LESSON PLAN

Name of the Teacher	:	Dr. Amaresh Bej
Designation	:	State Aided College Teacher (Category-I)
Course of Studies	:	B.Sc. Undergraduate
Subject	:	Electronics (Honours)
Semester	:	Second
Paper	:	ELT-A-CC-2-04-TH: C Programming and Data Structures
Credits	:	04
Hours of Lecture	:	56
Objective of the Course	:	To enable the students to deal with the C language and data structure efficiently.

Week	Lessons taught	No of classes	Objective of learning
1	**C Programming Language** Introduction, Importance of C, Character Set, Tokens, Keywords, Identifier, Constants, Basic Data Types, Variables, Declaration and Assigning Values	4	Understanding of the fundamentals of the C programming language
2	**C Programming Language** Structure of C Program, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bit Wise Operators, Expressions and Evaluation of Expressions, Type Cast Operator, Implicit Conversions, Precedence of Operators	4	
3	**C Programming Language** Arrays, Concepts, Declaration, Accessing Elements, Storing Elements, Two-Dimensional and Multi-Dimensional Arrays, Input Output Statement and Library Functions (Math and String Related Functions)	2	
	Review and class test	2	
4	**Decision Making, Branching and Looping** Decision Making, Branching and Looping, if, if-else, else-if, Switch Statement, Break, for loop, while loop and do loop	4	

5	**Decision Making, Branching and Looping** Functions, Defining Functions, Function Arguments and Passing, Returning Values from Functions	4	Understanding of the advanced facilities of the C programming language
6	**Structures** Defining and Declaring Structure Variables, Accessing Structure Members, initializing a Structure, Copying and Comparing Structure Variables	4	
7	**Structures** Array of Structures, Arrays within Structures, Structures within Structures, Structures and Functions, Pointers	4	
8	**Introduction to C++** Object Oriented Programming, Characteristics of an Object-Oriented Language	2	Understanding of an object-oriented programming language using C++
	Review and class test	2	
9	**Data Structures** Definition of Stack, Array Implementation of Stack, Conversion of Infix Expression to Prefix and Postfix Expressions, Evaluation of Postfix Expression	4	Understanding of data storage mechanism in digital format
10	**Data Structures** Definition of Queue, Circular Queues, Array Implementation of Queues	4	
11	**Data Structures** Linked List and its Implementation, Link List Implementation of Stack and Queue, Circular and Doubly Linked List	4	
12	**Searching and Sorting** Insertion Sort, Selection Sort, Bubble Sort, Merge Sort	4	Development of data handling capabilities in an optimised manner
13	**Searching and Sorting** Linear Search, Binary Search, Trees, Introduction to Trees, Binary Search Tree, Insertion and Searching in a BST, Preorder	4	
14	**Searching and Sorting** Postorder and Inorder Traversal (Recursive)	2	
	Review and class test	2	

LESSON PLAN

Name of the Teacher	:	Dr. Amaresh Bej
Designation	:	State Aided College Teacher (Category-I)
Course of Studies	:	B.Sc. Undergraduate
Subject	:	Electronics (Honours)
Semester	:	Fourth
Paper	:	ELT-A-CC-4-08-TH: Operational Amplifiers and Applications
Credits	:	04
Hours of Lecture	:	56
Objective of the Course	:	To enable the students to deal with the core component of the modern electronic circuit.

Week	Lessons taught	No of classes	Objective of learning
1	**Basic Operational Amplifier** Concept of Differential Amplifiers (Dual Input and Balanced and Unbalanced Output), Constant Current Bias, Current Mirror, Cascaded Differential Amplifier Stages with Concept of Level Transistor	4	Understanding of the fundamentals of operational amplifier (OPAMP)
2	**Basic Operational Amplifier** Ideal Op-Amp and its Characteristics, Block Diagram of Op-Amp (IC 741), Deviations for a Real Op-Amp from Ideal Behaviour	4	
3	**Op-Amp Parameters** Input offset voltage, Input offset current, Input bias current, Differential input resistance, Input capacitance, offset voltage adjustment range, input voltage range, Common mode rejection ratio, Slew rate, and Supply voltage rejection ratio.	2	
	Review and class test	2	
4	**Op-Amp Circuits and Applications** Open and Closed Loop Configuration, Frequency Response, Inverting, Non-Inverting, Summing and Difference Amplifiers, Integrator, Differentiator, Multiplier and Divider, Voltage to Current and Current to Voltage Converter, Instrumentation Amplifier.	4	
5	**Comparators** Basic Comparator, Level Detector, Voltage Limiters, Schmitt Trigger	4	

6	**Signal Generators** Concept of Sinusoidal and Relaxation Type, Phase Shift Oscillator, Wien Bridge Oscillator, Square Wave Generator, Triangle Wave Generator, Saw Tooth Wave Generator	4	Creating different necessary circuits used in hardware testing facilities using OPAMP
7	**Signal Generators** Voltage Controlled Oscillator (IC 566).	4	
8	**Review and class test**	2	
8	**Timers Circuits** Multivibrators (IC 555), Functional Block Diagram	2	Understanding of signal generator, timer, and various power supply mechanisms
9	**Timers Circuits** Astable and Monostable Multivibrator Circuits and Applications, Phase Locked Loops (PLL), Block Diagram, Phase Detectors, IC565, Voltage Controlled Oscillator (IC 566)	4	
10	**Fixed and Variable IC Regulators** IC 78xx and IC 79xx (Concepts only), IC LM317, Output Voltage Equation, SMPS, Principle of DC-to-DC Conversion, Block Diagram Representation of SMPS Module	4	
11	**Review and class test**	2	
11	**Signal Conditioning Circuits** Sample and Hold Systems	2	Learning of analog signal filters used in modern electronic communication systems
12	**Signal Conditioning Circuits** Active Filters, Butterworth Filter	4	
13	**Signal Conditioning Circuits** First and Second Order Low Pass and High Pass Filters, Band Pass Filter, Band Reject Filter, All-Pass Filter	4	
14	**Signal Conditioning Circuits** Log and Antilog Amplifiers	2	
	Review and class test	2	

LESSON PLAN

Name of the Teacher	:	Dr. Amaresh Bej
Designation	:	State Aided College Teacher (Category-I)
Course of Studies	:	B.Sc. Undergraduate
Subject	:	Electronics (Honours)
Semester	:	Fifth
Paper	:	ELT-A-CC-5-11-TH: Electronic Instrumentation
Credits	:	04
Hours of Lecture	:	56
Objective of the Course	:	To enable the students to understand and design various electronic instruments and sensors.

Week	Lessons taught	No of classes	Objective of learning
1	**Qualities of Measurement** Specifications of Instruments and their Static and Dynamic Characteristics, Error (Gross Error, Systematic Error, Absolute Error and Relative Error) and Uncertainty Analysis, Statistical Analysis of Data and Curve Fitting	4	Understanding the fundamentals of measuring quantities, errors and various measurement techniques
2	**Basic Measurement Instruments** PMMC Instrument, Galvanometer, DC Measurement, Ammeter, Voltmeter, Ohm Meter, AC Measurement, Digital Voltmeter (Integrating and Nonintegrating Types) System, Digital Multimeter, Digital Frequency Meter System	4	
3	**Connectors and Probes** Low Capacitance Probes, High Voltage Probes, Current Probes, Identifying Electronic Connectors, Audio and Video, RF/Coaxial, USB etc.	4	
4	**Review and class test**	2	
4	**Measurement of Resistance and Impedance** Low resistance by Kelvin's double bridge method, Medium Resistance by Voltmeter Ammeter Method and Wheatstone Bridge Method	2	
5	**Measurement of Resistance and Impedance** High Resistance by Megger AC Bridges, Measurement of Self Inductance, Maxwell's Bridge, Hay's Bridge and Anderson's Bridge, Measurement of C, Schering's Bridge, DeSa Measurement of Capacitance, Schering's Bridge, DeSauty's Bridge, Measurement of Freq., Wien's Bridge uty's Bridge, Measurement of Frequency, Wien's Bridge	4	

6	**A-D and D-A Conversion** Circuit and working of 4 Bit Binary Weighted Resistor Type and R-2R Ladder Type D-A Conversion, Circuit of A-D Conversion, Characteristics	4	Handling different measuring circuits and analog to digital conversion
7	**A-D and D-A Conversion** Successive Approximation ADC, (Mention of Relevant ICs for all)	2	
7	**Review and class test**	2	
8	**Oscilloscope** CRT, Waveform Display and Electrostatic Focusing, Time Base and Sweep Synchronization, Measurement of Voltage, Frequency and Phase by CRO	4	Visual understanding of amplitude, frequency, and phase of a signal and respective signal generator circuits
9	**Oscilloscope** Oscilloscope Probes, Block Diagram, Working Principle, Advantages and Applications of Dual Trace Oscilloscope, Sampling Oscilloscope, DSO and Powerscope, CRO Specifications (Bandwidth, Sensitivity, Rise Time)	4	
10	**Signal Generators** Audio Oscillator, Pulse Generator, Function Generators	4	
11	**Review and class test**	2	
11	**Transducers and Sensors** Classification of Transducers, Basic Requirement/Characteristics of Transducers	2	Learning of the role and physics behind the transducers and sensors used in modern instruments
12	**Transducers and Sensors** Active and Passive Transducers, Resistive (Potentiometer, Strain Gauge, Theory, Types, Temperature Compensation and Applications), Capacitive (Variable Area, Variable Air Gap and Permittivity Types)	4	
13	**Transducers and Sensors** Inductive (LVDT) and Piezoelectric Transducers, Measurement of Displacement, Velocity and Acceleration (Translational and Rotational), Measurement of Pressure (Manometers, Diaphragm, Bellows), Measurement of Temp. (RTD, Thermistor, Thermocouple, Semiconductor IC Sensors)	4	
14	**Transducers and Sensors** Light Transducers (Photoresistors, Photovoltaic Cells, Photodiodes)	2	
	Review and class test	2	

LESSON PLAN

Name of the Teacher	:	Dr. Amaresh Bej
Designation	:	State Aided College Teacher (Category-I)
Course of Studies	:	M.Sc. Postgraduate
Subject	:	Electronics Science
Semester	:	Second
Paper	:	EST 202: Digital Circuits, Microprocessors and Micro-controllers
Credits	:	04
Hours of Lecture	:	56
Objective of the Course	:	To enable the students to learn digital electronics, microprocessor, and micro controllers.

Week	Lessons taught	No of classes	Objective of learning
1	**Digital Circuits** Combinational logic circuits: multiplexers, decoders, demultiplexers, parity generator/checker, arithmetic circuits	4	Understanding the fundamental digital circuits, memories, and FPGA
2	**Digital Circuits** Sequential circuits: flip-flops, asynchronous and synchronous circuits, flow tables, state tables and state diagrams, timing diagram. Shift-registers and counters	4	
3	**Digital Circuits** Data converters: ADCs and DACs. Display and display drivers: LED, 7-segment display	4	
4	**Semiconductor memories** Memory organization, address decoding, access times, SRAM, DRAM, ROM, PROM, EPROM, flash memory	4	
5	**HDL** Introduction to HDL. Digital system design using HDL, FPGA	4	
6	**Review and class test**	2	

6	**Microprocessor** Introduction to microprocessors (8085)	2	Understanding microprocessor architecture and developing the skill for low/core level code writing
7	**Microprocessor** Block diagram, address and data bus	4	
8	**Microprocessor** Assembly language programming	4	
9	**Microprocessor** Interrupts. Introduction to 8086 and advanced microprocessors	4	
10	**Microprocessor** Interfacing of memory, I/O devices and supporting ICs	4	
11	**Microprocessor** Analog interfacing and industrial control	2	
	Review and class test	2	
12	**Microcontroller** 8051 microcontroller architecture and programming	4	Developing electronically programmable circuits using microcontrollers
13	**Microcontroller** Interfacing of I/O devices	4	
14	**Microcontroller** 8051 based system design	2	
	Review and class test	2	

LESSON PLAN

Name of the Teacher	:	Dr. Amaresh Bej
Designation	:	State Aided College Teacher (Category-I)
Course of Studies	:	M.Sc. Postgraduate
Subject	:	Electronics Science
Semester	:	Third
Paper	:	EST 302: VLSI Technology
Credits	:	04
Hours of Lecture	:	56
Objective of the Course	:	To enable the students to VLSI technology used in fabricating integrating circuits.

Week	Lessons taught	No of classes	Objective of learning
1	**Fundamentals** Clean room and its usage, crystal growth (Czchrosky & floating zone), epitaxial growth, wafer cleaning.	4	Understanding the basic process of VLSI technology
2	**Thermal Oxidation** Uses of oxides, dry and wet oxidation, oxidation kinetics, ultrathin oxides, oxinitrides, oxidation systems.	4	
3	**Diffusion** Fick's law, constant-source and constant-dose diffusion, diffusion systems, diffusion mechanisms	4	
4	**Ion-implantation** Mechanism, system, advantages, implant damage, damage annealing	4	
5	**Annealing** Furnace annealing, rapid thermal annealing, rapid thermal oxidation (RTO), damage annealing	4	
6	**Review and class test**	2	
6	**Chemical vapor deposition** Deposition of oxide, nitride and poly-silicon, metals	2	

7	**Physical vapor deposition** Thermal evaporation, e-beam evaporation, sputtering, junction spiking, electromigration, step coverage	4	Understanding the various protocols of fabrication in VLSI technology
8	**Lithography** Photolithography and photoresist, steps, pattern transfer, resist stripping	4	
9	**Lithography** Introduction to e-beam and x-ray lithography	4	
10	**Etching** Wet and dry etching, plasma etching	4	
11	**Etching** Reactive ion etching (RIE)	2	
	Review and class test	2	
12	**Process integration** n-MOS, CMOS, BiCMOS, SOI and FinFET technology	4	Understanding the finalization process
13	**Finalization** High and low-k gate dielectrics, multi-level metallization	4	
14	**Finalization** Materials for local and global interconnects, silicide and SALICIDE, CMP	2	
	Review and class test	2	

LESSON PLAN

Name of the Teacher	:	Dr. Amaresh Bej
Designation	:	State Aided College Teacher (Category-I)
Course of Studies	:	M.Sc. Postgraduate
Subject	:	Electronics Science
Semester	:	Fourth
Paper	:	ESE 404: DSP and Computer Networking (Part)
Credits	:	02
Hours of Lecture	:	28
Objective of the Course	:	To enable the students to understand the backgrounds of a computer network.

Week	Lessons taught	No of classes	Objective of learning
1	**O.S.I. reference model and LAN** OSI reference model, TCP/IP model, circuit switching, packet switching, various transmission media, LAN Topologies, LAN components- NIC, hubs, switches, MAN and WAN- routers, repeaters, gateways	4	Understanding the fundamentals of a computer network
2	**Data Link Layer** Error control and flow control techniques, MAC layer	4	
3	**Internet Protocol and Routing** Addressing scheme, subnet and supernetting, routing schemes	4	
4	**Transport layer** Reliability of transmission, ports, connections and endpoints, concept of sliding windows	4	
5	**Transport layer** TCP segment format, establishing, closing and resetting a TCP connection, TCP port numbers.	4	
6	**Introduction to Wireless Networks** GSM, MANET	4	
7	**Introduction to Wireless Networks** Bluetooth	2	
	Review and class test	2	

Lesson Plan

Name of the teacher:- **Gul Mohammad**
Designation:- Assistant Professor, Department of Electronics
UG Semester 3
Course taught:- ELT-A-CC-3-07-TH: Electromagnetics
Credits: 04
Lecture Hours: 56+2
Objective of the Course:- To enable the students, a fundamental understanding of electromagnetic theory and its applications in various engineering fields.

Week	Lessons Taught	No of classes	Learning Objective
1	Vector Analysis	4	Students will be able to apply vector analysis principles to solve Poisson's and Laplace's equations in various mathematical and physical contexts.
2	Poisson's Equation and Laplace Equation	4	
3	Electrostatics 1: Coulomb's Law, Electric Field and Electric Potential due to Discrete and Continuous Charge Distributions, Electric Flux Density, Gauss's Law – Maxwell's Equation and Applications,	4	students will be able to demonstrate a comprehensive understanding of electrostatic principles and apply them to solve complex problems in various contexts.
4	Electrostatics 2: Electric Dipole, Electric Fields in Different Materials, Current and Current Density, Polarization, Dielectric Constant, Linear and Nonlinear, Homogeneous and Inhomogeneous, Isotropic and Anisotropic Dielectrics,	4	
5	Electrostatics 3: Boundary Conditions, Poisson's and Laplace's Equations and their Derivations and Examples of Solutions, Uniqueness Theorem, Capacitance and Capacitors, Method of Images, Electrostatic Energy and Forces, Energy Density.	4	
6	Magnetostatics 1: Biot Savart's Law and Applications, Magnetic Dipole, Ampere's Circuital Law.	4	Students will be able to analysed and predict the behaviour of static magnetic fields and their interactions with charged particles and currents.
7	Magnetostatics 2: Maxwell's Equation and Applications, Magnetic Flux and Magnetic Flux Density – Maxwell's Equation, Scalar and Vector Magnetic Potentials.	4	
8	Magnetostatics 3: Magnetization in Materials and Permeability, Anisotropic Materials, Magnetic Boundary Conditions, Inductors and Inductances, Mutual and Self Inductance, Magnetic Circuits, Magnetic Energy, Forces, Torque and Moment	3	
9	Time-Varying Fields and Maxwell's Equations 1: Faraday's Law of Electromagnetic Induction – Maxwell's Equation.	4	Students will be able to analysed time-varying fields and apply Maxwell's equations to predict electromagnetic
10	Time-Varying Fields and Maxwell's Equations 2: Stationary Circuit in Time-Varying Magnetic Field, Transformer and Motional EMF,	4	

	Displacement Current, Maxwell's Equations in Differential and Integral Form and Constitutive Relations.		phenomena.
11	Time-Varying Fields and Maxwell's Equations 3: Potential Functions, Lorentz Gauge and Wave Equation for Potentials, Concept of Retarded Potentials, Electromagnetic Boundary Conditions.	3	
12	Electromagnetic Wave Propagation 1: Time-Harmonic Electromagnetic Fields, Electromagnetic Spectrum, Wave Equation in a Source Free Isotropic Homogeneous Media	4	Understand the principles and mechanisms governing electromagnetic wave propagation.
13	Electromagnetic Wave Propagation 2: Uniform Plane Waves in Lossless and Lossy Unbounded Homogeneous Media, Uniform Plane Waves in Good Dielectrics and Conductor, Skin Effect, Wave Polarization, Reflection and Transmission of Plane Waves at Normal and Oblique Incidence	4	
14	Electromagnetic Wave Propagation 2: Snell's Law, Fresnel's Equation, Brewster's Angle, Wave Propagation in Dispersive Media, Normal and Anomalous Dispersion, Concept of Phase and Group Velocity, Electromagnetic Power and Poynting Vector and Poynting Theorem.	4	
15	Review and Class Test	2	To review

Lesson Plan

Name of the teacher:- **Gul Mohammad**

Designation:- Assistant Professor, Department of Electronics

UG Semester 4

Course taught:- ELT-A-CC-4-10-TH: Signals and Systems

Credits: 04

Lecture Hours: 56

Objective of the Course:- To provide students with an understanding of fundamental principles and techniques for analyzing and manipulating signals in both time and frequency domains within various engineering applications.

Week	Lessons Taught	No of classes	Learning Objective
1	Signals and Systems 1: Continuous and Discrete Time Signals, Digital Signal, Types of Signals	4	Students will understand the fundamental principles and mathematical representations of signals and systems, including analysis techniques and their applications in engineering and communication systems.
2	Signals and Systems 2: Signals in Time, Spatial and Frequency Domain, Transformation of the Independent Variable	4	
3	Signals and Systems 3: Exponential and Sinusoidal Signals, Impulse and Unit Step Functions, Continuous and Discrete Time Systems and their Classifications, Basic System Properties.	4	
4	Linear Time Invariant Systems (LTI) 1: Discrete and Continuous Time LTI Systems, Properties of LTI Systems	4	students will understand the principles and properties of Linear Time Invariant Systems (LTI) and their application in signal processing and control.
5	Linear Time Invariant Systems (LTI) 2: Convolution, Commutative, Distributive, Associative, LTI Systems with and without Memory.	4	
6	Linear Time Invariant Systems (LTI) 3: Invariability, Causality, Stability, Unit Step Response, Differential and Difference Equation Formulation, Block Diagram Representation of First Order Systems.	6	
7	Fourier Series 1: Fourier Series Representation of Periodic Signals, Continuous Time Periodic Signals	4	students will be able to understand and apply Fourier series to analyze periodic functions and decompose them into a sum of sinusoidal functions.
8	Fourier Series 2: Convergence of the Fourier Series, Properties of Continuous Time Fourier Series	4	
9	Fourier Series 3: Discrete Time Periodic Signals, Properties of Discrete Time Fourier Series	4	
10	Fourier Series 4: Frequency Selective Filters, Problem solving on this chapter.	4	

11	Fourier Transform 1: Aperiodic Signals, Periodic Signals, Problem solving	6	Students will be able to apply Fourier Transform to analyze and synthesize signals in both time and frequency domains.
12	Fourier Transform 2: Properties of Continuous Time Fourier Transform, Convolution and Multiplication Properties, Problem solving	6	
13	Fourier Transform 3: Properties of Fourier Transform and Basic Fourier Transform Pairs, Problem solving.	4	
14	Z-Transform 1: Introduction to Z-Transform, Region of Convergence, Properties of Z-Transforms,	4	
15	Z-Transform 2: Inverse Z-Transforms, Relation with Laplace and Fourier Transforms, Condition of Stability, Application of Z-Transforms.	6	Students will be able to apply the Z-Transform method to analyze discrete-time signals and systems in the frequency domain.
16	Problem solving on Z-Transform	4	

LESSON PLAN

Name of the Teacher	:	Dr. Adrija Banerjee
Designation	:	State Aided College Teacher (Category-I)
Course of Studies	:	B.Sc. Undergraduate
Subject	:	Electronics (Honours)
Semester	:	Third
Paper	:	ELTA-CC-3-06-TH: Electronic Circuits
Credits	:	04
Hours of Lecture	:	56
Objective of the Course	:	To learn about the theoretical principles and practical applications of various electronic circuits

Week	Lessons taught	No. of classes	Objective of learning
1	**Diode Circuits** Piece-Wise Linear Characteristics of Diode, DC Load Line Analysis, Quiescent (Q) Point, Clipping and Clamping Circuits	4	To learn about the constructions, working principles and practical applications of the basic diode circuits
2	**Diode Circuits** Rectifiers, Half-Wave Rectifier, Full-Wave Rectifier (Center Tapped and Bridge), PIV, Ripple Factor, Efficiency	4	
3	**Diode Circuits** Filters, Types, Circuit Diagram and Explanation of Shunt Capacitor, Filter with Waveforms, Zener Diode Regulator, Circuit Diagram, Explanation for Load and Line Regulation	4	
4	**Review and Class Test**	2	
	Bipolar Junction Transistor Circuits Review of CE, CB Characteristics and Regions of Operation. Hybrid Parameters, re Model, Transistor Biasing, DC Load Line, Operating Point, Thermal Runaway, Stability and Stability Factor	2	To learn about the constructions, working principles and practical applications of the basic BJT circuits
5	**Bipolar Junction Transistor Circuits** Fixed Bias with and without Emitter Resistor, Collector to Base Bias, Voltage Divider Bias and Emitter Bias, Transistor as a Switch, Circuit and Working, Darlington Pair and its Applications	4	

6	**Bipolar Junction Transistor Circuits** BJT Amplifier, Voltage and Power Amplifier DC and AC Load Line Analysis, Hybrid Model of CE Configuration, Quantitative Study of Frequency Response of CE Amplifier	4	
7	**Bipolar Junction Transistor Circuits** Effect on Gain and Bandwidth for Cascaded RC Coupled CE Amplifier	2	
	Review and Class Test	2	
8	**Feedback Amplifiers** Concept of Feedback, Negative and Positive Feedback, Types of Feedback Circuits, Advantages and Disadvantages of Negative Feedback, Voltage (Series and Shunt) and Current (Series and Shunt) Feedback Amplifiers	4	To learn about the basic principle, characteristics, advantages and disadvantages of feedback and its application in various electronic circuits
9	**Feedback Amplifiers** Effect of Negative Feedback on Gain, Input and Output Impedances, Bandwidth and Distortion, Barkhausen Criteria	4	
10	**Feedback Amplifiers** Phase Shift Oscillator, Colpitts Oscillator, Hartley Oscillator, Regulated Power Supply, Series and Shunt (using BJT)	4	
11	**Review and Class Test**	2	
	MOSFET Circuits Review of Depletion and Enhancement MOSFET, Biasing of MOSFETs, Small Signal Parameters	2	To learn about the constructions, working principles and practical applications of the MOSFET circuits, power amplifiers and single-tuned amplifiers
12	**MOSFET Circuits** Common Source Amplifier Circuit Analysis, CMOS Circuits **Power Amplifiers** Difference between Voltage and Power Amplifier, Classification of Power Amplifiers, Class A, Class B, Class C, Class AB and their Comparisons	4	

13	**Power Amplifiers** Operation of Class A Single Ended Power Amplifier, Operation of Transformer Coupled Class A Power Amplifier, Efficiency, Operation of Complementary Symmetry Class B Push Pull Power Amplifier, Crossover Distortion, Heat Sinks	4	
14	**Single Tuned Amplifiers** Circuit Diagram, Working and Frequency Response, Limitations of Single Tuned Amplifier, Applications of Tuned Amplifiers in Communication Circuits	2	
	Review and Class Test	2	

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Name of the Teacher	:	Dr. Adrija Banerjee
Designation	:	State Aided College Teacher (Category-I)
Course of Studies	:	B.Sc. Undergraduate
Subject	:	Electronics (Honours)
Semester	:	Six
Paper	:	ELT-A-CC-6-14-TH: Photonics
Credits	:	04
Hours of Lecture	:	56
Objective of the Course	:	To learn the basic principles, characteristics and practical applications of photonics

Week	Lessons taught	No. of classes	Objective of learning
1	**Light as Electromagnetic Wave** Plane Waves in Homogeneous Media, Concept of Spherical Waves, Reflection and Transmission at an Interface, Total Internal Reflection, Brewster's Law, Stoke's Law, Interaction of Electromagnetic Waves with Dielectrics, Origin of Refractive Index, Dispersion	4	To learn about the wave characteristics of light and different types of optical phenomena like interference and diffraction
2	**Interference** Superposition of Waves of Same Frequency, Concept of Coherence, Interference using Division of Wavefront and Division of Amplitude, Young's Double Slit, Thin Film Interference, Anti-Reflecting Films, Newton's Rings, Michelson Interferometer, Holography	4	
3	**Diffraction** Huygen's Principle, Diffraction Integral, Fresnel and Fraunhoffer Approximations, Fraunhoffer Diffraction by Single Slit, Rectangular Aperture, Double Slit, Rayleigh Criterion of Limit of Resolution, Resolving Power of Microscopes and Telescopes, Diffraction Grating, Resolving Power and Dispersive Power	4	
4	**Review and Class Test**	2	

	Polarization Linear, Circular and Elliptical Polarization	2	To learn about the basic characteristics and effects of polarization
5	**Polarization** Polarizer-Analyzer and Malus' Law, Double Refraction by Crystals, Interference of Polarized Light	4	
6	**Polarization** Wave Propagation in Uniaxial Media, Half Wave and Quarter Wave Plates, Faraday Rotation and Electro-Optic Effect	4	
7	**Review and Class Test**	2	
	Light Emitting Diodes Construction, Materials, Operation, Concept of Quantum Efficiency	2	To learn about the theories, working principles and practical applications of LED and Lasers
8	**Lasers** Interaction of Radiation and Matter, Einstein Coefficients, Condition for Amplification, Laser Cavity, Threshold for Laser Oscillation, Line Shape Function, Examples of Common Lasers, Semiconductor Injection Laser Diode	4	
9	**Review and Class Test**	2	
	Photodetectors Bolometer, Photomultiplier Tube, Charge Coupled Device	2	To learn about the theories, working principles and practical applications of photodetectors and LCD displays
10	**Photodetectors** Photo Transistors and Photodiodes(p-i-n, Avalanche), Quantum Efficiency and Responsivity	4	
11	**LCD Displays** Types of Liquid Crystals, Principle of Liquid Crystal Displays, Applications, Advantages over LED displays	2	
	Review and Class Test	2	

12	**Guided Waves and Optical Fiber** TE and TM Modes in Symmetric Slab Waveguides, Effective Refractive Index, Field Distributions	4	To learn about the theories, working principles and practical applications of guided waves and optical fiber
13	**Guided Waves and Optical Fiber** Dispersion Relation and Group Velocity, Step Index Optical Fiber, Total Internal Reflection, Concept of Linearly Polarized Waves in Step Index Circular Dielectric Waveguides, Single Mode and Multimode Fibers, Attenuation and Dispersion in Optical Fiber	4	
14	**Guided Waves and Optical Fiber** Basic Idea of OEIC (Optoelectronic Communication System)	2	
	Review and Class Test	2	

LESSON PLAN

Name of the Teacher	:	Dr. Adrija Banerjee
Designation	:	State Aided College Teacher (Category-I)
Course of Studies	:	M.Sc. Postgraduate
Subject	:	Electronics Science
Semester	:	First
Paper	:	EST 104: Semiconductor Devices
Credits	:	04
Hours of Lecture	:	56
Objective of the Course	:	To learn about the basic principles, characteristics and applications of semiconductor devices

Week	Lessons taught	No. of classes	Objective of learning
1	**Elements of semiconductor physics** Electron and hole concentrations in the bands for degenerate and nondegerate semiconductors**,** effective density of states in the conduction and valence band	4	To learn about the basic elements of semiconductor physics
2	**Elements of semiconductor physics** Distinction between shallow and deep impurities, charge neutrality condition, calculation of Fermi level, features of SRH processes	4	
3	**Basic equations for device operations** Basic carrier transport mechanisms in semiconductors, electron and hole current densities, continuity equations; Poisson's equation and distribution of electric field and potential.	4	
4	**Review and Class Test**	2	
	Metal-semiconductor diode Device structure and energy band diagram, Schottky effect, barrier height	2	To learn about the basic principles and characteristics of Metal-semiconductor diode
5	**Metal-semiconductor diode** Voltage dependence of semiconductor surface potential, current transport mechanisms, device capacitance, series resistance effect, ohmic contact	2	
	Review and Class Test	2	

6	**P-N junction diode** Recapitulation of basic features for abrupt and linearly graded junctions, concept of quasi Fermi level and derivation of Shockley equation, generation and recombination currents, diffusion capacitance, breakdown mechanisms: thermal instability, tunneling and avalanche multiplication, transient and noise behavior	4	To learn about the basic principles, characteristics and applications of semiconductor diodes and bipolar junction transistors
7	**P-N junction diode** Device performance as rectifier, voltage regulator, varistor, varactor, application of P-N junction as solar cell	2	
	Semiconductor hetero junction diode Device structure and energy band diagram, concept of band discontinuities, built-in potential	2	
8	**Semiconductor hetero junction diode** Device capacitance, current transport mechanism	2	
	Bipolar Junction Transistor Device structure, band diagrams, current components, amplification, Ebers-Moll relations, microwave BJT	2	
9	**Bipolar Junction Transistor** Ebers-Moll relations, microwave BJT	2	
	Review and Class Test	2	
10	**Field-Effect Transistors**: **JFET** Device structure and operation, gradual channel approximation, pinch-off and saturation, I-V characteristics, normally-on and -off FET	4	To learn about the basic principles, characteristics and applications of various Field-effect Transistors like JFET, MESFET and MOSFET
11	**MESFET** Device structure and operation, energy band diagram and operation	2	
	MOS capacitors Energy band diagram, accumulation, depletion and inversion mode of operation, threshold voltage, flat band voltage, defects in MOS system, capacitance-voltage characteristics	2	
12	M**OSFET** Device structure and operation, band diagram, I-V characteristics, subthreshold current and other performance parameters, parasitic effects	4	
13	**Review and Class Test**	2	

	Power Electronic Devices Basic Characteristics of SCR, reverse and forward blocking, two transistor analogy	2	To learn about the basic principles, characteristics and applications of power electronic devices
14	**Power Electronic Devices** Constructions and the basic characteristics of DIAC, TRIAC, IGBT and UJT, and their applications	2	
	Review and Class Test	2	

LESSON PLAN

Name of the Teacher	:	Dr. Adrija Banerjee
Designation	:	State Aided College Teacher (Category-I)
Course of Studies	:	M.Sc. Postgraduate
Subject	:	Electronics Science
Semester	:	Fourth
Paper	:	EST 401: Control and Instrumentation
Credits	:	04
Hours of Lecture	:	56
Objective of the Course	:	To study the basic concepts and different types of analysis of the control system along with its practical applications in modern electronic instruments

Week	Lessons taught	No. of classes	Objective of learning
1	Introduction to control system, open loop and closed loop control system, system sensitivities, error amplifier, on-off controller, Proportional (P), Proportional-Integral (PI), Proportional-Derivative (PD), and PID controllers	4	To learn about the basic concepts of a control system and its analysis
2	Transfer function, block diagram and signal flow graph	4	
3	**Review and Class Test**	2	
	Stability analysis	2	To learn about the different methods of stability analysis of a control system
4	Stability analysis	2	
	Root locus techniques	2	
5	Root locus techniques	2	
	Polar plot, Nyquist analysis	2	
6	Bode analysis, Nichol's chart design	2	
	Review and Class Test	2	
7	State variable analysis	4	To learn about the method of state variable analysis and the basic concept of nonlinear control system
8	Introduction to nonlinear control system analysis	2	
	Review and Class Test	2	
9	Characteristics of instruments and measuring systems, errors in measurements, dynamic characteristics of instruments and measurement systems, galvanometers, ammeter, voltmeter, potentiometers	4	To learn about the basic characteristics, working principles and practical applications

10	AC bridges, watt meter, optoelectronic measurements	4	of various measuring instruments
11	**Review and Class Test**	2	
	Oscilloscopes: CRT, CRO,	2	To learn about the basic constructions, working principles and applications of oscilloscopes
12	Storage and digital storage oscilloscope	2	
	Review and Class Test	2	
13	Wave analyzer and spectrum analyzer. Transducers	4	To learn about the basic constructions, working principles and applications of wave analyzer, spectrum analyzer, and transducers. Also a brief introduction to the interfacing
14	Interfacing: RS 232 serial, parallel, IEEE 488, introduction to interfacing softwares	2	
	Review and Class Test	2	

Lesson Plan

Name of the Teacher:- **Imtiaz Ahammad**

Designation:- Assistant Professor, Department of Electronics
Class – M.Sc. PG Semester - II
Course Taught:- EST 204: Communication
Credits: 04
Lecture Hours: 56
Objective of the Course:-

1. To identify the basic elements of a communication system
2. To analyse baseband signals in time domain and in frequency domain
3. To compare and contrast various analog and digital modulation and demodulation techniques
4. To evaluate the performance of modulation and demodulation techniques in various transmission environments
5. To analysis of noise and its impact on different modulation techniques.

Week	Lessons Taught	No of classes	Learning Objective
1	**Analog Communication:** Basic signal theory: Introduction to communication systems, difference between analog and digital communication process.	4	To know the basic elements of a communication system & to understand the basic concepts of the analog communication systems & analyze various analog continuous wave modulation and demodulation techniques
2	Amplitude modulation:Basic principles of DSB, SSB & VSB amplitude modulation systems,	4	
3	Modulation and demodulation principles, modulators and demodulators, Quadrature amplitude modulation (QAM).	4	
4	Frequency & phase modulation: Modulators and demodulators	4	Understand the concept of Angle modulation and demodulation and attain the knowledge about the functioning of different AM, FM Transmitters & Receivers.
5	Frequency discriminators and phase locked loops, receivers, comparison of the effect of noise in different processes.	4	
6	Noise and noise analysis.	4	To understand the influence of noise on the performance of analog communication systems
7	Pulse Modulation: Sampling, PAM, PWM, PPM, delta modulation, ADM.	4	To understand the various processes like sampling, PCM, delta modulation, adaptive delta modulation
8	Review and Class Test	2	To Review what is taught
9	**Digital Communication**: Quantization: Uniform & non-uniform, pulse code modulation, basic idea of digital compression of speech signals, echo control.	4	To understand the detail on the various schemes used to transmit digital signals, including ASK,FSK, PSK, BPSK, QPSK and digital coding techniques, channel coding techniques that are used in modern telecommunication system
10	ASK, FSK, PSK, BPSK and QPSK	4	
11	Principle of data transmission; Data transmission in presence of noise, Fundamentals of digital signal processing, correlations & autocorrelations,	4	
12	General communication applications: Principles of telephony, television fundamentals, radar principles,	4	To understand the concepts of satellite subsystems and designing of satellite uplink and downlinks
13	Mobile and cellular telephony, Satellite communications	4	

14	Fiber Optic Communication.	4	Students should be able to understand the functionality of each components of a fiber optic communication system.
15	Review and Class Test	2	To Review what is taught

Lesson Plan

Name of the Teacher:- **Imtiaz Ahammad**

Designation:- Assistant Professor, Department of Electronics
Class – B.Sc. UG Semester - I
Course Taught:- ESE 401: **VLSI Design**
Credits: 04
Lecture Hours: 56
Objective of the Course:-

1. To build upon the theoretical, mathematical and physical analysis of digital VLSI circuits, for proper understanding of concept, working, analysis and design.
2. To use modelling of the various semiconductor devices for digital VLSI circuit design
3. To learn the basic theory of MOS Transistors, basic steps of fabrication
4. To learn basic CMOS Circuits and CMOS process technology.
5. To impart in-depth knowledge about analog and digital CMOS circuits

Week	Lessons Taught	No of classes	Learning Objective
1	Overview of VLSI design: design flow, design hierarchy and design styles.	4	Understanding the basics of the physical design process of VLSI design flow analysing of the design rules and layout diagram
2	CMOS processing technology: process flow, concept of masks, stick diagram, design rules and layout.	4	
3	CMOS inverter design issues: circuit characterization and performance estimation, voltage transfer characteristics	4	Understanding & analyzing the performance of CMOS Inverter circuits on the basis of their operation and working.
4	Noise margins, switching characteristics and gate delay, power Dissipation.	4	
5	Combinational and sequential circuit design: design of logic circuits, complex circuits, Euler's rule. Design of latches and flip-flops	4	Understanding combinational & sequential CMOS circuit with various topologies like domino logic, Bi-CMOS etc.
6	Clocking strategies. Pseudo-nMOS circuits, switch-logic based design.	4	
7	BiCMOS technology and circuits, I/O structures	4	
8	Dynamic logic circuit design: charge storage & leakage. Precharge-evaluate, domino & zipper logic. Dynamic shift register design.	4	Understanding the Dynamic Logic Circuit Concepts and CMOS Dynamic Logic Families
9	Review and Class Test	2	To Review what is taught
10	Chip design options: custom and semicustom design, gate array, standard cell and programmable logics.	4	Understanding the design of memories with efficient architectures to improve access times, power consumption
11	Semiconductor memories: memory organization, sense amplifier, drivers and buffers.	4	
12	Design of SRAM, DRAM, and non-volatile memory devices.	4	
13	Analog CMOS design: MOSFET capacitances & small signal models. MOS resistor, MOS current source, current mirror circuits	4	Understanding of the current mirrors and Differential amplifier & apply the entire concepts to design CMOS amplifier
14	MOS voltage source. CMOS OPAMP design: differential amplifier, output stage and compensation techniques.		
15	Review and Class Test	2	To Review what is taught

Lesson Plan

Name of the Teacher:- Tridibendra Narayan Chattopadhyay

Designation:- Associate Professor, department of Electronics

PG Semester 1

Course Taught:- EST 101: Mathematical and Computational Methods

Lecture Hours: 48+2

Objective of the Course:- To enable the students, understand the mathematical background of physics and to compute numerical solutions to problems of physics.

Week	Lessons Taught	No of classes	Learning Objective
1	Introduction to complex variables	4	To enable students understand the mathematical background of Physics
2	Integral transforms and application in signal processing,	4	
3	Matrices,	4	
4	Differential equations	4	
5	Special functions	4	
6	Computational algorithms, errors in numerical computation, interpolation	4	To enable students understand the numerical methods of solution of different problems of mathematical physics
7	Numerical differentiation and integration,	4	
8	Numerical algorithms and methods to solve transcendental equations, linear and nonlinear ordinary and partial differential Equations.	4	
9	optimization and curve fittings.	4	
10	Familiarization with computers: programming languages, variables and constants	4	To familiarise the students with, “C” programming language
11	Arrays,program structures, jump, loop, conditional branching	4	
12	Subroutines and functions	4	
13	Review and Class Test	2	To Review what is taught

Lesson Plan

Name of the Teacher:- Tridibendra Narayan Chattopadhyay

Designation:- Associate Professor, department of Electronics

PG Semester 1

Course Taught:- EST 102: Quantum Mechanics

Lecture Hours: 48+2

Objective of the Course:- To enable the students understand, the formalism of quantum mechanics and use of it to solve physics problems.

Week	Lessons Taught	No of classes	Learning Objective
1	Review of classical mechanics and historical origin of quantum theory	4	Understanding the basics and formalism of quantum mechanics
2	Formalism of quantum mechanics. Vector space and Hilbert Space.	4	
3	Operator method of solving quantum mechanical problems	4	
4	Angular momentum and spin	4	
5	Solving hydrogen atom problem	4	
6	Perturbation method for non-degenerate and degenerate quantum system and applications	4	Understanding the use of quantum Mechanics in different physical problems.
7	Time dependent perturbation theory	4	
8	Harmonic and constant perturbation	4	
9	variational method	4	
10	WKB approximation and applications	4	
11	Scattering theory, identical particles, interaction of radiation with matter	4	
12	Introduction to second quantization.	4	
13	Review and Class Test	2	To Review what is taught

Lesson Plan

Name of the Teacher:- Tridibendra Narayan Chattopadhyay

Designation:- Associate Professor, department of Electronics

PG Semester 3

Course Taught:- CBCC A-3 Digital Signal Processing

Lecture Hours: 48+2

Objective of the course :- This course will enable the students to enhance the analytical ability in facing the challenges posed by growing trends in communication, control and signal processing areas.

Week	Lessons Taught	No of classes	Learning Objective
1	Introduction to Discrete–time Signals and Systems	4	To enable the students understand the basic concepts of Digital signal processing
2	Classification of Discrete time signals and sequences Linear time-invariant (LTI) systems, (BIBO) stability, and causality	4	
3	linear convolution in time Domain, graphical approach	4	
4	The concept of z-Transforms---Region of convergence; properties; inverse z transform	4	To enable the students understand and use the mathematical tools needed for DSP
5	Realization of digital filter structures (direct forms type II, transposed form, cascaded form, parallel form)	4	
6	Discrete-time Signals in Transform Domain Discrete Fourier Series(DFS).	4	
7	Discrete-time Fourier Transforms(DTFT)	4	
8	Infinite Impulse-response (IIR) filters analog filter approximations (Butterworth and Chebyshev)	4	To enable the students design a IIR filter from analog filter and FIR filter from design specifications
9	Impulse invariant transformation; bilinear transformation; design of IIR filters from analog filters.	4	
10	Characteristics of FIR filters; frequency response design of FIR filters using window techniques	4	
11	comparison of IIR and FIR filters	4	
12	Multi-rate Processing---Decimation; interpolation sampling-rate conversion. Implementation of sampling rate conversion	4	
13	Review and Class Test	2	To Review what is taught

Lesson Plan

Name of the Teacher:- Tridibendra Narayan Chattopadhyay

Designation:- Associate Professor, department of Electronics

PG Semester 4

Course Taught:- **ELT-A-DSE-6-A-2-TH: Digital Signal Handling**
Credits: 04
Lecture Hours: 28+2

Objective of the course:-

Week	Lessons Taught	No of classes	Learning Objective
1	Analysis of Signals and Systems:	2	To enable the students understand the basic concepts of Digital signal processing
2	Discrete time signal analysis and linear systems.	2	
3	Sampling of continuous time signals.	2	
4	Z-transform, inverse z-transform.	2	To enable the students understand and use the mathematical tools needed for DSP and various design concepts.
5	Signal flow graph representation	2	
6	Basic structures for IIR and FIR filters	2	
7	Noise in digital filters	2	
8	Filter design techniques	2	
9	Discrete Fourier Transform (DFT)	2	
10	Fast Fourier Transforms (FFT)	2	
11	DSP Algorithm Implementation Considerations	2	To enable the students design various Degital filters from design specification.
12	Basic issues software implementation, computation of the DFT	2	
13	Tunable digital filters,	2	
14	Concept of multirate digital signal processing	2	
15	Review and Test	2	To Review what is taught

Lesson Plan

Name of the Teacher:- Imtiaz Ahammad

Designation:- Assistant Professor, Department of Electronics

Class – B.Sc. UG Semester - I
Course Taught:-ELT-A-CC-1-1-TH: Basic Circuit Theory and Network Analysis
Credits: 04
Lecture Hours: 56
Objective of the Course:-

1. To develop an understanding of the fundamental laws and elements of electrical circuits.
2. To learn the energy properties of electric elements and the techniques to measure voltage and current.
3. To learn a number of powerful engineering circuit analysis techniques such as nodal analysis, mesh analysis, theorems, source transformation and several methods of simplifying networks.
4. To develop the ability to apply circuit analysis to DC and AC circuits.
5. Different types of two-port network analysis using network parameters, with different types of connections.
6. To understand the concept of graphical solution to electrical network.

Week	Lessons Taught	No of classes	Learning Objective
1	Classification of Circuit Elements, Fixed & Variable Resistors, Construction & Characteristics, Color coding of Resistors, Resistors in Series & parallel. Inductors, Fixed & Variable Inductors, Self & Mutual Inductance, Energy stored in Inductor, Inductor in Series & parallel, Testing of Resistance & Inductance using Multimeter	4	To Enable Students, understand the basic elements & make the students capable of analyzing any given electrical network and to learn techniques of solving circuits involving different active and passive elements.
2	Capacitors, Principle of Capacitance, Parallel plate capacitor, Energy stored in Capacitor, capacitor in Series & parallel, Air, Paper, Mica, ceramic, Plastic & Electrolytic Capacitor, Testing of inductance using Multimeter	4	
3	Ideal and Practical Voltage & Current Sources, Dependent Sources, Laws of conservation of flux Linkage and charge	4	Understand the concepts of basic circuit laws, mesh and Nodal analysis of circuits and circuit solving methods.
4	KVL, KCL, Node Analysis, Mesh Analysis, Linear Circuits, Principle of Duality, Star-Delta Conversation	4	
5	DC Transient Analysis: Transient Response of Series RL and RC circuits under DC excitation	4	To develop the ability to apply circuit analysis to DC circuits.
6	DC Transient Analysis: Transient Response of Series RLC circuits under DC excitation	4	
7	Review and Class Test	2	To review what is taught
8	AC Circuit Analysis: Sinusoidal Voltage & Current; Definition of Instantaneous, Peak to Peak, RMS & Averages Values, Voltage-Current relationship in Resistor, Inductor & Capacitor, Phasor, Complex Impedance, Instantaneous Power, Average Power, Reactive Power, Power factor	4	Analyze the frequency response of circuits containing inductors and capacitors and apply phasor analysis to AC circuits in sinusoidal steady state.
9	A. Sinusoidal Circuit Analysis for RL, RC, Series & Parallel RLC circuits, Power in AC Circuits B. Resonance in Series & Parallel RLC Circuits, Quality (Q) Factor & Bandwidth	4	
10	Passive Filters, Low Pass, High Pass, Band Pass & Band Stop Filters. Integrator & Differentiator	4	To analyze various types of filters
11	Network Theorems: Superposition Theorem, Millman's Theorem, Thevenin's Theorem, Norton's Theorem &	4	To Apply the concept of linearity and the associated

	Maximum Power Transfer Theorem		technique to circuits and networks & their knowledge in analyzing Circuits by using network theorems.
12	Network Theorems: Reciprocity Theorem, Compensation Theorem, Tellegen's Theorem, Bisection Theorem, AC circuit analysis using Network Theorems	4	
13	Two Port Networks: Impedance (Z), Admittance (Y) and Transmission (ABCD) Parameters	4	To Learn the concepts of Two-port Network theory and Analyze simple two-port circuit
14	Network Graph Theory: Equivalent Graph, Incidence Matrix, Fundamental Tie-Set, Cut-Set.	4	To Learn Network Analysis methods through the use of Graph Theory
15	Review and Class Test	2	To review what is taught

Lesson Plan

Name of the Teacher:- Imtiaz Ahammad

Designation:- Assistant Professor, Department of Electronics

Class – B.Sc. UG Semester - II
Course Taught:-ELT-A-CC-2-3-TH: Applied Physics
Credits: 04
Lecture Hours: 56
Objective of the Course:-

1. To develop an understanding of the importance of Applied Physics in describing the physical phenomena.
2. To employ the knowledge of crystallography and X-Rays to understand the structure-property relationship of materials.
3. To implement the concept of Theory of relativity and Quantum mechanics for research applications.
4. To evaluate thermal properties of solids using statistical approach
5.
6. To recognize the use of Magnetic materials and Superconductors in various fields.

Week	Lessons Taught	No of classes	Learning Objective
1	Crystalline Materials, Crystal Structure in Solids, Concept of Lattice & Basis, Crystal Axes & Planes, Primitive & Unit cells, Packing fraction of Simple, Body-centered & Face-centered Cubic lattices, Miller Indices, Calculation of Interplaner spacing for Cubic lattice.	4	To Enable Students, understand the basic elements & make the students capable of analyzing any given electrical network and to learn techniques of solving circuits involving different active and passive elements.
2	Concept of Reciprocal lattice, Bragg's Equation in Direct and Reciprocal lattice, Bonding in Solids, Basic Ideas of Metallic Bonds, Ionic Bonds, Covalent Bonds & Vander Wall's Bonds.	4	
3	Inadequacies of Classical Physics, Compton's Effect, Photo-Electric Effect, Blackbody Radiation, Wien's Law, Raleigh Jeans Law.	4	Understand the concepts of basic circuit laws, mesh and Nodal analysis of circuits and circuit solving methods.
4	Planck's Law, Introduction of Wave Particle duality, de-Broglie's Hypothesis, Heisenberg's Uncertainty Principle, Probability density & Born Interpretation.	4	
5	Basic Postulates & Formalism of Quantum Mechanics, Wave functions, Operator in Quantum Mechanics, Eigen states & Eigen values & Eigen functions, Schrodinger wave Equation, Particle in a one dimensional box, Extension to a three dimensional box.	4	To develop the ability to apply circuit analysis to DC circuits.
6	Potential Barrier Problems (Free Electron, Electron in an Infinite Well), Qualitative Discussion of Phenomenon of Tunnelling, Kronig-Penney Model and Development of Band Structure, E-k Diagram in Solids, Classification of Conductors, Insulators and Semiconductors.	4	
7	Mechanical Properties of Materials**:** Concept of Elastic & Plastic Deformations, Hooke's Law, Elastic Moduli, Brittle and Ductile Materials, Tensile Strength.	4	To review what is taught
8	Thermal Properties: Specific Heat in Solids, Phonons, Heat Capacity, Debye's Law, Basic Concept of Thermoelectricity, Laws of Thermodynamics, Concept of Entropy, Thermodynamic Potentials, Helmholtz Free Energy, Enthalpy Function, Gibb's Free Energy, Chemical Potential, Relation of Chemical Potential with Fermi Level.	4	Analyze the frequency response of circuits containing inductors and capacitors and apply phasor analysis to AC circuits in sinusoidal steady state.

9	Review and Class Test	2	To review what is taught
10	**Statistical Mechanics:** Macroscopic & Microscopic States, Concept of Phase Space & Density of States, Statistical Interpretation of Entropy, Quantization of Phase Space.	4	To analyze various types of filters
11	Maxwell-Boltzmann Distribution Function, Fermi-Dirac Distribution Function and Bose-Einstein Distribution Function and their Importance.	4	To Apply the concept of linearity and the associated technique to circuits and networks & their knowledge in analyzing Circuits by using network theorems.
12	**Electric Properties:** Metals (Conductors), Basic Concept of Free Electron Theory, Conductivity of Metals, Ohm's Law, Relaxation Time, Collision Time and Mean Free Path, Electron Scattering and Resistivity of Metals, Heat Developed in Current Carrying Conductor, Concept of Superconductivity; Insulators, Dielectric Properties, Concept of Polarization, Permittivity & Dielectric Constant	2	
13	Semiconductors, Bonding in Elemental and Compound Semiconductors, Intrinsic and Extrinsic Semiconductor, Concept of Holes, Computation of Carrier Concentrations, Fermi Level in Semiconductors, E-k Diagrams to Explain Direct and Indirect Band gap Semiconductors.	2	To Learn the concepts of Two-port Network theory and Analyze simple two-port circuit
14	**Magnetic Properties:** Classification of Magnetic Materials, Magnetic Moment, Dia, Para, Ferro and Antiferro Magnetism, Ferrimagnetic Materials, Saturation Magnetisation, Curie Temperature.	2	To Learn Network Analysis methods through the use of Graph Theory
15	Review and Class Test	2	To review what is taught

Lesson Plan

Name of the Teacher:- Imtiaz Ahammad

Designation:- Assistant Professor, Department of Electronics

Class – B.Sc. UG Semester - II
Course Taught:-ELT-A-CC-3-5-TH: Semiconductor Devices
Credits: 04
Lecture Hours: 56
Objective of the Course:-

Week	Lessons Taught	No of classes	Learning Objective
1	**Semiconductor Basics:** Introduction to Semiconductor Material, Elemental & Compound Semiconductors, Direct & Indirect Band gap Semiconductors, Intrinsic & Extrinsic Semiconductors, Carriers in Semiconductors. Concept of Effective Mass, Density of States.	4	To Enable Students, understand the basic elements & make the students capable of analyzing any given electrical network and to learn techniques of solving circuits involving different active and passive elements.
2	Carrier Concentration at Normal Equilibrium in Intrinsic Semiconductors, Dependence of Fermi Level on Temperature and Doping Concentration, Temperature Dependence of Carrier Concentrations, Charge Neutrality Condition, Degenerate & Non-Degenerate Semiconductors.	4	
3	**Carrier Transport Phenomena:** Carrier Drift, Mobility, Resistivity, Hall Effect, Diffusion Process, Einstein Relation, Current Density Equation, Carrier Injection, Generation & Recombination Processes, Continuity Equation.	4	Understand the concepts of basic circuit laws, mesh and Nodal analysis of circuits and circuit solving methods.
4	**Physics of Junctions: Homojunction & Heterojunction:** Metal-Metal Contact, Metal-Semiconductor Contact (Both Ohmic & Schottky Junction).	4	
5	Formation of Depletion Layer / Space Charge Region at the Junction, Variation of Depletion Width in presence & absence of Field, Built-in Electric Field and Potential, Derivation of Electrostatic Potential Difference at Thermal Equilibrium, Junction Capacitance, Junction Breakdown Mechanism, Concept of Abrupt and Linearly Graded Junctions.	4	To develop the ability to apply circuit analysis to DC circuits.
6	**PN Junction Diode**: Current-Voltage Characteristics, DC and AC Equivalent Circuit (Eber's-Moll Equation & Charge Balance Equation). Varactor Diode, Solar Cell, Zener Diode.	4	
7	Review and Class Test	2	To review what is taught
8	**Bipolar Junction Transistors (BJT):** Basic Transistor Action, BJT as a Current Control Device, Energy Band Diagram of Transistor in Thermal Equilibrium,	4	Analyze the frequency response of circuits containing inductors and capacitors and apply phasor analysis to AC circuits in sinusoidal steady state.
9	Quantitative Analysis of Static Characteristics (Minority Carrier Distribution & Terminal Currents), Base-Width Modulation, Modes of Operation, Input and Output Characteristics of CB, CE and CC Configurations.	4	To review what is taught
10	**Field Effect Transistors:** Transverse Field Effect and Channel Isolation, Categories of FETs.	4	To analyze various types of filters

11	**JFET:** Construction, Channel Formation, Pinch-off and Saturation Voltage, Current-Voltage Output Characteristics.	4	To Apply the concept of linearity and the associated technique to circuits and networks & their knowledge in analyzing Circuits by using network theorems.
12	**MOSFET**: MOS Capacitor, Channel Formation, Threshold Voltage (Ideal &Real), Current-Voltage Relation, Depletion & Enhancement Type MOSFET, Complimentary MOS (CMOS).	4	
13	**Power Devices:** UJT, Construction, Working Principle, Equivalent Circuit, Intrinsic Standoff Ratio, Characteristics, Relaxation Oscillator,	4	To Learn the concepts of Two-port Network theory and Analyze simple two-port circuit
14	**Power Devices:** Basic Working Principle & Characteristics of SCR, Diac and Triac.	4	To Learn Network Analysis methods through the use of Graph Theory
15	Review and Class Test	2	To review what is taught

Lesson Plan

Name of the Teacher:- Imtiaz Ahammad

Designation:- Assistant Professor, Department of Electronics

Class – B.Sc. UG Semester - II
Course Taught:-ELT-A-CC-4-9-TH: Digital Electronics and VHDL
Credits: 04
Lecture Hours: 56
Objective of the Course:-

Week	Lessons Taught	No of classes	Learning Objective
1	**Number System and Codes:** Decimal, Binary, Hexadecimal and Octal Number Systems, Base Conversions and Arithmetic (Addition, Subtraction by Complement Method, Multiplication), Representation of Signed and Unsigned Numbers, Binary Coded Decimal (BCD) Code.	4	To Enable Students, understand the basic elements & make the students capable of analyzing any given electrical network and to learn techniques of solving circuits involving different active and passive elements.
2	**Logic Gates and Boolean Algebra:** Basic Postulates and Fundamental Theorems of Boolean Algebra, Switching Equivalent Circuits of Basic Gates, Truth Tables and Symbolic Representation of OR, AND, NOT, NAND, NOR XOR, XNOR Gates, Universal Logic Gates, Circuit Representation using Universal Logic Gates.	4	
3	**Digital Logic Families:** Fan-in, Fan-out, Noise Immunity, Noise Margin, Power Dissipation, Figure of Merit, Speed Power Product, TTL & CMOS Families & their Comparison.	4	Understand the concepts of basic circuit laws, mesh and Nodal analysis of circuits and circuit solving methods.
4	**Combinational Logic Analysis and Design:** Standard Representation of Logic Functions (SOP and POS), Karnaugh Map (K-Map) Minimization,	4	
5	Binary Adder and Subtractor (Half & Full), Parallel Adder/Subtractor, Comparator, Parity Checker	4	To develop the ability to apply circuit analysis to DC circuits.
6	Multiplexers and Demultiplexers, Encoder and Decoder, Implementation of Logic Functions with Multiplexer	4	
7	Review and Class Test	2	To review what is taught
8	**Sequential Logic Design:** Latches and Flip Flops, Registers, Counters (Ripples, Ring, Johnson, Synchronous, Asynchronous and Modulo-N), State Table, State Diagrams,	4	Analyze the frequency response of circuits containing inductors and capacitors and apply phasor analysis to AC
9	Counter Design using Excitation Table and Equations. Basic Concepts, ROM, PLA, PAL, CPLD, FPGA.	4	To review what is taught
10	**Memory:** Memory Technology, Types of Memory, Volatile and Non-Volatile, ROM, PROM, EPROM, EEPROM, Flash Memory, SRAM, DRAM, SDRAM, Concept of Primary, Secondary and Cache Memory.	4	To analyze various types of filters
11	Brief History of HDL, Structure of HDL Module, Introduction to Simulation and Synthesis Tools, Test Benches. VHDL Modules, Delays, Data Flow Style, Behavioral Style, Structural Style, Mixed Design Style, Simulating Design. Introduction to Language Elements, Keywords, Identifiers, White Space Characters, Comments, Format, VHDL Terms, Hardware in VHDL, Entity, Architectures, Concurrent signal Assignment, Event Scheduling, Statement Concurrency, Structural Designs.	4	To Apply the concept of linearity and the associated technique to circuits and networks & their knowledge in analyzing Circuits by using network theorems.
12	Process Statements, Process Declarative Region, Process Statement Region, Process Execution, Sequential Statements, Architecture Selection, Configuration	4	

	Statements, Power of Configuration. Introduction to Behavioral Modeling, Inertial Delay and Model, Transport Delay and Model, Inertial vs Transport Delay, Simulation Delta Drivers, Driver Creation, Generics, Block Statements, Guarded Blocks.		
13	**Sequential Processing:** Process Statement, Sensitivity List, Signal Assignment vs Variable Assignment, Sequential Statements, IF, CASE, LOOP, NEXT, EXIT and ASSERT Statements, Assertion BNF, WAIT ON Signal, WAIT UNTIL Expression, WAIT FOR Time Expression, Multiple Wait Conditions, WAIT Time-Out, Sensitivity List vs WAIT Statement Concurrent Assignment, Passive Processes.	4	To Learn the concepts of Two-port Network theory and Analyze simple two-port circuit
14	**Data Types:** Object Types, Signal, Variable, Constant, Data Types, Scalar Types, Composite Types, Incomplete Types, File Type Caveats, Subtypes, Subprograms and Functions.	4	To Learn Network Analysis methods through the use of Graph Theory
15	Review and Class Test	2	To review what is taught

Lesson Plan

Name of the Teacher:- Imtiaz Ahammad
Designation:- Assistant Professor, Department of Electronics
Class – B.Sc. UG Semester - II
Course Taught:-ELT-A-DSE-5-A-2-TH: Digital Electronics and VHDL
Credits: 04
Lecture Hours: 56
Objective of the Course:-

1. To introduce basic Control Theory and establish the fundamentals of devices in Control applications
2. To introduce different types of system and identify a set of algebraic equations to represent and model a complicated system
3. To understand concepts of the mathematical modelling, feedback control and stability analysis in Time and Frequency domains
4. To understand system stability concept and learn methods for examining system stability in both time and frequency domains including determining the system stability margins

Week	Lessons Taught	No of classes	Learning Objective
1	**Introduction to Control Systems:** Open Loop and Closed Loop Control Systems, Mathematical Modeling of Physical Systems (Electrical, Mechanical and Thermal),	4	To understand the basics of control systems, Feedback and non-feedback systems and their applications Transfer function, block diagram representation and reduction techniques.
2	Derivation of Transfer Function, Block Diagram Representation. Reduction Technique. Simple Problem	4	
3	Signal Flow Graph, Reduction Technique, Mason's Gain Formula, Effect of Feedback on Control Systems.	4	
4	**Time Domain Analysis:** Time Domain Performance Criteria, Transient Response of First, Second and Higher Order Systems	4	Understand Transient response of first and second order systems to standard inputs
5	Steady State Errors and Static Error Constants, Performance Indices.	4	
6	**Concept of Stability:** Asymptotic Stability and Conditional Stability, Routh-Hurwitz Criterion, Relative Stability Analysis, Root Locus Plots and their Applications.	4	Analyze stability of Linear system and understanding to Draw the root loci
7	Review and Class Test	2	To review what is taught
8	**Frequency Domain Analysis:** Correlation between Time and Frequency Response, Polar & Inverse Polar Plots.	4	Understanding to analyze and test the performance of feedback control systems in frequency-domain and the Stability of a linear system using Bode Plot and Nyquist stability criterion
9	Frequency Domain Specifications, Logarithmic Plots (Bode Plots), Gain and Phase Margins	4	
10	Nyquist Stability Criterion, Relative Stability using Nyquist Criterion, Constant M and N Circles.	4	
11	**State Space Analysis:** Definitions of State, State Variables, State Space, Representation of Systems, Solution of Time Invariant,	4	Understand the modelling of linear-time-invariant systems using state space forms
12	Homogeneous State Equation, State Transition Matrix and its Properties.	4	
13	**Controllers and Compensation Techniques:** Response with P, PI and PID Controllers Relaxation Oscillator.	4	Ability to understand and analyze the impact of different controllers on linear system.
14	Concept of Compensation, Lag, Lead and Lag-Lead Networks.	4	Understanding the designing of different type of compensators
15	Review and Class Test	2	To review what is taught

Lesson Plan

Name of the Teacher:- Tridibendra Narayan Chattopadhyay

Designation:- Associate Professor, department of Electronics

UG Semester 4

Course Taught:- ELT-A-SEC-4-B-2-TH: Programming with Scilab
Credits: 02
Lecture Hours: 28+4
Objective of the Course:- To enable the students, solving Electronic and physics problems with Scilab Programming.

Week	Lessons Taught	No of classes	Learning Objective
1	SCILAB Environment, Basic Computer Programming, Variables and Constants	2	To Enable Students, understand the basic features of SCILAB command window
2	Operators and Simple Calculations, Formulas and Functions, SCILAB Toolboxes	2	
3	Matrix and Linear Algebra Review	2	To Enable Students, understand the basic features of SCILAB Programming
4	Vectors and Matrices in SCILAB	2	
5	Matrix Operations and Functions in SCILAB.	2	
6	Algorithms and Structures,	2	
7	Review and Class Test	2	To review what is taught
8	SCILAB Scripts and Functions (m-Files),	2	To Enable Students, writing regular SCILAB codes
9	Simple Sequential Algorithms, Control Structures.	2	
10	Reading and Writing Data, File Handling,	2	
11	Personalized Functions, Toolbox Structure,	2	
12	SCILAB Graphic Functions.	2	
13	Numerical Methods and Simulations,	2	
14	Random Number Generation,	2	To Enable Students, solve simple problems of Physics and Electronics
15	Montecarlo Methods.	2	
16	Review and Class Test	2	

Lesson Plan

Name of the Teacher:- Tridibendra Narayan Chattopadhyay

Designation:- Associate Professor, department of Electronics

UG Semester 6

Course Taught:- **ELT-A-DSE-6-A-2-TH: Digital Signal Processing**
Credits: 04
Lecture Hours: 56+4
Objective of the Course:- To enable the students, designing Simple Digital filters

Week	Lessons Taught	No of classes	Learning Objective
1	Discrete Sequences, Linear Coefficient Difference Equation	4	To enable the students, understand the fundamental of digital signals
2	Representation of DTS, LSI Systems. Stability and Causality,	4	
3	Frequency Domain Representations and Fourier Transform of DT Sequences.	4	
4	Concept and Properties of Pole-Zero, Synthesis of Two Terminal Reactive Networks,	4	To enable the students, understand the fundamental of Network synthesis
5	Foster's Reactance Theorem, Network Realization of Reactance Function, Canonical Networks.	4	
6	Fraction Networks (Cauer Networks), Synthesis of Two Terminal R-C and R-L Networks, Positive Real Functions, Numerical problems	4	
7	Review and Class Test	2	To review what is taught
8	DFT Assumptions and Inverse DFT, Matrix Relations, Relationship with FT and its Inverse, Circular Convolution	4	To enable the students, understand the fundamental of Discrete Fourier Transform
9	DFT Theorems, DCT, Computation of DFT, FFT Algorithms and Processing Gain	4	
10	Discrimination, Interpolation and Extrapolation, Gibbs Phenomena, FFT of Real Functions	4	
11	Interleaving and Resolution Improvement, Word Length Effects	4	
12	Analog Filter Review, Concept of Filters in Signal Processing, Filter Parameters, Concept of LP, HP, BP, Notch Filters.	4	To enable students, understand the principals of electronic filter design.
13	Types of Filters, Butterworth and Chebyshev, System Function for IIR and FIR Filters	4	
14	FIR Filter Realization Techniques, Discrete Correlation and Convolution, Properties and , Limitations.	4	To enable the students, Design FIR and IIR type Digital filters
15	Network Representation, Canonical and Decomposition Networks, IIR Filter Realization Methods and their Limitations	4	
16	Review and Class Test	2	To review what is taught

Lesson Plan

Name of the Teacher: - Munna Dutta Ghose

Designation: - SACT-II, Department of Electronics

PG Semester 1

Course: - EST-103 -TH: Physics of Electronic Materials

Credits: 04

Lecture Hours: 50

Objective of the Course:- To provide a detailed understanding of the physical principles underlying the behaviour and properties of electronic materials. This course typically covers topics such as crystal structure, band theory of solids, semiconductor physics, and the properties of various electronic materials.

Week	Lessons Taught	No of classes	Learning Objective
1	Crystal structure and symmetries, determination of crystal structure by X-ray diffraction, crystal binding, lattice vibration, concept of phonons, defects in solids	4	Students are expected to develop a deep understanding of crystallography and symmetry, which are fundamental concepts in the study of materials science and solid-state physics. Students are expected to have a comprehensive understanding of the Hall effect and its applications, as well as the ability to apply this knowledge to solve practical problems in materials science and physics. students are expected to have a thorough understanding of the concepts of polarization and dielectric constant, as well as the ability to apply this knowledge to analyze and design materials for various applications.
2	Free electron theory of metals, energy band in solids, Bloch theorem, Kronig Penny model, E-k diagram	4	
3	Concept of effective mass, electrons in weak periodic potential, tight binding model	4	
4	F-D statistics, density of states, carrier concentration, carrier transport in semiconductor,	4	
5	SRH recombination model, continuity equation, Boltzmann transport equation and transport coefficients	4	
6	Electron dynamics under electric and magnetic fields, Hall effect	4	
7	Dielectric and magnetic properties of materials: polarization and dielectric constant	4	
8	Clasius-Mossotti relation, electronic and ionic polarizability, dielectric loss	4	
9	ferroelectric materials, domain theory	4	
10	piezoelectricity and pyroelectricity, applications of ferroelectric materials	4	
11	Organic semiconductor and conducting polymers	4	
12	liquid crystals, introductory concepts of nanomaterials.	4	
13	Doubt clear class	2	

Lesson Plan

Name of the Teacher: - Munna Dutta Ghose

Designation: - SACT-II, Department of Electronics

UG Semester 1

Course: - ELT-A-CC-2-TH: Mathematics Foundation for Electronics

Credits: 04

Lecture Hours: 56

Objective of the Course:- To provide a strong mathematical foundation that is essential for understanding and analysing electronic systems and circuits. The course typically covers topics such as calculus, differential equations, linear algebra, complex numbers, and Fourier analysis, among others.

Week	Lessons Taught	Sub-Topic	No of classes	Learning Objective
1	Ordinary Differential Equation	1st Order ordinary differential equation and basic concept	2	These objectives provide a solid foundation for students to apply differential equations in diverse scientific contexts and prepare them for more advanced studies in applied mathematics or related fields
1		Separable Ordinary differential equation	1	
1		Exact Ordinary differential equation	1	
2		Linear Ordinary differential equation	1	
2		2nd Homogeneous &Non-Homogeneous differential equations	2	
2	Series Solution of differential equations and special functions	Power Series method	1	These objectives provide students with a comprehensive understanding of the theory and applications of series solutions and special functions, preparing them for more advanced studies in applied mathematics or related fields.
3		Legendre Polynomials.	1	
3		Frobenius Method	1	
3		Bessels Equations and Bessel's Functions of First and Second Kind,	2	
4		Error Functions and Gamma Function	2	
4	Matrices	Introduction to Matrices	1	These learning objectives aim to provide B.Sc students with a solid foundation in matrix algebra, equipping them with the mathematical tools necessary for further studies in various scientific disciplines, including physics, engineering, computer science, and applied mathematics.
4		System of Linear Algebraic Equations	1	
5		Gaussian Elimination Method	1	
5		Gauss-Seidel Method	1	
5		LU Decomposition, Solution of Linear System by LU Decomposition	1	
5		Eigenvalues and Eigenvectors	1	
6		Linear Transformation, Properties of Eigenvalues and Eigenvectors	1	

Week	Lessons Taught	Sub-Topic	No of classes	Learning Objective
6		Cayley-Hamilton Theorem, Diagonalization	1	
6		Powers of a Matrix, Real and Complex Matrices	1	
6		Symmetric, Skew Symmetric, Orthogonal Quadratic Form Hermitian, Skew Hermitian, Unitary Matrices	1	
7	**Sequences and Series**	Sequences, Limit of a Sequence,	1	These learning objectives aim to provide B.Sc students with a comprehensive understanding of sequences and series, enabling them to apply these concepts across various mathematical and scientific disciplines.
7		Convergence, Divergence and Oscillation of a Sequence	2	
7		Infinite Series	1	
8		Necessary Condition for Convergence	1	
8		Cauchy's Integral Test, D'Alembert's Ratio Test	1	
8		Cauchy's nth Root Test, Alternating Series	2	
9		Leibnitz's Theorem, Absolute Convergence and Conditional Convergence, Power Series	2	
9	**Complex Variables and Functions**	Complex Variable, Complex Function, Continuity, Differentiability	2	These objectives aim to provide B.Sc students with a solid foundation in complex analysis, preparing them for advanced studies in mathematics and its applications in science and engineering.
10		Analyticity, Cauchy-Riemann (C-R) Equations, Harmonic and Conjugate Harmonic Functions,	2	
10		Exponential Function, Trigonometric Function, Hyperbolic Function	2	
11		Line Integral in Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula	2	
11		Derivative of Analytic Functions, Sequences	1	
11		Series and Power Series, Taylor's Series, Laurent Series	1	
12		Zeroes and Poles, Residue Integration Method, Residue Integration of Real Integrals	2	
12	**Laplace Transform**	Properties of Laplace Transform	3	These objectives aim to equip B.Sc students with the knowledge and skills necessary to apply Laplace transforms in solving engineering problems, analysing systems, and understanding
13		Laplace Transform of Different Signals	2	
13		Inverse Laplace Transform and Applications in Circuit Analysis,	3	

Week	Lessons Taught	Sub-Topic	No of classes	Learning Objective
14		Equivalent Circuit of Inductor and Capacitor in s-Domain	2	dynamic behaviours in various scientific and engineering disciplines.

Name of the Teacher: - Munna Dutta Ghose

Designation: - SACT-II, Department of Electronics

UG Semester IV

Course: - ELT-A-CC -4-08-TH: Operational Amplifiers and applications

Credits: 04

Lecture Hours: 56

Objective of the Course:- To provide a strong mathematical foundation that is essential for understanding and analysing electronic systems and circuits. The course typically covers topics such as calculus, differential equations, linear algebra, complex numbers, and Fourier analysis, among others.

Week	Lessons Taught	Sub-Topic	No of classes	Learning Objective
1	**Basic Operational Amplifier**	Concept of Differential Amplifiers (Dual Input and Balanced and Unbalanced Output), Constant Current Bias, Current Mirror, Cascaded Differential Amplifier Stages with Concept of Level Transistor,	2	These objectives aim to provide B.Sc students with a solid foundation in understanding, analysing, and designing basic operational amplifier circuits, preparing them for further studies in electronics and related fields.
1		Ideal Op-Amp and its Characteristics	1	
1		Ideal Op-Amp and its Characteristics	1	
2		Block Diagram of Op-Amp (IC 741)	1	
2		Deviations for a Real Op-Amp from Ideal Behavior.	2	
2	**Op-Amp Parameters**	Input offset voltage, Input offset current	1	These objectives aim to provide B.Sc students with a comprehensive understanding of the various parameters that characterize op-amp behaviour. Mastery of these parameters is essential for designing and analysing circuits in a wide range of electronic applications.
3		Input bias current, Differential input resistance	1	
3		Input capacitance, Offset voltage adjustment range	1	
3		Input voltage range, Common mode rejection ratio	2	
4		Slew rate, Supply voltage rejection ratio	2	
4	**Op-Amp Circuits and Applications**	Open and Closed Loop Configuration, , ,	1	These learning objectives aim to provide B.Sc students with a comprehensive understanding of various op-amp circuits and their applications in electronic systems and signal processing. Mastery of these concepts prepares students for applications in fields such as
4		Frequency Response	1	
5		Inverting, Non-Inverting	1	
5		Summing and Difference Amplifiers	1	
5		Integrator, Differentiator	1	

Week	Lessons Taught	Sub-Topic	No of classes	Learning Objective
5		Multiplier and Divider	1	telecommunications, instrumentation, control systems, and more.
6		Voltage to Current and Current to Voltage Convertor	1	
6		Instrumentation Amplifier	1	
6		Multivibrators	1	
6		Numerical Problems	1	
7	**Comparators and Signal Generators**	Basic Comparator, Level Detector, Voltage Limiters	1	These learning objectives aim to provide B.Sc students with a solid understanding of comparator principles, configurations, and applications, preparing them for various fields such as electronics, control systems, and signal processing.
7		Schmitt Trigger, Concept of Sinusoidal and Relaxation Type	2	
7		Phase Shift Oscillator	1	
8		Wien Bridge Oscillator	1	
8		Square Wave Generator	1	
8		Triangle Wave Generator, Saw Tooth Wave Generator	2	
9		Voltage Controlled Oscillator (IC 566).	2	
9	**Timers Circuits**	Multivibrators (IC 555), Functional Block Diagram	2	These learning objectives aim to provide B.Sc students with a comprehensive understanding of timer circuits, their modes of operation, and their applications in electronics and control systems. Mastery of these concepts prepares students for various fields, including digital electronics, communications, and embedded systems.
10		Astable and Monostable Multivibrator Circuits	2	
10		Applications	2	
11		Phase Locked Loops (PLL),	2	
11		Block Diagram of IC565	1	
11		Phase Detectors	1	
12		Voltage Controlled Oscillator (IC 566)	2	
12	**Fixed and Variable IC Regulators and Signal Conditioning Circuits**	IC 78xx and IC 79xx (Concepts only), IC LM317, Output Voltage Equation, SMPS, Principle of DC-to-DC Conversion	3	These learning objectives aim to provide B.Sc students with a comprehensive understanding of signal generators, enabling them to use these instruments effectively in laboratory experiments, testing, and analysis across various scientific and engineering disciplines.
13		Block Diagram Representation of SMPS Module Sample and Hold Systems	2	
13		Active Filters, Butterworth Filter, First and Second Order Low Pass and High Pass Filters	3	
14		Band Pass Filter, Band Reject Filter, All Pass Filter, Log and Antilog Amplifiers	2	

Name of the Teacher: - Munna Dutta Ghose

Designation: - SACT-II, Department of Electronics

UG Semester V

Course: - ELT-A-DSE-5-B-2-TH: Power Electronics

Credits: 04

Lecture Hours: 56

Objective of the Course:- To provide a comprehensive understanding of power electronic circuits and systems. Power electronics is a crucial field in electrical engineering that deals with the control and conversion of electrical power using electronic devices.

Week	Lessons Taught	Sub-Topic	No of classes	Learning Objective
1	**Power Devices**	Need for Semiconductor Power Devices,	2	These learning objectives aim to provide B.Sc students with a solid understanding of power devices, enabling them to design and analyze power electronic systems and contribute to various fields such as energy, automation, and electronic devices.
1		Power Diodes, Enhancement of Reverse Blocking Capacity	1	
1		Introduction to Family of Thyristors	1	
2	**Silicon Controlled Rectifier (SCR) and its application**	Structure, Two Transistor Analogy, I-V Characteristics	1	These learning objectives aim to provide B.Sc students with a solid understanding of power devices, enabling them to design and analyze power electronic systems and contribute to various fields such as energy, automation, and electronic devices.
3		Turn-On and Turn-Off Characteristics, Ratings, Factors affecting the Characteristics/Ratings of SCR,	1	
3		Gate-Triggering Circuits, dv/dt Triggering Circuits, Control Circuits Design and Protection Circuits, Snubber Circuit	1	
3		SCR as Static Switch, Phase Controlled Rectification	2	
4		Single Phase Half Wave, Full Wave and Bridge Rectifiers with Inductive and Non-Inductive Loads, AC Voltage Control using SCR and Triac as Switch	2	
4	**Diac and Triac and Insulated Gate Bipolar Transistors (IGBT):**	Basic Structure of Diac and Triac	2	These learning objectives aim to provide B.Sc students with a solid understanding of power devices, enabling them to design and analyze power electronic systems and contribute to various fields such as energy,
4		Working and V-I Characteristics	1	
5		Application of Diac as Triggering Device for Triac.	2	
5		Basic Structure of IGBT	1	
5		I-V Characteristics	1	
5		Switching Characteristics	1	
6		Device Limitations	1	

Week	Lessons Taught	Sub-Topic	No of classes	Learning Objective
6		Safe Operating Area (SOA) etc.	1	automation, and electronic devices.
6				
6				
7	**Power MOSFETs and Power Inverters**	Operation Modes	1	These learning objectives aim to provide B.Sc students with a comprehensive understanding of Power MOSFETs, enabling them to analyze, design, and implement power electronic systems for various applications in energy control and conversion.
7		Switching Characteristics	2	
7		Power BJT, Second Breakdown, Saturation and Quasi-Saturation State.	1	
8		Need for Commutating Circuits and their Various Types	1	
8		DC Link Inverters	1	
8		Parallel Capacitor Commutated Invertors with and without Reactive Feedback and its Analysis, Series Inverter,	2	
9		Limitations and its Improved Versions, Bridge Inverters	2	
9	**Choppers**	Basic Chopper Circuit, , ,.	2	These learning objectives aim to provide B.Sc students with a comprehensive understanding of choppers, enabling them to analyze, design, and implement chopper-based systems for various applications in energy conversion and control.
10		Types of Choppers (Type A-D), Step-Down and Step-Up Choppers	2	
10		Operation of DC Chopper Circuits using Self-Commutation (A-Type and B-Type Commutating Circuit)	2	
11		Cathode Pulse Turn-Off Chopper (using Class D Commutation)	2	
11		Load Sensitive Cathode Pulse Turn-Off Chopper (Jones Chopper)	2	
11		Morgan's Chopper	2	
12				
12	**Regulators and Converters and Electromechanical Machines**	Basics, Series, Shunt, Buck, Boost, Buck-Boost, Cuk. DC Motors, Basic understanding of Field and Armature	3	These courses aim to provide students with a solid foundation in the theory and application of regulators, converters, and electromechanical machines, preparing them for careers in industries such as power electronics, power systems, and electric machinery
13		Principle of Operation, EMF Equation, Back EMF, Factors Controlling Motor Speed	2	
13		Thyristor Based Speed Control of DC Motors, AC Motor (Induction Motor only)	3	
14		Rotor and Stator, Torque and speed of Induction Motor, Thyristor Control of AC Motors (Block Diagrams only).	2	

Name of the Teacher: - Munna Dutta Ghose

Designation: - SACT-II, Department of Electronics

UG Semester VI

Course: - ELT-A-DSE-6-B-2-TH: Transmission Lines, Antenna and Microwave Devices

Credits: 04

Lecture Hours: 56

Objective of the Course:- To provide a comprehensive understanding of the principles and applications of transmission lines, antennas, and microwave devices in the field of electronics and communication engineering.

Week	Lessons Taught	Sub-Topic	No of classes	Learning Objective
1	**Transmission Lines**	Typical Transmission Lines, Co-Axial, Two Wire, Microstrip, Coplanar and Slot Lines, Transmission Line Parameters, Transmission Line Equations, Wave Propagation in Transmission Lines	2	These learning objectives aim to provide B.Sc students with a comprehensive understanding of transmission lines, enabling them to analyze, design, and optimize systems for efficient energy transfer and signal propagation.
1		Characteristics Impedance, Propagation Constant, Lowloss and Lossless and Distortionless Line, Input Impedance, Reflection Coefficient, Standing Wave and Standing Wave Ratio	1	
1		Power and Lossy Lines, Short-Circuited and Open-Circuited Line, Matched Line, Smith Chart, Transmission Line Applications	1	
2	**Guided Waves and Waveguides**	Wave Propagation between Parallel Conducting Planes	1	These learning objectives aim to provide B.Sc students with a comprehensive understanding of guided waves and waveguides, enabling them to analyze, design, and implement systems for efficient guided wave propagation in various applications.
3		TEM, TE and TM Modes	1	
3		Rectangular Waveguides, Circular Waveguides	1	
3		Power Transmission and Attenuation, Rectangular Cavity Resonators	2	
4		Directional Couplers, Isolator, Circulator	2	
4	**Antenna Fundamentals and Parameters**	Concept of Retarded Potentials, Antenna Radiation Mechanism, Current Distribution on a Thin Wire Antenna,	2	These learning objectives aim to provide B.Sc students with a comprehensive understanding of antenna fundamentals and parameters, enabling them
4		Input Impedance, Radiation Resistance, Radiation Pattern (Field, Power, and Phase Patterns)	1	

Week	Lessons Taught	Sub-Topic	No of classes	Learning Objective
5		Radiation Power Density, Radiation Intensity, Directive Gain, Directivity, Power Gain	2	to analyze, design, and implement effective antenna systems for various communication applications.
5		Antenna Efficiency, Beamwidth, Bandwidth	1	
5		Beam Efficiency, Effective Height	1	
5		Effective Aperture, Aperture Efficiency	1	
6		Polarization, Antenna Noise	1	
6		Temperature and Noise Figure	1	
6				
6				
7	**Antenna as Transmitter/Receiver Types of Antennas (Qualitative Study Only)**	Radiation from Elementary Dipole (Hertzian Dipole)	1	These learning objectives aim to provide B.Sc students with a comprehensive understanding of how antennas function as both transmitters and receivers in various communication systems, preparing them for roles in the design and optimization of wireless communication technologies.
7		Field Regions around Antenna (Radiation, Induction and Electrostatic Fields)	2	
7		Radiation Field of Half Wave Dipole, and their Radiation Resistance	1	
8		Monopole, Dipole, Folded Dipole, Loop Antenna	1	
8		Helical, Rhombic Yagi-Uda, Log Antenna	1	
8		Periodic, Horn, Parabolic Reflector Antenna	2	
9		Antenna Array, Microstrip Antenna	2	
9	**Propagation of Radio Waves**	Different Modes of Propagation,	2	These learning objectives aim to provide B.Sc students with a comprehensive understanding of radio wave propagation, enabling them to analyze, design, and optimize communication systems in diverse environments.
10		Ground Wave, Space Wave	2	
10		Radio Horizons, Sky Wave	2	
11		Structure of Ionosphere	2	
11		Critical Frequency, Maximum Usable Frequency (MUF)	2	
11		Skip Distance, Virtual Height, Duct Propagation.	2	
12				
12	**Microwave Devices (Qualitative Study Only)**	Microwave Domains, Two-Cavity Klystron, Reflex Klystron	3	These learning objectives aim to provide B.Sc students with a comprehensive understanding of microwave devices, enabling them to analyze, design, and implement microwave systems for various applications in communication and technology.
13		Travelling Wave Tube (TWT) Magnetron	2	
13		Transferred Electron Mechanism and Gunn Diode, Avalanche Transit Time Mechanism	3	
14		IMPATT Diode, Tunnel Diode	2	

Lesson Plan

Name of the Teacher: - Dr. Sudarsan Barui

Designation: - Assistant Professor, Department of Electronics

PG Semester 2

Course Taught: - EST 201: Analog Circuits and Systems

Credit: 4
Lecture Hours: 48+2

Objective of the Course: - To enable the students, understand the fundamentals of Analog Circuits and small signal models and its application in various engineering fields.

Week	Lessons Taught	No of classes	Learning Objective
1	Introduction to Analog circuits, network theorems, Applications of transform methods in network analysis	4	To enable students, understand the fundamentals of circuits and network theorems
2	Passive filters and analysis	4	
3	Properties and synthesis of passive and active networks, Positive real function,	4	To enable students, understand the real functions, theorems and poles zeros
4	Cauer's and Forter's reactance theorem	4	
5	LC ladder network, poles and zeros of network functions	4	
6	Small signal models of Diode, BJT and MOSFETs	4	Students will be able to understand the fundamentals of different circuit element and different amplifiers
7	Analyses of various active circuits in different frequency ranges, Feedback amplifiers	4	
8	Power and tuned amplifiers	4	
9	Operational amplifier, architecture, differential amplifiers, applications of OPAMP	4	
10	Active filters, Switch capacitor filter	4	To familiarise the students with active filters, oscillators and wave form generation
11	Sinusoidal feedback oscillators, relaxation oscillators	4	
12	555 timer, VCO and PLL operation	4	
13	Review and Class Test	2	To Review what is taught

Lesson Plan

Name of the Teacher: - Dr. Sudarsan Barui

Designation: - Assistant Professor, Department of Electronics

UG Semester 3

Course Taught: - ELT-A-SEC-3-A-2-TH: Circuit Modelling using PSPICE
Credits: 02
Lecture Hours: 28+4
Objective of the Course: - To enable the students, a fundamental understanding of PSPICE Software and its applications in various engineering fields.

Week	Lessons Taught	No of classes	Learning Objective
1	Introduction to Pspice Software.	2	To Enable Students, understand the basic features of PSPICE Software
2	File types, Concept of Netlist Commands.	2	
3	DC, AC, Transient analysis	2	To Enable Students, understand the basic & advanced features of PSpice Programming
4	Analog behavioural models, IF statement	2	
5	Voltage, Current and Frequency Dependent Sources	2	
6	Advanced analyses, noise analyses	2	
7	Monte-Carlo analyses	2	
8	Review and Class Test	2	To review what is taught
9	Solution of simple series circuit, Thevenin Solution	2	Students will be able to simulate and predict the behaviour of Basic circuit elements
10	PSpice I-V characteristic with temperature dependence	2	
11	Diode models,Rectifier, clipping, Zener circuits	2	
12	BJT, AC,DC, transient and bias point simulations, Small signal analyses, Pspice models	2	
13	Common emitter Amplifier, emitter follower, input output impedence.	2	
14	MOSFETS, AC,DC, transient and bias point simulations,Small signal analyses, Small signal models	2	
15	common source Amplifier, Source follower, input output impedence. OP Amps Analyses	2	
16	Review and Class Test	2	To review what is taught

Lesson Plan

Name of the Teacher: - Dr. Sudarsan Barui

Designation: - Assistant Professor, Department of Electronics

UG Semester 5

Course Taught: - **ELT-A-CC-5-12-TH: Microprocessors and Microcontrollers**
Credits: 04
Lecture Hours: 56+4
Objective of the Course: - To enable the students, a fundamental understanding of Microprocessors and Microcontrollers and its applications in various engineering fields.

Week	Lessons Taught	No of classes	Learning Objective
1	Introduction to Microprocessors, Classification, Block diagram.	4	To enable the students, understand the fundamental of Microprocessors
2	8085 Architecture, block diagram, Registers, Address and Data bus, Control signal generation	4	
3	Pin description of 8085 and analyses, Basic interfacing concepts, memory mapped and I/O mapped interfacing, DMA	4	
4	Opcode,8085 instructions, Different instructions classification and format,	4	To enable the students, understand the Operations and writing the ALP of 8085 Microprocessor
5	Some examples of Assembly language programming (ALP)	4	
6	Stack & Subroutine, call, return instructions,Counters, Timing diagrams, Instruction Cycle, Machhine Cycle, T-States, Time delay	4	
7	Interrupt structure of 8085, vectored and non-vectored interrupts, 8255 chip interfacing and control word format	4	
8	Review and Class Test	2	To review what is taught
9	Introduction to microcontroller, classifications	4	To enable the students, understand the fundamentals of Microcontroller
10	CISC vs. RISC Architectures, memory types	4	
11	Clocking, interrupts, timers, periferals	4	
12	PIC16F887 microcontroller, architecture, PIN diagram, Program and data memory organization, I/O ports	4	To enable students, understand the basic features and operations of PIC microcontroller
13	Different module: oscillator module, timer (0,1,2) module, comparator module, ADC module etc.	4	
14	Data eeprom, Special features of CPU, interrupts, addressing modes, instruction set	4	
15	Interfacing of LED, DC motor, etc. to PIC 16F887	4	
16	Review and Class Test	2	To review what is taught

Lesson Plan

Name of the Teacher: - Dr. Sudarsan Barui

Designation: - Assistant Professor, Department of Electronics

UG Semester 6

Course Taught: - **ELT-A-CC-6-13-TH: Communication Electronics**
Credits: 04
Lecture Hours: 56+4
Objective of the Course: - To enable the students, a fundamental understanding of Electronic Communication Systems and its applications in various engineering fields.

Week	Lessons Taught	No of classes	Learning Objective
1	Electronic Communication System, Block Diagram, EM Spectrum	4	To enable the students, understand the fundamentals of Electronic Communication
2	Concept of Channel, Base band Signal, Band designations and applications, Modulation Significance	4	
3	Concept of Noise, types, S/N ratio, Noise figure, Noise Temperature	4	
4	Friis Transmission Equation, Modulation techniques, Amplitude modulation, modulation index and frequency spectrum, Generation of AM	4	Students will be able to understand the fundamentals of AM modulation and demodulation techniques as well as transmitter and receiver
5	Demodulation techniques, Diode detector, Concept of DSBSC, SSBSC	4	
6	Pilot carrier Amplitude modulation, VSB modulation, Independent side band modulation	4	
7	AM transmitter and receiver, different stages, Super heterodyne receiver, Advantages	4	
8	Review and Class Test	2	To review what is taught
9	Frequency and phase modulation, modulation index and frequency spectrum, Equivalence between FM and PM	4	Students will be able to understand the fundamentals of FM and PM modulation and demodulation techniques
10	Generation of FM, PLL FM detector, Block diagram of FM transmitter	4	
11	FM receiver, different stages, AM, FM and PM Comparison, Sampling theorem, PAM modulation and detection techniques	4	
12	PDM, PPM modulation and detection techniques, Multiplexing, TDM and FDM	4	Students will be able to understand the fundamentals of Pulse analog and Pulse code modulation techniques
13	Pulse code modulation, Need for digital transmission, Quantization, Companding, coding and decoding	4	
14	Block diagram of digital transmission and reception, bit rate, baud rate, ASK techniques and analyses	4	Students will be able to understand the fundamentals of Digital carrier modulation techniques.
15	FSK, PSK, BPSK and QPSK techniques and analyses	4	
16	Review and Class Test	2	To review what is taught