Detailed Syllabus (B.Sc. (Engineering) in ECE)

(Effective from Jan-Jun, 2017)

SUMMARY OF COURSES
LEVEL-1 SEMESTER-I

Serial No.	Course Code	Course Title	Credit	Contact hours/week
1	EEE 103	Basic Electrical Engineering	3.00	3.00
2	EEE 104	Basic Electrical Engineering Sessional	0.75	1.50
3	CSE 107	Computer Basics and Programming	2.00	2.00
4	CSE 108	Computer Basics and Programming Sessional	1.50	3.00
5	MAT 109	Differential and Integral Calculus	3.00	3.00
6	CHE 139	Chemistry	3.00	3.00
7	CHE 140	Chemistry Sessional	0.75	1.50
8	SSL 107	Technical English	2.00	2.00
9	SOC 105	Sociology	2.00	2.00
		Total	**18.00**	**21.00**

No. of Theory Courses: 6
No. of Sessional Courses: 3
Total contact hours: (15.00 + 6.0) = 21.00
Total credit: (15 + 3) = 18.00

Course Code: EEE 103
Course Title: Basic Electrical Engineering
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Fundamental Concepts: Voltage, current, power, energy, independent and dependent sources, resistance. Electric field E, Electric dipole, Gauss's law.

Basic Circuits law: Ohm's law, Kirchhoff's current and voltage laws, Condition for Maximum Power Transfer. Simple resistive circuits: Series and parallel circuits, voltage and current division, wye-delta transformation. Solution of Electrical Networks: Loop and Nodal Analysis, Thevenin's, Norton's, Superposition, Millman's and Reciprocity Theorem. Introduction to Alternating Current Circuits: Sinusoidal voltage & current, frequency, phase difference, Energy Stored in Capacitor & Inductor, Average and RMS Values, Complex Impedance and Phasor Algebra, Power relations in AC Circuits, Series and Parallel Resonance.

Responses of RL, RC and RLC circuits: Natural and step responses. Instantaneous voltage, current and power, impedance of AC quantities, RMS value & average value, RLC series and parallel circuits. Q-factor and bandwidth, Power factor, Application of RLC circuit.

Magnetic quantities and variables: Flux, permeability and reluctance, magnetic field strength, magnetic potential, flux density, magnetization curve. Laws in magnetic circuits: Ohm's law and Ampere's circuital law, Biot Savart law. Magnetic circuits: series, parallel and series-parallel circuits.

Course Code :EEE 104
Course Title: Basic Electrical Engineering Sessional
Credit: 0.75
Contact Hours/ Week:1.50
Syllabus:
Experiments based on syllabus of EEE 103
Course Code: CSE 107
Course Title: Computer Basics and Programming
Credit: 2.00
Contact Hours/ Week: 2.00
Syllabus:
Introduction to Computer Basics: Types and Generations of Computers, Basic Organization and Functional units of Computers, CPU, Motherboards, BIOS, Memory units, Keyboard, Mouse, OMR, OCR, MICR, CD ROM, DVD, Printers, CRT, Floppy Disk, Hard Disk, Magnetic tape etc.
Introduction to Computer Programming: Problem solving techniques, algorithm specification and development, programming style, debugging and testing, documentation, program design methodologies, structured and modular program design.
Programming Language with C: Data types, operators and conversions, control structures, array, user defined function, string operation, pointer, structure, union and file management.

Course Code: CSE 108
Course Title: Computer Basics and Programming Sessional
Credit: 1.50
Contact Hours/ Week: 3.00
Syllabus:
Experiments based on Syllabus of CSE 107

Course Code: MAT 109
Course Title: Differential and Integral Calculus
Credit: 3.00
Contact Hours/ Week:3.00
Syllabus:
Differential Calculus: Review of differentiation of various types of functions with domain and Range; Limit, Continuity and Differentiability, Differentiation of Explicit & Implicit Functions and Parametric Equations, Significance of Derivatives & Differentials, Successive Differentiation of various types of Functions, Rolle's Theorem, Mean value theorem. Taylor's and Maclaurin's theorems in finite and infinite forms. Divergence and Convergence of series. Partial differentiation, Tangent, normal and curvature. Determination of maxima and minima of functions and their application.
Integral Calculus: Review of indefinite and definite integration of various types of functions. Use of definite integration in summing series. Walli's formulae. Improper integrals. Beta function and Gamma functions. Area under a plane curve and area of a region enclosed by two curves in Cartesian and polar coordinates. Volume and surface areas of solids of revolution.

Course Code: CHE 139
Course Title: Chemistry
Credit: 3.00
Contact Hours/ Week: 3.00

Syllabus:

Inorganic Chemistry:

Structure of Atom: Wave nature and particle nature of electrons, de Broglie's equation, Heisenberg's Uncertainty Principle, Schrodinger's wave equation, particle in one dimensional box and in the three dimensional box, normalization and orthogonalization of wave functions.

Coordination Chemistry: Structure and Bonding of Coordination Compounds, Different Theories of Coordination Compounds and their Limitations, Geometry, Electronic Spectra, Isomerism of Coordination Compounds, Chelate compounds.

Chemical bonding: Valence Bond Theory, Molecular Orbital Theory, Linear combination of atomic orbital, Metallic Bonding, Hydrogen Bonding, Vander waal's forces. Semiconductor Materials: Structure and properties of semiconductor elements: B, Si, Ge, Ga, As, Sb, Semiconductor, Energy band description on semiconductor, effect of temperature on semiconductor.

Physical Chemistry:

Electrochemistry: Conductance, Types of Electrolytic conductance, Variation of Electrolytic conductance with concentration and temperature, migration of ions, Kohlrauch's law, Ionic Mobility, Abnormal Ion Conductance, Transport Number, Electrochemical cell, Writing cell diagram, Cell emf, Salt bridge, Reversible electrodes, Relation between emf and free energy, Derivation of Nernst's equation for a reversible electrode, Electrode potential, Application of standard electrode potential.

Spectroscopy: Quantization of Energy, Regions of Spectrum, Representation of Spectra, Interaction of electromagnetic radiation with matter, derivation and application of Beer-Lambert's law, Principle of UV-visible spectroscopy, Instrumentation of UV-visible Spectrophotometer.

Photochemistry: Photochemical Reactions, Laws of Photochemistry, Quantum Yield, Photosensitized Reaction.

Organic Chemistry:

Reaction Mechanism: Free radical Reaction, Nucleophilic and Electrophilic Substitution and Addition, Chemistry of Polymerization; Addition and Polymerization, Free Radical, Anionic and Cationic. Condensation Polymerization; Some Synthetic and Natural Polymers and their Properties.

Course Code: CHE 140
Course Title: Chemistry Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:

1. Preparation of Standard Solution.
2. Acid-base Titration.
3. Oxidation Reduction Titration.
4. Identification of Organic Compound.

Course Code: SSL 107
Course Title: Technical English
Credit: 2.00
Contact Hours/ Week: 2.00
Syllabus:

Phonetics: Phonetics and phonology, their branches, sounds, vowel, consonant, Some general rules of pronunciation. IPA transcriptions.

Grammar: Use of Prepositions, Question words, Phrases and Idioms, Correction of Error, Structure of Sentences, Clauses, Transformation of Sentences.

Writing: Précis Writing, Comprehension, Paragraph Writing on Scientific and Other Themes, Official and Commercial Correspondence, Technical Report Writing, Research Paper Writing, Thesis, dialogue, Study of manners, Effective oral presentation, Preparing resumes and job letters, Applications, Press report writing, Tender Notice, Free Composition.

References:

1. English Phonetics and Phonology by Roach, P.
2. Phonetics and Phonology by Varshney, Dr.R.L.
3. Elements of General Phonetics by Abercombie, David.
4. Introduction to English Language Study by Dr. Moniruzzaman.
5. Language by Dr. Ataul Haque, Dr. Jahurul Islam.

Course Code: SOC 105
Course Title: Sociology
Credit: 2.00
Contact Hours/ Week: 2.00
Syllabus:
Part A:

Introduction: Sociology, common sense and science; meaning of technology; relationship between society, science and technology; human technolgy interaction; technology and behavior; basic concepts of sociology (society, community, association, institution, group, state and government).

Modern Society and Contemporary Society (Bangladesh): Innovation and diffusion of technology; the attributes of innovation and their rate of adaption; uses and impacts of technologies in various social aspects and changing society (creation of social inequality-mass media and satisfaction); advancement of society (e-commerce, e-banking, e-governance); industrialization, hi-tech park and e-waste; political activism on internet; impacts of technology on workplace.

The Information Technology Revolution: Technology, society and historical change; the historical sequence of the information technology revolution; the creation of the internet; the self in the information society; technologies of the life; types of society (pre-industrial, industrial and post industrial).

Population, Environment and Technology: Technology, environmental problems and sustainable development from sociological perspective.

Part B:

The New Economy based on Technology: Globalization on markets for goods and services; informational production and selective globalization of science and technology.

The Transformation of Work and Employement: Networks, Jobless and Flex-Timers: The maturity of the inforamtional society: employment projection in the twenty-first century; the effects of information technology on employment: towards the jobless society.

Communication Revolution and Mass Media: Meaning of social networking and social media; types of media; cyber world and life.

The Culture of Real Virtuality: The Integration of Electronic Communication, The End of Mass Audience and The Rise of Interactive Networks: The interactive society; the culture of real virtuality; social networks and virtual communities; everyday life in the electronic cottage; the self, reality and virtual reality; cyber crime (meaning, types, cause, effects, solution and respective laws).

Books Recommended

1. Manuel Castells The rise of the network society

2. Michael Adas Machines as the measure of man
3. Wenda K, Bauchspies, Jennifer Croissanmt, and Sal Restivo
Science, Techonology and Society.

SUMMARY OF COURSES
LEVEL-1 SEMESTER -II

Serial No.	Course Code	Course Title	Credit	Contact hours/week
1	ECE 151	Electronics-I	3.00	3.00
2	ECE 152	Electronics-I Sessional	1.50	3.00
3	EEE 157	Electrical Drives	3.00	3.00
4	EEE 158	Electrical Drives Sessional	0.75	1.50
5	AIE 110	Mechanical Engineering Drawing	0.75	1.50
6	PHY 111	Engineering Physics	3.00	3.00
7	PHY 112	Engineering Physics Sessional	1.00	2.00
8	MAT 113	Ordinary & Partial Differential Equations and Matrix	3.00	3.00
9	ECN 129	Economics	2.00	2.00
		Total	**18.00**	**22.00**

No. of Theory Courses: 5
No. of Sessional Courses: 4
Total contact hours: (14.00 + 8.00) = 22.00
Total credit: (14 + 4) = 18.00

Course Code: ECE 151
Course Title: Electronics-I
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

P-N junction as a circuit element: Intrinsic and extrinsic semiconductors, operational principle of p-n junction diode, contact potential, current-voltage characteristics of a diode, simplified dc and ac diode models, dynamic resistance and capacitance. Diode circuits: Half wave and full wave rectifiers, rectifiers with filter capacitor, characteristics of a zener diode, zener shunt regulator, clamping and clipping circuits,Tunnel diode, varactor diode, L-C filter, C-L-C filter.

Transistor: Introduction to Bipolar Junction Transistor (BJT), Packages, Ratings, Parameters, Bipolar Junction Transistor Characteristics, Transistor Configurations and Their Equivalent Circuits (CB, CE, & CC), Biasing and Stabilization of BJT Amplifiers, Load Line, r-Parameters, h-Parameters, Analysis at Low, Medium and High Frequencies, Different Transistor Amplifier Circuits and their Cascading, Effects on I/O Impedance, Darlington Pair, Emitter Follower, JFET and MOSFET Characteristics, Biasing and Stabilization of Q Point, amplifier configurations, Small and large Signal Analysis, Frequency Response, MOS differential amplifier, Photoelectric Devices, Solar Energy Converter

Operational Amplifier (Op-Amps): Introduction to Op-Amps, Op-Amp characteristics, AC, AD, CMRR, Slew Rate, Offset Voltage and Other Parameters, Differentiator, Integrator,

Comparator Circuits, Schmitt trigger, Linear Applications of OP-Amps, Non linear applications of OP-Amp, Comparator, Astable & Monostable modes of Amplifier, IC 555 with applications, Phase Looked Loop (PLL).

Course Code: ECE 152
Course Title: Electronics-I Sessional
Credit: 1.50
Contact Hours/ Week: 3.00
Syllabus:
Experiments based on Syllabus of ECE 151

Course Code: EEE 157
Course Title: Electrical Drives
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:
DC Generator: Description of Different Parts of DC Generators, EMF equation, Principle of DC Generator. Parallel operation. Application of DC Generator.
AC Generator: Construction, Theory of Operation, Alternator Regulation, Synchronizing & Load Sharing of Alternator, Applications of AC Generator.
Transformer: Working principle and its construction, Parallel Operation, Types, Equations, Lossess, Regulations, Efficiency, Auto and Current transformers, Cooling of a transformers, Three Phase operation of single Phase Transformer, Applications of Single phase & Three Phase Transformer.
DC Motor: Principle of operation, Classification, Applications of DC Motor.
AC Motor: Induction Motor, General Principles, Rotating Magnetic Field, Single Phase Motor, Starting Methods, Speed Control Methods. Applications of AC Motor.
Synchronous Motor: Theory of Operation, Motor Characteristics, Synchronous Condenser, Applications of Synchronous Motor. Introduction to Single Phase A/C Machines, Stepper Motor, Servo Motor.

Course Code:EEE 158
Course Title: Electrical Drives Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of EEE 157

Course Code: AIE 110
Course Title: Mechanical Engineering Drawing
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Basic elements of Mechanical Drawing- Type of lines, Scale of Drawing, Dimensioning, Lettering. Orthographic projection, Sectional view, Auxiliary view, Isometric views/projection, Missing line, Detail and Assembly drawing, AutoCAD or other software's/ contemporary packages.

Course Code: PHY 111

Course Title: Engineering Physics
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Optics: Combination of lenses: Equivalent Lens and Equivalent Focal Length, Defects of Images Formed by Lenses; Spherical Aberration, Astigmatism, Coma, Distortion, Curvature of Image, Chromatic Aberration.

Interference: Interference by Multiple Reflection, Interferometers, Newton's rings, Huygen's Principle and construction, Young's Double Slit Experiment, Bi-prism.

Diffraction: Fresnel and Fraunhofer Diffraction, Diffraction by Single Slit, Diffraction of Double slit, Diffraction of Gratings.

Polarization: Production and Analysis of Polarized Light, Optical activity of Nicol prism & others, Optics of Crystals.

Laser: Induced absorption, Spontaneous and stimulated emissions, Laser principle, Properties & characteristics of laser beam concepts of coherence, He-Ne and semiconductor lasers (simple ideas) and applications.

Fibre Optics: Propagation of light in fibres, numerical aperture, single mode and multi mode fibres, applications.

Oscillations: Simple harmonic motion, Combination of S.H.M. and Lissajous Figures, Free, Damped and Forced Oscillations, Resonance, Vibrations of Membranes and Columns. Standing Waves, Travelling Waves, Principle of Superposition, Wave Velocity, Group Velocity and Phase Velocity, Power and intensity in a wave.

Sound waves: Audible, Infrasonic and Ultrasonic, Travelling Longitudinal Waves, Standing longitudinal Waves, Vibrating Systems and Sources of Sound, Beats, Doppler Effect.

Relativity: Michelson- Morley Experiment, Galilean-Lorentz Transformation, Relativity of Mass, Einstein Mass-Energy Relation.

Quantum Theory: Photoelectric Effect, Quantum Theory of Light, Compton Effect, De-Broglie Wave, Uncertainty principle and its application, Time dependent and time independent Schrodinger's wave Equation.

Atom Model: Bohr's theory of one Electron Atom, Correspondence principle, Vector Atom Model, Nucleus, Properties of Nucleus-Binding Energy.

Course Code: PHY 112
Course Title: Engineering Physics Sessional
Credit: 1.00
Contact Hours/ Week: 2.00
Syllabus:
Experiments based on Syllabus of PHY 111

Course Code: MAT 113
Course Title: Ordinary & Partial Differential Equations and Matrix
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Ordinary differential equations: Definition, Formation of ODE; Degree and order of ODE; Solution of first order and first degree ODE with various methods; Solution of first order and higher order homogeneous and Non-homogeneous differential equations with constant coefficients; Engineering applications. Solution of DE in series use Frobenious method; Special function: Bessel's functions, Legendre's polynomials and their properties.

Partial differential equations (PDE): Formation of PDE; Solution of linear and Nonlinear PDE of order one; Charpit's method; Second order PDE; Homogeneous and Non-homogeneous linear equations with constant coefficients. Solution separations of variables; PDE of engineering (Wave equation, heat flow equation; Transmission line equations i. e. telephone equation, telegraph equations, radio equations etc) and their solutions.

Matrix: Definition of Various types of matrix; Algebra of matrix; Elementary transformation of matrix; Rank of matrix in canonical and normal from; Inverse of matrix; Solution of linear equations; Eigen values and eigen vectors; Calay-Hamilton theorem; Matrix Polynomials.

Course Code: ECN 129
Course Title: Economics
Credit: 2.00
Contact Hours/ Week: 2.00
Syllabus:

Introduction: Definition and scope of economics; basic concepts and tools used in economics; economic problem scarcity and choice; opportunity cost, factors of production, microeconomics vs. macroeconomics; production possibility frontier.

Demand and Supply : Concepts of demand and supply; laws of demand and supply; shifting demand and supply curves; market equilibrium; price ceiling and price floor; Elasticity of demand and supply.

Theory of Consumer Behavior: Utility analysis of demand; law of diminishing marginal utility; cardinal vs. ordinal utility; indifference curve analysis; properties of indifference curves; budget constraints; consumer's equilibrium.

Market: Structure of markets; characteristics of different types of markets; perfect competition, monopoly, oligopoly.

National Income: GNP-concept and measurement, GNP and NI, NI and personal disposable income, GNP and spending, nominal and real GNP, comparing income levels in different countries.

Money and Banking: Definition and functions of money, different kinds of money; banking – from goldsmith banking to modern banking, commercial banks and multiple deposit creation, functions of central bank, money supply, open market operations, high-powered money and money multiplier and monetary policy.

Inflation and Unemployment: Definitions, measures of inflation, types of inflation, unemployment definitions and types, inflation-unemployment trade off.

Cost Benefit Analysis: Project Approval, NPV, IRR and their application to cost benefit analysis

Recommended Books:

Arnold, R A (2007): Economics, South Western Publishing Company, Eighth Edition,

Koutsoyiannis, A (2003): Modern Microeconomics, Palgrave Macmillan, Second Revised Edition

Mankiw, N G (2006): Principles of Economics, Thomson South Western Publishing, Fourth Edition

Samuelson, P A and W D Nordhaus (2005): Economics, McGraw-Hill USA, Eighteenth Edition.

Stiglitz, J E and C E Walsh (2005): Principles of Microeconomics, W, W Norton and Co Inc. USA

Dornbusch, Rudiger et al (2004): Macroeconomics, McGraw-Hill International, Ninth Edition

SUMMARY OF COURSES
LEVEL-2 SEMESTER-I

Serial No.	Course Code	Course Title	Credit	Contact hours/week
1	ECE 202	Electronic Circuit Design Sessional	1.00	2.00
2	ECE 203	Electronics-II	3.00	3.00
3	ECE 204	Electronic-II Sessional	1.50	3.00
4	ECE 205	Signals and Systems	3.00	3.00
5	ECE 206	Signals and Systems Sessional	0.75	1.50
6	CSE 211	Data Structures and Algorithms	3.00	3.00
7	CSE 212	Data Structures and Algorithms Sessional	1.50	3.00
8	MAT 203	Vector Analysis and Operational Calculus	3.00	3.00
9	ACT 293	Financial and Manegerial Accounting	2.00	2.00
		Total	**18.75**	**23.50**

No. Of Theory Courses: 5
No. Of Sessional Courses: 4
Total contact hours: (14.00 + 9.50) = 23.50
Total credit: (14 + 4.75) = 18.75

Course Code: ECE 202
Course Title: Electronic Circuit Design Sessional
Credit: 1.00
Contact Hours/ Week:2.00
Syllabus:

Electronic symbols, PCB Design, Etching and assembly, Audio preamplifier, Driver and output stage, Signal tracing in amplifier with an oscilloscope, Loud speaker and connecting it in the output stage of an amplifier, Testing a push-pull power amplifier, Electronic schematic diagrams, Trouble shooting of Signal generators-Audio amplifiers-Oscillators-Radio receivers-TV receivers and Oscilloscope, Familiarization with IC components.

Course Code: ECE 203
Course Title: Electronics-II
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

RC Coupled Amplifiers: Analysis of RC Coupled Transistor Amplifier Circuits at Low Frequency (LF), Medium Frequency (MF), High Frequency (HF)Ranges.

Un-tuned Power Amplifiers: Analysis of Class A, B, C, D, E and AB Amplifiers. Neutralization, Push pull, Class B, Class C Amplifier and their Design. Transistor Amplifier with Complementary Symmetry.

Tuned Amplifiers: Resonant Circuit, Quality factor and Bandwidth of an Amplifier, Tuned Potential Amplifiers, Single Tuned, Double Tuned and Cascade Amplifier analysis.

Feedback Amplifiers: The Feedback concept, General characteristics of Negative Feedback amplifier.

Methods of Feedback: Voltage series Feedback, Current series Feedback, Current shunt Feedback, Voltage shunt Feedback.

Oscillators: Condition of Self Oscillations. Study of Different Types of Oscillators. Design of Oscillators. Frequency Stability, Negative Resistance in Oscillators.

Linear wave shaping: Diode Wave Shaping Techniques, Clipping and Clamping circuits, Comparator Circuits, Switching Circuits, Pulse transformers, Pulse transmission, Pulse generation.

Active filters: Different types of filters and specifications, transfer functions, realization of first and second order low, high and band pass filters using Op-Amps.

Course Code: ECE 204
Course Title: Electronics-II Sessional
Credit: 1.50
Contact Hours/ Week: 3.00
Syllabus:
Experiments based on Syllabus of ECE 203

Course Code: ECE 205
Course Title: Signals and Systems
Credit: 3.00
Contact Hours/ Week: 3.0
Syllabus:

Classification of signals and systems: Signals classification, basic operation on signals, elementary signals, representation of signals using impulse function; systems classification. Properties of Linear

Time Invariant (LTI) systems: Linearity, causality, time invariance, memory, stability, inevitability.

Time domain analysis of LTI systems: Analogues system Differential equations system representation, order of the system, solution techniques, zero state and zero input response, system properties; impulse response convolution integral, determination of system properties; state variable basic concept, state equation and time domain solution.

Frequency domain analysis of LTI systems: Fourier series- properties, harmonic representation, system response, frequency response of LTI systems; Fourier transformation- properties, system transfer function, system response and distortion-less systems.

Applications of time and frequency domain analyses: Solution of analog electrical and mechanical systems, amplitude modulation and demodulation, sampling theorem time division and frequency division multiplexing.

Laplace transformation: Properties, inverse transform, solution of system equations, system transfer function, system stability and frequency response and application. Pole zero concepts.

Introduction to Random signals: Stationary, Ergodicity, Noise models, Correlation and power spectrum, Distribution and density functions.

Course Code: ECE 206
Course Title: Signals and Systems Sessional
Credit: 1.00
Contact Hours/ Week: 2.00
Syllabus:

Experiments based on Syllabus of ECE 205

Course Code: MAT 203
Course Title: Vector Analysis and Operational Calculus
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Vector Analysis: Vector and scalar quantity, linearly dependent and independent Vector differentiation; Gradient, Divergence and Curl. Vector Integration, Line integrals; surface integrals; Volume integrals; The divergence theorem of Gauss; Stoke's theorem; Greenn's theorem in the plane; Re-lated integral theorem. General Coordinates.

Operational Calculus: Fourier analysis: Real and complex from of Fourier series; Half-rang Expansion; Fourier value problems using Fourier transform.

Laplace Transform: Definition of Laplace transform and inverse laplace transform; property of Laplace transform; Laplace transform of Derivatives and Integrals; Unit-step function, Dirac-Delta function, Periodic function; some special theorems on Laplace transforms, solutions of D.E and evaluation of improper integral use Laplace transform.

Course Code: CSE 211
Course Title: Data Structures and Algorithms
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Concepts and examples of Elementary Data objects: Abstract data types and data structures, Classes and objects,

Complexity of Algorithms: Worst case, average case, and amortized complexity, Algorithm analysis. Algorithm design paradigms, Lists: stacks, queues, implementation, garbage collection.

Dictionaries: Hash tables, binary search trees, AVL trees, red-black trees, splay trees, skip-lists, B-trees. Priority queues, Topological Short.

Graphs: Greedy algorithm, Divie-and-Conquer algorithms, Dynamic programming, Randomized algorithms, Backtracking algorithms, NP complexity, Tuning Machine, Shortest path algorithms, minimal spanning tree algorithms, depth-first and breadth- first search. Sorting: Advanced sorting methods and their analysis, lower bound on complexity, order statistics.

Course Code: CSE 212
Course Title: Data Structures and Algorithms Sessional
Credit: 1.50
Contact Hours/ Week: 3.00
Syllabus:
Experiments based on Syllabus of CSE 211

Course Code: ACT 293
Course Title: Financial and Manegerial Accounting
Credit: 2.00
Contact Hours/ Week: 2.00

Syllabus:

Accounting: Meaning and Importance of Accounting, Some relevant accounting principles, Journal-Ledger, Trial balance, Final accounts (Income statement and balance sheet); Considering adjusting entries.

Costing: Concept of cost; Classification of costs; Labour, Overhead and Job costing, Marginal costing, Operating costing.

Management and Organization: Brief history of the development of management theories, management functions; principles of management; organization structure; type of organization; lines of command and response; span of control, centralization and decentralization, authority-responsibility relationship.

Personnel management: Management function; principles of management and industrial relations; manpower planning, recruitment and development; discipline; leadership types of leaders; types of leading; communication skills; moral and motivation; human needs and theories of motivation; reaction to frustration; job rotation; enlargement and enrichment.

Performance appraisal and compensation: Job evaluation; merit rating; salary and wages; wage incentive plans; wages and productivity; fringe benefits.

Marketing Management: Purchasing procedures; contracts and subcontracts, purchasing problem, marketing concepts, industrial and consumer selling; distribution channels of goods, marketing problems, sales promotion techniques; advertising; organization for purchasing and selling; sales department.

SUMMARY OF COURSES
LEVEL-2 SEMESTER-II

Serial No.	Course Code	Course Title	Credit	Contact hours/week
1	ECE 251	Digital Logic Design	3.00	3.00
2	ECE 252	Digital Logic Design Sessional	0.75	1.50
3	ECE 253	Electromagnetic Fields & Waves	3.00	3.00
4	ECE 255	Analog Communications	3.00	3.00
5	ECE 256	Analog Communications Sessional	0.75	1.50
6	ECE 257	Industrial Electronics	3.00	3.00
7	ECE 258	Industrial Electronics Sessional	0.75	1.50
8	CSE 261	Object Oriented and Internet Programming	2.00	2.00
9	CSE 262	Object Oriented Programming Sessional	1.50	3.00
10	STT 211	Engineering Statistics and Complex Variables	3.00	3.00
		Total	**20.75**	**24.50**

No. of Theory Courses: 6
No. of Sessional Courses: 4
Total contact hours (17.00+7.50) = 24.50
Total credit: (17+3.75) = 20.75

Course Code: ECE 251
Course Title: Digital Logic Design
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Number Systems: Representation of Numbers in different bases. Addition, Subtraction in different bases; Base Complement: Subtraction using Complements; Binary Multiplication and Division.

Binary Codes & Simplification of Boolean functions: Different Code Systems. Boolean algebra: Various Gates. Sum of products and Product of Sums; Maxterm, Minterm, Standard and Canonical form and other Logical Operations. Karnaugh map method; Tabular method of simplification.

Implementation of Logic Circuits using various Gates: NOR, NAND, AND, OR, INVERT Implementation. Diode Logic Gates, Transistor Switches, Transistor Gates, MOS Gates, Logic Families: TTL, ECL, IIL and CMOS logic with operation details.

Combinational Logic Circuits: Design Procedure; Adder, Subtractor, Code Converters, Parity bit Checker etc. Analysis of Combinational Circuits and its Truth Table. Encoder, Decoder, Multiplexer, Demultiplexer, ROM and PLA.

Flip-Flops: Latches, Flip-Flops, SR, JK, Master Slave, T & D type Flip Flops and their Truth Tables.

Sequential Circuits: Introduction to Sequential Circuits. Analysis and Synthesis of Synchronous Sequential Circuits.

Counters: Classifications, Synchronous and Asynchronous Counter Design and Analysis, Ring Counter, Johnson Counter, Counter with Parallel Load.

Registers: Classifications, Shift Register, Transfer Registers, Circular Registers and their Applications. Registers with Parallel Load.

Converters: Digital to Analog (D/A) & Analog to Digital (A/D) Converters and their Applications.

Coure Code: ECE 252
Course Title: Digital Logic Design Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 251

Course Code: ECE 253
Course Title: Electromagnetic Fields and Waves
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Coordinate System: Introduction to coordinate systems, transformations between coordinate systems.

Electrostatics field: Coulomb's law, force, Electric Field Intensity, Electric Flux Density, Gauss's theorem with application, Electrostatic potential, Boundary conditions, Method of images, Laplace's and Poisson's equations, Energy of Electrostatic System. Conductor and Dielectrics.

Magnetostatics field: Concept of Magnetic Field, Ampere's law, Biot-savart Law, Vector Magnetic Potential, Energy of Magnetostatic System, Mechanical Forces and Torque in Electric and Magnetic Fields. Curvilinear co-ordinates. Rectangular, Cylindrical and Spherical Coordinates, Solutions to Static Field, Problems, Graphical field mapping with applications, Solutions to Laplace's equations. Rectangular, Cylindrical and Spherical harmonics with applications.

Maxwell's Equations: Derivations of Maxwell's equations in different co-ordinate systems and its applications, Continuity of Charges, Concept of Displacement Current, Boundary conditions for Time Varying Systems, Potentials used with Varying Charges and Currents. Retarded Potentials. Wave equations and their solutions.

Relation between Circuit Theory and Field Theory: Circuit Concepts and its derivation from Field Equations. High frequency circuit concepts, Circuit radiation resistance. Skin effect, Concept of good and perfect conductors and dielectrics, Depth of penetration and Circuit impedance. Current distribution in various types of conductors, internal impedance, Power loss.

Plane Electromagnetic Waves: Propagation of plane wave in lossless and lossy media, Polarization of plane wave, Flow of EM power and Poynting vector.

Radio wave propagation: Plane wave propagation through ionosphere and ground wave propagation. Effect of earth curvature on wave propagation.

Course Code: ECE 255
Course Title: Analog Communication
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Introduction to Analog communication: Necessity and Types of modulation, transmitters, transmission channels and receivers.

Spectral Analysis: Preview of Fourier transform theory, energy, power, Parseval's theorem, Power Spectral Density Functions (PSDF), Analog Spectrum Analyzers, Auto Correlation Function, Relationship between the PSDF and the Auto Correlation Function, PSDF's of harmonic signals and un-correlated (white) signals. Review of signal transfer in linear systems, Ideal Low pass Filters.

Continuous Wave linear Modulators: Amplitude modulation (AM), Time Domain Expression and Modulation Index, Frequency Domain (Spectral) representations, and Transmission bandwidth for AM. AM for a single Tone Message, Phasor Diagram of an AM signal, Illustration of the Carrier and Side Band Components.

Double Side Band (DSB) Modulation: Time and Frequency Domain Expressions, Square Law Modulators, Balanced Modulators, Ring Modulators, Single Side Band Modulation (SSB), Generation of SSB using a Side Band filter, Indirect Generation of SSB, Vestigial Side band Modulation (VSB).

Demodulation for Linear Modulation: Demodulation of AM signals, Square Laws and Envelop Detectors, Super heterodyne Receiver for Standard AM Radio, Synchronous demodulation of AM, DSB and SSB.

Frequency and Phase modulation: Instantaneous Frequency and phase, Time Domain Representations for FM and PM, Phasor Diagram for FM and PM. FM and PM Signals for a Single Tone Message, Modulation Index and Phasor Diagrams. Spectral representation of FM and PM for single tone message. Transmission bandwidth for FM, Carson's rule, Narrow band and Wide Band FM and PM signals. Generation of FM, Commercial FM requirements. Demodulation of FM and PM signals, Limiter, discriminator, Commercial and Stereo FM Radio.

Frequency division multiplexing (FDM) Systems: FDM in Telephony, Telephone Hierarchy and examples of Group and Super group Generation. Satellite System and Applications and Frequency Division Multiple Access (FDMA) Systems. Filters and Oscillator requirement in FDM.

Representation of Random Signals and Noise in Communication System: Signal Power and Spectral Representations, White noise, Thermal noise, PSDF of White Signals. Input and Output Relationship for Random Signals and Noise Passed Through a Linear Time Invariant System, Band Limited White Noise, ARC Filtering of White Noise.

Noise performance of Analog Communication Systems: Signal-to-Noise Ratio in Linear Modulation, Synchronous Detection of DSB. Signal-to-Noise Ratio for AM and SSB, FM, Effect of Noise in Envelope and Square Law Detection of AM, Threshold Effects in Nonlinear Detectors.

Course Code: ECE 256
Course Title: Analog Communication Sessional
Credit: 0.75

Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 255

Course Code: ECE 257
Course Title: Industrial Electronics
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Introduction to Thyristor Family: SCR, DIAC,TRIAC, IGBT, GTO, UJT, UJT Relaxation Oscillator, Programmable UJT (PUT); PUT Relaxation Oscillator, Schottky diode, Silicon Unilateral Switch (SUS), Silicon Bilateral Switch (SBS), Asymmetrical AC trigger devices. Phase Control Converters: Single Phase and Three Phase, Semi and Full Converters. DC to DC Converters, Step-up & Step-down Choppers, Thyristor Chopper Circuits.

DC Motor Control: DC Motor Braking and Plugging Circuit; Emergency Stop. Speed Control of PM/Shunt Motors: Electronic Speed Control using Armature Voltage Control Method. Solid State Motor Speed Controllers: Single Transistor Speed Control; OP-AMP and Darlington Power Amplifier Speed Control; OP-AMP and MOSFET Power Amplifier Control for PM/shunt Motors.

SCR Speed Control Circuits for PM/shunt Motors: Simple SCR Circuit; SCR plus UJT Circuit Variation of Pulse Width Modulation (PWM) Speed Control Circuit.

Speed Control of Series/Universal Motors: Series/Universal Motor Control Circuit using SCR (half wave control); TRIAC and DIAC (full wave control); TRIAC Control with Hysteresis compensation. DC Motor Reverse Control: Balance Bridge(reversing) Drive for PM or Shunt Motors, Phase Control Circuit for Series DC Motor, DC-DC Chopper Control.

Stepper Motors: Stepper Motor Drive circuit using Transistors, Darlington Transistors and MOSFETs.

AC Motor Control: Speed Control, Variable Frequency Converter, Block Diagram, Simplified Single Phase Cycloconverter, Control Rectification, TRIAC Control, Single Phase Inverter, Three Phase Six Step Inverter. Controlled Rectification, Electronic Timers, Switched Mode Power Supplies. Voltage Multipliers, Magnetic Amplifiers, Induction Heating, Dielectric Heating.

Elctronic Control of Heating and Welding: Resistance heating, Principle of induction heating, Heat free power source, Applications, Principles and theory of dielectric heating, Electric welding.

Course Code: ECE 258
Course Title: Industrial Electronics Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 257

Course Code: CSE 261
Course Title: Object Oriented Programming
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Programming Using C++: Principles of Programming Languages and Structured Programming Concepts. Variables, Arithmetic Expressions, Data types, Operators and Expressions, Control Flow, Arrays, Pointers, Procedures and Functions, Structures and Unions, String Operations, Dynamic Memory Allocation, File Management System, Graphics, Writing, debugging and running Programs in C++, Sequential I/O operation, Random I/O operation, Error handaling, Problem solving using object oriented programming.

Programming Using JAVA: Java foundation, control flow, abstract classes and packages, exception handling, applets, web based java application, multithreading.

Course Code: CSE 262
Course Title: Object Oriented Programming Sessional
Credit: 1.50
Contact Hours/ Week: 3.00
Syllabus:
Experiments based on Syllabus of CSE 261

Course Code: STT 211
Course Title: Engineering Statistics and Complex Variable
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Statistical Analysis: Definition, uses, scopes of probability, variable and its type, Presentation of data, Measure of central tendency, Measures of dispersion; Moments skewness and kurtosis; correlation and regression. Definition and rules of combination, probability theory, Random variable and probability density functions, Mathematical expectation, Probability distributions, discrete probability distributions like binomial, Poisson,Geometric, Hypergeometric distribution, Continuous probability distribution like normal and exponential, characteristics of distributions, Test of hypothesis, Marcov's and Chebyshev's Inequality, Central limit theorem, Laws of large numbers.

Complex Variable: General functions of a complex variable, Limits and continuity of a function of complex variable. Complex differentiation and the Cauchy-Riemann equations. Line Integral of a complex function, Cauchy's Integral theorem, Cauchy's Integral formula.

SUMMARY OF COURSES
LEVEL-3 SEMESTER-I

Serial No.	Course Code	Course Title	Credit	Contact hours/week
1	ECE 301	Semiconductor physics and devices	3.00	3.00
2	ECE 303	Control System Engineering	3.00	3.00
3	ECE 304	Control System Engineering Sessional	0.75	1.50
4	ECE 305	Digital Communication	3.00	3.00
5	ECE 306	Digital Communication Sessional	1.50	3.00
6	ECE 307	Microwave Engineering	3.00	3.00
7	ECE 308	Microwave Engineering Sessional	0.75	1.50
8	ECE 309	Numerical Methods in Engineering	3.00	3.00
9	ECE 310	Numerical Methods in Engineering Sessional	0.75	1.50
10	CSE 316	Internet Programming Sessional	1.50	3.00
		Total	**20.25**	**25.50**

No. of Theory Courses: 5
No. of Sessional Courses: 5
Total contact hours: (15.00+10.50) = 25.50
Total credit: (15+5.25) = 20.25

Course Code: ECE 301
Course Title: Semiconductor Physics and Devices
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Introduction: Carrier statistics and Fermi level. Carrier transport and Hall effect. Recombination. Optical processes in semiconductors. Homogeneous and in homogeneous semiconductors under equilibrium and non-equilibrium conditions. Thermionic and field emissions. Breakdown phenomena. Schrodinger's wave equation and one dimensional potential structure.

Optical properties in semiconductor: Direct and indirect band-gap materials, radiative and non-radiative recombination, optical absorption, photo-generated excess carriers, minority carrier life time, luminescence and quantum efficiency in radiation.

Light emitting diode (LED): Principles, materials for visible and infrared LED, Internal and external efficiency, loss mechanism, structure and coupling to optical fibers, Stimulated emission and light amplification: Spontaneous and stimulated emission, Einstein relations, population inversion, absorption of radiation, optical feedback and threshold conditions. Semiconductor Lasers: Population inversion in degenerate semiconductors, laser cavity, operating wavelength, threshold current density, power output, hetero-junction lasers, optical and electrical confinement, Introduction to quantum well lasers.

Photo-detectors: Photoconductors, junction photo-detectors, PIN detectors, avalanche photodiodes and phototransistors.

Solar cells: Solar energy and spectrum, silicon and Schottkey solar cells.

Modulation of light: Phase and amplitude modulation, electro-optic effect, acousto-optic effect and magneto-optic devices.

Course Code: ECE 303
Course Title: Control System Engineering
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Introduction to Control System: Rotating Power Amplifier, AC & DC Servomotor, Input to Control System, Steady State Response to Step, Ramp and Parabolic Inputs, Transient Response, Poles and Zeros, Frequency Response of pole and zero diagram, Routh's stability Criterion, Block Diagram Representation, Transfer function and flow graph, Absolute and relative stability, Parameter sensitivity, Root locus, Frequency response, Nyquist Stability Criterion.

Modern Control System: Introduction, State Variable Analysis, Canonical Forms, Controllability and Observability, Application of Eigen Values, Linear Control System Design by State Feedback Control Design, P, I, PI and PID Types.

Course Code: ECE 304
Course Title: Control System Engineering Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 303

Course Code: ECE 305
Course Title: Digital Communication
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Introduction to Digital Communication Systems: Digital Communication Sources, Transmitters, Transmission Channels and Receivers, Distortion, Noise and Interference, Nyquist Sampling Theory, Sampling of Analog Signals, Spectrum of Sampled Signal, Sampling Theorem for Band-limited Signals, Effects of Aliasing, Reconstruction of Sampled Signals.

Baseband Pulse and Digital Signaling: Pulse Amplitude Modulation (PAM), Bandwidth Requirements and Reconstruction Methods, Pulse Duration Modulation (PDM), Generation of PDM Signals and Reconstruction Methods. Analog to Digital Conversion, Quantization and Encoding Techniques, Pulse Code Modulation (PCM), Quantization of Noise in PCM, Companding in PCM Systems, Differential PCM (DPCM), Delta Modulation (DM), Adaptive DM (ADM).

Multiplexing: Time Division Multiplexing (TDM), Synchronous TDM, Statistical TDM, TDM Hierarchy, The T1 PCM System, Synchronization. Line Codes and Spectra: Different Types of Line Codes and Spectra, Eye Pattern, Regenerative Repeater.

Digital Modulation Techniques: Band Pass (modulated) Digital Data Systems, Binary Digital Modulation, ASK, PSK, DPSK and FSK. M-array Data Communication Systems, Quadrature Amplitude Modulation (QAM) Systems, Four Phase PSK, Probability of Error Expression for Binary Communications, Probability of Error in QAM Systems, Comparison

of Digital Modulation systems. Application of Modems for Transmission over Telephone Lines. Introduction to Spread Spectrum System.

Course Code: ECE 306
Course Title: Digital Communication Sessional
Credit: 1.50
Contact Hours/ Week: 3.00
Syllabus:
Experiments based on Syllabus of ECE 305

Course Code: ECE 307
Course Title: Microwave Engineering
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

H.F. Transmission lines: Transmission Line Analogy, Reflection from Conducting and Dielectric Boundary; Liquids and Solids, Microwave Transmission Lines, Impedance Matching Techniques, Smith Chart and Its Applications.

Wave Guides: Guided Electromagnetic (E.M) Waves Propagation; Propagation of different waves through Parallel-Plate Wave Guides, Rectangular and Circular Wave Guides, Dominant and degenerate modes, Field patterns, Cavity Resonators.

Microwave Tubes: Microwave systems, Classification of microwave tubes, Limitations of conventional microwave tubes in microwave applications, Klystron amplifier, Reentrant cavities, Velocity Modulation, Space Charge wave, Multicavity Klystron Amplifier, Reflex Klystron Oscillator. Magnetron, Travelling Wave Tube (TWT) Amplifier, Backward Wave Oscillator (BWO). Waveguide Components,

Solid State Microwave Devices: Gunn diode, Energy band structure of Gunn diode, Gunn oscillator, Different modes of Gunn diode oscillator, Application of Gunn diode, Solid state devices used as microwave amplifier, Applications of solid state microwave devices. Industrial applications of Microwaves, Microwave Heating, Microwave Radiation Hazards.

Course Code: ECE 308
Course Title: Microwave Engineering Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 307

Course Code: ECE 309
Course Title: Numerical Methods in Engineering
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Numbers and Errors: Significant Figures, Absolute and Relative error, Rounding Error in Functional Evaluation, Propagation of Error in Arithmetic Process.

Single Non-linear Equation: Picard Iteration, Newton Raphson Method of Convergence.

Interpolation: Difference Tables, Newton Forward and Backward Interpolation Formulae with Error, Divided Difference and Central Difference Formulae, Lagranges Interpolation Formula, Numerical Differentiation.

Numerical Integration: Numerical Integration by Trapezoidal Rule; Simpson's rule; Rhomberg rule with Error.

Curve Fitting: Curve fitting by Least Squares Method, Cubic Spline, Chebyshev Polynomials, Min-max Properties.

Differential Equations: Modified Euler Method, Runge-Kutta Method, Predictor Corrector Method, Linear Algebraic Systems, Direct and Iterative Methods, Matrix Inversion.

Solution of Partial Differential Equation: Introduction to Partial Differential Equation, Geometric Interpretation, Definition of Elliptic, Parabolic and Hyperbolic Partial Differential Equation.

Matrix Methods: Introduction and Concept of Eigen Value and Eigen Vector. Solution of Homogeneous Linear System, Estimation of Eigen values.

Course Code: ECE 310
Course Title: Numerical Methods in Engineering Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 309

Course Code: CSE 316
Course Title: Internet Programming Sessional
Credit: 1.50
Contact Hours/ Week: 3.00
Syllabus:
HTML - HyperText Markup Language, CGI - Common Gateway Interface, Javascript/Jscript, Java, VBScript, ASP - Active Server Pages, PHP, XML - eXtensible Markup Language

SUMMARY OF COURSES
LEVEL-3 SEMESTER-II

Serial No.	Course Code	Course Title	Credit	Contact hours/week
1	ECE 352	Electronic Project Design and Development	0.75	1.50
2	ECE 353	Information Theory and coding	3.00	3.00
3	ECE 355	Digital Signal Processing	3.00	3.00
4	ECE 356	Digital Signal Processing Sessional	0.75	1.50
5	ECE 357	Computer communications and Networks	3.00	3.00
6	ECE 358	Computer communications and Networks Sessional	0.75	1.50
7	ECE 359	Antennas and Propagation	3.00	3.00
8	ECE 360	Antennas and Propagation Sessional	0.75	1.50
9	ECE 361	Microprocessor and Microcomputer	3.00	3.00
10	ECE 362	Microprocessor and Microcomputer Sessional	0.75	1.50
		Total	**18.75**	**22.50**

No. of Theory Courses: 5
No. of Sessional Courses: 5
Total contact hours: (15.00+7.50) = 22.50
Total credit: (15+3.75) = 18.75

Course Code: ECE 352
Course Title: Eletronic Project Design and Development
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:

Electronic Circuit Design or Development in the area of Electronics and Communications: (Design and Development of Radio Receiver, Study and Circuit tracing, Fault Finding by Signal Injection and other means, Alignment, B/W TV, Color TV, VCP and VCR, DVD, Satellite TV Receiver and Cable TV, Telephone, Mobile, etc.)

Course Code: ECE 353
Course Title: Information Theory and Coding
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Introduction to Information Theory, Information Rate and Shannon's Theory, Applications of Information Theory. Codes for Source and Channels, Probability Distribution and Discrete Source and Channels, Discrete Noiseless Channels, Capacity of Discrete Noiseless

Channels, Codes for Data Translation, Information Content of Discrete Sources, Entropy function, Prefix and Block Codes for Data Compaction, Neyman-Pearson Theorem, Notch Filter, Discrimination Function, Elementary Bounds on Performance. Discrete Noisy Channels, Mutual Information Function, Transmission of Information, Capacity of Discrete Noisy Channels, Block Codes for Data Transmission, Random Coding Bound. Transmission at Rates above Capacity, Compression of information, Information Content of Compressed Data. Continuous Amplitude Signals, Information Measures of Gaussian Signals, Gaussian Channels and Sources without and with Memory, Gaussian Waveform Channels and Sources, Bit Energy and Bit Error Rate, Signaling with and without Bandwidth Constraint.

Course Code: ECE 355
Course Title: Digital Signal Procesing
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

IIR Filter Design: Impulse Invariant and Bilinear Transformation Methods, Spectral Transformation Technique for HP, BP and BS Filter Design, Direct Design of IIR Filters, Finite Word Length Effects.

Filter Structures: Direct Form I, Direct Form II, PSOS and CSOS Forms, Lattice Structures.

Discrete Fourier Transforms: Periodic and Finite Duration Sequences, Odd and Even Sequences, Properties of DFT, Linear Convolution using DFT, FFT Algorithms (decimation in time and decimation in frequency algorithms).

FIR Filter Design: FIR Filter Design by Fourier Approximation, Gibb's Phenomenon, Window Functions; Rectangular, Bartlett, Hamming, Hanning and Kaiser Windows, FIR Filter Design using Frequency Sampling Method, Remez Exchange Algorithm, Discrete Wavelet Transform and its Applications.

Power Spectrum Estimation: Use of DFT in Spectrum Estimation, Non- parametric Methods of Power Spectrum Estimation; Bartlett Method, Welch Method, Blackman-Tukey Method, Parameter Methods for Power Spectrum Estimation; Linear Prediction, AR, MA and ARMA Methods.

Implementation of DSP Algorithms: Custom VLSI, DSP Processors and FPGA Based Implementation, Architectural Features, Processing Capability, Fixed Point DSP Processors (ex: TMS 320c54x) Floating Point Processors (ex: TMS 320c6x, ADSP SHARC).

Course Code: ECE 356
Course Title: Digital Signal Processing Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 355

Course Code: ECE 357
Course Title: Computer Communications and Networks
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:
Protocol Hierarchies, Data link Control; HLDC, DLL in Internet; DLL of ATM, LAN Protocols, Standards IEEE 802, Switches and Hubs, Bridges, FDDI, Fast Ethernet, Routing algorithm, Congestion Control, Internetworking, WAN, Fragmentation, Firewalls, IPV4, IPV6, ARP, RARP,

Mobile IP, Network Layer of ATM, Transport Protocols, Transmission Control Protocol, Connection Management, Transmission Policy, Congestion Control, Timer Management, UDP, AAL of ATM, Network Security, Cryptography, DES, IDEA, Public Key Algorithm, Authentication, Digital Signatures, Gigabit Ethernet, Domain Name system, Name Servers, Email and its privacy, SNMP, HTTP, World Wide Web, DSK and Radio link.

Course Code: ECE 358
Course Title: Computer Communications and Networks Sessional
Credit: 1.50
Contact Hours/ Week: 3.00
Syllabus:
Experiments based on Syllabus of ECE 357

Course Code: ECE 359
Course Title: Antennas and Propagation
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Fundamental of Antennas: Radiation Mechanism, Radiation Patterns, Lobes, Power Density and Intensity, Directive Gain and Directivity, Power Gain, Bandwidths, Radiation Efficiency, Input Impedance, Effective Aperture and Antenna Temperature. Vector Potential Functions, Electric and Magnetic Fields for Electric and Magnetic Current Sources, Solution of Vector Potential Wave Equation, Duality, Reciprocity and Reaction Theorems.

Linear Wire and Loop Antennas: Infinitesimal, Small, Finite Length and Half-wave Length Dipoles, Determination of Radiation Fields, Radiation Patterns, Radiation Resistance, Directivity and Input Impedance of Dipoles, Mutual Impedance Between Linear Elements Near Infinite Planes Conductors and Ground Effects. Circular, Square, Triangular, Rectangular, Rhombic and Ferrite Loop Antennas. Cylindrical Dipole, Folded Dipole, Matching Techniques, Balun Transformers.

Antenna Arrays: Two-Element Array, N-element Linear Arrays; Broad-side, End-fire, Phased, Binomial, Dolph-Tchebyschef and Super-directive Arrays, Determination of Array Factor and Patterns, Planar and Circular Arrays.

Travelling-Wave and Broad-band Antennas: Long wire, V, Rhombic and Helical Antennas, Yagi, Uda array, Frequency Independent and Log-periodic Antennas.

Aperture, Reflector and Lens antenna: Huygen's principle, rectangular and circular apertures, micro strip antennas. Babinet's Principle, Sectoral, Pyramidal and Conical Horns, Parabolic and Cassegrain Reflector Antennas, Lens Antennas.

Course Code: ECE 360
Course Title: Antennas and Propagation Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 359

Course Code: ECE 361
Course Title: Microprocessor and Microcomputer
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Introduction: Introduction to Different Types of Microprocessors and their Applications, Intel 8086 Microprocessor; Architecture, Instruction Format, Instruction Sets, Op-code, Processor Status and Flag Registers, Addressing Modes, Branching and Looping, Interrupt structures, I/O Operation. Machine and Assembly Language Program Writing, Debugging and Execution, Programming in Microcomputers, Subroutine and Reentrant Programs, Disk File Handling.

Interfacing: I/O Interfacing, DMA, Peripherals and their Interfacing, Programming Peripherals; 8255, 8253.

Coprocessors: Numeric Data Processor (NDP) 8087.Overview of Intel 80186, 80286, 80386, 80486 and Pentium Processors, RISC and CISC processors, Transputer.

Assembler: General Design Procedures, Table Processing, Macro Language and Macro-Processor.

Loaders: Design of Absolute Loader and Direct Link Loader, Linkers, Translators.

Course Code: ECE 362
Course Title: Microprocessor and Microcomputer Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 361

SUMMARY OF COURSES
LEVEL-4 SEMESTER-I

Serial No.	Course Code	Course Title	Credit	Contact hours/week
1	ECE 402	Project and Thesis	1.50	3.00
2	ECE 403	Telecommunication Networks and Switching	3.00	3.00
3	ECE 404	Telecommunication Networks and Switching Sessional	0.75	1.50
4	ECE 405	VLSI Technology	3.00	3.00
5	ECE 406	VLSI Technology Sessional	0.75	1.50
6	ECE 407	Wireless and Mobile Communication	3.00	3.00
7	ECE 408	Wireless and Mobile Communication Sessional	0.75	1.50
8	ECE 409	Multimedia Communication	3.00	3.00
9	ECE 410	Multimedia Communication Sessional	0.75	1.50
10	ECE ***	Elective I	3.00	3.00
11	ECE +++	Sessional based on ECE ***	0.75	1.50
		Total	**20.25**	**25.50**

Elective –I

Category	Course No.	Title	Credit (s)
	ECE 431	Microwave Integrated Circuit and Filter	3.00
	ECE 432	Microwave Integrated Circuit and Filter Sessional	0.75
	ECE 433	Numerical Techniques in Electromagnetics	3.00
	ECE 434	Numerical Techniques in Electromagnetics Sessional	0.75
	ECE 435	Analog Integrated Circuit	3.00
	ECE 436	Analog Integrated Circuit Sessional	0.75
	ECE 437	Electronic Instrumentation	3.00
	ECE 438	Electronic Instrumentation Sessional	0.75
	ECE 439	Biomedical Instrumentation	3.00
	ECE 440	Biomedical Instrumentation Sessional	0.75
	ECE 441	Digital Speech Processing	3.00
	ECE 442	Digital Speech Processing Sessional	0.75

No. of Theory Courses: 5
No. of Sessional Courses: 6
Total contact hours: (15.00+10.50) = 25.50

Total credit: (15+5.25) = 20.25

Course Code: ECE 402
Course Title: Project and Thesis
Credit: 1.50
Contact Hours/ Week: 3.00
Syllabus:
Study of Problems in the Field of Electronics and Communication Engineering.
(Continued to Level IV Term II.)

Course Code: ECE 403
Course Title: Telecommunication Networks and Switching
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:
Introduction: Evolution of Telecommunications, Simple Telephone Communications, Basics of Switching System, Classification of Switching System, Major Telecommunication Networks, Principle of Carbon Granule Microphone and Speaker, Intensity Modulation.
Telephone Networks: Subscriber Loop Systems, Call Establishment Steps, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering and Charging Plans, Signaling Techniques, In-channel and Common Channel Signaling, SS7 Protocol Architecture, Pulse Dialing, DTMF and MF Signaling, SDMF and MDMF Message Format.
Telephone Set: Functions of Telephone Set, Subsystems and Their Descriptions, Cordless Telephone, Crosstalk, Side tone, Necessity of Side tone.
Switching: Principles of Common Control, Touch Tone Dial Telephone, Principles of Cross Bar Switching, Cross Bar Switch Configurations, Basic Time Division Space Switching, Basic Time Division Time Switching, Time Multiplexed Space Switching, Time Multiplexed Time Switching, Combination Switching.
Traffic Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Earlang Distribution.
ISDN: Introduction to ISDN, Motivation for ISDN, New services, Transmission Standards, User-network Interfaces.

Course Code: ECE 404
Course Title: Telecommunication Networks and Switching Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 403

Course Code: ECE 405
Course Title: VLSI Technology
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:
VLSI Technology: Top Down Design Approach, Technology Trends and Design Styles.

Review of MOS Transistor Theory: Threshold Voltage, Body Effect, I-V Equations and Characteristics, Latch-up Problems, NMOS and PMOS Inverter with Different Load, Pass-Transistor and Transmission Gates, Resistance, Capacitance, Rise and Fall Times, Delay, Gate Transistor Sizing and Power Consumption, Flip Flop Architectures and Operations, Static and Dynamic Memory Units.

CMOS Inverter: CMOS Circuit Characteristics and Performance Estimation, CMOS Circuit and Logic Design, Modern Inverter Structures and Operations.

Fabrication Technology: Layout Design Rules, Lambda Based Design Rule, Physical Design of Simple Logic Gates, Stick Diagram and Mask Layout, Demarkation Line in CMOS Design, Complete Fabrication Steps, Photolithography, Etching Techniques, Description of Masks in Several Steps of NMOS and CMOS Fabrication Process, Ion Implant Process, Barkley n-well Fabrication Process.

CMOS Subsystem Design: Adders, Multiplier, Parity Generator and Memory System, Programmable Logic Arrays, I/O Systems.

Course Code: ECE 406
Course Title: VLSI Technology Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 405

Course Code: ECE 407
Course Title: Wireless and Mobile Communication
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

History and Evolution of Mobile Radio Communication: Limitations of Conventional System, Principle of Cellular Mobile Radio Systems, Pager, Cellular Standards.

Cellular Radio Systems: Basic Elements of a Cellular Radio System/Network, Principles of Operations, Frequency Spectrum and its Management, Radio Planning in Cluster, Co-Channel Interference, Frequency Reuse Distance, Frequency Management and Channel Assignment. Initiation of Handoff, Soft Handoff, Hard Handoff, 1G, 2G, GSM, GPRS, EDGE, CDMA, WCDMA, 3G, HSPA, HSPA+ and 4G Cellular Mobile Systems.

GSM: Evaluation of GSM, GSM Architecture and Their Functions, GSM Identities, Subsystems of GSM, GSM Frequency Bands, Channel Concepts, Mobile Station, Associated Problems and Their Solutions.

Mobile Radio Propagation: Three Basic Propagation Model, Two Ray Ground Reflection Model, Path Loss, Fresnel Zone Geometry, Indoor and Outdoor Propagation Model, Practical Link Budget Design using Path Loss Model.

Course Code: ECE 408
Course Title: Wireless and Mobile Communication Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 407

Course Code: ECE 409
Course Title: Multimedia Communication
Credit: 3.00

Contact Hours/ Week: 3.00
Syllabus:

Multimedia: Media and Data Streams, Medium, Properties of Multimedia Systems, and Traditional Data Stream Characteristics.

Sound / Audio: Basic Sound Concepts, Music, MIDI Devices and Standards, Speech Generation, Speech Analysis and Transmission.

Images and Graphics: Digital Image Representation, Image Format, Graphic Format, Computer Image Processing.

Video and Animation: Video Signal Representation, Computer Video Format, and Computer Based Animation.

Data Compression: Coding requirements, Source coding, Entropy and Hybrid Coding, Basic Compression Techniques, JPEC, H.261, MPEG, DVI.

Computer Technology: Communication Architecture, Multimedia Work-stations, UNIX based Systems, QuickTime, Windows Multimedia Extensions, OS/2 Multimedia Presentation Director Multimedia Communication Systems: Application Subsystem, Transport Subsystem, QoS and Resource Management Multimedia synchronization, security. Security issues in multimedia digital water- marking, partial encryption schemes for video streams

Multimedia Applications: Internet Telephony, Teleconferencing, HDTV, Email and E-commerce, Virtual Reality, Authoring Tools, Multimedia Documents, Games.

Course Code: ECE 410
Course Title: Multimedia Communication Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 409

Elective I

Course Code: ECE 431
Course Title: Microwave Integrated Circuits and Filters
Credit: 3.0
Contact Hours/ Week: 3.0
Syllabus:

Introduction to MIC: Types of MIC and Their Technology, Thick-film and Thin-film Manufacture, Plate-through and Etch-back Technique, Monolithic Technology: Choice of Materials, MMIC Fabrication Process, Fabrication of Active Devices, Lumped and Distributed Elements, Choices of Technology.

Impedance Matching: Condition for Impedance Matching, Narrowband Matching Techniques, Realizations of Stubs in Microwave Circuit, Line Impedance Matching within Lumped Elements, Broadband Matching Techniques.

Microwave Resonators: Cavities and Equivalent Circuits, Cavity Resonator, Excitation, Tuning and Q Factor, Loop Coupled, Re-entrant and Hole & Slot Cavity.

Microwave Filters: Filter Parameters, Mismatch Effects, Realization of Filter Elements, Design of Low Pass, High Pass, Band Pass and Band Reject Filters.

Course Code: ECE 432
Course Title: Microwave Integrated Circuits and Filters Sessional
Credit: 0.75
Contact Hours/ Week: 1.5

Syllabus:
Sessional Based on Syllabus of ECE 431

Course Code: ECE 433
Course Title: Numerical Techniques in Electromagnetics
Credit: 3.0
Contact Hours/ Week: 3.0

EM Problems: Classification of Solution Regions, Classification of Differential Equations, Classification of Boundary Conditions, Superposition Principle, Uniqueness Theorem

Finite Difference Methods: Finite Difference Schemes, Finite Differencing of Parabolic PDEs, Finite Differencing of Hyperbolic PDEs, Finite Differencing of Elliptic PDEs, Band Matrix Method, Iterative Methods, Accuracy and Stability of FD Solutions, Applications in Transmission line and waveguide.

Wave Scattering (FDTD): Yee's Finite Difference Algorithm, Absorbing Boundary Conditions for FDTD, Accuracy and Stability, Lattice Truncation Conditions, Initial Fields

Finite Differencing for Nonrectangular Systems: Cylindrical Coordinates, Spherical Coordinates Numerical Integration: Euler's Rule, Trapezoidal Rule, Simpson's Rule, Newton-Cotes Rules ,Gaussian Rules

Moment Methods: Introduction and Classification of Integral Equations, Connection Between Differential and Integral Equations, Green's Functions for Free Space and for Domain with Conducting Boundaries

EM Absorption in the Human Body: Derivation of Integral Equations, Transformation to Matrix Equation (Discretization), Evaluation of Matrix Elements

Finite Element Method: Introduction, Solution of Laplace's Equation, Finite Element Discretization, Element Governing Equations, Assembling of All Elements, Solving the Resulting Equations, Solution of Poisson's Equation, Solution of the Wave Equation, Automatic Mesh Generation in Rectangular Domains and Arbitrary Domains.

Finite Element Methods for Exterior Problems: Infinite Element Method, Boundary Element Method, and Absorbing Boundary Conditions.

Course Code: ECE 434
Course Title: Numerical Techniques in Electromagnetics Sessional
Credit: 0.75
Contact Hours/ Week: 1.5
Syllabus:
Sessional Based on Syllabus of ECE 433

Course Code: ECE 435
Course Title: Analog Integrated Circuit
Credit: 3.0
Contact Hours/ Week: 3.0

Course Code: ECE 436
Course Title: Analog Integrated Circuit Sessional
Credit: 0.75
Contact Hours/ Week: 1.5
Syllabus:
Sessional Based on Syllabus of ECE 435

Course Code: ECE 437
Course Title: Electronic Instrumentation
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

The Instrumentation System: Application Domains, The Importance of Engineering Design, Precision and Accuracy, Calibration, Dynamic range, Noise Floor to Saturation, Decibels, The Signal Plan Diagram for an Amplifier System, Signal to Noise Ratio, Measurements that are Affected by the Instrument.

The Need for Signal Conditioning: Amplification, Noise Control, Bandwidth Limiting (to limit noise), Distortion (of waveshape), Harmonic Generation, Linearity and Signal Compression, A-D Converter Step Size, Impedance Buffering.

Noise: Noise Limits, Smallest Measureable Signal, Thermal Noise, Noise Voltage and Current in Op-Amps, Noise Calculation Example, Noise Measurement: an AC Voltmeter

Operational Amplifier Imperfections: Offset Voltage and Drift, Bias Current, Offset Current, Power Supply Rejection Ratio, Common Mode Rejection Ratio.

The Transducer and its Conditioning Circuits: Thermistor, Sensitive but Non-linear, Thermocouple, Small Signal, Linear, Wide Range Transducer.

Course Code: ECE 438
Course Title: Electronic Instrumentation Sessional
Credit: 0.75
Contact Hours/ Week: 1.5
Syllabus:
Sessional Based on Syllabus of ECE 437

Course Code: ECE 439
Course Title: Biomedical Instrumentations
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Action Potential: Vector Representation of ECG, EEG and EMG Signals, their Origin and Applications in Medical Diagnosis. Electrodes for Recording ECG, EEG and EMG Signals, Instrumentation Amplifiers, Signal Conditioners, A/D and D/A converter, Interfaces to PC, Computerized Automatic Analysis, Introduction to Telemedicine.

Transducer: Physiological Parameters used in Transduction, their Characteristics. Measurement of Body Temperature, Blood Pressure and Heart Beat, Optial Fiber Transducers, Chemical Transducers, Smart Transducers.

Diagnostic Methods: Ultrasound, CT and MRI, Merits of these Methods, X-ray Physics, Medical Optics, Lasers and Applications of Lasers in Medical Diagnostics and Therapy, Patient Safety, Electrical Shock Hazards, Incorporation of Safety Aspects in Biomedical Instrumentation.

Surgical Diathermy Machines: Defibrillators, Automatic Drug Delivery, Pacemakers, Lithotriptors, Ventilators, Intensive Care Units. .

Course Code: ECE 440
Course Title: Biomedical Instrumentations Sessional

Credit: 0.75
Contact Hours/ Week: 1.5
Syllabus:
Sessional Based on Syllabus of ECE 439
Course Code: ECE 441
Course Title: Digital Speech Processing
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Production and Classification of Speechs: Introduction, Mechanism of Speech Production. Electrical Modeling of Speech Organs, Acoustic Phonetics: Vowels, Diphthongs, Semivowels, Nasals, Fricatives, Stops and Affricates.

Time-Domain Methods for Speech Processing: Time Dependent Processing of Speech, Short-time Energy and Average Magnitude, Speech vs. Silence Detection, Pitch Period Estimation Using Parallel Processing Approach.

Frequeny-Domain Methods for Speech Processing: Introduction, Definitions and Properties, Fourier Transforms Interpretation and Linear Filter Interpretation, Filter Bank Summation and Overlap Add Methods Sinusoidal and Harmonic Plus Noise Method of Analysis.

Homomorphic Speech Processing: Introduction, Homomorphic System for Convolution, The Complex Cepstrum of Speech, Homomorphic Vocoder.

Appliations of Speech Processing: Brief Applications of Speech Processing in Voice Response Systems, Hearing Aid Design and Recognition Systems.

Course Code: ECE 442
Course Title: Digital Speech Processing Sessional
Credit: 0.75
Contact Hours/ Week: 1.5
Syllabus:
Sessional Based on Syllabus of ECE 441

SUMMARY OF COURSES
LEVEL-4 SEMESTER-II

Serial No.	Course Code	Course Title	Credit	Contact hours/week
1	ECE 452	Project and Thesis	3.00	6.00
2	ECE 453	Radio and Television Engineering	3.00	3.00
3	ECE 454	Radio and Television Engineering Sessional	0.75	1.50
4	ECE 455	Optical Fibre Communications	3.00	3.00
5	ECE 456	Optical Fibre Communications Sessional	0.75	1.50
6	ECE 457	Satellite Communications & RADAR	3.00	3.00
7	ECE 458	Satellite Communications & RADAR Sessional	0.75	1.50
8	ECE 459	Digital Image Processing	3.00	3.00
9	ECE ^^^	Elective –II	3.00	3.00
10	ECE ***	Sessional Based on ECE ^^^	0.75	1.50
	Total		**21.00**	**27.00**

Elective II

Elective-II	ECE 481	Advanced Communications and networking	3.00
	ECE 482	Advanced Communications and networking sessional	0.75
	ECE 483	Digital Filter Design	3.00
	ECE 484	Digital Filter Design Sessional	0.75
	ECE 485	Neural and Fuzzy Systems in Communications	3.00
	ECE 486	Neural and Fuzzy Systems in Communications Sessional	0.75
	ECE 487	Optoelectronics	3.00
	ECE 488	Optoelectronics Sessional	0.75
	ECE 489	Introduction to Nanotahnology	3.00
	ECE 490	Introduction to Nanotahnology Sessional	0.75
	ECE 491	Digital Integrated Circuit	3.00
	ECE 492	Digital Integrated Circuit Sessional	0.75

No. of Theory Courses: 5
No. of Sessional Courses: 5
Total contact hours: (15.00+12.00) = 27.00
Total credit: (15+6) = 21.00

Course Code: ECE 452
Course Title: Project and Thesis
Credit: 3.00
Contact Hours/ Week: 6.00
Syllabus:
Study of Problems in the Field of Electronics and Communication Engineering.
(Continued from Level IV Term I.)

Course Code: ECE 453
Course Title: Radio and Television Engineering
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:
Radio: Evolution of Wireless Transmission, Subsystems of Radio Communications, Radio Network, Transmission and Reception, Audio Power Amplifier, Coverage Area, Spectrum Analysis, Frequency Alocation, CCIR Standards.
TV Systems: TV Standards, Interlace Scanning, Bandwidth, Signal Generation by VSB Modulation, Composite Video Signal Analysis, Horizontal and Vertical Sync Details. Video Section, Contrast Control Methods, Flyback Transformer, Sync Separation Circuit , Transistor VHF Tuner , Video IF Section, Practical Video IF Circuit.
Color TV: Color Mixing, Color Reproduction Circuits and Color Matrix, Color Killer Circuit, ICs used in Color TV Receivers, Remote Control Circuits, Digital TV.
HDTV: Introduction, Principle, Standards and Applications, TV Booster. Digital TV and Multimedia Applications, Satellite Broadcasting Home TV System, Cable TV System.
Modern TV Receiver: Introduction to LCD, LED, Plasma, Quantum Dot LED TV Receiver.

Course Code: ECE 454
Course Title: Radio and Television Engineering Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 453

Course Code: ECE 455
Course Title: Optical Fiber Communications
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:
Overview of Optical Fiber Communication, Ray Propagation in Optical Fibers, State of Polarization, Phase Gain in TIR, Evanescent Field, Goos-Haenchen Shift. Optical Fiber Types. Models in Step-Index Fibers and their Intensity Patterns, LP Modes, Dispersion Relations and Mode Cutoff. Light Propagation in Graded-Index Fibers. Dispersion in Optical Fiber and Dispersion Management, Fiber Fabrication Techniques. Fiber to fiber Coupling and Splicing Techniques.

Optical Transmitter: Emission and Absorption, LASER, LED, Modulation Responce and Efficiency.Semiconductor LASERs Architecture and Operations, Optical Modulation, EAM and MZM Modulator.

Optical Receiver: Noise Source, Photodiode, PIN diode, APD Receivers along with SNR, Q-Factor and Bit Error Probablity, Coherent Detection.

Fiber Optic Links: Link Budget, Power Budget and Rise-Time Budget Analysis. Line Coding Formats. Wavelength Division Multiplexing (WDM).

System Measurements: Fibber Attenuation and Dispersion, OTDR LED and photodiode Characteristics. Eye Pattern Technique. SONET/SDH.

Course Code: ECE 456
Course Title: Optical Fiber Communication Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 455

Course Code: ECE 457
Course Title: Satellite Communication and RADAR
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:
Satellite :

Introduction to Satellite Communication. : Overview of Satellite System Engineering. Keplar's Law, Two body Euation of Motion, Spacecraft, Introduction to Spacecraft Subsystem, Antennas in Practice, Frequency Reuse, Equipment Reliability and Space Qualification, Reliability Redundancy, Placement or Launching of Satellite, Satellite Visibility Criteria, Look Angle, Coverage Area and Slant Range, Ecilipse, Sun Transit Outage.

Earth station Technology: Modern Earth Station Technology, Orthogonal Mode Transducer, Earth Station Design for Low System Noise Temperature, Earth Station Antennas, Practical Link Budget Design Using G/T Ratio, VSAT technology.

RADAR : Introduction to Radar, Radar Range Equation, Operating Principle of Radar with Block Diagram, CW and FM Radar, Missed Detection and False Alarm, False Alarm Time, Duplexer, Tracking Radar, Dopler Radar, Pulse Dopler Radar, Angle Tracking, Range Gate, Moving Target Indicator, Antennas for Radar, Radar Receivers, Radar Transmitting System, Radar Applications, Radar Display, Beackon Radar.

Course Code: ECE 458
Course Title: Satellite Communication and RADAR Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Experiments based on Syllabus of ECE 457

Course Code: ECE 459
Course Title: Digital Image Processing
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Basic Image Processing Systems: Image Sources, Characteristics, Image Representation, Hardware and Software Requirements

Two-Dimensional Systems: Properties of Two-Dimensional Sequences and Systems, 2D Fourier Transform, 2D Z-Transform, Image Quantization, Image Perception, Quality Measures.

Image Transforms: 2D DFT, 2D DCT, Sine Transform, Hadamard, Slant and KL Transform.

Image Filtering: Filtering in Spatial Domain, Filtering in Frequency Domain, Histogram Processing, Local and Global Processing, Image Enhancement.

Image Compression Algorithms: Redundancy and Types, Compression Ratio, Pixel Coding-PCM, Run Length Coding, Predictive Technique DPCM, Transform Coding-DCT, Wavelet Based Compression, Inter-frame Coding.

Image Segmentation: Feature Extraction, Point Detection, Edge Detection, Boundary Extraction, Thresholding and Its Classicifications, Region Representation, Shape Features, Scene Matching Image Segmentation, Classification Techniques of Supervised and Non-supervised Learning.

Elective II

Course Code: ECE 481
Course Title: Advanced Communications and Networking
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Overview of Wi-MAX: Evolution of Broadband Wireless, Fixed and Mobile Broadband Wireless, Comparison of Wi-MAX and Other BB Technologies, Spectrum Options for BB Wireless, Business and Technical Aspects of Wi-MAX.

Salient Features of Wi-MAX: Wi-MAX Physical Layer, OFDM Basics and Parameters in Wi-MAX, Sub Channelization, Slot and Frame Structure, Adaptive Modulation and Coding, MAC Layer Overview, Quality of Service, Power Saving Features, Mobility Support, Multicast and Broadcast Services.

OFDM: Basics of OFDM, OFDM in Wi-MAX, Timing and Frequency Synchronization, The Peak to Average Ratio.

LTE: Evolution of LTE/4G Technology, Network Architecture, Protocol Stack, Positioning Techniques. Channels and Signals, Radio Bearer, Mapping among Channels and Bearers, Quality of Services. Medium Access Control: MAC Layer Functions, Protocol Data Unit, Radio Link Control, Transparent Mode, Acknowledged Mode, Unacknowledged Mode. Overview of Visible Light Communications, Global Positioning System, Photonics Crystal Fiber, Metamaterial.

Course Code: ECE 482
Course Title: Advanced Communications and Networking Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Sessional Based on Syllabus of ECE 481

Course Code: ECE 483
Course Title: Digital Filter Design
Credit: 3.00
Contact Hours/ Week: 3.00

Course Code: ECE 484
Course Title: Digital Filter Design Sessional
Credit: 0.75
Contact Hours/ Week: 1.50
Syllabus:
Sessional Based on Syllabus of ECE 483

Course Code: ECE 485
Course Title: Neural and Fuzzy Systems in Communications
Credit: 3.00
Contact Hours/ Week: 3.00
Syllabus:

Fuzzy Logic Systems: Fuzzy Set Theory, Fuzzification, Fuzzy Rules, Defuzzification, Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Logic Control (FLC), Fuzzy Cognitive Maps.

Introduction to Fuzzy Logic Control. Foundations and Philosophy of Fuzzy Logic and Applications to Control Theory, Relationship between Classical PID Control and Fuzzy Rule-based Control, Techniques for Rule Construction and Adaptive Fuzzy Logic Controllers

Applications of FLC: Backing-up a Car, Backing up of a Tractor & Trailer.

Regression and Optimization: Least-squares Estimators, Derivative-based Optimization; Descent Methods, Steepest Descent Method, etc. Derivative-free Optimization; Genetic Algorithms, Simulated Annealing, Random Search, Downhill Simplex Search.

Neural Networks: Bidirectional Associative Memories, Adaptive Networks and Back Propagation, Supervised Learning; Perceptrons, Back Propagation Multilayer Perceptrons, Radial Basis Function NN, Learning from Reinforcement, Temporal Difference Learning, Q-learning, Unsupervised Learning, Competitive Learning, Kohonen Self-organizing Networks, Hebbian Learning, Hopfield, Hardware of NN Architectures.

Applications of NN: NN Modeling of EM Fields, Pattern Recognition of Printed Character Recognition, Inverse Kinematics in Robotics.

Course Code: ECE 486
Course Title: Neural and Fuzzy Systems in Communications Sessional
Credit: 0.75
Contact Hours/ Week: 1.5
Syllabus:
Sessional Based on Syllabus of ECE 485

Course Code: ECE 487
Course Title: Optoelectronics
Credit: 3.0
Contact Hours/ Week: 3.0
Syllabus:

Fundamentals of opto-electronic devices: Theory and Industry Practices, Photodetectors, Quantum Efficiency, Optical Gain, Bandwidth, Noise, Light Emitting Diodes and Lasers,

Homojunction, Heterojunction, Quantum well Structure Lasers, Wavelength, Power, Linewidth, Linearity, Temperature Sensitivity.

Receiver Amplifier: Signal to Noise Ratio, Low and High Impedance, Trans impedance, Front End, FET Preamplifiers, Integrated Optics, Receiver Performance Considerations.

Noise: Thermal Noise, Shot Noise, Dark Current, Digital Signaling and Analogue Transmission, Quantum Noise, Receiver Noise.

Optical Amplifiers: Semiconductor Laser Amplifier and Fiber Amplifier, Optical Span, Repeater.

Integrated Optics: Planar Waveguides, Some Integrated Optical Devices: Beam Splitter, Directional Couplers, Switches, Modulators, Filters, Injection Lasers, Polarization Transformers and Frequency Translator, Optoelectronics Integration. Optical Bistability and Digital Optics.

Opto-electronic System Packaging: Packaging Considerations; Optical Alignment, Power Dissipation Loss, Operation Sensitivity, Optical Transponders—System Monitoring, Functions, Silicon Optical Bench, Optical and RF Connectors.

Course Code: ECE 488
Course Title: Optoelectronics Sessional
Credit: 0.75
Contact Hours/ Week: 1.5
Syllabus:
Sessional Based on Syllabus of ECE 487

Course Code: ECE 489
Course Title: Introduction to Nanotahnology
Credit: 3.0
Contact Hours/ Week: 3.0

Course Code: ECE 490
Course Title: Introduction to Nanotahnology Sessional
Credit: 0.75
Contact Hours/ Week: 1.5
Syllabus:
Sessional Based on Syllabus of ECE 489

Course Code: ECE 491
Course Title: Digital Integrated Circuit
Credit: 3.0
Contact Hours/ Week: 3.0

Course Code: ECE 492
Course Title: Digital Integrated Circuit Sessional
Credit: 0.75
Contact Hours/ Week: 1.5
Syllabus:
Sessional Based on Syllabus of ECE 491