SYLLABUS

Under Graduate (UG) Course CBCS

for

Subject- Electronics

(Under National Education Policy-2020)

B.Sc. PART I (Semester I & II) for Session 2023-24
B.Sc. PART II (Semester III & IV) for Session 2024-25
B.Sc. PART III (Semester V & VI) for Session 2025-26

DEPARTMENT OF PHYSICS
JAI NARAIN VYAS UNIVERSITY, JODHPUR

Titles of the Courses in B.Sc. (Electronics) as per NEP-2020 w.e.f Session 2023-24

	Sem	Course Type	Course code	Course Title	L/W	P/W	H/W	Total Hrs.	Credits	Total Credits	CA	EoSE	M.M.
Level-5 (NHQEF-4.5)	I	DCC	ELE5001T	Basic Circuit Elements and Network Analysis	4	0	4	60	4	6	30	70	100
			ELE5001P	Circuits and Networks Lab	0	2	4	60	2		30	70	100
	II	DCC	ELE5002T	Semiconductor Devices	4	0	4	60	4	6	30	70	100
			ELE5002P	Semiconductor Devices Circuits Lab	0	2	4	60	2		30	70	100
Level-6 (NHQEF-5)	III	DCC	ELE6001T	Analog Electronics	4	0	4	60	4	6	30	70	100
			ELE6001P	Analog Electronics Lab	0	2	4	60	2		30	70	100
		SEC	SEC6321T	Application of Software Packages	2	0	2	30	2	2	30	70	100
	IV	DCC	ELE6002T	Waveshaping circuits and Instrumentation	4	0	4	60	4	6	30	70	100
			ELE6002P	Electronics circuits Lab	0	2	4	60	2		30	70	100
		SEC	SEC6322T	Energy Resources : Harvesting and Storage	2	0	2	30	2	2	30	70	100
Level-7 (NHQEF-5.5)	V	DSE	ELE7101T	Communication Electronics	4	0	4	60	4	6	30	70	100
			ELE7101P	Analog Communication Lab	0	2	4	60	2		30	70	100
			ELE7102T	Digital Electronics	4	0	4	60	4	6	30	70	100
			ELE7102P	Digital Electronics Lab	0	2	4	60	2		30	70	
		SEC	SEC6323T	Ceramic Glasses : Synthesis and Applications	2	0	2	30	2	2	30	70	100
	VI	DSE	ELE7103T	Advanced Communication Systems	4	0	4	60	4	6	30	70	100
			ELE7103P	Digital Communication Lab	0	2	4	60	2		30	70	
			ELE7104T	Operational Amplifiers	4	0	4	60	4	6	30	70	100
			ELE7104P	OP-AMP Circuits Lab	0	2	4	60	2		30	70	100
		SEC	SEC6324T	Advances in Nano-materials & Technology	2	0	2	30	2	2	30	70	100

DCC – Discipline Centric Core Course; DSE - Discipline Specific Elective Course; L/W – Lecture per week; P/W- Practical per week; H/W – Hours per week, CA – Continuous Assessment; EoSE – End of Semester Examination, M.M. – Maximum marks, NHEQF – National Higher Education Qualification Framework Level

Semester-I

Course Code-ELE5001T

Basic Circuit Elements and Network Analysis

UNIT 1

Circuit elements: Electronic passive and active components, Voltage and current sources, Types of resistors and their rating, inductance, types of inductors, self and mutual – inductance, transformer principle, types of transformers, capacitance, types of capacitors, construction and characteristics of elements.

DC analysis:RC Circuit- Charging and discharging with initial charge, RL Circuit with Initial Current, Time Constant, RL and RC Circuits with Sources.

UNIT 2

Networks analysis: Kirchhoff's Laws, Kirchhoff 's Current Law (KCL), Kirchhoff 's Voltage Law (KVL), Network definitions, Node Analysis, Mesh Analysis, conversion between T and π configurations (Star-Delta Conversion).

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

Unit 3

AC Circuit Analysis: Sinusoidal Voltage and Current, Definition of Instantaneous, Peak, Peak to Peak, Root Mean Square and Average Values. Voltage-Current relationship in Resistor, Inductor and Capacitor, Phasor, Complex Impedance, Power in AC Circuits: Instantaneous Power, Average Power, Reactive Power, Power Factor. Sinusoidal Circuit Analysis for RL, RC and RLC Circuits. Resonance in Series and Parallel RLC Circuits, Frequency Response of Series and Parallel RLC Circuits, Quality (Q) Factor and Bandwidth.

UNIT 4

Coupled circuits: Coupled circuits and impedance transformation,inductive coupled circuits

Two Port Networks: Impedance (Z) Parameters, Admittance (Y) Parameters,Hybrid (h) parameters, characteristics impedance, Characteristics impedance of symmetrical T and π networks.

UNIT 5

Filters: Constant – k type low, high, band pass and band elimination filters, cascading of filters, attenuators.

AC Bridges based measurements: Wheatstone bridge, Kelvin bridge, Generalform of AC bridge balance, comparison bridges, Maxwell's bridge, Hay bridge, Scheringbridge, Wien bridge, impedance bridges, Q- meter

Books Suggested:

Grob: Basic Electronics Mcgraw Hill 1985

Mottershead: Electronics, Devices and Circuits PHI, 1984
Ryder: Networks, Lines and Fields PHI 1983
Helfrick & Cooper: Modern Electronic Instrumentation & Measurement Techniques, PHI.
Robert L. Boylestad: Essentials of Circuit Analysis, Pearson Education (2004)
Alexander and M. Sadiku: Fundamentals of Electric Circuits , McGraw Hill (2008)

Course Code-ELE5001P

Circuits and Networks Lab

1. Design and study of constant voltage source
2. Design and study of constant current source
3. Familiarization with – Resistance and capacitors in series and parallel b) Capacitors & Inductors in series & Parallel.
4. Study of voltage, frequency of a wave and phase angle of RC circuit using CRO.
5. Measurement of impedance-by-impedance bridge
6. Study of frequency response of series LCR resonance circuit
7. Study of frequency response of parallel resonance circuit
8. To measure the of maximum power transfer from source to load using resistive circuit
9. Verify the Thevenin theorem.
10. Verify the Norton theorem.
11. Verification of Superposition Theorem.
12. Charging and discharging RC Circuits and measurement of Time Constant.
13. To measure the characteristic impedance of symmetrical two-port resistive network
14. Design of passive low pass filter circuitand study of its Frequency Response.
15. Design of passive high pass filter circuitand study of its Frequency Response.

Note: - New experiments may be added on availability of equipments.

Semester-II

Course Code-ELE5002T

Semiconductor Devices

Unit-1

Semiconductor Basics: Semiconductors: Energy bands in metals, insulators and semiconductors, intrinsic semiconductors, mobility and conductivity, extrinsic semiconductors - n type and p type, carrier concentration, conductivity, Fermi levels, Hall effect, generation and recombination of carriers, Temperature Dependence of Carrier Concentrations, life time, photoconductivity, diffusion, continuity equation.

Unit 2

Semiconductor diodes:Formation of Depletion Layer, Space charge region and potential barrier, Current- voltage equation, forward and reverse bias characteristics, d.c. and a.c resistance, Space Charge and diffusion capacitances, Zener and Avalanche Junction Breakdown Mechanism. Varactordiode, tunnel diode and their characteristics.

Unit3

Bipolar Junction Transistors (BJT): Basic Transistor Action, NPN and PNP transistorsand their characteristics in CB, CE and CC configurations, Current Gainα, β and hybrid parameters, simple CE amplifier and its graphical analysis.
Metal Semiconductor Junctions: Ohmic and Rectifying Contacts.

Unit4

Field effect transistors: Junction field effect transistors (JFET) and their characteristics, Construction, Idea of Channel Formation, Pinch-Off and Saturation Voltage.
MOSFET, types of MOSFETs, Circuit symbols, Working and Characteristic curves of Depletion type MOSFET and Enhancement type MOSFET, comparison between p channel and n channel MOSFET, Comparison between BJT and FETs.
Power Devices: Silicon controlled rectifier (SCR), Diac, Triac and UJT and their Construction, Working and characteristics.

Unit5

Diode application: Half wave and full wave rectification, voltage regulation. Ripple factor, use of inductor, capacitor, L and π type filters, voltage regulation circuit using Zener diode
Optoelectronics devices: Photoconductivity cells, PN photodiodes, PIN photodiodes, Avalanche photodiode, simple applications of photodiodes, photovoltaic effect, solar cell: circuit symbol, characteristics, applications, LED and Phototransistors.

Books suggested:

Robert Boylstead and Louis Nashelsky: Electronic Devices and circuit theory, , PHI, 2013.
Allen Mottershed: Electronic Devices and Circuits, PHI, 1984.
J. Millman and C. C. Halkias: Integrated Electronics, Tata McGraw Hill (2001)

N.N. Bhargava, D.C. Kulshrestha and S.C. Gupta: Basic Electronics and Linear Circuits, T.T. T. I, Chandigarh,Tata Mc-Graw Hill Publishing Company Ltd., New Delhi, 1984.
R. S. Sedha: A Textbook of Applied Electronics, S. Chand and Company Ltd., 1990

Course Code-ELE5002P

Semiconductor Devices Circuits Lab

1. Study the semiconductor diode characteristics in forward bias condition
2. Study the Zener diode characteristics in reverse bias condition
3. Study the bipolar junction transistor (BJT) characteristics in CB mode configuration
4. Study the bipolar junction transistor (BJT) characteristics in CE mode configuration
5. Study the FET characteristics
6. Study the photo cell characteristics
7. Study the voltage regulation by Zener diode.
8. Study the DIAC characteristics.
9. To study ripple factor and rectification efficiency of a half wave and full wave rectifier circuits with different filters.
10. To trace the output of half wave and full wave rectifier with different filters using CRO.
11. Study the V-I characteristics of SCR.
12. Study the V-I characteristics of the UJT.
13. Study the V-I characteristics of a solar cell.

Note: - New experiments may be added on availability of equipments.

Semester-III

Course Code-ELE6001T

Analog Electronics

Unit-1

Amplifier: Basic requirement and principles-

Biasing and stability: Transistor biasing, bias stabilization, load line andOperating point, thermal instability, stability factor, fixed bias, collector to base bias, emitter bias, voltage divider bias with emitter bias (+VCC and –VEE bias) and emitter by pass capacitor.

Small signal transistor amplifier: small signal hybrid equivalent circuits at low frequencies, analysis of transistor amplifier using h - parameters, current gain, input impedance, voltage gain and output impedance.

Unit-2

Multistage Amplifier: Comparison of CE, CB, CC amplifiers, Cascading of transistor amplifiers, frequency response of a CE amplifier, RC coupled amplifiers,voltage gain at low, mid and high frequencies, gain band width product, effect of cascading on gain, phase and bandwidth.

Feedback concept: General theory of feedback, Voltage feedback- series input, shunt input, current feedback- series input and shunt input.

Unit-3

Negative Feedback amplifier: Characteristics of negative feedback - gain, stability, distortion, noise, frequency response, effect of negative feedback on input and output impedances of an amplifier.

Feedback amplifier:CE amplifier with current series and voltage shunt feedback, Amplifier using FET's, input capacitance, miller effect, bias methods, emitter follower, and source follower, Cascode amplifier for transistor and FET, Darlington pair, bootstrapping principle.

Unit-4

FET amplifiers: Amplifier using FET's, input capacitance, miller effect, bias methods, source follower.

Large signal (power) amplifier: Difference between voltage and power amplifier, Class A, Class B and class C operationsand their comparisons, efficiencies, distortions, Operation of a Class A single ended power amplifier. Operation of Transformer coupled Class A power amplifierpower amplification, class B push pull amplifiers using transistors, transistor phase inverter.

Unit-5

Tuned amplifiers: Circuit diagram, Working and Frequency Response, Limitations of singletuned amplifier, Class C tuned amplifier,Applications of tuned amplifiers in communication circuits.

Wide band (or video) amplifier: high frequency hybrid πcircuits for transistors, pulse testing, rise time, sag, various compensation techniques

Books Suggested:

Allen Mottershead: Electronic Devices and Circuits: An Introduction, Prentice Hall of India, 2005.

Robert Boylstead and Louis Nashelsky:Electronic Devices and circuit theory, 9th Edition, PHI,2013.

J. Millman and C. C. Halkias: Integrated Electronics, Tata McGraw Hill, 2001

V.K. Mehta and R. Mehta: Principles of Electronics, S. Chand and Company, Rev. Ed., 2010.

N.N. Bhargava, D.C. Kulshrestha and S.C. Gupta: Basic Electronics and Linear Circuits, T.T.T.I., Chandigarh, Tata Mc-GrawHill Publishing Company Ltd., New Delhi, 1984.

R. S. Sedha: A Textbook of Applied Electronics, S. Chand and Company Ltd., 1990

Course Code-ELE6001P

Analog Electronics Lab

1. Study the frequency response of a single stage BJT amplifier (CE amplifier)
2. Study the frequency response of single stage FET amplifier.
3. Study the frequency response of two stage RC coupled BJT amplifier.
4. Study the frequency response of two stage RC coupled FET amplifier.
5. Study the frequency response of a current series negative feedback amplifier.
6. Measurement of voltage gain, input and output impedance of a voltage amplifier
7. Measurement of voltage gain, input and output impedance of emitter follower
8. Measurement of voltage gain, input and output impedance of source follower
9. Study of Darlington pair emitter follower.
10. Study of voltage divider bias for BJT amplifier and find its operating point.
11. Measurement of transistor hybrid parameters.
12. Study of power amplifier.
13. Measurement of ac voltage operating range, and determination of voltage gain, bandwidth, and phase change using CRO for a single stage CE amplifier
14. Study of phase and gain variation in low, mid and high frequency regions of a voltage amplifiers.

Note: - New experiments may be added on availability of equipments.

Course Code- SEC6321T

Application of Software Packages

Unit-1

Software packages, system software and application software packages, general purpose application software packages, MS office Package, components of MS office, MS word: word documents, editing tools, font types, font size, other editing tools, inserting tables, figures, graphs, symbols and equations, equation editor, page layout, review tools: spelling, grammar and thesaurus

Unit-2

MS Excel: Excel worksheet, data types and range, calculation using Excel, inserting formulas, using common mathematical functions: Log, Exp, factorial, Random Numbers and sum; analysis of data using statistical functions such as: AVERAGE, MEDIAN, MODE, Standard Deviation, Normal distribution; linear regression, slope and intercept functions, graphs using Excel.

Unit-3

MS Powerpoint: PPTs slides, editing tools, font types, font size, other editing tools, inserting tables, figures, graphs, symbols and equations, inserting animations in PPTs, equation editor, page layout, review tools: spelling, grammar and thesaurus.

Books Suggested

Alexander Mamishev and Murray Sargent, Creating Research and Scientific Documents Using Microsoft Word, Microsoft Press (2013).

Les Kirkup, Data Analysis with Excel: An introduction for Physical Scientists, Cambridge University Press, Cambridge U.K. (2002).

Semester-IV

Course Code-ELE6002T

Waveshaping Circuits and Instrumentation

UNIT-1

Wave shaping circuits: Waveform terminology, RC wave shaping circuits, Differentiation and integration of step, pulse and square wave inputs, clipping and clamping circuits.

UNIT-2

Oscillators: Positive feedback and Barkhausen criterion, Block diagram of electronic oscillator, RC phase shift oscillator, Wein bridge oscillator, LC oscillators, Hartley and Colpitt oscillators.
Wave form generators: Astable, monostable and bistable multivibrators, Schmitt trigger, UJT as sawtooth waveform generator, general features of a time base signal, simple voltage and current sweep circuits.

UNIT-3

Regulated power supplies: voltage regulation using transistors, basic regulated dc power supply, transistor series and shunt regulator circuit, IC voltage regulators (78XX, 79XX and LM317).
Controlled rectification: Controlled rectification using SCR, current rating of SCR, DIAC and TRIAC, phase control circuits

UNIT-4

Cathode ray oscilloscope: Construction of CRT, deflection sensitivity of tube, block diagram of CRO, various controls and their operation, details of X and Y sections, horizontal sweep section, synchronization of sweep, triggered sweep, measurement of voltage, current, frequency and phase angle using CRO, basic idea about dual trace CRO.

UNIT-5

Laboratory Equipments: block diagram of standard signal generators, FETVM, digital voltmeter, digital multimeter, frequency counter, harmonic distortion – tuned circuit harmonic distortion analyzer, heterodyne harmonic analyzer.
Transducers, IC555 and its use in square and triangular waveform generator origin of bio-electric signals, ECG, cardiac monitor, sonography.

Books Suggested:

Allen Mottershead: Electronic Devices and Circuits: An Introduction, Prentice Hall of India, 2005.
Robert Boylstead and Louis Nashelsky:Electronic Devices and circuit theory, 9th Edition, PHI,2013.
J. Millman and C. C. Halkias: Integrated Electronics, Tata McGraw Hill, 2001
A. D. Helfrick and W. D. Cooper: Modern Electronic Instrumentation and Measurement Techniques, PHI
Jacob Millman and Herbert Taub: Pulse, Digital and Switching Waveforms, TMH

A. Anand Kumar: Pulse and Digital Circuits, PHI, 2012.
H.S. Kalsi: Electronic Instrumentation, Tata Mc-Graw Hill publishing Ltd., New Delhi, 3rd Ed, 2006.
David A. Bell, Electronic Instrumentation and Measurements, 3rd Edition, Oxford University Press (2013).

Course Code-ELE6002P

Electronics Circuits Lab

1. Design and study of RC phase shift oscillator
2. Design and study of Wein bridge oscillator
3. Design and study of Hartley oscillator
4. Design and study of UJT sawtooth waveform generator
5. Design and study of differentiating and integrating RC circuits
6. Design and study of clipping circuits
7. Design and study of clamping circuits
8. Design and waveformstudy of free running multivibrator(Astable multivibrator)
9. Design and study of digital timing circuit using IC555 as Astable multivibrator
10. Designing and testing of 9 V/12V DC regulated power supply using transistor and ICsand find its load and line regulation
11. Design and study of regulated dc power supply using IC-LM317.
12. Study of transistor switching behavior and their operating point.
13. Design and study of Schmitt trigger.

Note: - New experiments may be added on availability of equipments.

Course Code- SEC6322T

Energy Resources : Harvesting and Storage

Unit-1

Unit-2

Unit-3

Books Suggested

Semester-V

Course Code-ELE7101T

Communication Electronics

UNIT-1

Electronic communication: Block diagram of an electronic communication system,electromagnetic spectrum, need for modulation, Concept of Noise, Signal to noise ratio. Types of modulation: Analog, Digital and Pulse Modulation, Advantages and Disadvantages.

Amplitude Modulation: Amplitude Modulation, modulation index and frequency spectrum, side bands, power consideration, Generation of AM (collector and base modulation circuits), Block diagram of AM Transmitter

Concept of transmitter and Radio Receiver: Block diagram of Transmitter and Receiver Characteristics and their measurements, tuned radio frequency receiver, frequency translation, superheterodyne receiver – block diagrams, explanation of various stages.

UNIT-2

Amplitude Demodulation:linear envelope detector- diode detector, Concept of Double side bandsuppressed carrier, Single side band suppressed carrier and their transmission.

Radio Receiver: Block diagram of Receiver, Characteristics and their measurements, tuned radio frequency receiver, frequency translation, superheterodyne receiver – block diagram-explanation of various stages, AGC.

UNIT-3

Angle modulation: Frequency and Phase modulation, modulation index and frequencyspectrum, equivalence between FM and PM, Generation of FM (direct and indirect methods),
demodulation of FM signals, amplitude limiter, Foster- Seeley frequency discriminator, Ratio detector. Block diagram of FM Transmitter and Receiver, Comparison between AM, FM and PM.

UNIT-4

Transmission line: Equivalent circuit of a transmission line and its voltage and current equations,Propagation constant and characteristic impedance, reflection on a line not terminated in characteristics impedance, reflection coefficient and VSWR, open and short-circuited lines, Impedance properties of $\lambda/4$ and $\lambda/2$ lines, stub matching.

UNIT-5

Propagation of radio waves: Ground wave, sky wave and space wave propagation, structure of ionosphere, refraction and reflection of sky wave by ionosphere, refractive index, critical frequency, MUF, skip distance and fading.

Books Suggested:

Terman: Electronic and Radio Engineering, McGraw Hill
George Kennedy: Electronic Communication Systems, Tata McGraw Hill
S.P. Sharma: Basic Radio and Television, TMH

D. Roddy and J. Coolen: Electronic Communication, 4th Ed, PHI, 2004
Anokh Singh: Principles of Communication Engineering, S. Chand & Company, 2nd Ed. 2006

Course Code-ELE7101P

Analog Communication Lab

1. Design and study of AM modulation
2. Design and study of AM demodulation
3. Study of Balanced demodulator
4. Study of SSB-SC Modulator and Detector
5. Design and study of FM modulation
6. Design and study of demodulation
7. Design and study of cascading of filters circuits to simulated transmission lines
8. Study of AM Transmitter/Receiver
9. Study of FM Transmitter/Receiver
10. Study of AGC Characteristicsin radio receiver

Note: - New experiments may be added on availability of equipments.

Course Code-ELE7102T

Digital Electronics

UNIT-1

Number System and Codes:Binary, octal, decimal, hexadecimal and their inter-conversion, Weighted and Non-Weighted Codes, 8421,Excess-3 Code, BCD, ASCII andGray code.

Binary Arithmetic: Binary, octal and hexadecimal arithmetic (addition, subtraction by complement method) representation of signed and unsigned numbers.

UNIT-2

Basic logic gates and their electronic circuits: Introduction to Boolean Algebra and Boolean operators, Truth Tables of OR, AND, NOT,constructionand symbolic representation of XOR, XNOR, Universal (NOR and NAND) gates, Boolean Algebra, De'Morgan theorems.

Digital Logic families: Fan-in, Fan out, Noise Margin, Power Dissipation, Figure of merit, Speed power product, DTL and TTL families.

UNIT-3

Logic circuits for Boolean expressions: Sum of Products (SOP) and Productsof Sum (POS), Simplification of logical expression, Karnaugh maps: 2,3,4 Variable.

Memories: Semiconductor memories, RAM, ROM, Hard disk, optical disk. Main and secondary memory, cache memory.

Combinational Logic: Encoder and Decoder, Multiplexers and Demultiplexers, Half adder, Full adder, Parallel adder, Half subtractor, Full subtractor, ParallelSubtractor, 2's Compliment Adder-Subtractor, Magnitude Comparator.

UNIT-4

Sequential Circuits: Latches and Flip flops, RS using NAND and NOR Gates, D-Flip Flop, JK Flip-Flop, T Flip Flop,Timing Diagrams, clocked and edge triggered, PRESET and CLEAR, Active low and active highconditions, J-K Master Slave Flip-Flop.

Counters: Asynchronous counters, Synchronous counter, Ripple up, Ripple down counters, Mod 'n' counter, Up-Down counter, Timing Diagrams, Ring counter and Johnson counter.

Registers: Buffer register, shift register,SISO, SIPO, PISO, PIPO registers

UNIT-5

Microcomputer Architecture: Organisation of 8085 microprocessor: Registers, ALU, bus organization, memory and instruction set, simple examples of 8085 programming.

Data transfer: Types of data transfer, DMA data transfer, interrupts of 8085 and their interfacing,

Books Suggested:

B. Ram, Fundamental of Microprocessor and Microcomputers, Dhanpat Rai Publications, New Delhi

A.P. Malvino, Digital Computer Electronics, Tata McGraw Hill
A.P. Malvino and D. Leach, Digital Principle and applications, Tata McGraw Hill
Morris-Mano, Computer System Architecture, PHI
Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994)
R.S. Gaonkar, Microprocessor Architecture, Programming and Applications. Wiley Eastern Ltd

Course Code-ELE7102P

Digital Electronics Lab

1. To design and verify AND, OR, NOT and XOR gates using universal (NAND/ NOR) gates.
2. To convert a Boolean expression into a logic gate circuit and assemble it using logic gate IC's.
3. Design and study of half adder and full adder logic circuits.
4. Design and study of half subtractor and full subtractor logic circuits.
5. Write and run assembly language program for simple arithmetic operations using 8085 microprocessors.
6. To build a Flip- Flop Circuits using elementary gates. (RS, Clocked RS, D-type).
7. Design and study of filp- flop circuits using elementary gates (JK and master/slave)
8. Design shift registers from D Flip-Flop, to study serial and parallel shifting.
9. Design and study of 4-bit counter using JK/T Flip-Flop.
10. Design and study of multiplexer and demultiplexer.
11. Design a 4 X 1 Multiplexer using gates.
12. Design a 2 X 4 Decoder using gates.

Note: - New experiments may be added on availability of equipments.

Course Code- SEC6323T

Ceramic Glasses : Synthesis and Applications

UNIT-I

Ceramic glasses Introduction: History of glasses, types of natural & artificial glasses, selections of chemical composition & Doping materials, Calculation of glass batch composition to raw materials, homogeneity & grinding of glass batch composition, Annealing & polishing

UNIT-II

Synthesis Technologies: Melt quenching, Chemical reaction, Thermal evaporation, Sputtering, Gel-desiccation and Electrolyte depositions

UNIT-III

Ceramic glasses application: application of ceramic glasses in research laboratory equipment, medical field, commercials, fibers, coloring & discoloring etc.

Reference Books Suggestions

1 Ceramic materials - Roman Pampalls
2 Glass and Glass ceramic - M H Lewis
3 Functional Glasses and glass ceramic; Processing, Properties and applications - Basudeb Karmakar

Semester-VI

Course Code-ELE7103T

Advanced Communication Systems

UNIT-1

Pulse Analog Modulation: Introduction,Sampling theorem, PAM, PDM, PPMmodulation and detection techniques, Multiplexing, TDM and FDM.

Pulse Code Modulation: Need for digital transmission, Quantizationand the binary code,Quantization Noise, Companding, Coding, Decoding, Regeneration.

Unit-2

Digital Carrier Modulation Techniques: Block diagram of digital transmission andreception, Advantage and disadvantages of digital transmission, Information capacity, Bit Rate, Baud Rate and bandwidth. Amplitude ShiftKeying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Binary PhaseShift Keying (BPSK) and Quadrature Phase Shift Keying (QPSK)

UNIT-3

Monochrome Television transmission: Broadcast channels, picture scanning, Horizontal and vertical scanning, Image continuity, Number of scanning lines, Flicker, Interlaced scanning, camera tubes, frequency band and resolution, Bandwidth of video signal, Vestigial side band system, Composite video signal, Blanking pulses, Horizontal and vertical synchronization, Equalizing pulses, block diagrams of transmitter and explanation of each block.

Television Receiver: Block diagram of monochrome receivers and explanation of each block,MonochromePicture tube.

UNIT-4

Colour Television: Essentials of colour T.V. (compatibility, natural light, three colour theory), Luminance, Hue and Saturation, Chromaticity diagram, Luminance signal(Y), Production of colour difference voltage, Colour transmission, PAL system, Colour burst signal, Block diagram of colour receivers and explanationof each block; Delta gun colour picture tube.

UNIT-5

Radar system: Basic radar system, radar range equation, pulsed radar system, Doppler effect, CW Doppler radar system, moving target indicator principle, FM radar system.

Satellite Communication: Kepler's Laws, Satellites orbital patterns, Geo-synchronous satellites, Apogee,perigee, Angle of inclination, Antenna look angles, orbital spacing,Satellite systems link modules: Uplink Model,C-band transponder, Downlink Model

Books Suggested:

George Kennedy:Electronic Communication, 3rd edition, TMH.
S.P. Bali and Rajeev Bali: Audio & Video Systems, Khanna Book Publishing, Delhi (2004)
A. M. Dhake: Television and Video Engineering, TMH, 1998
S.P. Sharma: Basic Radio and Television, TMH, 2nd Ed., 2010.D. Roddy and J. Coolen: Electronic Communication, 4th Ed., PHI, 2004.
Wayne Tomasi: Advanced Electronic Communication System, Pearson, 2007.

M.I. Scholnik: Introduction to Radar Systems, 2ndEd., TMH, 2006
R.R. Gulati:Monochrome and Colour television, New Age International.
Bernard Grob:Basic Television Principle & Servicing, , McGraw Hill.
S. Haykin: Communication Systems, Wiley India, 2006.

Course Code-ELE7103P

Digital Communication Lab

1. Design and study of pulse width/position/amplitude modulation and demodulation circuits.
2. Design and study of ASK, FSK and BPSK modulation and demodulation circuits
3. Design and study of various moving objects and their detection using radar system.
4. Study of Time Division Multiplexing and de multiplexing.
5. Measurement of propagation loss, bending loss and numerical aperture of an optical fiber.
6. Study of optical fiber parameters.
7. Pulse code modulation and demodulation system.
8. Delta Modulation and Demodulation.
9. Study simple OFC Link.
10. Verification of Sampling Theorem

Note: - New experiments may be added on availability of equipments.

Course Code-ELE7102T

Operational Amplifiers

Unit-1

Basic Operational Amplifier: Concept of differential amplifiers (Dual input balanced and unbalanced output), Emitter- Coupled differential amplifier,Common mode and difference mode signals and their gains, Common-ModeRejection Ratio (CMRR) of differential amplifier, constant current bias.

Op-Amp parameters: Block diagram representation of a typical Op- Amp, Idealoperational amplifier, input offset voltage, input offset current, offset error voltages and currents, input bias current, differential input resistance, input capacitance, universal balancing techniques, input voltage range, common mode rejection ratio, slew rate, power supply voltage rejection ratio (PSRR),.

Unit-2

Op-Amp Circuits: Op-Amp IC-741 and its Pin-Connection, Open and closed loop configuration, Frequency response of an op-amp in open loop and closed loop configurationsand Band width, Equivalent circuit of OPAMP, Inverting, Non-invertingand their characteristics,op-amp with negative feedback; Closed loop gain, Input andoutput impedance,Concept of virtual ground.

Unit-3

Applications of Op-Amp: Inverting Op-Amp as constant multiplier, Sign-Changer, Adder or summingamplifier, Subtractor,Integrator, Integrator with adder, Differentiator, Log and Antilog amplifier. Op-amp as a Current to Voltage converter and Voltage to Current converter.

Comparators: Basic comparator, Level detector, Voltage limiters, Schmitt Trigger.

Unit-4

Signal generators: Phase shift oscillator, Wein bridge oscillator, square wave generator and triangle wave generator.

Signal Conditioning circuits: Voltage regulation by using op-amp, Sample and hold systems, Active filters: First order low pass and high pass Butterworth filter, derivation for cut-off frequency, Study of band pass, filters(Qualitative only).

Unit-5

D-A and A-D Conversion: Basic principles, 4-bit binary weighted register method and R-2R ladder D-A converters, A-D conversion characteristics, counter method and successive approximation ADC

Books Suggested:

Ramakant A. Gayakwad: Op-Amps and Linear Integrated Circuits, Prentice Hall of India Private Limited, New Delhi, 2010.

R. F. Coughlin and F. F. Driscoll: Operational amplifiers and Linear Integrated circuits, PearsonEducation (2001)

J. Millman and C.C. Halkias, Integrated Electronics, Tata McGraw-Hill,(2001)

A.P.Malvino: Electronic Principals,6th Edition , Tata McGraw-Hill,(2003)
K.L.Kishore: OP-AMP and Linear Integrated Circuits, Pearson(2011)

Course Code-ELE7104P

OP-AMP Circuits Lab

1. Study of differential amplifier and determine its CMRR.
2. Study the voltage gain and frequency response of operational amplifier in inverting mode.
3. Design and study of Op Amp as an Adder and subtractor.
4. Study of voltage regulation using OPAMP.
5. Design and study of Op Amp as log and anti-log amplifier circuit
6. Design and study of Op Amp as differentiator, integrator and inverting amplifier.
7. Measurement of different voltage gain and determination of frequency response and band width using CRO for an inverting amplifier.
8. Design and study of basic comparator, zero-crossing detector and Schmitt trigger circuit using Op Amp.
9. Design and study of first order low-pass filters using Op Amp.
10. Design and study of first order high-pass filters using Op Amp.

Course Code- SEC6324T

Advances in Nano-Materials & Technology

Unit-1

Nanoscience and Nanotechnology

General Introduction of Nanoscience and Nanotechnology, History of Nanomaterials, Classification of Nanomaterials, Some typical properties of nanomaterials, present and future applications of nanomaterials.

Unit-2

Synthesis of Nanomaterials

Physical Methods: Ball Milling, Photolithography, Electron-beam Lithography, Physical Vapour Deposition- Thermal Evaporation, E-beam Evaporation, Pulsed Laser Deposition, Chemical Methods: Sol-Gel Process, Solvothermal Synthesis, Hydrothermal Synthesis.

Unit-3

Characterization Techniques of Nanomaterials

X-ray crystallography, Scanning Electron Microscope, Transmission Electron Microscope, Ultraviolet-Visible Spectroscopy, Fourier Transform Infrared Spectroscopy, Raman Spectroscopy, Photoluminescence Spectroscopy, Electrical properties of nanomaterials, Magnetic properties of nanomaterials.

Suggested Books:

1. Nanoscience and nanotechnology, Sundar Singh, PragatiPrakashan, 2019.
2. Nanomaterials, A.K. Bandopadhyay, New Age International Publishers, 2008.
3. Fundamentals and Applications of Nanomaterials, Zhen Guo& Li Tan, ARTECH HOUSE, 2009.
4. Nanotechnology: An Introduction to Synthesis Properties and Applications of Nanomaterials, Thomas Varghese & K.M. Balakrishna, Atlantic Publishers & Distributors Pvt Ltd. 2020.