course prerequisites:

- Knowledge of Electronic Components
- Fundamentals of P-N diode.
- Knowledge of BJT and its configuration

Course objective:

1. To make student understand working of bipolar junction transistor and field effect transistor with different biasing techniques
2. To make student understand a practical approach of design and analysis of waveshaping circuits using diode and multivibrator using transistors
3. To make student understand working of FET and MOSFET and its applications
4. To make student understand working of optoelectronic devices and its applications.
5. To make student understand the fabrication process of PCB

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate knowledge of working and applications of diode.
2. Demonstrate knowledge of working of BJT with different biasing techniques.
3. Analyze applications of BJT as an amplifier and multivibrator.
4. Explain working of FET and MOSFET and its applications.
5. Demonstrate knowledge of working of optoelectronic devices.
6. Design, built and test any small electronic circuit on PCB.

Contents:

Unit-I

Transistor Biasing **(08Hours)**

Need of biasing, DC load line analysis, operating point, Thermal runaway. Requirements of a biasing circuit, Different biasing circuits: fixed bias, collector to base bias & voltage divider bias. Stability factor, General expression for stability factor, stability factor for all biasing circuits, Design of biasing circuits, Transistor as an amplifier.

Unit-II

BJT Amplifiers **(08Hours)**

Two port device and Hybrid model , transistor Hybrid model, h- parameters, Simplified CE Hybrid Model, Analysis of amplifiers using Approximate Model(CE, CC, CB), BJT Single Stage Amplifiers, Small Signal Analysis of Single Stage BJT Amplifiers, Distortion in Amplifiers.

Unit-III

Field Effect Transistor (FET) **(08Hours)**

Types of FET viz. JFET,MOSFET, JFET -construction, VI characteristics, transfer characteristics, Characteristics Parameters of JFET, FET Biasing(Self Bias, Fixed Bias, Current Source Bias), JFET amplifiers-CS,CD and CG amplifiers, Application of FET.

Unit-IV

MOSFETs **(08Hours)**

Types of MOSFET viz. D-MOSFET, E-MOSFET, n-MOS, p-MOS and CMOS devices, DMOSFET and EMOSFET characteristics and parameters,non-ideal V-I characteristics viz. finite output resistance, body effect, subthreshold conduction ,breakdown effects and temperature effects, MOSFET as VLSI device

Unit -V

Wave shaping and Multivibrator Circuits **(08Hours)**

Diode as clipper- series and parallel forms of clipper circuits, biased clipper, their operations, Diode as a clamper, voltage multiplier circuits-voltage doubler, tripler and quadrupler configuration, Multivibrator circuits-astable and monostable multivibrator circuit using BJT.

Unit-VI

Optoelectronic devices and PCB design **(08Hours)**

Construction ,V-I characteristics and applications of LED, LDR, Photodiode, Phototransistor, Photoconductive cell, Photovoltaic cell, optcoupler.

PCB: types of PCB, PCB design rules, layout design, artwork design, fabrication process of single sided PCB, different copper clad laminates, composition of solder metal.

List of Experiments:

1. Biasing techniques of BJT- to find stability factor of self bias, collector to base bias, fixed bias
2. To plot frequency response of single stage CE amplifier and find its bandwidth
3. To plot frequency response of single stage FET amplifier (CS/CD configuration) and find its bandwidth.
4. To study different types of Clipper circuits
5. To study different types Clamper circuits
6. To plot transfer characteristics of Optocoupler
7. To plot V-I and optical characteristics of LED and LDR
8. To plot V-I and optical characteristics of Photodiode and phototransistor

Assignments:

1. Simulation of BJT amplifier using Multisim.
2. Define h-parameters for CE, CB, CC configuration and describe how these parameters are determined from BJT characteristics.
3. Describe fabrication process of MOSFET and any two real time applications of MOSFETs
4. Real time applications of optoelectronics devices such as LED, Optoisolator
5. To design, built and test given electronic circuits (Group activity)
6. Obtain industry exposure based on product design industry and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. "Electronic Devices and Circuits" by S. salivahanan,Suresh kumar- Mc Graw Hill Publication
2. "Integrated Electronics", by Millman J and Halkias .C., TMH publication
3. "Electronic Devices and Circuits " by Millman ,Halkies,TMH publication

Reference Books:

1. "Electronic Devices and Circuits" by Allen Mottershed- PHI Publication
2. "Electronic Devices and Circuits" by J.B. Gupta-Katson educational series
3. "Microelectronics "by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
4. "Printed Circuits Handbook " by Clyde F. Coombs - McGraw Hill Handbooks
5. "Microelectronic Circuits Theory and applications "by Adel S. Sedra , Kenneth C. Smith- Oxford

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Class: B.Tech (Biomedical) Sem:- III

SUBJECT: - Signals and Systems

Lecture: 3 Hrs/week

Tutorial: 01 Hr/Week

Theory: 60 marks

Unit Test: 20 Marks
Attendance: 10Marks
Assignments: 10Marks
TW & Oral: 50 Marks

Course prerequisites:

Before proceeding with this tutorial, you must have a basic understanding of differential and integral calculus, limits and adequate knowledge of mathematics.

Course objective:

The course aims to develop good understanding about signals, systems and their classification and analysis tools in the time and frequency domain. It also provides knowledge of correlation function and sampling.

Course Outcomes: On successful completion of this course, students will be able to

1. Represent & classify signals, Systems & identify LTI systems
2. Analyze the systems in time domain using convolution.
3. Apply Fourier transform, Laplace transform and Z-Transform for analysis of LTI systems.
4. Conceptualize the effects of sampling on signal and describe the auto correlation and cross correlation between signals.

Contents:

Unit-I

Introduction to signals **(06 Hours)**

Definition of signals, classification of signals: continuous time signals & discrete time signals, even & odd signals, periodic & non-periodic, deterministic & non-deterministic,

energy & power, elementary signals: unit impulse, unit step, unit ramp, exponential & sinusoidal, basic operations on signals.

Unit-II

Classification of Discrete time systems **(06 Hours)**

Definition ,Classification of System, System Interconnections, state space analysis, Linear & non -linear ,Time-Invariant & Time variant, causal & non-causal, static & dynamic, stable & unstable systems, stability & impulse response of systems to standard signals.

LTI system Analysis: Introduction to LTI systems. Block Diagram, Linear Convolution-Convolution Integral, Impulse response, Methods of Convolution. Properties of convolution

Unit-III

Continuous Time system Analysis: **(06 Hours)**

Response of LTI Systems to exponential signals, periodic signals. Fourier series, Fourier Transforms, properties, applications of Fourier series & Fourier transforms to the system analysis.

Unit-IV

System Analysis in Laplace Transform **(06 Hours)**

Laplace Transform: Definition and its properties, ROC and pole zero concept. Applications of Laplace transforms to the LTI system analysis. Inversion using duality, numerical based on properties.

Unit-V

System Analysis in Z-Transform **(06 Hours)**

Z-Transform: Definition and its properties, Region of Convergence for the Z-Transform, the Inverse z-Transform, Applications of Z-Transform to the LTI system analysis

Unit VI:

Correlation and Spectral Density **(06 Hours)**

Definition of Correlation and Spectral Density, correlogram, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density, Sampling theorem & its proof, aliasing, reconstruction of sampled signals, interpolation.

Assignments:

Perform the following assignments using MATLAB (any three) and Virtual Lab (any three)

1. Generation of Signals
2. Linear convolution of any two signals
3. Fourier transform of given signal
4. Laplace Transform of given signal
5. Z-transform of given signal
6. Sampling Theorem & aliasing effect.

Content Delivery Methods: Chalk & talk, Power point presentation, Quiz

Assessment Methods:

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

Text Books:

1. Alan V Oppenheim, Alan S, Willsky and A Hamid Nawab, "Signals and Systems" Pearson Education Asia / PHI, 2nd edition, 1997. Indian Reprint 2002
2. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons , Inc,2004.

Reference Books:

1. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2005
2. H. P Hsu, R. Ranjan, "Signals and Systems", Scham‟s outlines, McGraw Hill,2006
3. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, McGraw Hill International/TMH, 2007

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Class: B.Tech (Biomedical) SEM: - III
SUBJECT: - Circuit Theory

Lecture: 3 hours/week
Practical: 2 hours/week

Theory: 60 marks
Unit Test: 20marks
Attendance: 10 marks
Assignments: 10 marks
TW & Practical: 50 marks

Course prerequisites:

- Knowledge of KCL and KVL Laws from Basic Electrical Engineering
- Knowledge of Linear Differential Equations and Systems of Linear Equations from Engineering Mathematics - I and II.

Course objective:

The objective of the course is to enable the student to perform any of the network analysis task required in the subsequent courses. The student is exposed to some concepts in graph theory for providing a good foundation for the methods of Mesh Analysis and Node Analysis. The transient analysis using Laplace Transforms is also included. The series and parallel resonance circuits which occur quite frequently in electronics are analyzed. The topic of constant K filter is included as it finds many applications in electronic design. The two port network parameters which are of fundamental importance in many courses on electronic devices are included in the last unit.

Course Outcomes: On successful completion of this course, students will be able to:

1. To find voltages and currents in a given network using Mesh Analysis or Node Analysis or Network Theorems.
2. To find voltages and currents in a given network by formulating network equilibrium equations from graph theory.
3. To find the transient response in a given network consisting of series or a parallel combination of resistance, capacitance and inductance.

4. To find all the parameters relating to a given series or a parallel resonant circuit.
5. To design a constant K prototype low pass, high pass, band pass or a band stop passive filter
6. To find any of the two port parameters of a given two port network.

Contents:

Unit I

Fundamentals Of Network **(6 Hours)**

KCL, KVL, Source Transformation, Source Shifting, Mesh Analysis, Node Analysis, Super Mesh, Super Node, Mesh and Node Analysis in Sinusoidal Steady State

Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem.

Unit II

Application Of Graph Theory **(6 Hours)**

Network Graph, tree, cotree & loops, Incidence Matrix, tie set matrix, cut-set matrix, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of Duality

Unit III

Transient Analysis **(6 Hours)**

Initial Conditions in networks. A procedure for evaluating initial conditions. Solution of step response in RC, RL, RLC circuits using classical method, Analogous equivalence of mechanical system.

Unit IV

Resonance **(6 Hours)**

Resonant condition, Definition of Quality factor. Finding resonant frequency, impedance at resonance, voltage and current variation with frequency, bandwidth, selectivity, magnification factor for series and parallel resonant circuits. General case of resistance present in both branches of parallel resonant circuit. Comparison of series and parallel resonant circuits, Applications of resonant circuits

Unit V

Passive Filters **(6 Hours)**

Filter Fundamentals, Image impedance, Characteristic impedance, Propagation constant. Constant K prototype for LPF, HPF, BPF and BSF, m-derived LPF, HPF, Terminating half sections, Composite filters

Unit VI

Two Port Networks **(6 Hours)**

Network Functions, Two port network parameters, Z, Y, H, ABCD and other parameters, Relationships between two-port network parameters, Interconnections of two-ports, Reciprocity and Symmetry conditions

List of Experiments:

1. To verify Thevenin's and Norton's Theorem.
2. To verify Superposition and Reciprocity Theorem.
3. To find resonant frequencies of series and parallel circuit.
4. To plot frequency response of frequency selective network (Twin T or Wein Bridge).
5. To plot frequency response & cut-off frequency of constant-k LPF and HPF.
6. To plot frequency response & cut-off frequency of constant-k BPF and BSF.
7. To find Z and Y parameters of given two port network.
8. To find H and ABCD parameters of given two port network.

Assignments:

1. Analyze the circuit using mesh and node analysis.
2. Apply graph theory for circuit.
3. Describe any two real time applications of passive filters.
4. Simulation of series and parallel resonance circuit using Multisim.
5. Transient response of RC, RL and RLC circuit using Multisim.
6. Obtain industry exposure based on product design industry and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books :

1. D. Roy Choudhury, 'Network and Systems', New Age International Publishers, Second Edition.
2. Franklin F. Kuo, 'Network Analysis and Synthesis', John Wiley & Sons (Second Edition)

References Books:

1. M. E. Van Valkenburg, 'Network Analysis', PHI (3rd Edition)
2. John D. Ryder, 'Networks, Lines and Fields', PHI Learning Pvt. Ltd., Second Edition

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Class: B.Tech (Biomedical) Sem:- III

SUBJECT: - Human Biology

Lecture: 3 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Oral: 50 marks

Course prerequisites:

- Basic knowledge of Human body parts.

Course objective:

This course provides in depth knowledge on Anatomy of Physiology of Different systems exist in Human body.

Course Outcomes: On successful completion of this course, students will be able to

1. Classify types of Bones
2. Demonstrate anatomy of various systems such as cardiovascular Respiratory, Gastrointestinal& Excretory System, various special senses.& Central nervous system.
3. Demonstrate Physiology of various systems such as cardiovascular Respiratory, Gastrointestinal, Excretory System & various special senses.

Contents:

Unit-I

General Anatomy **(06 hours)**

Anatomy of Cell, Tissues& bones, Types of bones of Upper and Lower extremity.

Unit-II

Systemic Anatomy **(06 hours)**

Structure &anatomy of Cardiovascular system, Respiratory system , Gastrointestinal system, Excretory system & reproductive system.

Unit-III

Anatomy of Special Senses& Central nervous system (06 hours)

Anatomy of special senses: Nose, Eye, Ear, Tongue, Skin & CNS: Cerebrum, Cerebellum, Brain Stem& Spinal Cord.

Unit-IV

Physiology of Cardio-respiratory System (06 hours)

Blood: composition, blood groups , blood vessels, blood pressure, blood transfusion ,blood clotting ,parts of heart, conduction system ,ECG, Physiology of respiration

Unit-V

Physiology of Gastrointestinal & Excretory System (06 hours)

Blood ,Blood Groups ,Blood Transfusion, Blood Pressure, Blood Clotting Physiology of Gastrointestinal system, Excretory system: Physiology of Nephron, urine formation, Functions of Kidney, Physiology of Endocrine System

Unit-VI

Physiology of special Senses (06 hours)

Physiology of Nose, Eye, Ear, Tongue & Skin.

Content Delivery Methods: Chalk & talk, Charts &Models

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books/ References Books:

1. Arthur C. Guyton"Medical Physiology" Prismbook.

2. B.D.Chaurasia "General Anatomy", Third edition, CBS publication.

3. Tortora and Graabowski, "Principles of Anatomy and Physiology",Haper colin Publication

B.Tech.(Biomedical) Sem-IV

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Class: B.Tech (Biomedical) Sem:- IV

SUBJECT: - Analog Integrated Circuits

Lecture: 3 hours/week
Practical: 2 hours/week

Theory: 60 marks
Unit Test: 20marks
Attendance: 10 marks
Assignments: 10 marks
TW & Oral: 50 marks

Course prerequisites:

- Knowledge of KCL and KVL Law
- Basic knowledge of Op-Amp and its configurations

Course objective:

This course provides in depth knowledge on the Op-Amp. Also it introduces the design of PLL, Waveform generators, Timer IC's and Converters.

Course Outcomes: On successful completion of this course, students will be able to

1. Design linear and nonlinear applications of Op-Amp.
2. Design of first and second order active filters.
3. Analyze and design Waveform Generators.
4. Demonstrate knowledge of Phase Locked Loop IC 565 and Converters.
5. Design of multivibrators using Timer IC 555

Contents:

Unit-I

Fundamentals of Operational Amplifier **(06 hours)**

Block diagram representation of a typical op-amp, Schematic symbol for op-amp ,Definition of integrated circuits ,Types of Integrated Circuits ,Manufacturers ,Designation for IC ,IC package types ,PIN identification & temp ranges , Ordering information, Characteristics of an op-amp, Internal &external offset voltage compensation, Frequency Response of an op-amp.

Unit-II

Operational Amplifier – Linear circuits **(06 hours)**

Inverting amplifier, Non-inverting amplifier, Voltage Follower, Adder, Subtractor, Scaling averaging amplifier, Integrator, Differentiator, Instrumentation amplifier using 1, 2 and 3 op-amps, Instrumentation amplifier using transducer bridge, Peaking amplifier

Unit-III

Operational Amplifier - Non-linear circuits **(06 hours)**

Precision half wave rectifier & full wave rectifier, comparator, Schmitt trigger, window detector, log-antilog amplifier and its temperature compensation techniques, log ratio, sample and hold circuit.

Unit-IV

Active filters and waveform generators **(06 hours)**

First and second order low pass Butterworth filters, first and second order high pass Butterworth filter, Band pass filter, Band reject filter, All-pass filter, notch filter, Square wave, Triangular wave, Sawtooth wave generator and study of function general or IC 8038

Unit-V

Special function IC's **(06 hours)**

IC 555- as Monostable and Astable Multivibrators and its applications.

IC 565- operating principle of Phase Locked Loop IC 565, Applications like Frequency multiplier, FSK and FM detector

Unit-VI

Interfacing circuits **(06 hours)**

V to I & I to V converter, D to A converter- Binary weighted resistors and R & 2R resistors, A to D Converter- Counter-ramp type, Successive approximation and Dual Slope.

List of Experiments:

1. To design and build Integrator and draw frequency response
2. To design and build Differentiator and draw frequency response
3. To design and build precision rectifier

4. To design and build schmitt trigger and find threshold levels
5. To design and build first order Butterworth low pass filter
6. To design and build first order Butterworth high pass filter
7. To design and build triangular waveform generator using IC 741
8. To design and build Function generator using IC 8038
9. To design and build Astable multivibrator using timer IC 555.

Assignments:

1. Find out any three ICs of op-amp other than IC 741 and compare the characteristics with IC 741.
2. List out any two linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
3. List out any two non-linear applications of op-amp which are not specified in syllabus and explain the working along with circuit diagrams.
4. Design sinusoidal generators using op-amp for a given frequency.
5. Real time applications of IC555/ IC565.
6. Obtain industry exposure based on product design and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall of India, 4th Edition, 2010.
2. K. R. Botkar, Integrated Circuits, khanna Publishers, 10th edition, 2010

References Books:

1. David A. Bell, "Operational Amplifiers and Linear ICs", Oxford publication,3rd edition,2011
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Tata McGraw Hill, 3rd edition, 2008
3. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt. Ltd., 4th edition, 2010.

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Class: B.Tech (Biomedical) Sem:- IV

SUBJECT: - Electronic Circuits and applications

Lecture: 4 hours/week
Practical: 2 hours/week

Theory: 60 marks
Unit Test: 20marks
Attendance: 10 marks
Assignments: 10 marks
TW & Practical.: 50 marks

Course prerequisites:

- Knowledge of linear circuit theory
- Basic concept of BJT

Course objective:

1. To make student understand analysis of multistage transistor amplifier.
2. To make student understand a practical approach of design and analysis of feedback amplifiers ,power amplifiers and oscillators
3. To make student understand analysis and design of voltage regulators.
4. To make student understand the behavior of high frequency BJT amplifiers

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Course Outcomes: On successful completion of this course, students will be able to

1. Analyze multistage amplifier.
2. Analyze and design feedback amplifier and power amplifier and oscillators
3. Analyze and design voltage regulators.
4. Characterize behavior of high frequency BJT amplifiers.

Contents:

Unit-I

Multistage amplifiers **(08hours)**

Need of Multistage amplifiers, Parameter evaluation such as Ri, Ro, Av, Ai & Bandwidth for general multi stage amplifier, Analysis & design at low frequency & mid frequency of direct

coupled, RC coupled, transformer coupled (Two stage) amplifier, Darlington amplifier, cascode amplifier

Unit-II

Feedback amplifiers **(08 hours)**

Concept of feedback, classification of amplifiers, Negative feedback topologies with their block diagram representation, Effect of negative feedback on Input impedance, Output impedance, Gain and Bandwidth with derivation, method of analysis of feedback amplifier, analysis of all feedback topologies.

Unit-III

Power amplifiers **(08 hours)**

classification of power amplifiers - Class A, Class B, Class C, and Class AB. Operation of - Class A with resistive load; Transformer coupled class A Amplifier; Class B Push – pull amplifier ; Class B Complementary symmetry amplifier. Efficiency analysis for Class A transformer coupled amplifier and Class B push – pull amplifier, cross over distortion in power amplifiers, harmonic analysis

Unit-IV

Oscillators **(08 hours)**

Positive feedback, Barkhausen criterion, Classification of oscillators, derivation and analysis of RC oscillators, Wien bridge Oscillators, LC Oscillators for frequency of oscillation, Tuned collector oscillator, Piezo-electric effect in crystals and Crystal Oscillator

Unit- V

Regulators **(08 hours)**

Block schematic of linear regulators, Performance parameters – Load and Line regulations, Ripple rejection, Output resistance Emitter follower regulator, Transistor series regulator, shunt regulator Study and design of regulators using IC's :78XX,79XX,723,LM317, Method of boosting output current using external series pass transistor. Protection circuits – Reverse polarity protection, over circuit, fold back current limiting, over voltage protection.

Unit-VI

High frequency amplifiers **(08hours)**

High frequency T model. Common base short circuit current frequency response ,alpha cut-off frequency ,CE short circuit current frequency response, high frequency hybrid π CE model, Amplifier response taking into account source and load resistances.

List of Experiments:

1. Study of CE two-stage amplifier with capacitive coupling
2. Study of Voltage series and current series feedback amplifiers
3. Study of Voltage shunt and current shunt feedback amplifiers
4. Study of Class B/AB push – pull/ Complementary Symmetry power amplifier.
5. Study of RC Oscillators - phase shift and wien bridge oscillators
6. Study of LC oscillators – Hartley, Colpitt oscillators
7. Study of Linear voltage regulators – series regulator using series pass transistor, shunt regulator using zener diode
8. Study of Fold back current limiting using IC 723

Assignments:

1. Analyze given feedback amplifier.
2. Describe any two real time applications of power amplifier.
3. Simulation of oscillator using Multisim.
4. Describe any two real time applications of regulator.
5. To design, built and test given electronic circuits(Group activity)
6. Obtain industry exposure based on electronic product design and prepare report for the same.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books:

1. "Electronic devices and circuits" by S. Salivahanan, Suresh Kumar Vallavaraj, Mc Graw Hill Publication

2. “Electronic devices and circuits “by Millaman Halkies ,TMH publication
3. “Integrated Electronics”, by Millman J and Halkias .C., TMH publication

Reference Books:

1. “Electronic Devices and Circuits “by Allen Mottershed- PHI Publication
2. “Electronic Devices and Circuits “by J.B. Gupta- KATSON educational series books
3. “ Microelectronic Circuits Theory and applications “by Adel S. Sedra, Kenneth C. Smith- Oxford
4. “Microelectronics “by Jacob Millman, Arvin Garbel- Mc Graw Hill Publication
5. “Electronic Principles “by Albert Malvino and David J Bates, 7 edition, Tata McGrawHill
6. “Basic Electronics” by Zbar, Malvino and Miller, 7 edition, Tata McGraw Hill

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Class: B. Tech. (Biomedical) Sem:- IV

SUBJECT: - Electronic Instruments and Measurement Systems

Lecture: 4 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & Practical: 50 marks

Course prerequisites:

- Knowledge of process instrumentation.
- Knowledge of Integrated circuits.

Course objective:

The objective of the course is to introduce the fundamentals of Electronics Instruments and Measurement. Students learn the essential topics in Measurement systems. The course includes an in-depth understanding of oscilloscope, digital storage oscilloscope, analyzers, communication Measurements.

Course Outcomes: On successful completion of this course, students will be able to:

1. Explain the basic operation of measuring instruments.
2. Describe functioning, specifications, and applications of signal analyzing instruments.
3. Describe the basic features of oscilloscope and the internal structures of different types of oscilloscopes.

Contents:

Unit-I

Fundamentals of Instrumentation & Measurement: (08 hours)

Necessity of Electronic Measurements, Block diagram of electronic measuring system, Concepts of Accuracy, Precision, Linearity, Sensitivity, Resolution, Hysteresis, Calibration

etc. Measurement Errors, Voltage, Current, Resistance measurement using DMM- 4 ½ & 6 ½, Auto zeroing, Auto ranging.

Unit-II

Measuring Instruments **(08 hours)**

Voltage , current and impedance measurement, VTVM, TVM, DVMs, AC voltmeters true RMS meters, vector voltmeter, vector impedance meter, direct current probes, alternating current probes ,LCR-Q meter.

Unit-III

Signal Generators & counters **(08 Hours)**

Sine-wave generator, standard signal generators, Frequency synthesized signal generator, swept frequency generator, random noise generator, Audio frequency signal generation, RF generator, Pulse generator (block diagram), Function generator Time, Frequency, Ratio, Time interval, Period & Multiple Period averaging using digital universal frequency counter.

Unit-IV

Signal Analyzers & computer aided measurements: **(08 hours)**

Harmonic and Wave analyzer, Distortion factor meter, Spectrum analyzer -FFT analyzer, tracking generator, Logic analyzer, logic timing analyzer, logic state analyzer, FFT analyzer, Mixed signal oscilloscope, IEEE 488, VXI based instruments, Introduction of Lab view software.

Unit-V

Communication Measurements: **(08 hours)**

Communication measurements, Measurements on transmitter and receiver: sensitivity, selectivity, phase jitter, S/N ratio, co-channel interference, SINAD test etc. Network analyzer- system elements, measurement accuracy, scalar network analyzer, vector network analyzer, S-parameter measurement using network analyzer.

Unit-VI

Oscilloscopes: **(08 hours)**

Overview of analog CRO, dual/ Multi-trace CRO, Various CRO probes &its applications. Digital Storage Oscilloscope - Sampling speed & Memory depth of DSO, Design

considerations, Attachments to DSO for enhancing the functionality, Measurements such as FFT, Math Functions, Curve Tracer, and Power scope.

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

List of Experiments:

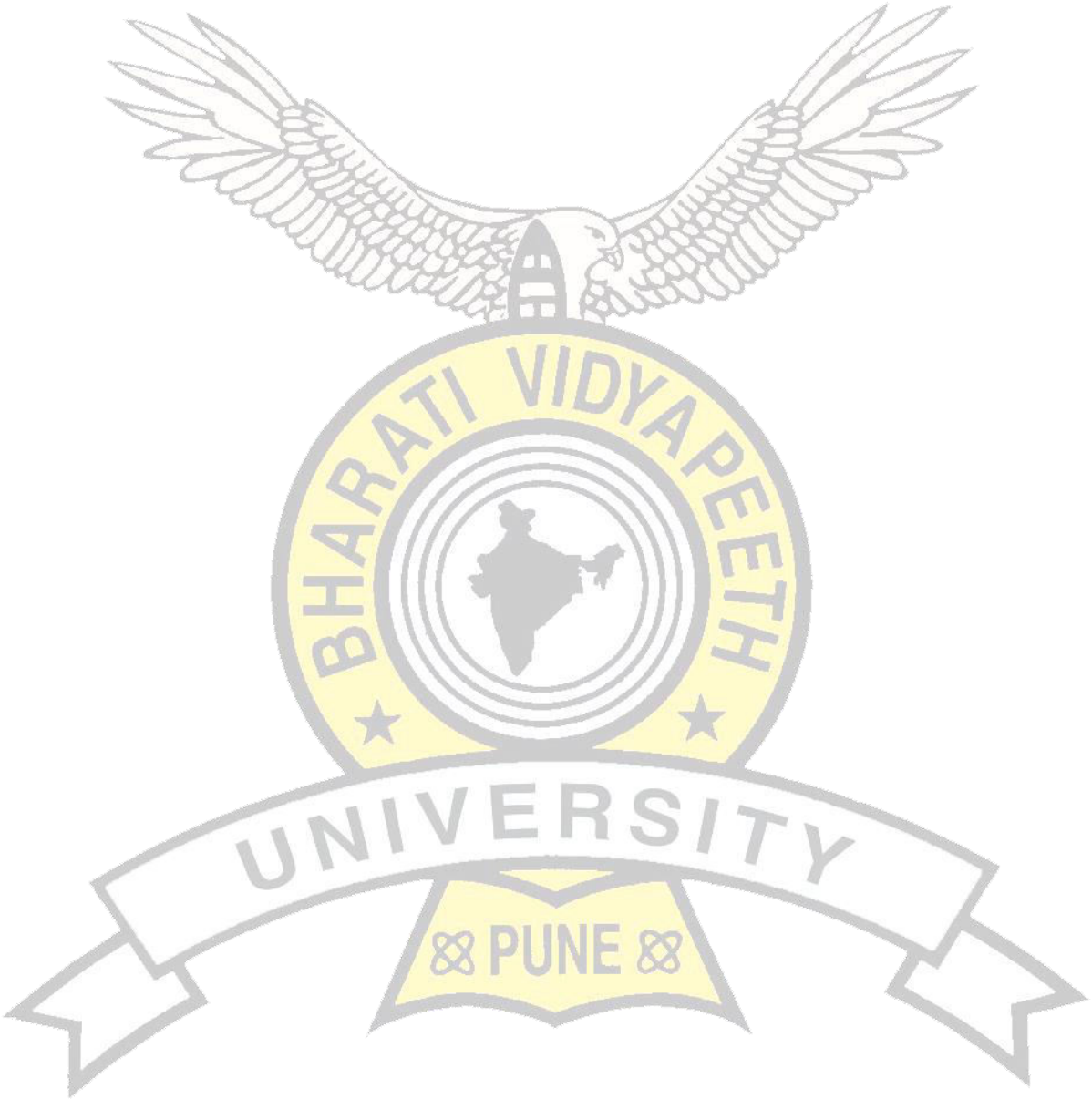
Any 8 assignments should be conducted from the following list.

1. Peak ,average and r.m.s. measurement using rectifier circuit.
2. Calibration of DVM for any one range: e.g. 200 V dc, 200 V ac, 200mA dc, using Standard calibrator or standard 6½DMM.
3. Measurement using spectrum analyzer and tracking generator. Observing spectrum of AM and FM waveforms for different modulation indices
4. Measurements on DSO:
   i) FFT analysis of LF signal
   ii) Capturing transients
   iii) Storing and retrieving number of different signals
   iv) Study of various operations like add, subtract, integrate, differentiate.
5. Measurement and timing analysis of digital signals using Logic Analyzer.
6. Experiment with virtual instruments using software such as Lab view.
7. Measurement of Total harmonic distortion using distortion factor meter.
8. Measurements on L-C-R Q meter.
9. Measurements with Universal counter (Frequency, Period, frequency ratio, Period Averaging and Time interval).
10. Study of characteristics of Diode, Transistors using Curve Tracer.
11. Study of Power scope.

Text Books/ Reference Books:

1. Oliver-Cage, “Electronic measurements and instrumentation”, TMH edition.
2. M.M.S. Anand, “Electronics instruments and instrumentation technology”, PHI.

3. Coombs, Clide F. Jr., “Electronic instrument handbook”, McGraw –Hill.
4. Car Joseph, “elements of Electronics Instrumentation and Measurement”, PHI
5. A. J. Bouwens, “Digital Instrumentation”, TATA McGraw Hill.



Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Class: B.Tech (Electronics) SEM: - III
SUBJECT: - Digital Logic Circuits

Lecture: 3 Hours/Week

Practical: 2 Hours/Week

Theory: 60 marks

Unit Test: 20 Marks
Attendance: 10Marks
Assignments: 10Marks

TW& Practical: 50 Marks

Course Prerequisite:

1. Fundamentals of Number Systems.

Course Objective:

1. To understand principles, characteristics & operations of combinational & sequential logic circuits.
2. To design combinational circuits by using logic gates, MSI circuits, PLDs.
3. To design, implement analyze, asynchronous & synchronous sequential circuits using flip flops.

Course Outcomes: On successful completion of this course, students will be able to

1. Demonstrate the knowledge of Boolean algebra including simplification techniques.
2. Describe the characteristics of Logic families TTL, CMOS, ECL & explain the fundamentals of semiconductor memories.
3. Analyze & design digital combinational circuits such as of multiplexers, Demultiplexer, encoder, decoder and arithmetic circuits.
4. Demonstrate the knowledge of operations of basic types of flip-flops, registers, counters & the design of Finite State Machine.
5. Describe the characteristics of PLDs, Semiconductor memories and their applications.

Contents:

Unit –I

Number Systems, Codes & reduction techniques: (6 Hours)

Review of Binary number system: Binary addition and subtraction using 1's, 2'scomplement method, sign magnitude representation. BCD codes, 8421, Excess –3, Grey code, codes with more than four bits, ASCII code.

Fundamental theorems of Boolean algebra, Canonical and standard forms (SOP and POS), minimization of logic functions, Karnaugh maps up to 4 variables, Don't care conditions, Quine Mc-Cluskey method.

Unit-II

Combinational Logic Modules and their Applications (6 Hours)

Adder, subtractor, carry look ahead adder, BCD adder, magnitude comparator, Excess-3 Adder, series and parallel adder, ALU.

Code conversion, Multiplexer, Demultiplexer, Encoder, Decoder and their applications. Parity generator and checker.

Unit-III

Logic Families (6 Hours)

Parameter definitions - Noise margin, power dissipation, voltage and current parameters, propagation delay. Typical values for TTL, CMOS & ECL. Two input TTL NAND gate, TTL logic families standard, Totem – pole, open collector, tri-state (concept & application). TTL-CMOS/CMOS-TTL interfacing, comparison of TTL & CMOS ECL.

Unit-IV

Sequential Logic Modules (7 Hours)

Basic sequential circuits-latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, MS J-K flip flop, T flip-flop.

Definition of state machines, Moore and Mealy machine, Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization.

Unit-V

Shift Registers & Counters **(5 Hours)**

Registers, Shift registers, Counters (ring counters, twisted ring counters), Sequence Generators, ripple counters, up/down counters, synchronous counters, lock out, Clock Skew, Clock jitter.

Unit-VI

PLDs & Memories **(6 Hours)**

Study of PROM, PAL, PLAs. Designing combinational circuits using PLDs.

Classification and characteristics of memory, different types of RAMs, ROMs and their applications, Double Data Rate RAMs.

List of Experiments:

1. Implementation of Boolean functions using logic gates
2. Study of characteristics of typical 74 TTL / 74 CMOS family like: fan in, fan out standard load , noise margin & interfacing with other families
3. Half, Full Adder and subtractor using gates and IC's
4. Code conversion using digital IC's
5. 1 & 2 bit digital comparator and ALU verification
6. Function implementation using Multiplexer and Demultiplexer
7. Sequence generator using MSJK flip flop IC's
8. Study of counters : Ripple , Synchronous , Ring , Johnson , Up-down counter and its application
9. Study of shift registers : Shift left , Shift right , parallel loading and Pulse Train generator
10. BCD Adder/Subtractor with Decoder driver and 7 segment display

Assignments:

1. Implement a multiplexer using Virtual laboratory
2. Design example based on combinational circuit
3. Design for e.g. digital clock, digital event counter,timers,and various multi-vibrator circuits, small processor ports or scrolling display
4. Implementation of combinational logic using PLAs
5. Design a pulse train generator using shift register
6. Design example based on state machine

Content Delivery Methods: Chalk & talk, Power point presentation

Assessment Methods:

1. Continuous Assessment (Attendance, Assignments/Tutorials, Unit Test)
2. End term Examination

Text Books:

1. R.P. Jain , "Modern digital electronics" , 3rdedition , 12th reprint TMH Publication, 2007.

2. Anand Kumar 'Fundamentals of Digital Circuits'--. PHI

3. Tocci R.J., Neal S. Widmer, *Digital Systems: Principles and Applications,* Pearson Education Asia, Second Indian Reprint 2002

Reference Books :

1. J.F.Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2004.

2. A.P. Malvino, D.P. Leach 'Digital Principles & Applications'' –Vith Edition-Tata Mc Graw Hill, Publication.

3. Morris Mano 'Digital Design'-- (Third Edition),.PHI

4. Thomas L Floyd & R.P Jain, *digital Fundamentals* (Eight editions), Pearson

Bharati Vidyapeeth Deemed University,
College of Engineering, Pune

Class: B.Tech (Biomedical) Sem:- IV

SUBJECT: - Rehabilitation Engineering

Lecture: 3 hours/week

Practical: 2 hours/week

Theory: 60 marks

Unit Test: 20marks

Attendance: 10 marks

Assignments: 10 marks

TW & oral: 50 marks

Course prerequisites:

- Basic Knowledge of Bones in Upper &lower Extremity
- Basic knowledge of Joints in Upper and Lower Extremity.

Course objective:

This course provides in depth knowledge on biomechanics of all soft tissues and also about prosthetic and orthotic devices introduces for upper and lower Extremity..

Course Outcomes:

On successful completion of this course, students will be able to:

1. Demonstrate Mechanical properties of soft tissues.
2. Classify various types of Orthosis and Prosthesis.
3. Demonstrate applications of orthosis and prosthesis.
4. Design of Prosthesis for upper extremity

Contents:

Unit-I

Tissue Biomechanics **(06 hours)**

General Principles of Biomechanics, Biomechanics of Soft Tissues: Stess strain behaviour,creep stability,biomechanics of Skin, biomechanics of Muscles, Biomechanics of Ligaments, biomechanics of Tendon& Bones.

Unit-II

Movement Biomechanics **(06 hours)**

Gait analysis, Forces transmitted by joints, Mass motion action, joint forces results in normal &disabled person, Biomechanical analysis of human motion using instrumentation

Unit-III

Classification of Orthosis **(06 hours)**

Principles in designing orthosis, Principles of Three point pressure, International conventions for providing orthosis, upper extremity orthosis, lower extremity orthosis, Recent developments

Unit-IV

Classification of Prosthesis **(06 hours)**

Principles in designing prosthesis, International Conventions for Providing Prosthesis,Upper extremity prosthesis, lower Extremity Prosthesis, Recent developments.

Unit-V

Design of upper Extremity Prosthesis **(06 hours)**

Introduction to Rehabilitator, Design of Artificial arms, nature of problem, general design considerations, safety & control, biomaterials used for the same.

Unit-VI

Design of Lower Extremity prosthesis **(06 hours)**

Design of Artificial limb for lower Extremity ,History of lower limb Prosthesis, Amputation surgery ,recent development.

List of Experiments:

1.study of Knee Ankle Foot Orthosis

2.Study of Hip Knee Ankle Foot Orthosis

3.Study of Below elbow Orthosis

4.Lamination of prosthesis

5.Study of Milwaukee brace

6.Study of Hand prosthesis and Orthosis

Content Delivery Methods: Chalk & talk, Models

Assessment Methods:

1. Continuous Assessment (Unit Test, Tutorials/ Assignments, Attendance)
2. End term Examination

Text Books/ Reference Books:

1. R.M.Kennedy "A Text Book of Biomedical Engineering",Blackie Publication
2. Prof Ghista,"Biomechanics",Private Publication,UAE
3. S.sunder,"Text Book of Rehabilitation ",Jaypee Publication
4. White and Puyator ,"Biomechanics",Private Publication,UAE