UG SYLLABUS UNDER SEMESTER SYSTEM

ELECTRONICS ELECTIVE PROGRAMME

TOTAL CREDITS: 34

DEPARTMENT OF ELECTRONICS
NORTH LAKHIMPUR COLLEGE (AUTONOMOUS)

P.O. KHELMATI, NORTH LAKHIMPUR, 787 031

B.Sc. Electronics (Elective)

Three Year Full-Time Programme (Six Semester Course)

Semester	Course Code	Subject	Marks	L	T	P	C
1	ET-5-ELE- 101	Basic Physics & Semiconductor Physics	100	4	1	0	5
	Semester Total		100	4	1	0	5
2	ET-3-ELE- 201	Network Analysis	60	3	0	0	3
	EP-2-ELE- 202	Lab Course -1	40	0	0	2	2
	Semester Total		100	3	0	2	5
3	ET-5-ELE- 301	Analog Electronics	100	5	0	0	5
	Semester Total		100	5	0	0	5
4	ET-3-ELE- 401	Digital Electronics	60	3	0	0	3
	EP-2-ELE- 402	Lab Course -2	40	0	0	2	2
	Semester Total		100	3	0	2	5
5	ET-4-ELE- 501	Electronics Communication	80	3	1	0	4
	EP-3-ELE- 502	Lab Course -3	60	0	0	3	3
	Semester Total		140	3	1	3	7
	ET-4-ELE- 601	Electromagnetic &Wave	80	3	1	0	4

6		propagation					
	PR-3-ELE- 602	Lab Course -4	60	0	0	3	3
	Semester Total		140	3	1	3	7
Programme Total			**680**	**21**	**3**	**10**	**34**

L – LECTURES PER WEEK (1 hour)
T - TUTORIALS PER WEEK (1 hour)
P – PRACTICALS PER WEEK (2 hour)
C - CREDITS

ELECTRONICS
Elective (General)
SEMESTER – I
TOTAL MARKS - 100

Course Code	Title	Marks	L	T	P	C
ET-5-ELE- 101	Basic Physics & Semiconductor Physics	100	4	1	0	5

Unit-I (Marks = 20)
Electrostatic and Electricity:

Coulomb's law, Gauss's law, Concept of electric potential, work & energy in electrostatics, electrostatics field in matter concept of electric displacement, Lorentz force, bio-savart law, Ampere's law, concept of magnetic vector potential, comparison of magnetostatics & electrostatics, Faraday's law of electromagnetic induction, Kirchoff's current &. Voltage laws.

Suspension Galvanometer, torque and deflection of the galvanometer, moving coil galvanometer. Ammeters, voltmeters (AC & DC), ohmmeters.

Unit-II (Marks=15)
Classical & Quantum Mechanics:

Inadequacies of classical mechanics, wave particle duality, de-Broglie waves, Davisson and Germar's experiments, Group and Phase velocities, wave packet.

Fundamentals of quantum mechanics, Heisenberg uncertainty principle, concept of wave function, Postulates of quantum mechanics, Schrodinger equations and application to potential problems (in one dimensional box),

UNIT-III (Marks: l0)

Electron Emission: Thermionic emission, Richardson's equation, Photoelectric emission, secondary emission, high field emission, Spacecharge, Child-Langmuir law.

UNIT—IV (Marks: 20)

Charge carrier in intrinsic and extrinsic semiconductor, p-type and n-type semiconductor, majority and minority carrier Fermi Level in semiconductor Mobility current density and conductivity; properties of p-n junction, I-V characteristics of p-n junction.

UNIT-V (Marks: 20)

Tunnel diode, Breakdown diodes, Transistor types, forward and reverse biased diode, common base, common emitter and common collector configurations, equivalent circuits, characteristic curves of transistor, current amplification factors, working principles of FET and UJT.

Unit-VI (Marks=15)

Power Supply: The ideal rectifier, Half-wave rectifier, Full-wave rectifier, Bridge rectifier, voltage doubler, capacitive filter, L-section filter, pi-section filter, controlled rectifiers, Electronic regulated power supply.

Text Book and References:

1. Beiser, Concepts of Modern Physics, McGraw-Hill Book Company .
2. Ghatak & S. Lokanathan, Quantum Mechanics: Theory and Applications, Macmillan India.
3. D C Tayal , Electricity and Magnetism
4. R Murugeshan, Modern Physics- S Chand
5. Streetman and Benerjee , Solid State Electronic devices, PHI
6. V K Mehta & R Mehta, Principle of Electronics, S Chand

ELECTRONICS
Elective (General)
SEMESTER – II
TOTAL MARKS - 60

Code (Paper)	Title	Marks	L	T	P	C
ET-3-ELE- 201	Network Analysis	60	3	0	0	3

UNIT -I (Marks: 15)

Network elements: Passive, Active elements, Tree and Graph of a Network, Nodal analysis, Mesh analysis.

Network Theorems: Superposition theorem, Milman theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem.

UNIT-II (Marks: 10)

Short Circuit Parameters: Two port Networks, Short circuit admittance parameters, open circuit impedance parameters, relation between Z- and Y-parameters, Transmission parameters (A, B, C, D,), A B C D parameters in terms of Z- and Y parameters, hybrid parameters, g- parameters; T-section representation, n-section representation, Image impedances, Symmetrical Networks, Ladder Networks, Lattice Networks.

UNIT-III (Marks: 15)

Network function for one and two port network, Poles and Zero's in the complex plane and the s-plane, properties of poles and zeros in the complex plane, Network functions for one port and two port networks, poles and zeros of network functions, restrictions on locations of poles and zeros, Time domain response from pole and zero plot, Significance of Poles and Zeros.

UNIT-IV (Marks: 10)

Laplace transformation, Transient response of RC, RL and RLC networks, Laplacian transform method, Laplacian transform of step voltage and a rectangular pulse, Laplacian transforms of commonly used voltage waveforms, Determination of network response with Laplacian transform, Response of networks to a pulse series.

UNIT-V (Marks: 10)

Network Filters: Constant K-Type filters, low pass, high pass, band pass, band elimination; m- derived filters (low pass, high pass), Delay network, attenuators and attenuating pads.

Suggested Text & Reference Books:

1.G.K. Mittal, Network Analysis, Khanna Publication.
2. A. V. Oppenheim, A. S. Wilsky and S. H. Nawab, Signals and Systems, Pearson Education
3. H. P. Hsu, Signals and Systems, Tata McGraw Hill.

4. M. Roberts, Fundamentals of Signals and Systems,Tata McGraw Hill.. S. T. Karris, Signal and Systems: with MATLAB Computing and Simulink Modelling, Orchard Publications.

Course Code	Subject	Marks	L	T	P	C
EP-2-ELE- 203	Lab Course -I	40	0	0	2	2

PAPER – EP-2-ELE- 202 **Total Class= 64**
Total Marks = 40
Lab Course - I

1. To study the V-I characteristics of a Semiconductor diode.
2. To study the V-I characteristics of a Zener diode.
3. To study the ripple factor of Half-wave rectifier using semiconductor diode.
4. To study the ripple factor of Full-wave rectifier using semiconductor diode.
5. To design and study Half-wave voltage doubler using semiconductor diodes.
6. To design and study Full-wave voltage doubler using semiconductor diodes.
7. To study the current-voltage characteristics of P-N-P and N-P-N transistors (CE configuration).
8. To study the characteristics of Emitter follower of P-N-P or N-P-N transistor.
9. To study the R-L-C series resonance circuit and evaluate the Q factor.
10. To study the R-L-C parallel resonance circuit and evaluate the Q factor.
11. To study the R-C circuit as an
    i) Integrator and
    ii) Differentiator.
12. To study the voltage divider network.
13. To verify the Thevenin's theorem and determine the equivalent circuit.
14. To verify the Norton's theorem and determine the equivalent circuit.

Course Code	Subject	Marks	L	T	P	C
ET-5-ELE- 301	Analog Electronics	100	5	0	0	5

PAPER - ET - 5 - ELE – 301 Total Class = 112
Total Marks =100
Analog Electronics

UNIT I: (Marks =15)
DC power supply: Block diagram of a power supply, Qualitative description of shunt capacitor filter, Regulated power supply using Zener diode , Temperature coefficient of Zener diode.

Unit II: (Marks =20)
Analysis of transistor amplifiers, Transistor biasing, stabilization, Two-port representation of a transistor, AC equivalent circuit using h-parameters, Determination - of h parameters, Analysis of transistor amplifier using h parameters.
Classification of amplifiers; Distortion in amplifier, amplitude, frequency and phase distortion, Impedance matching, frequency range of amplifiers, Transistor as an amplifier in CE configuration, load line analysis, operating point, voltage gain, dc and ac equivalent circuits.

Unit III: (Marks = 20)
R-C coupled amplifiers, Impedance coupled amplifiers, Transformer coupled amplifier, Band pass amplifiers, Video amplifiers, direct coupled amplifiers, Noise in amplifiers, low noise amplifiers.
Power amplifiers, efficiency of amplifiers, class A amplifiers, push-pull class A operation, parallel class A operation, class B audio frequency amplifiers, class B and C radio frequency amplifiers, simplified analysis of linear class B and class C amplifiers.

Unit IV: (Marks = 15)
Feedback amplifiers: The feedback concept, feedback network, advantage of negative feedback's characteristics of negative feedback amplifiers, effect of negative feedback on input and output impedances and on bandwidth, high input impedance transistor circuits, emitter follower and biasing, cascade configuration, Design of RC - coupled cascaded audio amplifiers, Basic design considerations for preamplifiers.

Unit V: (Marks = 15)
Oscillator: Barkhausen criterion, Properties of feedback circuits, feedback requirements for oscillator, generation of continuous oscillation, Tuned collector oscillator, Hartley oscillator, Colpitts oscillator, phase-shift oscillator, Wien-Bridge oscillator, crystal oscillator, relaxation oscillators.

Unit VI :(Marks =15)
Integrated Circuits:

Fabrication of monolithic integrated circuits, Integrated circuit component, operational amplifier, Adder, Substractor, Integrator, Differentiator, Measurement of operational amplifier parameters, Characteristics of operational amplifiers.

Text Books & References

1. Millman and Hallkias, Integrated Electronics: Analog and Digital Circuit Systems,
2. Tata McGraw Hill.
3. A P Malvino and Bates, Principles of Electronics, Tata McGraw Hill.
4. Millman- Halkias, Electronic device & circuit: Tata McGraw Hill.
5. J B Gupta, Electronic device & circuits, KATSON Publication.
6. Ryder, Electronic Fundamentals & Applications, PHI
7. Malvino, Electronic Principles, Tata McGraw Hill.

Course Code	Subject	Marks	L	T	P	C
ET-3-ELE- 405	Digital Electronics	60	3	0	0	3

4th Semester
PAPER- ET-3-ELE- 401
Total Marks = 60
Digital Electronics

Unit -1 (Marks 10)
Number System and Base Conversion: Decimal, Binary, Octal, Hexadecimal and BCD number system, compliment Technique, addition, Subtraction, Multiplication of different system.
Boolean Algebra: Boolean postulates from basic gates, properties of Boolean algebra, De Morgan's theorem, simplification of Boolean expressions using K-map.
Codes: Need of Coding, Weighted codes (BCD), Exess - 3 code, Gray code and conversion, Alpha numeric code- ASCII and EBCDIC, Decimal to binary encoder, octal to binary encoder. Decoders, BCD- to-7 segment decoder.

Unit II (Marks 15)
Logic gates : Basic Logic operation, AND, OR, NOT, NAND, NOR, XOR, gates. Universal gales, Truth tables, Bipolar logic families, DTL families, RTL families, TTL families, Schottky TTL, Emitter coupled logic (ECL), MOS and CMOS ICs as inverter, NAND and NOR gates, Fan-in, Fan-out, Noise-immunity and propagation delay of logic families.

Unit – III (Marks 10)
Arithmetic circuits: Half adder, Full adder, parallel binary adder. Half subtractor. Full subtractor, subtraction using full adder, 4-bit adder/subtractor. Binary multipliers,
speed up addition.

Unit – IV (Marks 15)
Flip-flops: Combinational and sequential circuits, flip-flops, SR flip-flop. Clocked SR flip-flop, D-latch, JK flip-flop. Master-slave flip-flop, Edge-triggered devices, Application of flip-flops.

Unit – V (Marks 10)
ADC and DAC: Digital to analog converter, Weighted Register DAC, R-2R ladder DAC, Analog to digital converter, Successive approximation ADC.

Suggested Text and Reference Books:

1. R.L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw-Hill.

2. Thomas L. Floyd , Digital Fundamentals, Pearson Education Asia.
3. S.P. Bali, Solved Problems in Digital Electronics, Sigma Series, Tata McGraw Hill.
4. W. H. Gothmann, Digital Electronics: An Introduction To Theory And Practice,
5. Prentice Hall of India.
6. R.P. Jain, Modern Digital Electronics, Tata McGraw-Hill.

Course Code	Subject	Marks	L	T	P	C
EP-2-ELE- 406	Lab Course -II	40	0	0	2	2

PAPER= EP-2-ELE- 402 **Total Class = 64**
Total Marks = 40
Lab Course - II

1. To determine its h-parameters of a transistor in CE mode.
2. To study the characteristics of Emitter follower of PNP & NPN transistor.
3. To plot output & mutual characteristics of a field effect transistor.
4. To design and study the characteristics of RC coupled amplifier using NPN transistor in CE mode.
5. To design a passive low pass and high pass filters using RC components.
6. To study an OPAM as inverting and non-inverting amplifier.
7. To design and study OPAM as summer, Integrator and Differentiator.
8. To study AND, OR, NOT and XOR gates using RTL and gate ICs.
9. To study AND, OR, NOT and XOR gates using NAND gates.
10. Simplify a given Boolean expression and implement the circuit using logic gate.
11. To design and study Half and Full adder.

Course Code	Subject	Marks	L	T	P	C
ET-4-ELE- 507	Electronics Communication	80	3	1	0	4

PAPER = ET-4-ELE- 501 **Total Class = 96**
Total Marks = 80
Electronics communication

Unit - I (Marks 10)
Signals and systems, Classification, Basic communication system, Noise in communication system.

Unit – II (Marks 15)
Modulation: Amplitude modulation, frequency spectrum and power content, generation of AM, SSB and vestigial sideband; Angle modulation, frequency modulation, phase modulation, FM generation, varactor diode FM modulator, pulse modulation, pulse code modulation.

Unit – III (Marks 10)
Detection: Linear diode detector, detection characteristics of diode and its uses, effect of introducing C and R in a diode, diode for automatic volume control, square law diode detection, frequency demodulation, discriminator, limiter, detector, SSB detection, PCM encoders and decoders, multiplexing.

Unit - IV (Marks 15)
Propagation of waves: Ground, space and sky wave propagation. Propagation through troposphere and ionosphere, propagation through space, characteristics of various propagation media with reference to LF, HF, VHF and microwave signals.

Unit - V (Marks 20)

Radio Receivers and Television:

Parameters of radio receiver, regenerative receivers, tuned radio receiver, super heterodyne receiver, FM receiver, Telephone receiver

Picture elements, principle of image transmission, TV camera tubes-Image orthicon and Videocon, Electron beam scanning synchronization, separation of horizontal and vertical pulses, TV Bandwidth and channels, TV transmitter, and receiver, Colour TV, colour TV transmitter and receiver, picture tube.

Unit - VI (Marks 10)

Special Communication Systems:

Line-of-sight microwave links and communication via satellite, calculation of path Loss and transmitter power required, Block diagram of pulsed and CW radar transmitters and receivers, Radar range, power and frequency consideration; radio aids to navigation-direction finders, aircraft navigation system.

Suggested Text and Reference Books:

1. G. Kennedy and B. Davis, Electronic Communication Systems, Tata McGraw Hill.
2. W. Tomasi, Electronic Communication Systems: Fundamentals through Advanced, Pearson Education.
3. R. P. Singh and S. D. Sapre, Communication Systems: Analog and Digital, Tata McGraw Hill.
4. L. E. Frenzel, Communication Electronics: Principles and Applications, Tata McGraw Hill.
5. L. W. Couch II, Digital and Analog Communication Systems, Pearson Education.
6. T. G. Thomas and S. Chandra Sekhar, Communication Theory, Tata McGraw Hill.

Course Code	Subject	Marks	L	T	P	C
EP-3-ELE- 508	Lab Course -III	60	0	0	3	3

PAPER - EP- 3 – ELE – 502 **Total Class = 96**

Total Marks = 60

Lab Course - III

1. To study the Amplitude Modulation.
2. To study the Amplitude Demodulation.
3. To study the Frequency Modulation.
4. To study the Frequency Demodulation.
5. To study the Single Side Band Modulation.

6. To study the Single Side Band Demodulation
7. To study of AM Transmitter and Receiver
8. To study FM Transmitter and Receiver.
9. To determine the self inductance of a Coil by Anderson's Bridge using AC.
10. To study the variation of thermo-emf of a thermocouple with difference in temperature of its two junctions.
11. To determine the temperature coefficient of resistance by platinum resistance thermometer.

Course Code	**Subject**	**Marks**	**L**	**T**	**P**	**C**
ET-4-ELE- 609	Electromagnetic &Wave propagation	80	3	1	0	4

PAPER - ET- 4-ELE – 601 **Total Class = 96**
Total Marks = 80
Electromagnetic and wave propagation

Unit I :(Marks 20)

Electromagnetic theory:

Fundamentals concepts- gradient, divergence & curl of a vector –applications to simple problems, Gauss divergence theorem, Stoke's theorem, Green's theorem (proof not necessary), application to simple problems

Unit II: (Marks 25)

Electromagnetic theory of wave propagation:

Energy in a magnetic field, Maxwell's equation and Maxwell's wave equation, poynting theorem & poynting vector, simple problems.

The wave equation, the plane wave, polarization of electromagnetic waves, linear and circular polarization, reflection, refraction and dispersion, polarization by reflection and total internal reflection.

Electromagnetic waves in non-conducting media, reflection and transmission at oblique incidence, Snell's law, Fresnel's equation, Brewster's angle, electromagnetic waves in conducting media, skin depth, reflection,& transmission at a conducting surface, dispersion, normal and anomalous dispersion, Cauchy's equation.

Unit III: (Marks 15)

Transmission Line: Basic concept of transmission line, low & high frequency transmission line, distributed parameters, types of transmission line, voltage & current relation on radio frequency transmission line, characteristics impedance, transmission line as circuit element, voltage & current relation with distance from load end or receiving end, line terminator, propagation constant, conditions for distortion less transmission with minimum attenuation, loss free line, short circuit & open circuit lines, standing wave ratio, phase factor, reflection & transmission co-efficient, transmission Line matching, maximum power transfer.

Unit IV: (Marks 20)

Basic antenna principles, Wire and Aperture Antennas**,** Dipole, Power radiated, Radiation Resistance, Antenna Characteristics, Antenna Patterns, Radiation Intensity, Directive Gain, coordinate system, radiation fields, polarization, isotropic radiator.

Half-wave Dipole Antenna, Quarter-Wave Monopole Antenna, Small Loop Antenna, Aperture Antenna, Antenna Arrays, Microstrip Antennas.

Suggested Text and Reference Books:

1. W. H. Hayt and J.A. Buck, Engineering Electromagnetics, Tata McGraw Hill
2. M. N. O. Sadiku, Elements of Electromagnetics, Oxford University Press
3. D. C. Cheng, Field and Wave Electromagnetics, Pearson Education
4. J. A. Edminster, Electrmagnetics, Schaum Series, Tata McGraw Hill

Course Code	Subject	Marks	L	T	P	C

PR-3-ELE- 610	Lab Course -IV	60	0	0	3	3

PAPER- PR-3-ELE- 602 **Total Class = 96**
Total Marks = 60
Lab Course - IV

(One project based on papers of entire programme)

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