Bachelor of Science (Engineering) in
Telecommunication and Electronic Engineering
(B.Sc. (Engineering) in TEE)

Bachelor of Science (Engineering) in
Electronics and Communication Engineering
(B.Sc. (Engineering) in ECE)

Effective from: 2006-2016

Course Curriculum

Level 1: Semester I

New Course Code	Old Course Code	Course Title	Credits	
			Theory	Sessional
CSE 107	*CIT 105*	*Basic Information Technologies*	*3*	
CSE 108	*CIT 106*	*Basic Information Technology Sessional.*		*1.50*
	MAP 109	*Differential Calculus and Co-ordinate Geometry*	*3*	
	MAP 111	*Electromagnetism, Optics and Modern Physics*	*3*	
	MAP 112	*Electromagnetism, Optics and Modern Physics Sessional.*		*1.50*
	SSL 107	*English*	*3*	
	AIE 107	*Basic Mechanical Engineering*	*3*	
	AIE 108	*Basic Mechanical Engineering Sessional.*		*1.50*
		Subtotal	*15*	*4.50*
		Total Credit	*19.50*	

Level 1: Semester II

New Course Code	Old Course Code	Course Title	Credits	
			Theory	Sessional
CSE 159	*CIT 113*	*Computer Programming*	*3*	
CSE 160	*CIT 114*	*Computer Programming Sessional*		*1.50*
CSE 161	*CIT 115*	*Discrete Mathematics and Numerical Analysis*	*3*	
ECE 101	*TEE 101*	*Basic Electronics*	*3*	
ECE 102	*TEE 102*	*Basic Electronics Sessional*		*1.50*
	EEE 103	*Basic Electrical Circuits*	*3*	
	EEE 104	*Basic Electrical Circuits Sessional*		*1.50*
	MAP 113	*Integral Calculus and Differential Equations*	*3*	
	SSL 109	*Sociology and Government*	*3*	
	AIE 110	*Engineering Drawing and AutoCAD*		*1.50*
		Subtotal	*18*	*6.00*
		Total Credit	*24.00*	

Level 2: Semester I

New Course Code	Old Course Code	Course Title	Credits	
			Theory	Sessional
CSE 211	*CIT 219*	*Data Structure and Algorithms*	*3*	
CSE 212	*CIT 220*	*Data structure and Algorithms Sessional*		*1.50*
ECE 203	*TEE 203*	*Electronic Circuits & Devices*	*3*	
ECE 204	*TEE 204*	*Electronic Circuits & Devices Sessional.*		*1.50*
ECE 205	*TEE 205*	*Analog Communication*	*3*	
ECE 206	*TEE 206*	*Analog Communication Sessional*		*0.75*
CSE 213	*CEN 211*	*Digital Electronic & Logic Design*	*3*	
CSE 214	*CEN 212*	*Digital Electronic & Logic Design Sessional*		*0.75*
	MAP 205	*Matrices, Vectors and Fourier Analysis*	*3*	
	STT 211	*Basic Statistics and Probability Theory*	*3*	
	STT 212	*Basic Statistics and Probability Theory Sessional*		*1.50*
		Subtotal	*18*	*6.00*
		Total Credit	*24.00*	

Level 2: Semester II

New Course Code	Old Course Code	Course Title	Credits	
			Theory	Sessional
CSE 261	*CIT 223*	*Visual Programming*	*3*	
CSE 262	*CIT 224*	*Visual Programming Sessional*		*1.50*
ECE 207	*TEE 207*	*Principles of Telecommunication Network*	*3*	
ECE 208	*TEE 208*	*Principles of Telecommunication Network Sessional*		*1.50*
ECE 209	*TEE 209*	*Signals and Systems*	*3*	
ECE 210	*TEE 210*	*Signals and Systems Sessional*		*0.75*
ECE 211	*TEE 211*	*Digital Communication*	*3*	
ECE 212	*TEE 212*	*Digital Communication Sessional*		*0.75*
	EEE 207	*Electrical Machines and Measurements*	*3*	
	EEE 208	*Electrical Machines and Measurements Sessional*		*0.75*
	MAP 207	*Complex variables and Mathematical Transformations*	*3*	
ECE 200	*TEE 200*	*Industrial Tour*		*1.00*
		Subtotal	*18*	*6.25*
		Total Credit	*24.25*	

Level 3: Semester I

New Course Code	Old Course Code	Course Title	Credits	
			Theory	Sessional
CSE 315	*CIT 327*	*Database Management System*	*3*	
CSE 316	*CIT 328*	*Database Management System Sessional*		*1.50*
ECE 313	*TEE 313*	*Electromagnetic Fields, Waves and Antenna*	*3*	
ECE 314	*TEE 314*	*Electromagnetic Fields, Waves and Antenna Sessional*		*0.75*
ECE 315	*TEE 315*	*LAN, WAN Implementation and Routing Principles*	*3*	
ECE 316	*TEE 316*	*LAN, WAN Implementation and Routing Principles Sessional*		*1.50*
CSE 317	*CEN 313*	*Microprocessor and Embedded System Design*	*3*	
CSE 318	*CEN 314*	*Microprocessor and Embedded System Design Sessional.*		*0.75*
	ACT 307	*Financial and Managerial Accounting*	*2*	
	Elective-I	*One course from the Table: Elective-I*	*3*	*1.50*
		Subtotal	*17*	*6.00*
		Total Credit	*23.00*	

Level 3: Semester II

New Course Code	Old Course Code	Course Title	Credits	
			Theory	Sessional
ECE 317	*TEE 317*	*Optical Fiber Communication Systems*	*3*	
ECE 318	*TEE 318*	*Optical Fiber Communication Systems Sessional*		*1.50*
ECE 319	*TEE 319*	*Microwave Engineering*	*3*	
ECE 320	*TEE 320*	*Microwave Engineering Sessional*		*0.75*
ECE 321	*TEE 321*	*Network Analysis and Internetwork Design*	*3*	
ECE 322	*TEE 322*	*Network Analysis and Internetwork Design Sessional*		*1.50*
	Elective-II	*Two courses from the Table: Elective-II*	*3x2=6*	*1.50x2=3.00*
	Elective-III	*One course from the Table: Elective-III*	*2*	
		Subtotal	*17*	*6.75*
		Total Credit	*23.75*	

Level 4: Semester I

New Course Code	Old Course Code	Course Title	Credits	
			Theory	Sessional
ECE 425	*TEE 425*	*Digital Signal Processing*	*3*	
ECE 426	*TEE 426*	*Digital Signal Processing Sessional*		*1.50*
ECE 427	*TEE 427*	*Telecommunication Engineering*	*3*	
ECE 428	*TEE 428*	*Telecommunication Engineering Sessional*		*0.75*
ECE 429	*TEE 429*	*Cryptography and Network Security*	*3*	
	EEE 423	*Industrial & Power Electronics*	*3*	
	EEE 424	*Industrial & Power Electronics Sessional*		*0.75*
ECE 431	*TEE 431*	*Research Methodologies*	*2*	
ECE 432	*TEE 402*	*Project/Thesis*		*3.00*
	Elective-IV	*One course from each group of Table: Elective-IV*	*3x2=6*	*1.50*
		Subtotal	*20*	*7.50*
		Total Credit	*27.50*	

Level 4: Semester II

New Course Code	Old Course Code	Course Title	Credits	
			Theory	Sessional
ECE 435	*TEE 435*	*Tele traffic Engineering*	*3*	
ECE 437	*TEE 437*	*Wireless and Mobile Communications.*	*3*	
ECE 438	*TEE 438*	*Wireless and Mobile Communications Sessional*		*0.75*
ECE 439	*TEE 439*	*Telecom Business and Management*	*2*	
ECE 404	*TEE 404*	*Project/Thesis*		*3.00*
ECE 400	*TEE 400*	*Internship/Project*		*1.00*
	Elective -V	*Two courses from the Table: Elective-V*	*3x2=6*	*1.50x2= 3.00*
		Subtotal	*14*	*7.75*
		Total Credit	*21.75*	

Total Credit Summary

Level	Semester	Theory	Sessional Work	Credits
Level 1	*Semester I*	*15.00*	*4.50*	*19.50*
	Semester II	*18.00*	*6.00*	*24.00*
Level 2	*Semester I*	*18.00*	*6.00*	*24.00*
	Semester II	*18.00*	*6.25*	*24.25*
Level 3	*Semester I*	*17.00*	*6.00*	*23.00*
	Semester II	*17.00*	*6.75*	*23.75*
Level 4	*Semester I*	*20.00*	*7.50*	*27.50*
	Semester II	*14.00*	*7.75*	*21.75*
	Total	***137.00***	***50.50***	***187.75***

Detailed Syllabus

Level 1 Semester I

CIT 105 Basic Information Technologies *Credit: 3*

Introduction to computer: introduction, types and generations of computers, basic organization and functional units, hardware and software. Software: types of software, system software and application software, examples of operating systems software: DOS, WINDOWS, UNIX and system utilities. Classifications of applications software (word processors, spreadsheet, database management, graphics, mathematical and statistical, modeling and simulation, business and functional, communication packages), Number systems and code, Input, output and memory devices, Computer languages, Fundamentals of operating systems, Database systems, Data communications and networks, Computer applications.

Managerial Overview of Information Systems, Technical Foundations of Information Systems Business Applications of Information Systems, Managing the Development and Maintenance of Information Systems, Strategic and Managerial Implications of Information Systems.

CIT 106 Basic Information Technology Sessional. *Credit: 1.50*

Laboratory works based on CIT 105.

Reference Books:

1. Computers and Information Systems, Hutchinson / Sawyer.
2. Elements of Computer Science, S. K. Sarkar & A. K. Gupta.
3. Computer Fundamentals concepts. systems. applications, D. P. Nagpal
4. Management Information System, Gupta

MAP 109 Differential Calculus and Co-ordinate Geometry. *Credit: 3*

Different Calculus: Functions and expansion, limits, continuty, derivatives and application of differentiation; Theorems; Leibnitzs; Rolle's, Mean value, and Eulers; Lagrange's and Cauchy's form of remainders; L'Hospital rule; Tangent and normal; Sub tangent and subnormal in Cartesian and polar co-ordinates; Maximum and minimum values of functions; points of inflexion; Curvature; Asymptotes; Curve tracing.

Co-ordinate Geometry : Basic concepts point, line, plane, slope, segment, ray, distance, etc.; Transformation of co-ordinate axes; Equation of conics; Parallel, perpendicular and graphing lines: Homogeneous equation of second degree; Angle between the pair of straight lines; Pair of lines joining the origin to the point of intersection of two given curves, Circles: Circumference and arcs, perpendicular radii and tangents, perpendicular radii and chords, theorems about lengths of chords, tangents and secants, orthogonal, coaxial and director circles, Equations of parabola; Ellipse and hyperbola, polar parametric co-ordinates, Diameters;

MAP 111 Electromagnetism, Optics and Modern Physics *Credit: 3*

Electricity: Electric filed and potential; Divergence and Curl of electrostatic fields; Work and energy; Polarization; Field of a polarized object; Electric displacement; Conductors and Magnetism : Lorentz force, Biot-Savart, Ampere's, Faradays and Lenzs laws; Divergence and curl of magnetic field; Magnetization and the field of a magnetized object; Electromagnetic force; Electromagnetic induction; Maxwell's equations of Electromagnetic waves; Self inductance and mutual inductance; Magnetic properties of matter.

Modern Physics:- Theory of relativity, collisions, interaction of photons with matter, space and time problems, Lorentz; Elemmentray particles and forces: Symmetry, conservation laws, Noether's theorem and group theory, Nuclear dimensions; Electron orbits; Atomic spectra; Bohr atom model, Radio active decay; Nuclear binding energy; Half life.

MAP 112 Electromagnetism, Optics and Modern Physics Sessional.

Credit: 1.50

Laboratory works based on MAP 112.

Reference Books:

1. Resnick, R. and Halliday, D: Physics for Science and Engineering students Part-I and II.(Publ.-Wiley).
2. Sears, F.W. and others: University Physics Part-I and II. (Publ.-Addision Wesley).
3. Newman, F.H. and Searcy, V.H.L: The general properties of matter, (Publ-Edward-Arnold).
4. Keneth,Work : Thermodynamics ; (Publ.-McGraw Hill).

SSL 107 English *Credit: 3*

English Grammar: Types of sentences and their constructions, grammatical problems and common errors; Vocabulary; phonetics; Spoken; Developing fluency; Reading comprehension; reading strategies for different purposes; paragraph writing; paragraph development techniques; choice of words, mechanics of paragraph writing; precis writing; Amplification; Report writing, Formal, mechanics of language; Business correspondence and tenders; Short stories. The Theory

course must be conducted in English such that each student may speak in English fluently. Besides there may be some competition like debate, seminar in English for the same purpose.

AIE 107 Basic Mechanical Engineering *Credit : 3*

Thermodynamics Zeroth, first and second laws of Thermodynamics, thermodynamics system and processes, irreversbility and availability, entropy; Sources of energy; Conventional and renewable; IC engines; Refrigeration and Air conditioning systems; Kinematics and dynamics of particles and rigid bodies; Forces in trusses and frames; Heat-Transfer: Modes of heat transfer, one dimensional heat conduction, resistance concept and electrical analogy.

AIE 108 Basic Mechanical Engineering Sessional *Credit: 1.5*

Laboratory works based on AIE 107.

Level 1 Semester II

CIT 113 Computer Programming *Credit: 3*

Number systems; Introduction to programming; Structural programming language; Data types; Operators; Expressions; Control structures; Functions and Structure; Scope rules and storage classes; Recursion; Header files; Preprocessor; Pointers; Arrays; Unions; Enumerations; Standard and formatted input/output; File access; Error Handing; Graphics. Introduction to Java and its applications.

Fundamentals of Computers. Hardware and Software. Number systems. Basic logic functions, AND, OR, NOT, NAND, NOR, XOR and XNOR gates. Introduction to Programming in JAVA or/and C++. Introduction to Objects and Classes. Input and output operators, Arithmetic operators, Relational operators. Conditional Statements, Loops statements. More on Objects & Classes. Methods & Functions. Inheritance. Polymorphism. Arrays. Initializing & processing arrays. Multidimensional arrays. Graphics. GUI's. A project should be submitted under this course.

CIT 114 Computer Programming Sessional *Credit: 1.50*

Laboratory works based on CIT 113.

Reference Books:

1. Herbert Schildt : Java: The Complete reference
2. Deitel & Deitel : Java How To Program.

CIT 115 Discrete Mathematics and Numerical Analysis *Credit: 3*

Ser theory, Relations; Functions; Logics; Propositional and predicate calculus; Proof techniques; Structure of formal proofs, direct proofs, proof by counterexample, contraposition, contradiction and mathematical induction; Counting arguments; Sum and product rule, inclusion-exclusion, principle, Fibonacci numbers; The pigeonhole Principle; permutations and combinations; Recurrence relations; Graphs and trees.

Introduction to Taylor series; Solution of algebraic and transcendental equations: method of interaction, False Position method; Newton-Rhapson method; Solution of simultaneous linear equations; Gramer's rule , Iteraction method, Gauss-Jordan Elimination method; Interpolation

Diagonal and horizontal difference, differences of a polynomial, Newtons formula for forward and backward Interpolation, Spline Interpolation; Numerical Integration and differentiation; Solution of ordinary differential equations: Euler's method, Taylors series method, Runge-Kutta method; Least squares approximation of functions: Linear and polynomial regression, fitting exponential and trigonometric functions.

TEE 101 Basic Electronics *Credit: 3*

Composition, purity, n-type and p-type, carrier properties and distribution. Carrier action: diffusion, drift, generation, recombination. Diode equation, Forward and reverse biasing. Non ideal behavior. Capacitance, Switching response. Half-wave and fullwave rectifiers. Clipper and clamper circuits. Voltage multipliers. Zener, tunnel and varactor diodes, and their applications. LED, Laser diodes. PNP, NPN transistors. Input/output characteristics of CB, CC, insulators, conductivity, mobility, the Hall effect. Optics: optical absorption, photo luminescence, photo-conductivity, photo-electric effect, diffusion and drift current, the continuity equation, lasers, superconductivity.

TEE 102 Basic Electronics Sessional *Credit: 1.50*

Laboratory works based on TEE 101.

Reference Books:

1. J. Millman and C.C. Halkias : Electronic Devices and Circuits
2. V.K. Mehta: Principles of Electronics.
3. Robert Boylsted: Electronics Device and Circuits Theory
4. S. L. Gupta & V. Kumar: Handbook of Electronics
5. E. N. Lurch: Fundamental of Electronics.
6. A. Mottershead: Electronics Devices and Circuits.
7. J. J. Brophy: Basic Electronics for Scientists.

EEE 103 Basic Electrical Circuits *Credit: 3*

Charge, current, potential difference. Resistor, capacitor, inductor. Current-voltage relation for resistance, inductance, capacitor. Kirchoff's current law (node equations), Kirchoff's voltage Law (loop equations). Solution of Node and Loop equations. Duality and its uses. Magnetically coupled circuits and dot notation. First order differential equations. Forced and natural response. Analysis of R-C and R-L circuits. Effect of initial conditions. Second order differential equations and its standard form. Sinusoidal signals. Average and RMS values of waveforms. Complex number notations, Phasors. Concept of lead and lag. Complex power, power factor. Pre-requisites College Physics. Workshop practice: Electrical Circuits Electrical wiring: introduction to home wiring techniques, wiring diagrams, and material specifications. Industrial wiring, Layout plan of loads and calculation of wire sizes and voltage drops, protection and safety techniques. Calculations of breaking capacity of loads and wiring, study of circuit breakers, LT panels and Wapda power supply codes.

EEE 104 Basic Electrical Circuits Sessional *Credit: 1.50*

Laboratory works based on EEE 103.

Reference Books:

1. Irwin, Electric Circuits, McGraw Hill.
2. Edminister, Electric Circuits, Schaum's Outline series, McGraw-Hill, 2001.References1.
3. Hayt, Kemmerly, and Durbin, Engineering Circuit Analysis, 6th ed, McGraw Hill2.
4. Johnson, Hilburn, Scott, Basic Electric Circuit Analysis, 5th ed, Prentice Hall,1995.

MAP 113 Integral Calculus and Differential Equations *Credit 3*

Integral Calculus: Introduction to integration; integration by different methods; Application of integration for finding area under a curve, are length, surface area and centrodies; Improper and definite integrals; Polar coordinates and area.

Ordinary Differential Equations: Introduction to ODE; Solution of first order Differential Equations by various methods; Properties of linear system and the linearity principle, Solution of linear Equations.

Partial Differential Equations: Introduction to PDE; Different methods for solving PDE of order one, Second order PDE: Its nomenclature and classification to canonical-parabolic, elliptic, hyperbolic; Solution by separation of variables; Linear PDE with constant coefficients.

Series Solution: Solution of differential equations in series; Bessel's function; Legenders polynomial.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics.
2. Churchill, Operational Mathematics, McGraw Hill.2.
3. Churchill, Fourier Series and Boundary Value Problems3.
4. Boyce, Differential Equations.4. Koleman, Vector Analysis, Academic Press,5.
5. Churchill & Brown, Theory of Functions of Complex Variables.

SSL 109 Sociology and Government *Credit : 3*

Natures, scope, primary concept and importance of sociology; Modernity of social theory; Social and intellectual forces; Idealism vs. Empiricisms; Intellectual background in French, German and Bangladesh ; Approaches to the study of Bangladeshi society; Debates around social institutions and groups: Family and kinship, household, village as a form of social organization; Social stratification; Tribes in Bangladesh; Social evolution; Industrial revolution; Some current social problems in Bangladesh and their probable

Basic concepts of government; Good governance; Polities; Thinking politically in a culture of individuals; Dynamic of liberty and government; Functions; organs and forms of modern state and government; Socialism, Fascism, Marxism, Constitution and structure of Bangladesh government; Political process in Bangladesh; Administrative systems of developed countries; International polities.

AIE 110 Engineering Drawing and AutoCAD *Credit: 1.5*

Technical lettering, One point; projection of points and straight lines; Projection of simple solids, cylinders, cones, parallelepiped and pyramids in orthographic and isometric projections; perspective projection: principles of perspective projection by orthographic method and vanishing point.

Level 2 Semester I

CIT 219 Data Structure and Algorithms *Credit: 3*

Basic concepts of data and its representation; Arrays; Link lists; Stacks; Queues; Trees; Graphs; Sorting, Searching; Hashing; Heaps; Fibonacci heaps; B-trees; Recursion; Storage management.
Design and analysis of efficient algorithms such as sorting, searching, pattern matching, graph and network algorithms. Classes of algorithms, such as divide-and-conquer, randomized, branch-and-bound, greedy and dynamic programming. Measuring the time and space complexity of algorithms. Relating the empirical performance of algorithms to theoretical predictions. NP-complete problems.

CIT 220 Data structure and Algorithms Sessional *Credit: 1.50*

Laboratory works based on CIT 219.

Reference Books:

1. Fundamentals of Data Communication, Ellis Horowitz, Sartaj Sahni
2. Data Structure and Algorithm, Adam Drozdek
3. Data Structures, Edward M. Reingold, Wilfred J. Hansen

TEE 203 Electronic Circuits & Devices *Credit: 3*

Detailed study of CB, CE and CC amplifiers. BJT AC design and analysis. Design of CS, CD and CG amplifier circuits. FETs. AC design and analysis. Design and study of frequency response of BJT amplifiers and FET amplifiers. Power Amplifiers, Voltage regulators-series and shunt types. Feedback amplifiers, Transistor oscillators circuit and tuned amplifiers, Multistage amplifiers. CE-CE. CE-CB. Darlington pair. Direct coupled amplifiers. CE-CC amplifiers.

TEE 204 Electronic Circuits & Devices Sessional *Credit: 1.5*

Laboratory works based on TEE 203.

Reference Books

1.Bogart, Electronic Devices and Circuits, Prentice Hall, 2003.
2.Albert Malvino, Electronic Principles, 6th ed, McGraw-Hill, 1999.

TEE 205 Analog Communication *Credit: 3*

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 Lowpass Filters.
Amplitude Modulation: Necessity and Types of modulation, transmitters, transmission channels and receivers. Amplitude modulation (AM), Time Domain and Frequency Domain (Spectral) representations, and Transmission bandwidth for AM. Phasor Diagram of an AM signal. Square Law Modulators, Balanced Modulators, Ring Modulators, Single Side Band Modulation (SSB), Vestigial Side band Modulation (VSB). Demodulation of AM signals, Square Laws and Envelop Detectors, Super heterodyne Receiver, 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.
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

TEE 206 Analog Communication Sessional *Credit: 0.75*

Laboratory works based on TEE 205.

Reference Books:

1. George Kennedy, :Electronic communication systems
2. Taub and Schilling, :Principles of communication systems
3. Martin S Roden :Analog and Digital Communication systems
4. Sol Lepatine , :Electronic communication
5. Dennis Roody and John Coolen, :Electronic communication
6. J Dunlop & D G Smith :Telecommunication Engineering
7. Simon Haykin John :Communication Systems
8. Proakis & Salehi :Communication Systems Engineering
9. B P Lathi :Analog & Digital Communication Systems

CEN 211 Digital Electronic & Logic Design *Credit: 3*

Number systems; Base conversion and codes; Digital logic : Boolean algebra, De-Morgrans Theorems, logic gates and their truth tables, canonical forms, combinational logic circuits, minimization techniques; Arithmetic and data handling logic circuits; Decoders and Encoders, multiplexers and de multiplexers; Combinational circuit design; Flip-flops, race around problems ; Counters: Asynchronous Counters, synchronous Counters; PLA design ; Synchronous circuit analysis and design; State diagram, Mealy and Moore circuit; State minimization and assignments; Incompletely specified circuit;

CEN 212 Digital Electronic & Logic Design Sessional *Credit: 0.75*

Laboratory works based on CEN 211.

MAP 205 Matrices, Vectors and Fourier Analysis *Credit: 3*

Matrix :- Basic concepts of matrix and matrix operation; Determinants; Adjoin and inverse of matrix; Transformations of matrix; Matrix polynomials; Normal, Canonical and quadratic forms:

Symmetric matrices; Coyly Hamilton theorem; Eigenvalues and eigenvectors; Application of matrix for solving linear equations.
Vector :- Introduction; Addition, subtraction and multiplication of vectors; Linear dependence and independence of vectors; Vector space and subspace; Null, row and column spaces; Dimension and basis of a vector space; Linear transformation; Differentiation and integration of vectors; Gradients and directional derivatives, Divergence, Curl; Gauss; Green and Stokes theorems.

STT 211 Basic Statistics and Probability Theory *Credit: 3*

Statistics: Origin and historical development of Statistics, Condensation, Tabulation, and Presentations of Statistical data by graphs and charts. Variables and Attributes. Scales of Measurement, Construction of Frequency Distribution and Graphical Representations. Measurements of Location, Dispersion, Skewness and Kurtosis.
Introduction to Probability: Sample Space and Events, Probability of event, Frequency limit and probability. Axioms of of Probability. Addition law of Probability
Conditional Probability and Independence: Conditional probability, Multiplication Law for Probability. Bayes' Theorem and Applications. Independence. Dependent and Independent Trials.
Probability and sampling distribution: Basic Concepts of Random variables, Density and Distribution function, Expectation and variance. Joint distribution, Binomial, Poisson and Normal distribution. Sampling distributions (t, F & χ^2) and their uses.
Statistical tests: Hypothesis, type-I and type II errors, test of significance, level of significance and degrees of freedom. Basic steps for testing a hypothesis. Test for a specified mean, equality of means (independent & correlated), significance of correlation and regression coefficients, independence of attributes and test of goodness of fit etc.
Bi-variate Analysis: Scatter diagram, Pearson's correlation coefficient with its properties, Regression coefficient with its properties, Least squares method for fitting regression line.
Multivariate Sampling Distribution: The distribution of Hotelling's T^2 and its properties, study of the Wishart distribution and its properties. Bartlett's Decomposition and Generalization variance. Basic idea of Principal Components Analysis, Factor Analysis, Canonical Analysis

STT 212 Basic Statistics and Probability Theory Sessional *Credit: 1.5*

Laboratory works based on STT 211.

Level 2 Semester II

CIT 223 Visual Programming *Credit : 3*

Introduction to Computers, the Internet and the World Wide Web, Introduction to Java Applications, Introduction to Classes and Objects, Control Statement(Part1+Part2), Methods, Arrays, Classes and Objects, Inheritance, Polymorphism, GUI Component, Graphics and java, Exception Handling, Files and Streams, Recursion, Searching and Sorting, Data Structures, Generics, Collections, Introduction to Java Applets, Multimedia, Multithreading, Networking, Accessing Databases with JDBC, Servlets, Java Server Pages, Formatted Output, String, Characters and Regular Expressions.

The Creation of C#, An Overview of C#, Data Types, Literals, and Variables, Operators, Program Control Statements, Introducing Classes, Objects and Methods, Arrays and Strings, A Closer Look at Methods and Classes, Operator Overloading, Indexers and Properties, Inheritance, Interfaces, Structures and Enumerations, Exception Handling, Using I/O, Namespaces, the Preprocessors and Assemblies, Unsafe Code, Pointers and Miscellaneous Topics, Exploring the System Namespace, String and Formatting, Working with Collections, Networking Through the Internet, Building Components.

CIT 224 Visual Programming Sessional *Credit :1.5*

Laboratory works based on CIT 223.

TEE 207 Principles of Telecommunication Network *Credit: 3*

Hardware and software, reference models, transmission media, wireless transmission, the telephone system, narrow and broad-band ISDN, ATM, cellular radio, communication satellites. The data link layer: design issues, error detection and correction, sliding window protocols. The medium access sublayer: MAC protocols, IEEE 802.3 for LANs and MANs, fast Ethernet, satellite networks. The network layer: routing, congestion control, internetworking, the network layer in the Internet. The transport layer: the transport service, TCP and UDP. The application layer: network security, domain name system, electronic mail, the world wide web, multimedia. Statistical characterization of telecommunications traffic. The Erlang C formula and its applications. Circuit efficiency, grade of service and measurement of congested circuits. Dimensioning of telephone circuits and switches.

Switching Evolution of circuit switching systems. Space switching, time switching, and stored program control (SPC) switching. Blocking and non-blocking switches. Packet switching with comparison to circuit switching. Signaling Evolution of signaling systems. The CCITT no. 7 signaling system, Transmission Multiplexing hierarchies – PCM and time division multiplexing, SONET, SDH and WDM techniques and networks. Data Transmission, Transmission in LANS. Transmission in WANS – X.25, Frame Relay. Asynchronous Transfer Mode (ATM). Congestion control in data transmission Convergence of Technologies Voice and video over packet switching networks. Integrated networks. Applications in multimedia communications.

TEE 208 Principles of Telecommunication Network Sessional *Credit: 1.50*

Laboratory works based on TEE 207.

TEE 209 Signals and Systems *Credit: 3*

Block Diagram &Transfer Function. Discretization. Discrete Fourier Transform (DFT), FFT Algorithm. Continuous-time Signal Processing. Design of Analogue Filters. Digital Filter Design. IIR & FIR. Windowing. Discrete Introduction to Signal & Systems. Different types of Signals. Properties of Systems. Block Diagram &Transfer Function. Laplace Transform and Inverse Transform. Properties. Fourier Series and Fourier Transform Applications. Solution of Differential Equation. Poles-Zeroes LTI System. Response of system to Different inputs. Continuous-time Signal versus Discrete- Time Signal. Introduction to Difference Equations. Sampling. Aliasing. Practical Sampling. Discrete-time Fourier Transform, z-Transform. Inverse z-Transform. Properties. Filters, Network Analysis. Signals and Systems. Differential Equations, Transforms, Linear Algebra, Complex Variables. Knowledge of MATSESSIONAL® is encouraged.

TEE 210 Signals and Systems Sessional *Credit: 0.75*

Laboratory works based on TEE 210.

TEE 211 Digital Communication *Credit: 3*

Binary transmission and the concept of time: bits, baud, words per minute, timing, distortion and channel capacity. Digital input and output devices, data input and output devices. Digital transmission on an analog channel. FSK, PSK, PCM, DPCM, delta modulation, Companding. Multiplexing and demultiplexing systems. TDM, framing, synchronization, pulse stuffing, PCM switching, data switching and computer communication, packet switching, Optical fiber transmission. OSI reference model. Channel models and bit error rate.

Review of Fourier transforms; Channel coding and capacity; Synchronous and asynchronous communications; Hardware interface; Multiplexers and concentrators and buffers; Analog and Digital modulation techniques: AM, FM, PM, OOK, FSK, PSK, QPSK, QAM; Pulse modulation- PCM, PPM, PAM, Delta modulation; Companding; Communication mediums and their characteristics; Voice coding techniques; Speech redundancies; TDM, FDM; Layered concept of computer network architecture; ATM networks and switches.

TEE 212 Digital Communication Sessional *Credit: 0.75*

Laboratory works based on TEE 212.

Reference Books:

1. Data Communication and Networking, Forouzan
2. Data and Computer Communication, W. Stallings

EEE 207 Electrical Machines and Measurements *Credit: 3*

Introduction to polyphase phase circuits, Transformers: Construction and operating principle; open circuit and short circuit test; efficiency; equivalent circuit; power and current transformer; Construction and modeling of electric machines; Synchronous, induction, universal, permanent magnet DC and stepper motors. Basic Measurement of electrical quantities: Bridge, ammeter, voltmeter and wattmeter methods; Frequency and voltage Measurement using digital techniques; Transducers: Terminology, types; principles and application of photovoltaic, piezoelectric. Charge, current, potential difference. Resistor, capacitor, inductor. Current-voltage relation for resistance, inductance, capacitor. Kirchoff's current law (node equations), Kirchoff's voltage Law (loop equations). Solution of Node and Loop equations. Duality and its uses. Magnetically coupled circuits and dot notation. First order differential equations. Forced and natural response.

Analysis of R-C and R-L circuits. Effect of initial conditions. Second order differential equations and its standard form. Sinusoidal signals. Average and RMS values of waveforms. Complex number notations Phasors. Concept of lead and lag. Complex power, power factor. Pre-requisites College Physics. Workshop practice: Electrical Circuits Electrical wiring: introduction to home wiring techniques, wiring diagrams, and material specifications. Industrial wiring, Layout plan of loads and calculation of wire sizes and voltage drops, protection and safety techniques. Calculations of breaking capacity of loads and wiring, study of circuit breakers, LT panels and Wapda power supply codes, Drawing of electrical machinery, motors, transformers.

EEE 208 Electrical Machines and Measurements Sessional *Credit: 0.75*

Laboratory works based on EEE 207.

MAP 207 Complex variables and Mathematical Transformations *Credit: 3*

Linear Algebra: Linear Transformation, Matrices, Inverse of a Matrix, Determinants, System of Linear Equations, Solution of system of Linear Equations by Cramer's Rule and by Matrix Inversion, Gauss Elimination, Eigenvalues and Eigenvectors. Vector Differential Calculus: Scalar and Vector Fields, vector algebra, directional derivatives, gradient, divergence and curl of a vector Line, Surface and Volume Integrals, Green's Theorem, Stokes theorem, divergence theorem. Complex Analysis: Complex numbers, exponential and polar forms, Euler's formula, Hyperbolic functions, Complex Functions, Limits, Continuity, complex differentiation and Integration, Cauchy-Riemann conditions, Cauchy's Integral Theorem, Residue theorem, Contour Integration.

TEE 200 Industrial Tour *Credit: 1*

This will include industrial tour in different industries in country/abroad on the basis of different courses of B. Sc TEE Syllabus after Level 2 Semester II. After completion of the tour each student must submit a report and conduct a presentation work about the Industrial tour. Additionally, a tour may be organized on demand basis under any course individually in any semester. For the lacking of teachers for delivering lecturers, Visiting Professors of different universities of country/ abroad can conduct courses with specific govt. rules. In addition, for the lacking of laboratory facilities, there is possible to have practical classes / tours in different universities in country/ abroad for any course in any academic level of the degree. A list of visiting sites for Industrial Tour is given below:

SL	Course Title	Proposed Visiting site
1	Basic Information Technology	Software companies, web development companies, ICT Incubator, GIS companies.
2	Computer Programming	
3	Data Structure and Algorithms	
4	Discrete Mathematics and Numerical Analysis	
5	Visual Programming	
6	Database Management System	
7	Introduction to Digital Communications	Fiber optics landing station, weather office, fiber optics backbone network, radio and television center, satellite earth station, ISPs, CCNA center, Mobile companies.
8	Principles of Telecommunication Networks	
9	Transmission Line and Antenna Theory	
10	Optical Fiber Communication Systems	
11	Teletraffic Engineering	

12	DSP and Filter Design	
13	Microwave and RF Engineering	
14	Wireless and Mobile Communications	
15	LAN, WAN and Routing Principles	
16	WAN Implementation	
17	Network Analysis and Troubleshooting	
18	Internetwork Design	
19	Advanced Network Planning	
20	Basic Electrical Engineering	Power Stations, Energy Pac company.
21	Digital Logic Design	
22	Semi-conductor Devices and Technologies	
23	Electrical Machines and Measurements	

Level 3 Semester I

CIT 327 Database Management System *Credit: 3*

Database system: History, motivation, and components of database system, database management system functions, database architecture and data independence; Models: Entity-Relationship, conceptual, relational, and object-oriented; Relational databases: Mapping conceptual schema to a relational schema, entity and referential integrity, relational algebra and relational calculus; Database query language: Overview of database languages, SQL; Query optimization; Introduction to Object Query Language; Relational database design; File organization and access; Buffer, storage and transaction management; Recovery; Concurrently control; Reliability, protection and integrity; Performance analysis. DBMS, RDBMS applications, Normalizations.

CIT 328 Database Management System Sessional *Credit: 1.50*

Laboratory works based on CIT 327.

TEE 313 Electromagnetic Fields, Waves and Antenna *Credit: 3*

Transmission lines: characteristics of transmission lines, Transients on a loss-less line, time domain reflectometer. Differential steady-state equations, matched and mismatched lines, resonance, VSWR, Smith chart and its applications, impedance matching, quarter wave transformer. Waveguides: rectangular waveguides and cavities, cylindrical wave guides and cavities, spherical cavity, slab waveguide and the optical fiber. Antennas: radiation fields of elemental dipoles, antenna pattern and parameters, thin linear antennas, antenna arrays, back-scatter cross-section. Frii's transmission formula, radar equation, traveling wave antenna, helical antenna, Yagi-Uda antenna. aperture radiators. Introduction to GTD.

TEE 314 Electromagnetic Fields, Waves and Antenna Sessional

Credit: 0.75

Laboratory works based on TEE 313.

Reference Books:

1. Cheng, Engineering Electromagnetics, McGraw Hill.

2. Balanis, Antenna Theory, John Wiley.
3. Roger Freeman, Telecommunication System Engineering, John Wiley, 1996.

TEE 315 LAN, WAN Implementation and Routing Principles

Credit: 3

This subject provides students with knowledge of LAN hardware and physical layer standards, and basic computer networking concepts and principles, introduces local area network (LAN) design and the use of routers and routing in autonomous system intranets. It also explains how these access WANs. Use of the Cisco Academies online resources, and practical work in wiring and configuring LANs, including Cisco routers, are an integral part of this subject.

This subject extends the work covered in the prerequisite subject with VLANs and WAN protocols. WAN and LAN design is introduced. The UTS Cisco Academy resources are used for practical work. After completing this subject students may sit for the industry certification CCNA (Cisco Certified Network Associate)

This subject complements and extends the theory and practice learnt in the prerequisite subjects. It extends skills and knowledge in scalable interior and routing protocols (OSPF, EIGRP, BGP), route optimization and redistribution, NAT and network security. The subject is run in the UTS Cisco System Network Academy. Cisco routers are programmed as part of practical work. The subject is part of a sequence which will allow students to prepare for the CCNP industry certification.

TEE 316 LAN, WAN Implementation and Routing Principles Sessional

Credit: 1.50

Laboratory works based on TEE 315.

Reference: CCNA Online documents.

CEN 313 Microprocessor and Embedded System Design *Credit: 3*

Introduction to 8 bit microprocessor: 16 and 32 bit microprocessors: architecture, addressing modes, instruction set, interrupts, multi-tasking and virtual memory; Memory interface; Programmable peripheral interface, Keyboard / display interface; Arithmetic co-processor , Programmable interval timer; Programmable interrupt controller; DMA controller; Floppy and hard-disk controller, Bus interface.

Data acquisition and introduction to microprocessor based systems; Designing I/O systems; Programmable peripheral; Serial communication interface; Barcode reader; Sound card; MIDI interface; Printer interface; microprocessor interfacing with Standard bus; interfacing with power circuits, stepper motors, opto-isolation; Controlling semiconductor power switches- MOSFET, BJT, SCR, Triac and Solinoids.

CEN 314 Microprocessor and Embedded System Design Sessional.

Credit: 0.75

Laboratory works based on CEN 313.

ACT 307 Financial and Managerial Accounting *Credit: 2*

Accounting concepts and conventions; Double entry book-keeping; Journal, Ledgers; Manufacturing Account, Profit and loss account; Balance sheet; Accounting as an information system; Recording of transaction; Preparation of trial balance; Preparation of financial statements; Analysis and interpretation of financial statement.
Concepts of cost; Elements of cost and cost centers; Methods of costing and break-even analysis; Overhead recovery method/rate; Costing system; Job costing; Unit costing; Process costing; Operation costing: Quotation price; Inventory valuation; Absorption costing and marginal/variable costing technique; Budget and budgetary control; Investment decision.

Elective-I:

Credit: (3+1.5) x 1

Students must select any one course from the following courses. Sessional **w**orks will be based on the Theoretical courses. A Project and Presentation should be submitted under each course.

S/N	Course Code	Course Name	Credit (Theory+ Sessional)
1	*EEE 321,322*	*Power System*	*3+1.5*
2	*CEN 323,324*	*Microprocessor & Assembly Language*	*3+1.5*
3	*CEN 325,326*	*Digital Electronics & Pulse Techniques*	*3+1.5*
4	*CIT 331,332*	*UNIX Programming*	*3+1.5*
5	*CIT 333,334*	*Computer Graphics & Pattern Recognition*	*3+1.5*
6	*CIT 335,336*	*Internet Programming*	*3+1.5*
7	*CIT 337,338*	*AI and Expert System Design*	*3+1.5*
8	*CIT 339,340*	*Operating System*	*3+1.5*
9	*TEE 329,330*	*Telecommunication Hardware and Interfacing*	*3+1.5*
10	*TEE 331,332*	*Remote Access Network*	*3+1.5*
11	*TEE 333,334*	*Commerce on the Internet*	*3+1.5*
12	*TEE 335,336*	*Web Services, Technologies and Applications*	*3+1.5*
13	*TEE 337,338*	*Principles of Signal Processing*	*3+1.5*
14	*TEE 339,340*	*Real time computing and Communications*	*3+1.5*
15	*TEE 341, 342*	*Modern Digital and Analog Communications*	*3+1.5*

*Syllabus of elective courses-I is under construction.

Level 3 Semester II

TEE 317 Optical Fiber Communication Systems *Credit: 3*

Overview of Optical Fiber Communication, Optical Fibers: Structures, Waveguiding, and Fabrication, Signal Degradation in Optical Fibers, Optical Sources, Power Launching and Coupling, Photo detectors, Optical Receiver Operation, Digital Transmission Systems, Analog Systems, WDM Concepts and Components, Optical Amplifiers, Optical Networks, Measurements, Introduction to optical fibers, Optical Fibers and Fiber Cables, Electroluminescent Sources, Optical Fiber Transmitter, Optical Detectors, Optical Receiver Systems, Optical Fiber Connections and Optical Amplification, Telecommunication Application, The Communication Revolution, Information Transmission, Fiber optics as a Communications Medium: its Advantages, Light, The Optical Fiber, Fiber Characteristics, Fiber-Optic Cables, Sources, Detectors, Transmitters and Receivers, Connectors and Splices, Couplers Multiplexers and Other Devices, The Fiber-Optic Link, Fiber-Optic Cable Installation and Hardware, Fiber-Optic Systems: Network and Premises Applications, Fiber-Optic Systems: Telecommunications and Broadband Applications, Introduction to Test and Other Equipment.

TEE 318 Optical Fiber Communication Systems Sessional *Credit: 1.50*

Laboratory works based on TEE 317.

Reference Books:

1. Optical Fiber Communication By Gerd Keiser,
2. Fiber Optics By Donald J. Sterling,JR.
3. Optical Fiber Communication and Its Applications By S.C. Gupta.

TEE 319 Microwave Engineering *Credit: 3*

Review of Electromagnetic Wave Theory. Time varying fields and Maxwell's equations: Faradays law, Maxwell's equations, phasors and time harmonic fields, potential functions, boundary conditions, wave equations and their solution. Microwaves: circulators, directional couplers, Klystron, magnetron, traveling wave tube, solid-state microwave devices, physics of charged particle beams. Optics: polarization, Kerr, Pockel's and Faraday effects, interference, diffraction, Fourier optics. nonlinear phenomena, Gaussian beams, laser action, 3- and 4-level lasers, stability of laser cavities, step-index and graded-index optical fibers, laser-fiber interface.
Radar & Navigation, Air Traffic Management Air Traffic Management (ATM) concepts, En-route and Terminal Guidance, Supporting technology, Types of Navigational Aids, An introduction to ICAO Radar Systems Introduction & early history, Classification of Radars, Basic concepts & measurements, The Radar Equation, Propagation effects of atmospheric refraction, Properties of radar targets, Radar detection in the presence of noise, Introduction to Radar Signal Processing, Radar Antennas CW Radar, Frequency-Modulated CW Radar, MTI and Pulse Doppler Radar, Tracking Radar Introduction to Secondary Surveillance Radar (SSR). En-Route Navigational AidsRho-Theta Navigation, VHF Omni-Range (VOR), Distance Measuring Equipment (DME), Radio altimeter. Introduction to Doppler Navigation and Satellite based navigation. Navigational Aids for Landing Instrument Landing System (ILS), Microwave Landing System (MLS), Approach and Terminal Radars, Use of Precision Approach Path Indicators (PAPI). Automatic Dependant Surveillance (ADS) system.

Circuit Analysis of Energy Transfer Systems and Microwave Networks Scattering Parameters, S parameters for isolator, circulator, directional coupler, T junctions, Passive Devices Microwave filters, Directional Couplers, Hybrid Junctions and Ferrite Devices, Active Devices Microwave amplifiers and oscillators, Transistor, Varactor diode, IMPATT diode, Gunn diode, Klystron, IOT, Reflex Klystron, Magnetron, TWT, Microwave detectors and mixers, Point contact diode, Schottky Barrier diode, Backward diode.

TEE 320 Microwave Engineering Sessional *Credit: 0.75*

Laboratory works based on TEE 319.

Reference Books:

1. Pozar, Microwave Engineering, McGraw Hill.
2. Freeman, Fiber Optic Systems and Telecommunications, John Wiley
3. Cheng, Engineering Electromagnetics, Prentice Hall.
4. Djafar Mynbaev, Lowell Scheiner, Fiber Optic Communication Technology, Pearson Education, 2004
5. Rizzi, Microwave Engineering, McGraw Hill.

TEE 321 Network Analysis and Internetwork Design *Credit: 3*

Telecommunication networks: hardware and software, reference models, transmission media, wireless transmission, the telephone system, narrow and broad-band ISDN, ATM, cellular radio, communication satellites. The data link layer: design issues, error detection and correction, sliding window protocols. The medium access sub layer: MAC protocols, IEEE 802.3 for LANs and MANs, fast Ethernet, satellite networks. The network layer: routing, congestion control, internetworking, the network layer in the Internet. The transport layer: the transport service, TCP and UDP. The application layer: network security, domain name system, electronic mail, the world wide web, multimedia.

Signaling Evolution of signaling systems. The CCITT no. 7 signaling system Transmission Multiplexing hierarchies – PCM and time division multiplexing, SONET, SDH and WDM techniques and networks.

Data Transmission in LANS. Transmission in WANS – X.25, Frame Relay. Asynchronous Transfer Mode (ATM). Congestion control in data transmission Convergence of Technologies Voice and video over packet switching networks. Integrated networks. Applications in multimedia communications

TEE 322 Network Analysis and Internetwork Design Sessional *Credit: 1.50*

Laboratory works based on TEE 321

Reference: CCNA Online documents.

Elective-II: *Credit : (3+1.5) x 2*

Students must select any two courses from the following courses. Sessional will be based on the Theoretical course. A Project and Presentation should be submitted under the course.

S/N	Course Code	Course Name	Credit (Theory + Sessional)
1	*EEE 325,326*	*Transmission & Distribution of Electrical Power.*	*3+1.5*
2	*CEN 327,328*	*Micro-electronics & VLSI Design*	*3+1.5*
3	*CIT 341,342*	*Web Programming*	*3+1.5*
4	*CIT 343,344*	*.NET Enterprise Computing*	*3+1.5*
5	*CIT 345,346*	*Internet & Multimedia Communication*	*3+1.5*
6	*CIT 347,348*	*Data Mining*	*3+1.5*
7	*CIT 349,350*	*Geographical Information System*	*3+1.5*
8	*CIT 351,352*	*Neural Networks and Fuzzy Logic*	*3+1.5*
9	*CIT 353,354*	*Symbolic Logic*	*3+1.5*
10	*CIT 355,356*	*System Simulation and Performance Evaluation*	*3+1.5*
11	*STT 307,308*	*Stochastic Processes*	*3+1.5*
12	*TEE 343,344*	*Advanced Data Communications and Networking*	*3+1.5*
13	*TEE 345,346*	*Telephony and Telegraphy*	*3+1.5*
14	*TEE 347,348*	*Advanced Routing Principles (WAN, VLANs)*	*3+1.5*

CEN 327 Course Title: Micro-electronics & VLSI Design *Credit: 3*

Overview of Microelectronic Fabrication: Introduction to MOSFETs; Enhancement and Depletion type NMOSFET, MOSFET Equivalent Circuits, GaAs MOSFETs. Basic Monolithic Integrated Circuits, Epitaxial Growth, Masking and Etching, Diffusion of Impurities, Monolithic Transistors, Monolithic Diodes, Integrated Resistors, Integrated Capacitors and Inductors, Monolithic-circuit Layout, Large-scale and Medium-scale Integration, Metal-Semiconductor Contact.

MOSFET Logic Circuits: NMOS Inverter, CMOS inverter, CMOS Processing Technology, Overview of Silicon Semiconductor Technology, Basic CMOS Technology, CMOS Power Dissipation, Packaging, Scaling of MOS Transistor Dimensions Yield and Reliability. Process Enhancement, Layout Design Rules Latch up, CAD Tools for VLSI Design.

MOSFET Logic Gates: NMOS, CMOS, Dynamic and Domino Logic Gates, Clocked CMOS Logic, Pass-Transistor Logic, Transmission Gates, CMOS Combinational, Sequential Logic Circuits, Bi-CMOS Logic Circuits, GaAS-MOSFET Logic Circuits, Interfacing CMOS & Bipolar Logic Families. Circuit Characterization and Performance Estimation, Resistance, Capacitance Estimation, Switching Characteristics, Delay Models, Power Dissipation, Packaging, Scaling of MOS Transistor Dimensions Yield and Reliability.

CMOS Subsystem Design: Data-path Operations, Addition, Multiplication, Counters, Shifters, Memory Elements.

CEN 328 Micro-electronics & VLSI Design Sessional *Credit: 0.75*

Laboratory works based on CEN 328.

Recommended Books:

1. Perry, Douglas L :HDL
2. Fabricius, :Introduction to VLSI Design
3. Charles H Roth Jr :Fundamentals of Logic Design
4. Navabi, Zainalabedin. :HDL analysis and modeling of Digital System
5. Pucknell and Eshraghian, "Basic VLSI Design", 3rd ed., Prentice Hall, 1994

* Syllabus of other elective-II courses is under construction.

Elective-III: *Credit: 2*

Students must select any one course from the following courses. A Project and Presentation should be submitted under each course.

S/N	Course Code	Course Name	Credit (Theory + Sessional)
1	*ECN 307*	*Economics*	*2+0*
2	*MGT 307*	*Introduction to Business*	*2+0*
3	*MGT 309*	*International Business*	*2+0*
4	*MKT 307*	*Fundamentals of Marketing*	*2+0*
5	*MKT 309*	*International Marketing*	*2+0*
6	*SSL 307*	*Business Communication and Organizational Behavior*	*2+0*

ECN 307 Economics *Credit: 2*

Scope and subject matters of economics, Various economic system; Fundamental economic problems and their solutions; Economic growth and development; Markets and government in a modern economy; Demand and supply; Elastic ties; Market structure ; Monopoly, perfect competition, oligopoly; Microeconomy and macroeconomy ; Free market economy and its impact on Bangladesh.

*Syllabus of other courses for elective-III is under construction.

Level 4 Semester I

TEE 425 Digital Signal Processing *Credit: 3*

Signals and Signal Processing, Discrete-Time Signal and Systems, Discrete-Time Fourier Transform, Digital Processing of Continuous-Time signals, Finite-Length Discrete Transforms, z-Transform, LTI Discrete-Time Systems in the Transform Domain, Digital Filter Structures, IIR Digital Filter Design, FIR Digital Filter Design, DSP Algorithm Implementation, Analysis of Finite Word length Effects, Multirate Digital Signal Processing Fundamentals, Multirate Filter Banks and Wavelets, Applications of Digital Signal Processing , Discrete-Time Random Signals. Frequency Analysis of Signals and System, Efficient Computation of the DFT, Linear Prediction and Optimum Linear Filters, Power Spectrum Estimation.

TEE 426 Digital Signal Processing Sessional *Credit: 1.50*

Laboratory works based on TEE 425.

Reference Books:

1. Digital Signal Processing, Sanjit K Mitra.
2. Digital Signal Processing Principles, John G.Proakis and Dimitris G. Manolakis.

TEE 427 Telecommunication Engineering *Credit: 3*

Telephone: Telephone apparatus; ASTIC; Transmission bridge; Concept of telephone exchange; Local exchange; TAX, ITX; Strowger & EMD switch; Digital time switch; Digital space switch;

TST & STS switch; Video Telephony; Modem & codec; Intercom & PABX; Telephone traffic.

Telephone Networks: Subscriber loop systems, Switching hierarchy and routing, Transmission plan, Transmission systems, Numbering plan, Charging plan, Signaling techniques, Inchannel signaling, Common channel signaling.

Telegraph: Introduction to facsimile system; Scanning; Recording; Facsimile transmission & reception; Submarine cable telegraphy; E-mail.

Integrated Services Digital Network: Motivation for ISDN, New services, Network and protocol architecture, Transmission channels, User-network interfaces, Signaling, Numbering and addressing, Service characterization, Inter working, ISDN standards, Expert Systems in ISDN, Broadband ISDN, Voice data integration.

TEE 428 Telecommunication Engineering Sessional *Credit: 0.75*

Laboratory works based on TEE 427.

Reference Books:

1. James Martin, “Telecommunications and the Computer”
2. T. Viswanathan, “Telecommunication Switching Systems and Network”
3. William Stallings, “Data and Computer Communications”
4. Mischa Schwartz, “Information Transmission Modulations and Noise”
5. S. R. Smith, “Telephony and Telegraphy”
6. Rambhadram, “Telecommunication Principles Circuits and System”

TEE 429 Cryptography and Network Security *Credit: 3*

Classical Encryption Techniques, Block Ciphers and The Data Encryption Standard, Introduction To Fields, Advanced Encryption Standard, Contemporary Symmetric Ciphers, Confidentiality

Using Symmetric Encryption, Introduction To Number To Number Theory, Public-Key Cryptography And RSA, Key Management; Other-Key Cryptosystems, Message Authentications And Hash Functions, Hash Algorithm, Digital Signatures And Authentication Protocols, Authentication Applications, Electronic Mail Security, IP Security, Web Security, Intruders, Malicious Software, Firewalls.

EEE 423 Industrial & Power Electronics *Credit: 3*

Power Electronics Systems: Power electronics system, Power electronics versus linear electronics, Power semiconductor devices (application perspective): Power diode, Power Transistor, Thyristor, SCR, DIAC, TRIAC, GTO, MOSFET, IGBT, SIT.

Power Electronic Converters: Fixed output voltage and phase controlled AC/DC converters, single phase, three phase, semi/full, Analysis and performance with passive load, Dual converters, Power factor movement and forced commutation angle, PWM control.

DC/DC Converters: Chopper regulators, Step-up, Step-down, Chopper classification, Switch mode regulators, Thyristor chopper circuits.

Cyclo-Converters (Frequency Converters)**:** Single phase, Three phase and AC voltage converters with PWM.

DC/AC Inverters: PWM, Resonant pulse inverters, Push-pull inverters, Transformer-less inverters, MPPT, Grid-interactive inverters, Switch utilization in inverters, PV inverters.

Industrial Electronics: Magnetic amplifier and its applications Control of temperature and other non-electric quantities, Elements of microprocessor based control system for industries.

Motor Devices: DC and AC motor devices, Speed and position control of DC motors, Microprocessor based motor drive.

Industrial Heating: Resistive heating, High frequency heating, Induction heating, Dielectric heating and its use and applications, Servo mechanism, Closed loop control system, Polyphase rectifier.

PLC: Controllers, Hardware, Internal architecture, Programming, Testing and debugging, Commercial PLC.

Robots & Other Motion Control Systems: Types of robots, Types of robot control, Types of robot programs, CNC machines, Basic parts of a robot system, I/O circuits for robot system, I/O requests for robot system, Case studies in industrial electronics and industrial data communication.

EEE 424 Industrial & Power Electronics Sessional *Credit: 0.75*

Laboratory works based on EEE 423.

Reference Books:

1. Power Electronics, Converters, Application and Design, N Mohan, TM Undeland and WR Robbins.
2. Principles of Power Electronics, JG Kassakian, MF Schlecht and JC Verghese.
3. Power Electronics, Circuits, Devices and Applications, MH Rashid.
4. Electronics in Industry, Chute and Chute.

5. Theory and Application of Industrial Electronics, JA Cage.
6. Programmable Logic Controllers, W Bolton, Elsevier Publications.
7. Industrial Electronics, Thomas E. Kissel, Prentice Hall India.

TEE 431 Research Methodologies *Credit: 2*

The aim of this subject is to provide IT students with ongoing integrated academic language and basic research skills during the first semester of their postgraduate studies at UTS. This subject focuses on developing the academic written and spoken language skills required for post graduate study in IT. These academic skills are developed in conjunction with staff from the faculty of IT. Students take a critical/analytical approach to understanding and producing written and spoken texts appropriate for the Australian context.

The subject focuses in particular on critical reading skills, paraphrasing and summarizing, evaluating and using a variety of sources of information, citing, referencing, developing written arguments, presenting seminars, text drafting and editing, and the preparation of postgraduate assignments or research documents (literature reviews, articles, conference papers, etc.). In this subject, texts are selected and assessment prepared jointly by academic literacy experts and postgraduate coordinators and supervisor in the faculty of Information Technology.

This course will include technical writing, paper writing, thesis writing and other concepts of research. This course may also include a Project and Presentation should be submitted under this course as well as submit paper in the International/ National conference or journal for publication.

TEE 402 Project/Thesis *Credit: 3*

Each student must complete a research/Telecommunication based Industrial Attachment project. The research/project must be presented in both oral and written form. The written part may range from a scholarly paper that includes comprehensive references to the literature, to a suitably documented computer programme. Project may be done individually or in group consisting not more than 3 students.

The oral presentations are open to the public, including all interested faculty members and students. A report should be submitted and a presentation should be delivered.

Elective-IV *Credit : A: 3+1.5, B: 3+0*

Students must select two courses from the following TWO groups (Group A and Group B). Student must not select more than one course from any group. Sessional will be based on the Theoretical course. A Project and Presentation should be submitted under the course.

Elective-IV (Group A)			
S/N	Course Code	Course Name	Credit (Theory+ Sessional)
1	*EEE 421,422*	*Switchgear and Protective Relays*	*3+1.5*
2	*EEE 423,424*	*Special Electrical Machines*	*3+1.5*
3	*CEN 421,422*	*Mechatronics and Robotics*	*3+1.5*

4	*CEN 423,424*	*Computer Peripheral and Interfacing*	*3+1.5*
5	*CEN 425,426*	*Machine learning*	*3+1.5*
6	*CIT 431,432*	*Bio-informatics*	*3+1.5*
7	*CIT 433,434*	*System Analysis & Design*	*3+1.5*
8	*CIT 435,436*	*Advanced 3D Computer Animation*	*3+1.5*
9	*CIT 437,438*	*Medical Transcription*	*3+1.5*
10	*CIT 439,440*	*.NET Programming with JAVA*	*3+1.5*
11	*TEE 445,446*	*VOIP and Teleconferencing*	*3+1.5*
12	*TEE 447,448*	*Multilayer Switching Networks*	*3+1.5*
13	*TEE 449,450*	*Broadband Networks*	*3+1.5*
14	*TEE 451,452*	*Opto-electronic Devices*	*3+1.5*
15	*TEE 453,454*	*Distributed Operating Systems*	*3+1.5*
16	*TEE 455,456*	*Advanced Telecom Switching Systems and Networking*	*3+1.5*

	Elective-IV (Group B)		
S/N	Course Code	Course Name	Credit (Theory+ Sessional)
1	*EEE 425*	*Electromagnetic Theory*	*3+0*
2	*CEN 327*	*Computer Organization & Architecture*	*3+0*
3	*CEN 429*	*Distributed and Parallel Processing*	*3+0*
4	*EEE 427*	*Renewable Energy*	*3+0*
5	*EEE 429*	*Power System Operation and Reliability*	*3+0*
6	*CEN 431*	*Fault Tolerant Computing*	*3+0*
7	*CIT 441*	*PDA Technology*	*3+0*
8	*TEE 459*	*Inter-planet Communication System*	*3+0*
9	*TEE 461*	*Internet Quality of Service*	*3+0*
10	*TEE 465*	*Management of Telecommunications*	*3+0*
11	*TEE 467*	*Satellite Communication*	*3+0*
12	*TEE 469*	*Advanced Analog & Digital Communication Systems*	*3+0*
13	*TEE 471*	*Information Theory and Error Control Coding*	*3+0*

Level 4 Semester II

TEE 435 Teletraffic Engineering *Credit: 3*

Teletraffic Theory Statistical characterization of telecommunications traffic. The Erlang C formula and its applications. Circuit efficiency, grade of service and measurement of congested circuits. Dimensioning of telephone circuits and switches. Switching Evolution of circuit switching systems. Space switching, time switching, and stored program control (SPC) switching. Blocking and non-blocking switches. Packet switching with comparison to circuit switching.
Signaling Evolution of signaling systems. The CCITT no. 7 signaling system Transmission Multiplexing hierarchies – PCM and time division multiplexing, SONET, SDH and WDM techniques and networks.
Data Transmission, Transmission in LANS. Transmission in WANS – X.25, Frame Relay. Asynchronous Transfer Mode (ATM). Congestion control in data transmission, Convergence of Technologies Voice and video over packet switching networks. Integrated networks. Applications in multimedia communications
Introduction, Telecommunications transmission, Evaluation of switching systems, Telecommunications traffic, Switching networks, Time-division switching, Control of switching systems, Signaling, Packet switching, Networks, Signals and channels, Analogue modulation theory, Discrete signals, Noise in analogue communications systems, Noise in digital communications systems, High-frequency transmission lines, Antennas, Active microwave devices, Passive microwave devices, Telephony, Television systems, Optical fiber communications, Packet switched networks, Satellite communications, Mobile communication systems

Reference Books:

1) Telecommunications Switching, Traffic and Networks, J. E. Flood
2) Telecommunications Engineering, J. Dunlop, D.G. Smith

TEE 437 Wireless and Mobile Communications. *Credit : 3*

Introduction , Wireless transmission, Medium access control, Telecommunication systems, Satellite systems, Broadcast systems, Wireless LAN, Mobile network layer, Mobile transport layer, Support for mobility.
GSM system survey (en/lzt 123 3321) : Mobile Telephony, Global system for mobile communication(GSM) , GSM geographical network structure, GSM frequency bands.
GSM Advanced Cell Planning Principles Student Text (EN/LZT 123 5333 R4A) : System description, Radio Frequency guidelines, Dimensioning of Logical Channels, Antennas, Antennas Near Products, Map Data Basic and GPS, Ericsson propagation algorithms, Site survey, Tools, Indoor cell planning, Network Expansion, Parameters, GPRS impact on the radio network.

TEE 438 Wireless and Mobile Communications Sessional *Credit : 0.75*

Laboratory works based on TEE 438.

Reference Books

1. GSM System Introduction (En/Lzt 123 3641 R3a)
2. GSM BSC Operation & Maintenance (En/Lzt 123 3801 R2a)

TEE 439 Telecom Business and Management *Credit: 2*

Engineering Management: The decision making process. The relationship between engineering and management. Non monetary factors and multiple objectives. Application of cost concepts. Accounting. Money-time relationships. Interest formulas. Cash flow. Comparison of engineering economy study methods. Comparing alternatives using equivalent-worth, rate of return and capitalized worth methods. Depreciation. Methods for dealing with uncertainty. Replacement versus augmentation. Abandonment. Differences between public and private projects. The cost benefit ratio method. Engineering Ethics IEEE (USA) Code of Ethics. IEE (UK) Code of Ethics. BEC code of ethics. Government of Bangladesh. E business, laws, rules and regulations. copyright, patent etc.

TEE 404 Project/Thesis *Credit: 3*

Each student must complete a research/Telecommunication based Industrial Attachment project. The research/project must be presented in both oral and written form. The written part may range from a scholarly paper that includes comprehensive references to the literature, to a suitably documented computer programme. Project may be done individually or in group consisting not more than 3 students.

The oral presentations are open to the public, including all interested faculty members and students. A report should be submitted and a presentation should be delivered.

TEE 400 Internship/Project *Credit: 1*

At the end of Level 4 Semester II, the students for the degree of B.Sc in Telecommunication and Electronics Engineering (TEE) will undergo a training or Internship programme of duration of three months. Practical assignments will be given to the students to understand literature searching etc for research methodologies. At the completion of the training/ Internship and practical assignments, students must submit a report to the department for evaluation as well as present an oral presentation or conduct a workshop in the university on that practical training for few days. In case of failure to participate in the internship program, student may complete a project work under supervision of any expert having appropriate permission from the Dean, CSE faculty.

Elective -V *Credit : (3+1.5) x 2*

Students must select any two courses from the following courses. Sessional will be based on the Theoretical course. A Project and Presentation should be submitted under the course.

S/ N	Course Code	Course Name	Credit (Theory+ Sessional)
1	*EEE 431,432*	*High Voltage Engineering*	*3+1.5*
2	*CEN 435,436*	*Automatic Control System Design*	*3+1.5*
3	*CEN 437,438*	*Embedded System Design*	*3+1.5*
4	*CIT 443,444*	*E-Commerce*	*3+1.5*
5	*CIT 445,446*	*Software Engineering*	*3+1.5*
6	*CIT 447,448*	*Speech and Image Processing*	*3+1.5*

7	*TEE 471,472*	*Telemedicine Technology*	*3+1.5*
8	*TEE 473,474*	*Advanced WAP Technology*	*3+1.5*
9	*TEE 475,476*	*Bio-medical Signal Processing*	*3+1.5*
10	*TEE 477, 478*	*Modern Radio and TV systems*	*3+1.5*
11	*TEE 479, 480*	*GIS and GPS*	*2+1*

*Syllabus of other elective-v courses is under construction.

TEE 477 Modern Radio and TV systems *Credit: 3*

Radio Broadcasting Transmitter: Different types of transmitter by power & waves, Elements of transmitter stabilized master oscillator, Frequency multipliers, Mixer exciters, R.F. power amplifier, AM & FM transmitter, Transmitter performance, Carrier frequency stability, Audio frequency response. Distortion. Signal to distortion ratio.

Radio Receiver: Receiver classification, T. R. F. and heterodyne receiver, Principle of AM receiver, Superheterodyne receiver, AM demodulators, Reception and preselection, FM receiver, FM reception, AFC circuit, Limiters, Ratio detectors, Foster-Seely detector, Comparison of AM and FM receiver, Noise in receiver, Noise limiting circuits. AGC circuits, Receiver sensitivity, Cross modulation, Spurious response converters, Detector and modulation circuits. Radio receiver servicing, Servicing transistor receiver, Receiver troubles shootings.

Standard Broadcast Stations: Components of a broadcast system, The broadcast console, Audio levels, Frequency monitoring, Modulation monitors, Emergency broadcast systems, Disk recording, Playback records, Microwave relay system, Cable relay system, Satellite relay system, Broadcasting studio properties & design.

Fundamentals of TV: Transmission and reception of picture information, Scanning, Standard scanning pattern, Synchronization, Blanking pulses, Composite video signal, Vestigial sideband transmission, Line of sight transmission, TV channels. TV Camera Tubes: Storage type camera tubes: Non-storage type camera tubes; Iconoscope; Image orthicon, Vidicon, Plumbicon, Colour TV camera and other types of camera tubes.TV Receiver & Transmitter: Fundamentals of TV receiver, Picture tubes, Deflection circuit, High voltage power supply, Folded dipole with directors and reflectors for TV receiver, TV Transmitter and TV studio design.

Colour TV: Definition of colour TV, Types of colour video signals, Matrix circuits, Colourplexed composite video signal, Fundamentals of colour TV receiver, Colour picture tube, Chrominance, ACC bias, Colour troubles, TV receiver servicing.

TEE 478 Modern Radio and TV systems Sessional *Credit: 1.50*

Laboratory works based on TEE 478.

Reference Books

1. G. K. Mithal : Radio & TV Engineering
2. Gulati : Monochrome & Color Television
3. S.L.Gupta and V.Kumar : Hand book of Electronics.
4. Ghirardi and Johnson : Radio TV Receiver Circuitry and Operation
5. B. Grob : Basic TV.

6. A. Schure : Basic TV.