**B.Sc.(Hons) Electronics and Telecommunication Technology**

**FIRST YEAR**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course Code** | **Course Description** | **Credit Hrs** | **Contact Hrs** | **Status** |
| **SEMESTER 1** | |  |  |  |
| ENGL 11X | English Language | 2 | 2 | Compulsory |
| ICT 11X | Introduction to Computers & Applications I | 2 | 4 | Compulsory |
| PHYS 111 | General Physics I | 3 | 4 | Service Course |
| MATH 11X | General Maths I | 3 | 4 | Service Course |
| CHEM 11X | General Chemistry I | 3 | 4 | Service Course |
| COMPS 112 | Intro. to Computer Programming | 3 | 3 | Core Course |
| STS 110 | Science, Technology and Society | 2 | 2 | Compulsory |
| **SUB-TOTAL** |  | **18** | **23** |  |
| **SEMESTER 2** | |  |  |  |
| ENGL 12X | English Language | 2 | 2 | Compulsory |
| ICT 11X | Introduction to Computers& Applications II | 2 | 4 | Compulsory |
| PHYS 122 | General Physics II | 3 | 4 | Core Course |
| MATH 12X | General Maths II | 3 | 4 | Service Course |
| CHEM 12X | General Chemistry II | 3 | 4 | Service Course |
| ELTT 121 | Introduction to Electronics | 3 | 4 | Core Course |
| COMPS 122 | Discrete Maths | 2 | 3 |  |
| **SUB-TOTAL** |  | **18** | **25** |  |

**SECOND YEAR**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Course Code** | **Course Description** | **Credit Hrs** | **Contact Hrs** | **Status** |
| **SEMESTER 1** | |  |  |  |
| ENGL 21X | English Language | 2 | 2 | Compulsory |
| TMATH 211 | Mathematical methods I | 3 | 4 | Service Course |
| PHYS 211 | Thermal Physics/(Data & Algorithm) | 3 | 4 | Core Course |
| ELTT 212 | Digital Fundamentals and Logic design | 3 | 3 | Core Course |
| ELTT 213 | Introduction to Telecommunication Networks | 3 | 4 | Core Course |
| ELTT 214 | Analog & Digital Telecommunications | 3 | 3 | Core Course |
| COMPS 212 | Programming with Java/(Computer Operating Systems) | 3 | 4 | Core Course |
| **SUB-TOTAL** |  | **20** | 24 |  |
| **SEMESTER 2** | |  |  |  |
| ENGL 22X | English Language | 2 | 2 | Compulsory |
| TMATH 222 | Mathematical methods II | 3 | 4 | Service Course |
| ELTT 225 | Fundamentals of Microprocessors and Microcomputers | 3 | 3 | Core Course |
| ELTT 226 | Electronics Instrumentations & Measurement | 3 | 4 | Core Course |
| PHYS 222 | Electricity & Magnetism / | 3 | 4 | Core Course |
| COMPS 2212 | Programming with C++ | 3 | 4 | Core Course |
| COMPS 2210 | Data communications and Networking I | 3 | 4 | Core Course |
| **SUB-TOTAL** |  | **20** | **25** |  |

### THIRD YEAR

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Code** | **Course Description** | **LH** | **CH** | **Status** |
| **SEMESTER 1** | |  |  |  |
| EED 31X | Entrepreneurship | 3 |  | Compulsory |
| ELTT 317 | Communication Circuits | **3** |  | Core Course |
| COMPS 317 | Numerical Techniques | 3 |  | Core Course |
| ELTT 319 | Electromagnetic Fields & Waves | 3 |  | Core Course |
| COMPS 316 | Computer Architecture and Organization | 3 |  | Core Course |
| COMPS 312 | Applications of Java & C++ | 3 |  | Elective |
| ELTT 318 | Computer Aided Design | 3 |  | Elective |
| ELTT 319 | Linear Integrated Circuit | 3 |  | Elective |
| **SUB-TOTAL** |  | **21** |  |  |
| **SEMESTER 2** | |  |  |  |
| EED 322 | Entrepreneurship | 3 |  | Compulsory |
| ELTT 3210 | Antennas and Wave propagation | 3 |  | Core Course |
| ELTT 3211 | Radio & Satellite Communications | 3 |  | Core Course |
| COMPS 324 | Data communications and Networking II | 3 |  | Core Course |
| COMPS 3211 | Research Methods | 3 |  | Core Course |
| ELTT 3212 | Consumer & Power Electronics | 3 |  | Elective |
| COMPS 301 | Scientific Programming | 3 |  | Elective |
| BIT 319 | Information Systems in Organizations | 3 |  | Elective |
| **SUB-TOTAL** |  | **18** |  |  |

### FOURTH YEAR

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Code** | **Course Description** | **LH** | **CH** | **Status** |
| **SEMESTER 1** | |  |  |  |
| ELTT 4113 | Wireless and Cellular Communication Systems | 3 |  | Core Course |
| ELTT 4114 | Digital Integrated Circuits and Applications | 3 |  | Core Course |
| ELTT 4115 | Optical Communication Systems | **3** |  | Core Course |
| ELTT 4116 | Signals and Systems | 3 |  | Core Course |
| ELTT 4117 | MS Server Administration | 3 |  | Core Course |
| BIT 4117 | Computer System Audit and internal Control | 3 |  | Elective |
| COMPS 414 | Computer & Network Security | 3 |  | Elective |
| BIT 412 | Project Design and Management | 3 |  | Elective |
| **SUB-TOTAL** |  | **21** |  |  |
| **SEMESTER 2** | |  |  |  |
| ELTT 42 | Internship |  |  |  |
|  | Dissertation/ Project |  |  |  |
| **TOTAL** |  | **132** |  |  |

**ENGL 11X English Language I**

(Course Structure with Language Department)

**MATH 11X Algebra and Trigonometry**

Logic and elementary set theory, real and complex number systems; relations, functions and graphs; exponential, logarithmic and trigonometric functions, quadratic equations, inequality systems of equations, matrices and determinants, mathematical induction, Binomial theorem and its application, Analytic geometry of the straight line, circle and comic section.

**PHYS 111 General Physics I**

Basic SI units and measurement of length time and mass. Principle of venire, vectors and scalars. Addition and resolution of vectors.Motion in a straight line, projectiles. Newton’s laws of motion and their applications. Momentum, conversation laws. General conditions of equilibrium, center of gravity, levers and pulleys. Work and energy, conservation laws of energy and momentum. Circular motion, simple Harmonic Motion (SHM), period and frequency, simple pendulum – determination of ‘g’ solids, liquids, gases, atoms, electrons and nuclei. Friction, surface tension and viscosity ( qualitative). Hydrostatics.Temperature and its measurement including thermocouple. Thermal expansion: solids, liquids. Specific heat and latent heat.Ideal gas laws.Absolute zero of temperature. Transfer of heat: conduction, convection, and Radiation.

**COMPS 111 and COMPS 121 Introduction to Computers and Applications I**  
This course is an introduction to basic concepts underlying the computer and its applications in technology and science fields. The focus of the course is on studying the computer for acquiring and presenting information, using spreadsheet to solve problems, collecting and storing data, and word processing. Topics include: hardware and software computer concepts, an introduction to internet in acquiring and sharing information (WWW, User list, and Personal Message Centers), introduction to spread sheet applications in solving problems and charting, use of text editors to write documents (Word Processing), an introduction to technical presentations, and use of application programs for organizing data, and drawing charts and schematics.

**COMPS 111 Fundamentals of Computer Systems**

dot_clearThis unit provides an overview of the hardware and software of computer systems and introduces a number of important topics in computer science: overview of computer system architecture; computer memory, information representation and storage; introduction to numbering systems – conversion of various numbering systems; logic gates; Boolean logic operations.

**COMPS 121 Programming in Visual Basic**

User interface and algorithm design; Specifying VISUAL Controls for the user interface, design menus, use common dialog boxes, understand Event Driven programming; Algorithm Design and Elements of Program Style,definition of algorithm and role in problem solution, expressing algorithms in pseudocode or flowchart form; Coding programs in VISUAL BASIC, string and numeric variables and constants, evaluation of expressions and assignment statements, setting and changing VISUAL Control properties, object methods, logical operators and decision statements, looping structures, use of elementary VISUAL BASIC functions: numeric and string, subroutines and programmer created functions, including elementary parameter passing, creation and use of Control arrays, declaration and use of arrays including a simple bubble type sort, sequential file input and output operations; Elements of program testing and debugging, saving, retrieving and running VISUAL BASIC programs, choosing good test data, hand tracing and using an online debugger, checking the program's results; Structure and documentation of programs, the structured constructs, sequence, selection, repetition, using subroutines to modularize programs, how to improve readability of a program by use of remarks, indentation, and spacing and well chosen variable names

**COMPS 131 Introduction to Computer Programming**

This unit introduces key aspects of computer science including data storage and manipulation, and problem solving using a high-level programming language. Topics: the components of a modern computer system; fundamental concepts of data storage; function and evolution of operating systems; an introduction to algorithms and problem solving; fundamental aspects of a programming language including data types, input/output, simple selection and iteration control structures, procedural and data abstraction, one-dimensional arrays, strings and concept of files.

**FIRST YEAR SECOND SEMESTER**

**ENGL 102 English Language**

(Course Structure with Language Department)

**MATH 122 Introduction to Calculus, Applied Maths and Statistics**

Limits, derivatives, differentiation of polynomials and algebraic functions, Application of differentiation. Descriptive statistics, elementary probability, binomial distributions, normal approximation applications, Vectors and coplanar forces, kinematics of a particle, Newton'’ laws of motion applied to one-dimensional motion; friction.

**PHYS 102 General Physics II**

Laws of reflection of light.Reflection at plane and spherical surfaces.Laws of refraction.Refraction through plane medium – refractive index; total internal reflection.Refraction through a prism.Simple spectrometer.Lenses determination of focal length, magnification simple optical instruments.Initial concepts of waves.Displacement, amplitude, wavelength, velocity. Progressive waves: Transverse and longitudinal waves. Superposition of waves: Interference, stationary waves, resonance, beats. Vibration of air columns and strings.Introduction to electromagnetic waves. Magnetism: Properties of a magnet. Magnetic field. Earth’s magnetic elements and their determination dip circle. Electrostatics: Role of electrons; Electrification by friction and induction. Conductors and insulators. Gold – leaf electroscope Coulomb’s law. Electrostatics field, potential and energy; capacitors, Current electricity: Ohm’s law. Resistance and resistivity. Simple treatment of wheatson’s Bridge. Potentiometer principle forms and uses.Heating effect of current.Magnetic effect of current. Electromagnetic induction – generators (a.c&d.c.), motors D.C ammeter and Voltmeters.

**ELTT 102 Electronics for Computer Science**

Direct Current Circuits, Alternating Current, Digital Signals, Semi-Conductors, Diodes, Rectifiers, Diode as a logic gate, Bipolar Junction Transistor, Bias circuits of BJT, Transistor as logic gate, Families of logic circuits, Binary Systems, Boolean Algebra and Logic Gates.

**ELTT 112 Electric Circuits and Network Analysis**

AC and DC circuit theory. Topics include: review of algebra and trigonometry concepts; scientific and engineering prefix notation; unit conversions; rate of change; graphing; the sine wave; Ohm's Law; Kirchhoff's Laws; R-C, R-L, and R-L-C series circuits; complex numbers; R-L-C parallel circuits; R-L-C series-parallel circuits; Thevenin's, Norton's and superposition theorems; mesh and nodal analysis. Review of network theorems; filters; R-C and R-L time constants; series and parallel resonant circuits; magnetism; inductance and ideal transformer concepts.

**ELTT 122 Introduction to Experimental Techniques**

Laboratory procedures; learning use of common laboratory equipment such as power supplies, multimeters, signal generators, and oscilloscopes; understanding the assembly of electronic circuits by putting together and testing two simple printed circuit boards; making measurements; familiarization with simple DC resistor circuits; Ohm's law; analyzing AC signals, including frequency, period, amplitude, and rms value; inductors, capacitors and DC transients; measuring phase shift in an AC circuit due to an inductor or capacitor; and basics of laboratory report writing.

### SECOND YEAR FIRST SEMESTER

**ELTT 201 Digital Fundamentals**

Number systems, Boolean algebra and reduction techniques, logic gates, combinational logic design, multiplexers, decoders, encoders, code converters, flip-flops, synchronous sequential logic, counters and registers

**ELTT 211 Analog Electronics**

Introduction to Quantum Mechanics of Solid States Electronics. Junction Diode Characteristics and Diode Circuits. Bipolar Transistor Characteristics. Field Effect Transistors Characteristics, Small Signal Analysis, Power Amplifiers.

**ELTT 221 Introduction to Electronics Technology**

Hardware and software tools used in the electronics industry; includes hands-on projects to introduce electronic circuit fabrication skills

**TMATH 201 Mathematics for Technology I**

Algebra: Equations in one-variable: algebra, graphical solution, numerical solution; inequations in one variable: algebra, graphical solution; transformation of equations and formulae.

Sequences and series: informal introduction to the concepts of convergence of a series and limits, monotonic sequences, infinite series, the harmonic series, alternating series, simple tests for convergence

Functions and Graphs: Review of functions and graphs, including polynomials, rational functions and a review of trigonometry, problems of domain, limits, asymptotes, partial fractions, inverse trigonometric functions, hyperbolic and inverse hyperbolic functions.

Linear Algebra: Matrices, determinants, solution of systems of linear equations, matrix inverse, Gaussian and complete elimination.

**ELTT 231 Introduction to Telecommunication Networks**

Telecommunications fundamentals, the new public network, basic elements of telecommunications, transmission lines, electromagnetic spectrum, analog and digital transmission, modems, modulation, multiplexing, twisted-pair copper cable, coaxial cable, microwave, satellite, fiber optics, access systems: xDSL, LMDS, FSO, FO systems, PSTN, PDH, SDH.

**COMPS 201 Operating Systems Principles**

Introduction and overview

History of operating systems

Operating system structures

Process management: process concept, concurrent processes, CPU scheduling, scheduling algorithms

Process co-ordination: critical section, process synchronization, semaphores, monitors, critical regions, process communication

Deadlocks: deadlock prevention, avoidance, detection and recovery

Memory hierarchy: cache memory, associative memory

Memory management: swapping, fixed and variable partitions, relocation, paging and segmentation (external and internal fragmentation)

Virtual memory: page replacement algorithms, thrashing

Secondary storage management

File management: file-system organization, file operations, access methods, directory-structure organization

**COMPS 211 Introduction to Database Management**

Covers an introduction to information security basics, Internet search engines, and different types of database management systems. Students will use MS Access to create and link tables, sort and search (query) tables, use forms and create reports. Data integrity tools such as combo boxes and validation rules will be presented. E-R diagrams will be used to model relations. Ethical discussions will include information privacy, appropriate use and destruction of data, and data integrity.

**COMPS 221 Data Structure and Algorithms.**

Analysis Tools - Pseudocode, Math Analysis, Asymptotic Notation and Analysis.

Recursion - Recursive Methods and Analysis.

Stacks, Queues, Hash Tables, Graphs, Trees.

Abstraction Mechanisms - procedures, functions and iterators; activation records and storage management.

Algorithmic Strategies - brute-force algorithms, greedy algorithms, divide-and-conquer, backtracking, branch-and-bound, heuristics, pattern matching and string/text algorithms, numerical approximation algorithms.

Fundamental computing algorithms - O(n log n) sorting, hash tables, binary search trees, graphs, minimum spanning tree, depth-first and breadth-first traversals, shortest-path algorithms, transitive closure

**COMPS 231 Data Communication and Networking I**

Data communication: Components, basic concepts - Line configuration: point to point, multipoint; Topology - mesh, star, tree, bus, ring, hybrid; Access methods - command/response, interrupt-driven, Token passing, CSMA/CD; Transmission modes - simplex, half-duplex, full-duplex; Categories of networks - LAN, MAN, WAN.

The OSI Model: Layered Architecture, Functions of the layers. DTE-DCE interface, Modems: Role of modems, modem functions, operation of a modem, connecting modem to telephone line; Multiplexing: FDM, synchronous TDM, statistical TDM, WDM

Data link control: Line Discipline, flow control, error control: ARQ, stop-and –wait ARQ, sliding window ARQ, Go-back-N ARQ, Selective-Reject ARQ.

Data link protocols - Asynchronous protocols: XMODEM, synchronous protocols - Character oriented protocols: Binary Synchronous Communication (BSC), Bit Oriented Protocols: SDLC, HDLC.

### SECOND YEAR FIRST SEMESTER

**ELTT 202 Electronics Instrumentations and Measurements**

The basis of measurement, base and derived units, measurement standards, electrical standards, Measurement errors and their statistical characterization, Factors influencing measurement errors

**Electronic Meters:** A/D conversion, signal conditioning, ranging and amplification. DC and AC voltage and current measurement, resistance measurement, sources of error and their elimination.

**The Oscilloscope:** Basic operation of an oscilloscope, Oscilloscope probes, Digital oscilloscope basics, Storage oscilloscopes

**Electronic Counters:** Basic counter circuitry, frequency measurement, period measurement, time interval measurement, accuracy

**Signal Sources:** Function generator, pulse generator, audio and RF signal generators

**The Spectrum Analyzer:** Types of spectrum analyzers, superheterodyne spectrum analyzer and controls, methods of displaying information.

**Logic Analyzer:** Basic operation of a logic analyzer, measurement types, data acquisition, display, applications.

**Computer-based Instrument Systems:** Data acquisition systems, GPIB, VXI bus systems for instrument connectivity, automation and remote controls and frequency effects.

**ELTT 222 Fundamentals of Microprocessors and Microcomputers**

An introduction to basic principles of micro processor architecture and assembly language instructions. The content of the course is divided into three sections: microprocessor architecture, mnemonics and interfacing I/Os. The course is designed around the Z-80 and its mnenomics. Overview of computers and micro-computers, Z-80 microprocessor architecture, bus architecture, memory (R/W Memory, ROM, and EPROM) memory map, I/Os, interfacing devices and introduction to the Z-80 instruction set. The third section-interfacing I/Os-introduces various I/O techniques such as parallel I/O, techniques such as parallel I/O, serial I/O and interrupts.

**ELTT 232 Digital System Design**

Number Systems and codes: Decimal, Binary, Hexadecimal, and Octal number systems; Inter conversions, compliments; Addition and Subtraction using 1’s and 2’s complements; Binary Codes, Gray Code, Excess-3 Code.

Boolean Algebra: Basic Boolean functions, Postulates and theorems of Boolean Algebra, Sum-of-Products and Product-of-Sums forms of Boolean functions; Canonical and Standard forms.   
Simplification of Boolean Functions, Plotting of K-Maps, POS and SOP Simplification, NAND and NOR implementation; Plotting and Reading of a K-Map using VEM Process.

Combinational Logic: Design procedure for combinational logic circuits; design and analysis of Half Adder, Full Adder; their use in designing other combinational logic circuits; Analysis & Design of Encoders and Decoders; Multiplexer and demultiplexers; their use in designing combinational circuits.

Memory Elements: SR, JK, T, D Flip-flops and Latches, their schematic symbols, Truth table and Excitation Table; Triggering methods if Flip-flops.

Sequential Circuits: Design procedure for sequential circuits using state diagrams, State Tables; State assignments and State minimization methods; Circuit implementation.

Design and analysis of Counters, Single mode and Multi-mode Synchronous Counters; Modulo Counters, Asynchronous, Ripple and Ring Counters; Application of Counters.

Types of Shift Registers: SISO, SIPO, PISO, PIPO, Bi-directional Shift Registers, Loading methods for Shift Registers.

Logic Circuits: Positive and Negative logic RTL, DCTL, DTL, HTL, TTL, ECL and IIL gates. MOS gates. Comparison of logic gates

Memory Organisation: memory Hierarchy, Main Memory [RAM & ROM], Associative memory [only definition], Cache memory [Associative, Direct & Set-Associative Mapping], Virtual Memory [only definition]

**ELTT 242 Analog Telecommunications**

Types of signals, time domain and frequency domain representation of signals, signal transmission through linear systems, filter characteristics of linear system, Distortion less transmission line, Ideal filter, Relation between Bandwidth and rise time, Paley Wiener criteria of physical realization, Energy and power Density spectrum and their interpretation.

Principles of AM, Frequency spectrum of AM wave, AM power and current relationship, modulation by multiple sine waves, generation of AM using solid state circuit. (Base-injected, emitter-injected and collector-injected)

DSB-SC and SSB Techniques, Methods of generation and detection of DSB-SC signals-square law modulator, Switching modulator, Ring Modulator, Balance modulator, Coherent detection of DSB-SC, COSTAS receiver, Squaring loop detection, comparison of various methods.

Methods of generation and detection of SSB (Selective filtering, phase discrimination & third method), Coherent detection of SSB.Comparison of various methods.Effect of frequency and phase errors in synchronous detection, ISB, VSB, FDM.

Principles of FM and PM, Mathematical representation, Spectrum, Narrowband and wideband FM, Multiple frequency modulation, power contents of carrier and sideband, Effects of noise in FM, Direct modulation using FET, Armstrong method of generation, Frequency Multipliers, Slope Detector, Foster-Seelay discriminator, Radio detector.

AM and FM transmitter, TRF receivers, super heterodyne receivers, solidstate circuits for RF-amplifiers, Mixer, IF amplifier, AGC, AFC, Amplitude limiter, Pre-emphasis, De-emphasis, Audio muting, stereophonic FM.

Noise, various noise sources, Noise calculations for – single noise sources, multiple noise sources, cascade and cascode amplifiers. Noise figure and its measurement, Noise temperature, Equivalent input noise resistance, noise Bandwidth, noise measurement on line and channel.

Band – pass noise representation, noise figure calculation for various modulation systems (DSB-AM, DSB-SC, SSB and FM), Effects of transmitter noise.

**COMPS 232 Introduction to Object - Oriented Programming using C++**

C++ language to introduce programming foundations.Develops solutions to computing problems through algorithm design, development, and implementation.Includes documentation and formatting of output. Introduces object-oriented concepts..

**COMPS 242 Data Communication and Networking II**

Switching - Switching networks, Circuit switching: Space-Division switching, Time-Division switching, Packet switching: Datagram, Virtual Circuit [SVC, PVC], Message switching.

X.25: X.25 layers-Physical layer, frame layer, packet layer, PLP packets

Networking Devices: Repeaters, Bridges, Routers, Gateways.

Routing Algorithms: Distance Vector routing, link state routing, shortest path Algorithm- Flyod’s Algorithm.

ATM: ATM Architecture-Virtual connection, Identifiers, Cells, Connection, Establishment & Release

ISDN: Integrated Digital network, ISDN, ISDN channels-B, D, H Channels, ISDN Interfaces, Functional grouping, ISDN protocol architecture- Physical layer, data link layer, network layer, ISDN addressing.

**COMPS 262 Numerical methods**

Introduction to numerical analysis  
- experimental, rounding & truncation errors, convergence, order  
- matrices, variables, functions, vectorization, solving linear equations, looping & branching, plotting Numerical solution of algebraic equations  
- interval bisection, fixed point iteration, Newton's method; initial approximation & convergence

criteria  
-fzero, fsolve; function functions and handles

Interpolation & curve fitting of scalar functions  
- polynomial and piecewise-polynomial interpolants, least-squares, fast Fourier transform  
- interp1, spline, polyfit, fft

Numerical integration & differentiation  
- trapezium and Simpson's rule, Gauss quadrature  
- quad

Numerical solution of ODEs  
- explicit and implicit Euler, midpoint rule, trapezoidal, predictor-Corrector and Runge-Kutta methods  
- ode45, ode15s, odeset

**TMATHS 202**

Complex numbers: Arithmetic, geometrical representation, Cartesian and polar forms, powers and roots, exponential form, fundamental theorem of algebra.

Differentiation: Implicit and logarithmic differentiation, optimization, detailed graphing including inflection, rates, approximations, error analysis, Taylor polynomials, indeterminate forms, limits. Integration: Substitution, parts, general techniques, use of extensive tables, areas, centroids, volumes, arc lengths, surface areas, numerical integration.

Differential Equations: First order separable, exact, linear, orthogonal trajectories, second order linear with constant coefficients and simple right hand sides.

**ELTT 301 Consumer Electronic**

Electro acoustical Transducers:

Microphones, Loudspeakers, Pick-up characteristics, specifications and applications.

Sound Recording and Reproduction:

Principle and block schematic of disc recording system, magnetic recording system, optical recording system, compact disc.

Audio Amplifier and subsystems:

Audio mixers, Tone controls, Graphic equalizers, Features of Hi-Fi and stereo systems, Dolby system, Public Address systems, Tuners

Testing, Alignment & Servicing of Television Receivers:

Testing & Alignment of TV Receivers, TV Wobbuloscope, Video Pattern Generators, Television Test

Charts, Marker Generator, colour bar Generator, Colour Bar Pattern Generator, Vectoroscope.

CCTV system Feature:

Random Interlace, Video Camera signal processing, Single tube colour camera.

Cable Television:

Cable systems, Different frequency bands/Channels, Cable types and networks, Head End parameters, Trunk and cable distribution systems, scrambling and Conditional Access systems (CAS).

Satellite Television, Direct to Home TV

Digital Television:

Digital Television Systems, Digital TV signals, digitized Video parameters, Transmission of Digital TV Signals, Bit rate reduction.

Advanced TV systems:

Multiplexed Analog component Signals (MAC), D2-MAC/PACKET Signal, Advantages.

Projection Television: Basic Projection TV systems, Front & Rear projection, Schmidt Optical systems, LCD & Laser Projection systems.

High Definition Television Systems:

HDTV systems, HDTV standards & compatibility, MUSE system, HD-MAC Family, 3D Stereoscopic TV Techniques.

Principles of video recording:

Modes of recording, Conversion of analog audio and video signals to digital.

Modern home appliances with electronic control such as Microwave oven , Washing machines, DVD, MP3 player, digital camera, cordless phones, cell phones, remote controls for TV, Inverters, UPS

Working principle of photo copying and fax machine.

Maintenance and safety measures

**ELTT 311 Linear Integrated Circuits**

Op-amp introduction: Op-amp parameters, definitions, measurements, offset compensation; functional block diagram and working; Specifications of IC741; Equivalent circuit of op-amp and transfer curve. Frequency response and method of frequency compensation.

Applications of operational Amplifiers (Linear amplifiers and filters): Inverting and non-inverting amplifiers, summing amplifiers, Differentiator, Integrator; Subtractor, Instrumentation amplifier, Voltage follower,V-I and I-V Converter, Precision Rectifier, Log and Antilog amplifier, Active filters such as Low Pass, High Pass, Band Pass, Notch, Butterworth (design)

Oscillators, Comparators: Comparators, Zero crossing detectors, Schmitt trigger, Monostable and astablemultivibrators; Ramp generator, Wein bridge oscillator, phase shift oscillators, Sample and hold circuit

Voltage Regulators: Specifications, functional block diagrams and applications of IC723, as high and low voltage regulators Three terminal regulators IC78XX series, 79XX series, LM 309, LM317, voltage regulator4, dual tracking regulator.

Principle and working of switching mode regulators, applications of switching regulator IC78540

ADC & DAC: A/D and D/A conversion principles, Successive approximation, Binary weighted resistor and R-2R resistor ladder. Specifications, functional block diagrams, applications of 0809 &0808

Phase-Locked Loop (PLL): Basic principle of Phase-locked loop and diagram, transfer characteristics of PLL, Lock Range, Capture range; Applications of PLL frequency multiplier, AM Demodulation, FM demodulation.

Study of PLL IC 565 and its applications. Design

IC 555: Functional block diagram and specifications as Monostable, Astable, VCO, Missing pulse detector, design, PWM, frequency divider.

Waveform Generating ICs: Study of IC NE 566, IC 8038 and IC XR 2206 and their applications in waveform generations.

**ELTT 321 Communication Circuits.**   
Analysis and design of passive and active communication circuits. Coupling networks, filters, and impedance matching. Modulation and demodulation techniques. Computer solutions.

**ELTT 331 Electromagnetic fields and Waves**

Vector analysis, vector relations in Cartesian, cylindrical and spherical co-ordinate systems.

Integral theorems: Green’s theorem, Divergence theorem, Stoke’s theorem

Electrostatics: Coulomb’s law, electric field strength, electric displacement & displacement density, Gauss’s Law & Divergence theorem(application of Gauss’s Law), Potential function, field due to a continuous distribution of charges, Equipotential surfaces.

Electrostatics: Poisson’s & Laplace’s equation, Capacitance and electrostatic energy.

Steady Magnetic Fields: Faraday’s Law, Magnetic Flux density, Magnetic Field strength, Magnet motive force, Ampere’s circuital law, Energy stored in a magnetic field, Ampere’s law for a current element, Ampere’s Force Law & Magnetic Vector potential.

Maxwell’s Equations: Continuity equation for time varying fields, Displacement current density, Generalized Ampere’s Law, Maxwell’s equations, conditions at the boundary surface3 between the media.

Electromagnetic waves: Electromagnetic waves in a homogenous medium, solution of Maxwell’s equations for free space conditions, wave equation,

Uniform plane wave propagation, characteristics impedance of a medium, wave equations for a conducting medium.

Electromagnetic waves: Sinusoidal electric & magnetic fields, traveling waves & standing waves (TE, TM, TEM), propagation constant of a medium, wave propagation in conductors & dielectrics, polarization of a uniform plane wave, reflection and refraction of plane wave at the boundary between two media, surface impedance of a conducting medium.

Pointing Vector & power flow: Poynting’s theorem, Power loss in plane conductor.

**ELTT 341 Analytic Techniques in Electronics and Telecommunication Technology**

Matrices: types of matrices, determinants, adjoin, inverse of matrix, elementary transformation, elementary matrices, rank of matrix, reduction to normal form,, canonical form. Rank using elementary transformation, linear independence and dependence, system of the form AX=0 and AX=B, and their solutions, Eigen values, Eigen vectors with properties, Cay lay Hamilton theorem with its applications

Fourier series: Periodic functions, Trignometric series, Euler’s formulas, Dirichlets condition, even and odd functions, half range series, Paseralis identity  
Fourier transforms: Fourier transform, inverse Fourier transform applications

Laplace transforms: Definition, Existence condition, properties, inverse Laplace transforms. Laplace transforms of periodic functions, convolution theorem, Laplace transform of Dirac-Delta function, Application of Laplace transform in storing linear differential. Equation with initial condition, system of Linear simultaneous differential equations.

Z-transforms, properties, convolution and applications to differential equations wave equations: Derivation and solution of one-dimensional wave equation using separation of variable method. Heat equation, its derivation, and solution using separation of variable method.

**ELTT 351 Digital communications**

TDM, comparison of TDM with FDM; Typical multiplexed systems; Signal –to-noise ratio calculations for PAM, PWM and PPM and their comparisons. Pulse code modulation, generation and detection of PCM, quantization, companding, differential PCM; Delta modulation, Adaptive delta modulation; Signal-to-Noise Ratio calculations of PCM, DM and TDM-PCM, their comparisons.

Fundamentals of Binary ASK, PSK and FSK, generation and detection of BASK, BPSK and BFSK; Fundamentals of QPSK and DPSK, generation and detection of QPSK and DPSK, generation and detection of QPSK and DPSK, M-Ary PSK signaling schemes, equalization principles; Baseband data transmissions.

Information; Marginal, conditional and joint Entropies; Channel capacity, efficiency; Discrete communication channels; Shannon’s limit, continuous communication channels, Channel with finite memory.

General principles of coding, necessary and sufficient condition for noiseless coding, Shannon’s noiseless coding theorem, Coding efficiency, Shannon-Eano and Huffman coding; Error control, Hamming codes, Linear block codes, Cyclic Redundancy codes, Majority logic coding and decoding; Two dimensional coding, Algebraic coding, Trellis diagram.

Simple telephone communication, Simplex, half-duplex and full-duplex telephone circuits, Side tones, relays, bridges, Local battery exchange, Central battery exchange, signaling tones, Facsimile.

Principles of common control, Touch tone dial telephone, Dual-tone-multi-frequency signaling, stored program control, Centralized and distributed SPC, Single stage and multistage networks, Time division space switching, Time division space switching, Time multiplexed space switching, Time multiplexed time switching, Network traffic, Grade of service and blocking problem.

**COMPS 351 Computer Architecture and Organisation**

Overview: The Main Components of a Computer; Standards Organizations; Historical Development; The Computer Level Hierarchy; The von Neumann Model

Data Representation in Computer Systems: Positional Numbering Systems; Decimal, octal, hexadecimal and Binary Conversions; Signed Integer Representation; Floating-Point Representation; Character Codes; Codes for Data Recording and Transmission; Error Detection and Correction

Boolean Algebra and Digital; Boolean Algebra; Logic Gates; Digital Components; Combinational Circuits; Sequential Circuits

CPU Basics and Organization: The Bus; Clocks; The Input/Output Subsystem; Memory Organization and Addressing; Registers and Buses; Register Transfer Notation

Instruction Processing; The Fetch-Decode-Execute Cycle; Interrupts and I/O

Instruction Set Architectures: Instruction Formats; Instruction Types; Addressing

Exceptions, Interrupts and traps  
Memory: Types of Memory; The Memory Hierarch; Cache Memory; Virtual Memory, Paging,Segmentation

Input/Output and Storage Systems: Amdahl’s Law; I/O Architectures; Magnetic Disk Technology; Optical Disks; Magnetic Tape; RAID

**COMPS 361 Computer and Network Security**

Confidentiality, integrity and availability: the pillars of security.  
The ethics issues facing the security professional.  
Physical access to information resources: secure sites, security policies, backups, disaster recovery  
The human factor: social engineering  
Malware: viruses, worms, Trojan horses, mailers etc  
Penetration testing: threat discovery, assessment and system hardening.  
Confidentiality, integrity and non-repudiation: the use of cryptography in security (hash functions, message digests, public/private key cryptography)  
Tools for securing systems and preventing and detecting attacks: firewalls, IDSes, anti-malware (antivirus, anti-spyware, anti-rootkit)

**COMPS 302 Research Methods**

Purposes and types of educational research

Ethical issues in educational research

Steps in carrying out a research study

Selecting and developing research questions

Conducting a literature review

Development and validation of assessment instruments (e.g., surveys, attitude scales, questionnaires, rating scales, etc.)

Research designs (experimental, quasi-experimental, and non-experimental)

Data collection techniques

Principles of sampling

Basic statistical methods for data analysis

Interpreting and drawing conclusions from research results

Reporting results

**ELTT 322 POWER ELECTRONICS**

Introduction to Thyristor family. Constructional details of SCR. Principle and operation and VI-characteristics, Two-transistor model of SCR. Firing of SCR: R & RC, UJT firing.

Turn off of SCR: Using Class A, B, C, D, E, F commutation circuits

Protection and mounting schemes for SCR. Series and parallel operation of SCR. Triac and its applications. Gate turnoff Thyristor. Line commutated AC to DC converter: Single Phase Half Wave converter. Single Phase Full wave Controlled converter.

DC to DC converter-choppers: Principle of operation. Single Quadrant (type A & B) To Quadrant choppers (type C & D) . Four quadrant choppers (type E)

Control Strategies: PWM, constant pulse width variable frequency. Current limit control. Variable pulse width & frequency.

Single Phase AC Regulators with R & RL load.

DC to AC converter-inverter: Single phase Bridge Inverter. Series & Parallel.

Single phase Inverter. Three Phase Bridge Inverter for 1800 & 1200 mode.

Output voltage control in single-phase inverter: Re4eduction of Harmonics by PWM method. Elimination of Harmonics. Current Source Inverter. Speed Control of DC machines using SCR.

Cyclo-convertors: Principle of operation & Step-up Cyclo converters.

**ELTT 401 Wireless and Cellular Communication System**

Introduction to wireless communications. Cellular concepts, frequency reuse, interference and capacity, channel assignment, handover, trunking and GoS.

Mobile radio signal propagation: large-scale path loss, shadowing, propagation models, link budgets.

Small-scale fading and multipath propagation: factors causing small-scale fading, Doppler shifts, parameters of mobile channels, types of small-scale fading, models.

Digital modulation for cellular mobile systems: Overview of factors influencing choice, line coding, pulse shaping, linear modulation (BPSK, DPSK, QPSK, OQPSK, Pi/4QPSK), constant envelope modulation (FSK, MSK, GMSK), QAM, CDMA (DS-SS).

Multiple access systems and cellular standards: GSM, CDMA, WCDMA and capacity comparisons.

Wireless PAN, LAN and MAN technologies including 802.11, 802.15, 802.16.

**ELTT 411 Satellite Communication System**

Satellite orbits and inclination: Synchronous orbit, orbital parameters, satellite location with respect to earth, look angles, earth coverage and slant range, eclipse effects, placement in geostationary orbit, station keeping, stabilization.

Satellite subsystems: Power, altitude and orbit control, propulsion, repeaters, antennas, Telemetry, Tracking & Command (TTC), thermal control, structure.

Earth station: Design requirements, subsystems, small earth stations, VSATs, mobile and transportable earth stations.

Applications: Communication, remote sensing, earth observation, meteorological, military and scientific & technological applications. Indian National Satellite Systems (INSAT).

Frequency allocations and spectrum.

Link design: Design equations, system noise temperature, C/N and G/T ratio, atmospheric and ionospheric effects, uplink design, complete link design, interference effects, earth station parameters.

Analog communication: FM/FDM techniques, S/N and C/N ratio, SCPC system, FM/FDM TV satellite link, intermodulation products.

Basic television system: Sound and picture transmission, scanning methods, interlaced scanning, number of scanning lines, vertical and horizontal resolution, evaluation of bandwidth of baseband signal.

Television cameras: Principle of working and construction of Vidicon, CCD image sensors, colour television camera, gamma correction.

Composite video signal: Video signal levels, need for synchronization, details of synchronizing and equalizing pulses, scanning sequence details.

Signal transmission: AM and FM channel bandwidth, vestigial sideband transmission, VSB correction, television standards and their comparison (PAL, NTSC, SECAM), VHF and UHF bands.

Television transmission and relay system: Requirements of TV broadcast transmission, block diagram of a TV transmitter, visual and aural exciter, diplexer, microwave TV relay systems.

**ELTT 421 Digital Integrated Circuits and Applications.**   
Analysis and Design of Digital Integrated Circuits. Circuit analysis of piecewise linear single energy storage element networks. Rules for determining states of diodes and transistors. Bipolar junction and field effect transistors as switches. Basic digital logic gates. Integrated circuit logic and building blocks (TTL, MOS, CMOS, ECL, Integrated Injection Logic). Sweep circuits (constant current, Miller, bootstrap), Monostable, Astable, and Bistable (Schmitt Trigger) switching circuits, Applications (pulse width modulator, triangle wave generator, FM function generator design).

**ELTT 431 Optical Communication Systems**

Introduction: Need for optical communication, block diagram of an optical communication system.

Optical fibers: Basic Optical Laws and definitions, Optical fiber modes and configurations, Mode theory for circular wave guides, graded index fiber structure, Overview of Fiber material and fiber fabrication.

Signal degradation in optical fibers: attenuation, Signal distortion in optical waveguides, Pulse broadening in graded index waveguides, mode coupling.

Optical Sources: Light-emitting diode structures, Light source material, Internal quantum efficiency, modulation capability, Transient response. Laser diode modes and threshold conditions, Resonant frequencies, Laser diode structures and Radiation Patterns, modulation of laser diodes, Temperature effects.

Power Launching and Coupling: Source to fiber power launching, Lensing schemes for coupling improvement, Fiber-to-fiber joints, Fiber splicing, optical fiber connectors

Photodetectors: Physical principles of photodiodes, Photodetector noise, Detector response time, Photodiode material

Optical Receiver Operation: Fundamental Receiver operation, Digital receiver performance calculation, Preamplifier types, Analog receivers.

Unguided Optical Communication System: Transmission Parameters, Sources and Detectors, Examples of unguided optical communication systems.

Optical fiber communication systems: Digital optical fiber Telecommunication systems, Data Communication networks, Analog systems, the optical ether.

**ELTT 451 Antennas and Wave propagation**

Transmission Lines

Types of transmission lines, Basic theory of transmission lines, Primary constants and Secondary constants. Smith impedance chart and matching using transmission lines

Radio Wave Propagation

The radio spectrum, basics of spectrum management, MF, HF, VHF, UHF and SHF propagation, Path profiles, Fresnel clearance, reliability and outage

Antennas

Basic Theory and Definitions; the aperture concept*,* Types of antennas*,* Antenna arrays*,* MF, HF, VHF, UHF, SHF antennas and their feeding mechanisms

Towers

Masts and towers*,* Stays*,* Insulators *,* Earthing and Lightning protection

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**ELTT 461 Radio Communications**

Basic modulation techniques, radio transmitters, radio receivers, and the associated circuits employed by each. Circuits include AM, FM, PM, and SSB modulators and detectors, RF amplifiers, oscillators, and PLL circuits, frequency multipliers, voice processing circuits, filters, and squelch circuits. Includes specialized test equipment and the performance of EIA standard tests and measurements.

Emphasis on advanced circuits, total systems, and new technology.Includes transmission line theory, wave propagation, antenna theory, control systems, digital modulation techniques, transmitter and receiver combining, and electromagnetic interference control.

**ELTT 471 Signals and Systems**

Introduction: Definitions and concepts of different types of signals; Continuous-time and discrete-time signals; Transformation of independent variable; Exponential and sinusoidal signals; unit impulse and unit step functions.

Systems: Continuous-time and Discrete-time systems and basic system properties.

Linear time invariant (LTI) systems: Introduction; Discrete-time LTI systems, the convolution sum; continuous –time LTI systems; the convolution integral; Properties of LTI systems

Fourier Series: Introduction; response of LTI systems to complex exponentials; Fourier series representations of continuous-time periodic signals; Convergence of the Fourier series; properties.

Fourier series representation of discrete-time periodic signals; properties of discrete-time Fourier series.

Continuous-time Fourier Transform: Representation of a periodic signals; Fourier transform of periodic signals and their properties; Convolution property; multiplication property. MATLAB programs.

Discrete-time Fourier transforms: Representation of a periodic signals; Fourier transform of periodic signals; properties; convolution property; multiplication property.

Introduction to Discrete Fourier Transforms (DFT): Frequency-domain sampling, properties of DFT; Circular convolution and linear convolutions.

The Laplace Transform: Introduction; Laplace Transforms; the region of convergence; Inverse Laplace transforms; Analysis and characterization of LTI systems using the Laplace transforms; Unilateral Laplace transform.

The Z-transform: Introduction; Z-transform; the region of convergence; the Inverse Z-transform; properties of Z-transform; Analysis and characterization of LTI systems using Z-transforms, unilateral Z-transforms.

Sampling: Introduction, representation of continuous-time signals by its samples; Sampling theorem, reconstruction of a signal from its samples using interpolation; the effect of undersampling; aliasing, Discrete-time processing of continuous-time signals; Sampling of discrete-time signals; MATLAB exercises.