Rajiv Gandhi Technological University, Bhopal (MP)

B.E. (BM) Bio-Medical Engineering

Revised syllabus and Scheme of Examination effective from July 2007

THIRD SEMESTER

S. No	Course Category	Course Code (New)	Subject	Periods Per Week				Distribution of Marks				
								Theory	Practical	Internal Assessment		Total
				L	T	P	C			MST	TW	
1	BS-5	BE 301	Mathematics - III	3	1	0	4	100	-	20	-	120
2	HS-2	CS/EC/ EI/BM 302	Energy, Environment, Ethics & society.	3	1	0	4	100	-	20	-	120
3	DID 1	BM/CS/ EI 303	Digital Circuits and Systems	3	1	2	6	100	50	20	30	200
4	DC-1	BM 304	Human Physiology-I	3	1	2	6	100	50	20	30	200
5	DID 2	EX/ BM 305	Network Analysis	3	1	2	6	100	50	20	30	200
6	IT-2	BM 306	Java	0	0	4	4	-	50	-	50	100
7	NEC C-1	BM 307	Self Study	0	0	1	1	-	-	-	30	30
8	NEC C-2	BM 308	Seminar/Group Discussion etc.	0	0	1	1	-	-	-	30	30
Total				15	5	12	32	500	200	100	200	1000

BS	Basic Sciences	HS	Humanity Sciences
DC	Department Core	DID	Department Inter Disciplinary
IT	Information Technology subjects	NECC	Non Exam Credit Course
MST	Mid Semester Test	TW	Term Work (Session/ Practical)
C	Credits	L	Lecture Hrs
P	Practical Hrs	T	Tutorial Hrs

Rajiv Gandhi Technological University, Bhopal (MP)

B.E. (BM) Bio-Medical Engineering

Revised syllabus and Scheme of Examination effective from July 2007

FOURTH SEMESTER

S. No	Course Category	Course Code (New)	Subject	Periods Per Week				Distribution of Marks				
								Theory	Practical	Internal Assessment		Total
				L	T	P	C			MST	TW	
1	DC-2	BM 401	Biomedical Physics	3	1	0	4	100	-	20	-	120
2	DC-3	BM 402	Human Physiology II	3	1	2	6	100	50	20	30	200
3	DID 3	BM/EI 403	Analog Electronics	3	1	2	6	100	50	20	30	200
4	DID 4	BM/EI 404	Electronic circuits	3	1	2	6	100	50	20	30	200
5	DID 5	BM/CS/ EE 405	Analog And Digital Communication	3	1	2	6	100	50	20	30	200
6	IT-3	EI/BM 406	Software Lab -1	0	0	4	4	-	50	-	30	80
Total				15	5	12	32	500	250	100	150	1000

BS	Basic Sciences	HS	Humanity Sciences
DC	Department Core	DID	Department Inter Disciplinary
IT	Information Technology subjects	NECC	Non Exam Credit Course
MST	Mid Semester Test	TW	Term Work (Session/ Practical)
C	Credits	L	Lecture Hrs
P	Practical Hrs	T	Tutorial Hrs

COURSE CONTENTS

Category	Title	Code	Credits-4C			Theory Papers
Basic Sciences BS-5	Mathematics-III	BE 301	L	T	P	Max Marks-100
			3	1	0	Min Marks-35
						Duration-3 Hrs

Unit 1 Functions of Complex Variables: Analytic functions, Harmonic Conjugate, Cauchy - Riemann Equations, Line integral, Cauchy's theorem, Cauchy's Integral formula, Singular points, Poles and Residues, Residue theorem, Evaluation of Real Integral, Bilinear Transformation.

Unit 2 Numerical Analysis: Difference operators, Errors and Approximations, Interpolation, Inverse interpolation, Numerical differentiation, Numerical Integration by using Simpson's method, Weddel's rule and Gauss legendre open quadrate formula.

Unit 3 Solutions of algebraic and transcendental equations(Regular False, Newton-Raphson, Iterative, Graffe's root squaring methods), Solutions of simultaneous algebraic equations, Solutions of ordinary differential equations (Tailor's Series, Picard's Method, Modified Euler's method, Runge Kutta Method, Predictor-Corrector Method), Solution of Partial differential equation.

Unit 4 Introduction to optimization by linear programming, only two variable problems solution by graphical and simplex method, concept of degeneracy and duality; simple three variable transport and assignment problems and modeling into LPP.

Unit 5 introduction to Q theory and Markovian process, time independent property of exponential distribution, solution of only M/M/1 (∞/∞/FCFS) Queues; introduction to design of experiments, factorial design, sampling methods, Taguchi Loss Function, robust design methods, variance reduction and six (±3)σ outliers in quality.

References:

1. Kreyszig E; Advanced Engineering Mathematics; Wiley Eastern Limited.
2. Ramana BV; Higher Engineering Mathematics; TMH
3. Grewal BS; Higher Engineering Mathematics; Khanna Publisher.
4. Taha H; Operations Research an Introduction; PHI
5. Ross; Taguchi techniques for Quality engineering, TMH
6. Spiegel; Theory and problems of probability and statistics; TMH
7. Chandrasekharaiah DS; Engineering Maths Part II & III; Prism Books Pvt.
8. Johnson; Miller and Freund's Probability and statistics for Engineers; PHI.
9. Jaggi, Mathur; Engineering Mathematics; Khanna Publisher.

COURSE CONTENTS

Category	Title	Code	Credits-4C			Theory Papers
Humanities and Science HS 2	Energy Environment Ethics and Society	BM/CS/EC/ EE/EI/EX/IT 302	L	T	P	Max Mark-100
			3	1	0	Min Mark-35
						Duration-3Hrs

Unit 1 Energy: linkage with development, world energy scenario, fossil fuel resource- estimates and duration, India's energy scenario; Finite/ depleting energy resources, coal, oil, gas, nuclear fission, promises and present status of nuclear fusion energy; Renewable energy, solar, hydro, wind, biomass, ocean, tidal, wave and geothermal. Synergy between energy and environment, global environment issues, greenhouse gas emission, global warming, green energy solutions.

Unit 2 Society and environment: exponential growth in population, environmentally optimum sustainable population, free access resources and the tragedy of commons; environment problems and impact of P.A.T (Population, Affluence and Technology), environmentally beneficial and harmful technologies; environment impact assessment policies and auditing interaction between environment, life support systems and socio-culture system.

Unit 3 Ecosystem: definition, concepts, structure, realm of ecology, lithosphere, hydrosphere, biosphere, atmosphere-troposphere-stratosphere; energy balance to earth, matter and nutrient recycling in ecosystems; nitrogen, oxygen, carbon and water cycles, food producers, consumers and decomposers, food chains; biodiversity, threat and conservation of biodiversity. Worldviews and environmentally sustainable economic growth, introduction to Design For Environment (DFE), product lifecycle assessment for environment and ISO 14000; triple bottom-line of economic, environment and social performance; environmental ethics, its world impact and challenges.

Unit 4 (a) Air pollution-primary, secondary; chemical and photochemical reactions, effects of CO, NO, CH and particulates, acid rain, Ozone depletion; monitoring and control of pollutants
(b) Noise pollution-sources and control measures.
(c) Water pollution, analysis and management, heavy metals- and nuclear pollutions; industrial pollution from paper, pharmacy, distillery, tannery, fertilizer, food processing and small scale industries.

Unit 5 Ethics and moral values, ethical situations, objectives of ethics and its study, role morality and conflicts; values, policies and Organization Culture; Non-professional, quasi- and hard-professionals; preventive, personal, common and professional ethics; different ethical value criteria like utilitarian, virtue, right and duty ethics with discussion on the case of priority for improvement of urban (high traffic) or rural (low traffic) intersections causing equal number of fatalities; codes of ethics and their limitations; Institute of engineers code for corporate member, IEEE and ACM professional-code.

References:

1. Miller G. T Jr; Living in the environment; Cengage Publisher.
2. Cunningham W; Principles of Environmental Science: TMH
3. Harris CE, Prichard MS, Rabins MJ, Engineering Ethics; Cengage Pub.
4. Martin; Ethics in Engineering; TMH
5. Govindrajan, Natrajan, Santikumar; Engineering Ethics; PHI pub.
6. Rana SVS;Essentials of ecology and environment; PHI Pub.
7. Gerard Kiely, Environmental Engineering; TMH
8. Khan BH; Non Conventional energy resources; TMH Pub.
9. Raynold G.W. "Ethics in Information Technology; Cengage

Course Contents

Category	Title	Code	Credits-6C			Theory Paper
DID 1	Digital Circuits & Systems	BM/CS/EI 303	L	T	P	Max. Marks-100
			3	1	2	Min.Marks-35
						Duration-3hrs.

Unit I Number systems & codes, Binary arithmetic, Boolean algebra and switching function. Minimization of switching function, Concept of prime implicant , Karnaugh map method, Quine & McCluskey's method, Cases with don't care terms, Multiple output switching function.

Unit II Introduction to logic gates, Universal gate, Half adder, Half subtractor, Full adder, Full subtractor circuits, Series & parallel addition , BCD adders, Look-ahead carry generator.

Unit III Linear wave shaping circuits, Bistable, Monostable & Astable multivibrator, Schmitt trigger circuits & Schmitt-Nand gates. Logic families : RTL, DTL, All types of TTL circuits , ECL, I2L , PMOS, NMOS & CMOS logic, Gated flip-flops and gated multivibrator , Interfacing between TTL to MOS.

Unit IV Decoders, Encoders, Multiplexers, Demultiplexers, Introduction to various semiconductor memories & designing with ROM and PLA. Introduction to Shift Registers, Counters, Synchronous & asynchronous counters, Designing of Combinational circuits like code converters.

Unit V Introduction of Analog to Digital & Digital to Analog converters, sample & hold circuits and V-F converters.

References:

1. M. Mano; "Digital Logic & Computer Design"; PHI.
2. Malvino & Leach; "Digital Principles & Applications"; TMH
3. W.H. Gothman; "Digital Electronics"; PHI.
4. Millman & Taub; "Pulse, Digital & Switching Waveforms"; TMH
5. Jain RP; Modern digital Electronics; TMH
6. R.J. Tocci, "Digital Systems Principles & Applications".

List of experiment (Expandable)

All experiments (wherever applicable) should be performed through the following steps. **Step 1**: Circuit should be designed/ drafted on paper. **Step 2**: The designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER). **Step 3**: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results. **Step 4**: The bread board circuit should be fabricated on PCB prepared on PCB machine.

1. To study and test of operation of all logic gates for various IC's (IC#7400,IC#7403,IC# 7408,IC#74332,IC#7486).
2. Verification of Demorgan's theorem.
3. To construct of half adder and full adder
4. To construct of half subtractor and full subtractor circuits
5. Verification of versatility of NAND gate.
6. Verification of versatility of NOR gate.
7. Designing and verification of property of full adder.
8. Design a BCD to excess-3 code converter.
9. Design a Multiplexer/ Demultiplexer.

COURSE CONTENTS

Category	Title	Code	Credits-6C			Theory Papers
Departmental Core DC 1	Human Physiology-I	BM 304	L	T	P	Max Mark-100
			3	1	2	Min Mark-35
						Duration-3Hrs

Unit-I Cytology: Cell Structure, various cell organelles and their functions. Tissue, their types, structure and functions. Skeleto-muscular system, Different types of muscles and their function.

Unit-II Hematology: Blood composition, properties and function, Coagulation, Blood groups lymphatic systems, Reticule endothelial systems & defense mechanism of the body. Blood Groups, Hemoglobin estimation - RBC counting and WBC counting - platelet counting - Normal values.

Unit-III Cardiovascular System: Cardiac cycle- Heart sounds (PCG), Cardiac outputs, Blood flow, Blood pressure, arterial pulse and heart rate. Electrocardiogram (ECG).

Unit IV Respiratory system: Mechanics of respiration, Lung volumes and capacities, Transport of gases and control of respiration.

Unit V Renal function: Process involved in Urine Formation, Micturition, Composition of urine and principles of Haemodyialysis, temperature regulation.

References:

1. Text book of Human Physiology; Guyton, Saunderson.
2. Essentials of Anatomy & Physiology; Seeley, MGH
3. Human Physiology & Anatomy; Marieb, Adison Wesley
4. Principles of Anatomy & Physiology; Tortora, Wiley
5. Human Physiology (Vol I & II); Chatterjee, MAA
6. Medical Physiology; Marya, CBS
7. Essentials of Medical Physiology; Sembulingam, Jaypee

List of Experiments (Expandable):

1. Qualitative test for ABO grouping with antisera.
2. Determination of blood clotting time.
3. Determination of bleeding time.
4. Leucocytes count by Heamocytometry.
5. Erythrocytes count by Heamocytometry.
6. Determination of Heamoglobin.
7. Platelets count by Heamocytometry.

Course Contents

Category	Title	Code	Credit-6			Theory paper
			L	T	P	
DID-1	Network Analysis	BM/EC/EE/ EI/EX 305	3	1	2	Max. Marks-100 Min. Marks: 35 Duration: 3 hrs.

Unit I Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :- Transients in RL, RC&RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance, Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks, Dot convention, coupling co-efficient, tuned circuits, Series & parallel resonance.

Unit II Network Theorems for AC & DC circuits- Thevenins & Norton's, Superpositions, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.

Unit III Frequency domain analysis – Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain

Unit IV Concept of signal spectra, Fourier series co-efficient of a periodic waveform, symmetries as related to Fourier coefficients, Trigonometric & Exponential form of Fourier series.

Unit V Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function.
Two port parameters – Z,Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.

References:

1. M.E. Van Valkenburg, Network Analysis, (PHI)
2. F.F.Kuo, Network Analysis.
3. Mittal GK; Network Analysis; Khanna Publisher
4. Mesereau and Jackson; Circuit Analysis- A system Approach; Pearson.
5. Sudhakar & Pillai; Circuit & Networks- Analysis and Synthesis; TMH
6. Hayt W.H. & J.E. Kemmerly; Engineering Circuit Analysis; TMH
7. Decarlo lin; Linear circuit Analysis; Oxford
8. William D Stanley : Network Analysis with Applications, Pearson Education
9. Roy Choudhary D; Network and systems; New Age Pub
10. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits :TMH
11. Chakraborti :Circuit theory: Dhanpat Rai
12. B.Chattopadhyay & P.C.Rakshit; Fundamental of Electrical circuit theory; S Chand
13. Nilson & Riedel , Electric circuits ;Pearson

List of experiments (Expandable):
All experiments (wherever applicable) should be performed through the following steps. **Step 1**: Circuit should be designed/ drafted on paper. **Step 2**: The designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER). **Step 3**: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results. **Step 4**: The bread board circuit should be fabricated on PCB prepared on PCB machine.

1. To Verify Thevenin Theorem.
2. To Verify Superposition Theorem.

3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman's Theorem.
6. To Determine Open Circuit parameters of a Two Port Network.
7. To Determine Short Circuit parameters of a Two Port Network.
8. To Determine A,B, C, D parameters of a Two Port Network
9. To Determine h parameters of a Two Port Network
10. To Find Frequency Response of RLC Series Circuit.
11. To Find Frequency Response of RLC parallel Circuit.

Course Contents

Category	Title	Code	Credits-4C			Practical
IT-2	JAVA	CS/CE /BM 306	L	T	P	Max. Marks-50
			0	0	4	Min. Marks-25
						Duration-

UNIT-I Basic Java Features - C++ Vs JAVA, JAVA virtual machine, Constant & Variables, Data Types, Class, Methods, Objects, Strings and Arrays, Type Casting, Operators, Precedence relations, Control Statements, Exception Handling, File and Streams, Visibility, Constructors, Operator and Methods Overloading, Static Members, Inheritance: Polymorphism, Abstract methods and Classes

UNIT–II Java Collective Frame Work - Data Structures: Introduction, Type-Wrapper Classes for Primitive Types, Dynamic Memory Allocation, Linked List, Stack, Queues, Trees, Generics: Introduction, Overloading Generic Methods, Generic Classes, Collections: Interface Collection and Class Collections, Lists, Array List and Iterator, Linked List, Vector. Collections Algorithms: Algorithm sorts, Algorithm shuffle, Algorithms reverse, fill, copy, max and min Algorithm binary Search, Algorithms add All, Stack Class of Package java. Util, Class Priority Queue and Interface Queue, Maps, Properties Class, Un-modifiable Collections.

UNIT–III Advance Java Features - Multithreading: Thread States, Priorities and Thread Scheduling, Life Cycle of a Thread, Thread Synchronization, Creating and Executing Threads, Multithreading with GUI, Monitors and Monitor Locks. Networking: Manipulating URLs, Reading a file on a Web Server, Socket programming, Security and the Network, RMI, Networking, Accessing Databases with JDBC: Relational Database, SQL, MySQL, Oracle

UNIT–IV Advance Java Technologies - Servlets: Overview and Architecture, Setting Up the Apache Tomcat Server, Handling HTTP get Requests, Deploying a web Application, Multitier Applications, Using JDBC from a Servlet, Java Server Pages (JSP): Overview, First JSP Example, Implicit Objects, Scripting, Standard Actions, Directives, Multimedia: Applets and Application: Loading, Displaying and Scaling Images, Animating a Series of Images, Loading and playing Audio clips

UNIT–V Advance Web/Internet Programming (Overview): J2ME, J2EE, EJB, XML.

References:

1. Deitel & Deitel, ”JAVA, How to Program”; PHI, Pearson.
2. E. Balaguruswamy, “Programming In Java”; TMH Publications
3. The Complete Reference: Herbert Schildt, TMH
4. Peter Norton, “Peter Norton Guide To Java Programming”, Techmedia.
5. Merlin Hughes, et al; Java Network Programming , Manning Publications/Prentice Hall

List of Program to be perform (Expandable)

1. Installation of J2SDK
2. Write a program to show Concept of CLASS in JAVA
3. Write a program to show Type Casting in JAVA
4. Write a program to show How Exception Handling is in JAVA
5. Write a Program to show Inheritance
6. Write a program to show Polymorphism
7. Write a program to show Interfacing between two classes
8. Write a program to Add a Class to a Package
9. Write a program to demonstrate AWT.
10. Write a program to Hide a Class
11. Write a Program to show Data Base Connectivity Using JAVA
12. Write a Program to show “HELLO JAVA ” in Explorer using Applet
13. Write a Program to show Connectivity using JDBC
14. Write a program to demonstrate multithreading using Java.
15. Write a program to demonstrate applet life cycle.

COURSE CONTENTS

Category	Title	Code	Credits-4C			Theory Papers
DC 2	Biomedical Physics	BM 401	L	T	P	Max Marks-100
			3	1	0	Min Marks-35
						Duration-3 Hrs

Unit-I Bioelectricity: Theory of diffusion & permeability through biological membrane, Resting Membrane potential, Generation & transmission of impulses, Ionic channels, monophasic and biphasic recordings, Electrical activity of the heart Pace maker potential, Electrocardiography. Biological transducers, Receptor potentials. Electrical activity of the brain, Hodgin- Huxley model of squid giant axon. Contemporary models of neurons Synaptic transmission.

Unit-II Elasticity of living cell materials ,Elasticity and braking strength of bones, Muscle as a helical spring, Introduction of biomaterials, Structure and properties of material used as implants: Polymer, Ceramics, Metals composite bone cements , Tissue material. Tissue responses to implant, Cellular responses to foreign soft and hard tissues, uses of implants, Viscosity of Elemental protoplasm and its determination in cell, Role of viscosity in preparation and use of Pharmaceuticals, Surface energies of living materials, Surface tension of Bio-Fluids and its measurement.

Unit-III Radiation Biophysics-Radio Emission – Law of radioactive decay half life period- Production of radioisotopes for medical use, Generation & sources of electromagnetic radiation, Interaction of radiation with matter and tissue, Useful and harmful effects of magnetic fields, Radio waves, Micro waves, Ultraviolet radiation and infrared red thickness- Photo electric, Compton and pair production process and their significance in radiology. Radiation units- Detection and measurements of radiation.

Unit-IV Fluid Biophysics System, Fluid flow across the membrane, Fick's diffusion equation, coefficient of diffusion and permeability constant and their role in therapeutics, Influence of tube-well, Radius of tube, Length of tube and R.B.C. concentration on blood flow, Total energy equation for blood. The heart as a pump.

Unit-V Thermodynamics of living System: Living body as a thermodynamics system, Thermodynamic laws applied to bio-systems, Expressions for changes in internal energy and negative entropy change in living systems, Application of heat & mass Transfer principles to biological systems. Heat exchange, between a biological system & environment, Effect of hypothermia and hyperthermia, Production of ultra low and low temperature for medical use.

References:

1. Biophysics; Cotteril, wiley Publisher
2. Methods in modern biophysics- Benget Notling, Springer
3. Biophysics- Pattabhi, Gautham, Kulwer Acad Publisher
4. Massey and Meredeth, "Medical Physics".
5. David Freifelder, "Molecular Biology", Johns and Bartlet
6. David Cooney, "Principles of Biomedical Engineering".
7. Ruch and Patton, "Bio Physics and Medical Physiology"

COURSE CONTENTS

Category	Title	Code	Credits-6C			Theory Papers
Departmental Core DC 3	Human Physiology-II	BM 402	L	T	P	Max Marks-100
			3	1	2	Min Marks-35
						Duration-3 Hrs

Unit-I Nervous system: Structure of neuron and nerve fibre, nerve centers – Brain, its various parts and their functions, brainstem and spinal cord. Receptors, ascending and descending tracts, sensory perception with special reference to pain, Muscle tone, Regulation of posture and equilibrium and function of automatic nervous system.

Unit-II Special senses: Mechanism of vision, Color vision, Mechanism of Hearing, Test of hearing, Audimetry, Olfaction. Touch.

Unit-III Endocrine system: Endocrine glands, Hormonal Secretion and their effect, Reproductive system: functions of male reproduction system, Female reproduction organs and contraception.

Unit IV Digestive system: Salivary, Gastric and intestinal digestion and motility of gastrointestinal tract. Basic principles of metabolism and nutrition. - Enzymes - Classification - mode of action - factors influencing the enzyme action.

Unit V Biochemistry: Water and electrolytes - Brief description - acid base balance - electrophoresis - flame photometry - densitometry- colorimetry & pH metry.

References:

1. Text book of Human Physiology; Guyton, Saunderson.
2. Essentials of Anatomy & Physiology; Seeley, MGH
3. Human Physiology & Anatomy; Marieb, Adison Wesley
4. Principles of Anatomy & Physiology; Tortora, Wiley
5. Human Physiology (Vol I & II); Chatterjee, MAA
6. Medical Physiology; Marya, CBS
7. Essentials of Medical Physiology; Sembulingam, Jaypee

List of experiments(Expandable):-

1. Study of blood pressure by sphygmomanometer.
2. Study of heart activity by ECG instrument.
3. Study heart sound by phonocardiogram.
4. Measurement of blood Hemoglobin O_2 saturation level by plethysmoghraph.

COURSE CONTENTS

Category	Title	Code	Credits-6C			Theory Papers
DID 3	Analog Electronics	BM/EI 403	L	T	P	Max Mark-100
			3	1	2	Min Mark-35
						Duration-3Hrs

Unit I Bipolar Junction Transistor: Concept of load line, Biasing and bias stability, transistor at low and high frequencies, Transistor modeling – transistor hybrid model, the h parameters, the hybrid pi- model, gain bandwidth product.

Unit II JFET: Construction, Operation and Biasing of JFET, and MOSFET device, The FET small signal model, V-I characteristics, biasing and load line equivalent circuits of the device, analysis of FET amplifiers.

Unit III Multistage or Cascade amplifier: classification of multi-stage amplifier, coupling and frequency response of cascaded systems, effect of cascading on voltage gain, current gain, phase , input and output impedances and bandwidth of cascaded or multistage amplifiers, types of coupling, cascade and cascade circuits, tiller theorem, Darlington pair, bootstrap circuit.

Unit IV Tuned amplifier: single tuned, double tuned and stagger tuned amplifiers characteristics and their frequency response.

Unit V Power amplifier: Class A, B, AB, push pull and Class C power amplifiers, Comparisons of their efficiencies, types of distortion.

References:

1. Millman Halkias; Integrated Electronics. - TMH
2. Boyelstad & Neshelsky; Electronic Devices & circuits — PHI
3. David A.Bell; Electronic Devices & Circuits — PHI
4. Malvino; Principles of Electronic Devices –
5. Salivahanan Vallavraj; Electronics Devices and circuits –, TMH

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps. **Step 1**: Circuit should be designed/ drafted on paper. **Step 2**: The designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER). **Step 3**: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results. **Step 4**: The bread board circuit should be fabricated on PCB prepared on PCB machine.

1. To plot common base configuration input/output characteristic of PNP bipolar junction transistor.
2. To plot common emitter configuration input/output characteristic of NPN bipolar junction transistor.
3. To plot common Collector base configuration input/output characteristic of PNP bipolar junction transistor.
4. To draw the characteristics of FET.
5. To draw the frequency response characteristics of various types of amplifiers e.g. tuned and power amplifiers.

Course Contents

Category	Title	Code	Credit-6			Theory paper
DID 4	Electronic Circuits	BM/EI 404	L	T	P	Max. Marks-100
			3	1	2	Min. Marks: 35
						Duration: 3 hrs.

Unit I Feedback Amplifiers: Concept of feedback, positive and negative feedback, voltage and current feedback, series and shunt feedback, effect of feedback on performance characteristics of an amplifier, stability criterion.

Unit II Oscillators: Condition for sustained oscillation, R-C phase shift, Hartley, Colpitts, Crystal and wein bridge oscillators, Negative resistance Oscillator.

Unit III Transistor Circuit Techniques and amplifiers: Linear integrated circuits introduction, Differential amplifiers, configuration, Analysis using h parameters, Differential gain, common mode gain CMRR. Constant current sources, current mirrors, level shifting circuits, cascaded amplifier stages, direct coupled amplifiers, problem of drift, chopper amplifiers

Unit – IV Operational Amplifiers Specifications, imperfections in operational amplifiers. Slew Rate and its effect on full power bandwith, Input Offset voltage, Bias and offset currents, compensation, frequency response effects, Lag Compensation, application of OP.AMP Inverting and non inverting mode, differential mode, instrumentation amplifiers, comparator, Schmitt trigger, precision rectifiers, logarithmic amplifiers, Analogue computation, Summer, Average integrators, differentiators, scaling multipliers.

Unit-V Active Filters: Filter specifications, introduction to butter worth chebyshev, inverse chebyshev approximations and their comparison, first and second order low pass high pass, band pass and band stop filters, switched capacitor filters, 555 timer and its applications V/F and F/V converters, pulse generators, voltage to current to voltage converters.

References:

1. Tobbey et al: OP-Amps their design and applications
2. R.A. Gayakwad: OP-Amps and Linear Integrated circuit, PHI
3. D.Raychowdhary and Shaul Jain: Linear Integrated Circuits
4. Millman & Halkias: Itegrated Electronics

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps. Step 1: Circuit should be designed/ drafted on paper. Step 2: The designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER). Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results. Step 4: The bread board circuit should be fabricated on PCB prepared on PCB machine.

1. Char. Of Op-Amp (input offset voltage, slew rate, CMRR, BW, input bias current.
2. Linear application of Op-Amp (voltage follower, inverting and non-inverting amplifier and their frequency response, adder, subtractor, differential amplifier, integrator and differential frequency response)
3. Design and performance evaluation of feedback amplifiers.
4. Design and performance evaluation of oscillators.
5. Design and performance evaluation of various filters.

Course Contents

Category	Title	Code	Credit-6C			Theory Paper
DID 5	Analog and Digital Communication	BM/CS/EE/IT 405	L	T	P	Max.Marks-100
			3	1	2	Min.Marks-35
						Duration-3hrs.

Unit-I Time domain and frequency domain representation of signal, Fourier Transform and its properties, Transform of Gate, Periodic gate, Impulse periodic impulse sine and cosine wave, Concept of energy density and power density (Parseval's theorem), Power density of periodic gate and impulse function, impulse response of a system, convolutions, convolution with impulse function, causal and non causal system impulse response of ideal low pass filter, Correlation & Auto correlation.

Unit-II Base band signal, need of modulation, Introduction of modulations techniques, Amplitude modulation, Equation and its frequency domain representation, Bandwidth, Power distribution. AM suppressed carrier waveform equation and frequency domain representation Generation (Balance/Chopper modulator) and synchronous detection technique, errors in synchronous detection, Introduction to SSB and VSB Transmission Angle modulation, Frequency and phase modulation equation and their relative phase and frequency deviations, modulation index frequency spectrum, NBFM and WBFM, Bandwidth comparison of modulation techniques.

Unit-III Sampling of signal, sampling theorem for low pass and Band pass signal, Pulse amplitude modulation (PAM), Time division, multiplexing (TDM). Channel Bandwidth for PAM-TDM signal Type of sampling instantaneous, Natural and flat top, Aperture effect, Introduction to pulse position and pulse duration modulations, Digital signal, Quantization, Quantization error, Pulse code modulation, signal to noise ratio, Companding, Data rate and Baud rate, Bit rate, multiplexed PCM signal, Differential PCM (DPCM), Delta Modulation (DM) and Adaptive Delta Modulation (ADM), comparison of various systems.

Unit-IV Digital modulations techniques, Generation, detection, equation and Bandwidth of amplitude shift keying (ASK) Binary Phase Shift keying (BPSK), Differential phase shift keying (DPSK), offset and non offset quadrature phase shift keying (QPSK), M-Ary PSK, Binary frequency Shift Keying (BFSK), M-Ary FSK Quadrature Amplitude modulation (QAM), MODEM, Introduction to probability of error.

Unit-V Information theory and coding- Information, entropies (Marginal and conditional), Model of a communication system, Mathematical representation of source, channel and receiver characteristics, Mutual information, channel capacity efficiency of noise free channel Binary symmetric channel (BSC) Binary erasure channel (BEC), Repetition of signal, NM symmetric Binary channel, Shannon theorem, Shanon-Hartley theorem (S/N-BW trade off)Source encoding code properties; Shanon, Fano and Huffman coding methods and their efficiency error control coding, Minimum Hamming distance, Linear Block Code, Cyclic code and convolution codes. Line Encoding: Manchester coding, RZ, NRZ coding.

References:

1. Singh & Sapre, Communication System, TMH
2. Taub & shilling, Communication System, TMH
3. Hsu; Analog and digital communication(Schaum); TMH
4. B.P. Lathi, Modern Digital and analog communication system,
5. Simon Haykins, Communication System. John Willy
6. Wayne Tomasi, Electronic Communication system.
7. Martin S. Roden, Analog & Digital Communication System; Discovery Press.
8. Frank R. Dungan, Electronic Communication System, Thomson/Vikas.

List of Experiments (Expandable)

All experiments (wherever applicable) should be performed through the following steps. **Step 1**: Circuit should be designed/ drafted on paper. **Step 2**: The designed/drafted circuit should be simulated using Simulation S/W (TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER). **Step 3**: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results. **Step 4**: The bread board circuit should be fabricated on PCB prepared on PCB machine.

1. Study of sampling process and signal reconstruction and aliasing.
2. Study of PAM PPM and PDM
3. Study of PCM transmitter and receiver.
4. Time division multiplexing (TDM) and De multiplexing
5. Study of ASK PSK and FSK transmitter and receiver.
6. Study of AM modulation and Demodulation techniques (Transmitter and Receiver) Calculation of parameters.
7. Study of FM modulation and demodulation (Transmitter and Receiver) & Calculation of parameters
8. To construct and verify pre emphasis and de-emphasis and plot the wave forms.
9. Study of super hetrodyne receiver and characteristics of ratio radio receiver.
10. To construct frequency multiplier circuit and to observe the waveform
11. Study of AVC and AFC.

Course Contents

Category	Title	Code	Credit-4			Practical
IT-3	Software lab-1	EI/BM- 406	L	T	P	Max. Marks-50 Min. Marks: 25
			-	-	4	Duration: 3 hrs.

SECTION-A MATLAB

Introduction to MATLAB, Study of MATLAB programming environment, Modeling, Design and development of Programs.
Programs Related to Analog Electronics, Electronic circuits and other topics covered in the syllabus.

SECTION-B CIRCUIT SIMULATION/ PCB DESIGNING SOFTWARES

Study of Circuit Simulation Software (any one - TINA-V7/ PSPICE/ Labview/ CIRCUIT MAKER). PCB Layout Software (any one - PROTEL/ ORCADE/ ALTERA).
Design and Simulation of basic Electronic Circuits (Example Rectifiers, Amplifiers, Oscillators, Digital Circuits, Transient and steady state analysis of RC/RL/RLC circuits etc). Design and fabrication of PCB pertaining to various circuits studied on PCB machine.

References:

1. Chapman Stephen J.: MATLAB Programming for Engineers, 3rd Edition, Thomson /Cengage.
2. Rudra Pratap: Getting Started with MATLAB 7, Oxford University Press (Indian Edition).
3. Palm; Matlab 7.4; TMH.
4. Simulation/Designing Software Manuals.

List of Experiments/ Programs:
Programs to be performed based on the topics contained in the syllabus.