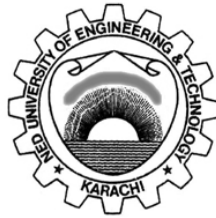# DEPARTMENT OF ELECTRONIC ENGINEERING

SYLLABI OF COURSES
FOR
BE (TELECOMMUNICATION ENGINEERING)
DEGREE PROGRAMME
APPLICABLE FORM BATCH 2014-2015 & ONWARDS

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY
KARACHI-75270, PAKISTAN

B.E (TELECOMMUNICATION ENGINEERING)
COURSES OF STUDIES
Applicable from Batch 2014-15

FIRST YEAR									
Spring Semester						**Fall Semester**			
Course Code	**Course Title**	**Credit Hours**				**Course Code**	**Course Title**	**Credit Hours**		
		Th	**Pr**	**Total**				**Th**	**Pr**	**Total**
HS-114	Functional English	3	0	3		EL-103	Basic Electronics	3	1	4
CS-113	Introduction to Computing	1	1	2		CY-109	Applied Chemistry	3	1	4
EE-120	Basic Electrical Engineering	3	1	4		EE-121	Circuit Analysis	3	1	4
MT-171	Differential & Integral Calculus	3	0	3		EL-104	Electronic Engineering Drawing and Workshop	0	2	2
HS-105/ HS-127	Pakistan Studies / Pakistan Studies for Foreigners	2	0	2		MT-227	Differential Equations	3	0	3
PH-122	Applied Physics	3	1	4		TC-105	Programming Languages	2	1	3
	Total	**15**	**3**	**18**			**Total**	14	06	**20**

SECOND YEAR									
Spring Semester						**Fall Semester**			
Course Code	**Course Title**	**Credit Hours**				**Course Code**	**Course Title**	**Credit Hours**		
		Th	**Pr**	**Total**				**Th**	**Pr**	**Total**
HS-205/ HS-209	Islamic Studies/ Ethical Behaviour	2	0	2		TC-212	Digital Signal Processing	2	1	3
TC-204	Signals and Systems	3	1	4		CS-216	Data Structure and Algorithms	3	0	3
EL-236	Electronic Devices and Circuits	2	1	3		EL-239	Analog Integrated Circuits	3	1	4
TC-203	Digital Logic Design	3	1	4		EE-223	Instrumentation and Measurement	2	1	3
MT-272	Linear Algebra & Geometry	3	0	3		HS-214	Academic Writing	3	0	3
EE-382	Electromagnetic Fields	2	0	2		MT-331	Probability & Statistics	3	0	3
	Total	**15**	**3**	**18**			**Total**	**16**	**3**	**19**

THIRD YEAR

Spring Semester

Course Code	Course Title	Credit Hours		
		Th	Pr	Total
HS-304	Business Communication and Ethics	3	0	3
EF-305	Engineering Economics & Management	3	0	3
EE-374	Feedback Control Systems	3	1	4
TC-313	Antenna and Microwave Engineering	3	1	4
TC-307	Communication System	3	1	4
	Total	**15**	**3**	**18**

Fall Semester

Course Code	Course Title	Credit Hours		
		Th	Pr	Total
TC-316	Telecommunication Networks	3	1	4
EF-304	Occupational Safety & Health	2	0	2
TC-314	Wireless & Mobile Communication	3	1	4
TC-315	Optical Fiber Communication	3	1	4
TC-311	Digital Communication and Information Theory	3	1	4
	Total	**14**	**4**	**18**

FINAL YEAR

Spring Semester

Course Code	Course Title	Credit Hours		
		Th	Pr	Total
MT-442	Numerical Methods	3	0	3
CS-430	Microprocessor programming and interfacing	3	1	4
TC-4XX	Elective 1	3	1	4
HS-405	Organization Behavior	3	0	3
TC-490	Telecommunications Engineering Project*	---	---	---
	Total	**12**	**2**	**14**

Fall Semester

Course Code	Course Title	Credit Hours		
		Th	Pr	Total
HS-403	Entrepreneurship	3	0	3
TC-485	Telecommunications Switching Systems	3	1	4
TC-4XX	Elective 2	2	1	3
TC-490	Telecommunications Engineering Project*	0	6	6
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	Total	**8**	**8**	**16**

* Duration one academic year: Requires literature survey and preliminary work during this semester

3+1 Credit hour Electives		**2+1 Credit hour Electives**	
TC-493	Satellite Communication	TC-424	Digital Image Processing
TC-481	Navigational Aids and Radar System	TC-425	Mobile Pervassive Computing

FIRST YEAR (SPRING SEMESTER)

HS-114   Functional English

Listening
Types of Listening (content, critical, selective, active, reflective, empathic etc.), Problems in listening and coping strategies, Listening skills and sub skills, Practice in Listening

Vocabulary Development
Words easily confused, compound words, prefixes and suffixes, Forming adjectives, descriptive adjectives (personalities), Using synonyms and Antonyms**,** homophones , Use of idioms in current language Exposure and practice to develop everyday vocabulary for formal and informal situations

Reading
Skimming, scanning, predicting, and anticipating , Guessing meanings of unfamiliar words from the context, Reading strategies, Reading practice through variety of reading texts and comprehension exercises, Beyond reading [speaking and writing outputs)

Writing
Making notes
Social formal letters (elements, style, formatting, organization and structure, types e.g. requests, invitation, thank you, condolence etc)
Short reports (structure, format, and types i.e. informational, event and analytical)

Grammar
Tenses, Frequency, time and quantity expressions, Punctuation, Conditional Sentences, Active and passive, Semantic markers, Phrasal Verbs

Speaking
Giving a presentation, Discussion, Beginning a discussion, Entering a discussion (at a subsequent stage), Interrupting a discussion without giving offence , Changing your stance / point of view in the course of a discussion, Summing up a discussion, Role play / dialogue (e.g. interviewing: with respect to social interaction)

CS-113   Introduction to Computing

Number Systems; Digital logic Gates, Classification of computer Systems, Structure and Organization of Computers and Computer system, Computer peripherals, Classification of software systems, Introduction, software Development Process, Levels of programming language

Lab work:
The practical work will be based on the above course

EE-120   Basic Electrical Engineering

Fundamentals of Electric Circuits:
Charge, Current, Voltage and Power, Voltage and Current Sources, Ohm's Law;

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Voltage and Current laws:
Nodes, Paths, Loops and branches, Kirchhoff 's Current Law, Kichhoff's voltage Law, the Single-Loop Circuits, the single Node-pair Circuit, Series and parallel Connected Independent Sources, Resistors in series and parallel, Voltage and Current Division.

Basic Nodal and Mesh Analysis:
Multi-Nodal Analysis, the super node, Mesh Analysis, The Super mesh.

Circuit Analysis Techniques:
Linearity and superposition, source transformations, Thevenin and Norton equivalent circuits, maximum power transfer, delta-wye conversion basic RL and RC circuits – the source- free RL circuit, properties of the exponential response, the source-free RC circuit, the unit-step function, driven RL circuits, natural and forced response, driven RL circuits

Capacitors and Inductors:
Capacitor, Inductor, capacitance and Inductance Combination

Basic RL and RC circuit:
The source free RL circuit, Properties of Exponential response, Source free RC circuits, Unit-Step function, Driven RL circuits, natural and forced response, Driven RL circuits

The RLC Circuit:
The Source-Free Parallel Circuit, the over damped parallel RLC Circuit, Critical Damping, the under Damped Parallel RLC Circuit, the Source-Free Series RLC Circuit, complete Response of the RLC Circuit, the Lossless LC Circuit

Lab work:
The practical work will be based on the above course

MT-171   Differential & Integral Calculus

Complex Number
Argand diagram, De Moivre formula, root of polynomial equations, curve and regions in the complex plane, standard functions and their inverses (exponential, circular and Hyperbolic functions)

Limits and Continuity
Bounds and bounded sets, Limit point of sets, Sequences, Convergence of sequences monotonic sequences, Function and their graph, limit of function and continuous functions

Differential Calculus
Differentiation and Successive differentiation and its application; Leibnitz theorem, Taylor and Maclaurin theorems with remainders in Cauchy and Lagrange form, Taylor and Maclaurin series, L' Hopitals rule, extreme values of a function of one variable using first and second derivative test, asymptotes of a function, curvature and radius of curvature of a curve, partial differentiation, exact differential and its application in computing errors. Multivariate functions, Maxima and Minima for multivariate functions, Maxima Minima under certain conditions (Lagrange Multiplier)

Integral Calculus
Indefinite integrals and their computational techniques, reduction formulae, definite integrals and their convergence, Beta and Gamma functions and their identities, double and triple integration with applications. (Area, volume, centroid, inertia, arc length)

Vectors Calculus
Scalar and Vector quantities, physical and geometrical meanings, Algebra of vectors, Scalar and vector triple products, Vector derivatives, Line and surface Integrals, Gradient of a Scalar

HS-105   Pakistan Studies

Historical and ideological perspective of Pakistan Movement

Two nation theory: Definition, Significance.

Creation of Pakistan: Factors leading to the creation of Pakistan, Quaid-e-Azam and the demand for Pakistan

Land of Pakistan:
Geo-physical conditions, Geo-political and strategic importance of Pakistan,
Natural resources, water and power

Constitutional Process:
Early efforts to make a constitution-problems and issues, Constitution of 1956 and its abrogation, Constitution of 1962 and its abrogation, Constitutional and Political crisis of 1971, Constitution of 1973, Subsequent constitutional developments

Contemporary Issues in Pakistan
A brief survey of Pakistan's Economy:
Agricultural and industrial development in Pakistan, Internal and external trade, Economic planning and prospects

Social issues:
Literacy & education in Pakistan, State of science & technology with special reference to IT education, Pakistan society and culture**.**

Environmental issues:
Hazards of atmospheric pollution, other forms of environmental degradation, their causes & solutions, Pakistan's role in preservation of nature through international conventions/efforts

Foreign Policy
Relations of Pakistan with neighbours, Relations with Super powers, Relations with Muslim world.

Human Rights:

Conceptual foundations of Human Rights- What are Human rights? Definition, significance and importance, Comparative analysis of Islamic and western Perspectives of Human rights.

UN System for Protection of Human rights - an over-view: UN Charter, International Bill of Human Rights, Implementation mechanism.

Other important international treaties and conventions - The convention on the elimination of all forms of discrimination against woman, International Convention on the rights of child (CRC), Convention against torture (CAT), Refugee Convention.

Pakistan's response to Human rights at national and international level -Constitutional Provisions, Pakistan's obligations to international treaties and documents, Minority rights in Pakistan, Pakistan's stand on violation of Human rights in the international perspective

HS 127 Pakistan Studies For Foreigners

Land of Pakistan:
Land & People-Strategic importance- Important beautiful sights, Natural resources.

A Brief Historical Background:
A brief Historical survey of Muslim community in the sub-continent, British rule & its impacts, Indian reaction, Two nation theory, Origin & development, Factors leading towards the demand of a separate Muslim state, Creation of Pakistan

Government & Politics in Pakistan:
Constitution of Pakistan, A brief outline, Governmental structure, Federal & Provincial, Local Government Institutions, Political History, A brief account.

Pakistan & the Muslim World:
Relations with the Muslim countries

Language and Culture:
Origins of Urdu Language, Influence of Arabic & Persian on Urdu Language & Literature, A short history of Urdu literature

PH-122 Applied Physics

Vector Analysis:
scalars and vectors, vector algebra, the Cartesian coordinate system, vector components and Unit vectors, the vector field, the dot product the cross product, other coordinate systems, circular cylindrical coordinates, the spherical coordinate system, transformations between coordinate systems.

Coulomb's Law and Electric Field Intensity:
The experimental law of coulomb, Electric field intensity, field of a point charge, field due to a continuous volume charge distribution, field of line charge, field of sheet charge, streamlines & sketches of fields.

Electric Flux Density Gauss's Law and Divergence:
Electric flux density, Gauss's law, application of Gauss's law, some symmetrical charge distributions, differential volume element, divergence, Maxwell's first equation, electrostatics, the vector operator and the divergence theorem.

Energy and Potential:
Energy expanded in moving a point charge in an electric field, the line integral, definition of potential difference and potential, the potential field of a point charge, the potential field of a system of charges, conservative property, potential gradient, the dipole, Energy density in the electrostatic field.

Conductor Dielectrics and Capacitances:
Current and current density continuity of current metallic conductors, conductor properties and bounded conditions, semi conductors, the nature of dielectric materials, capacitance, several capacitance examples, of a two wire lines. Curvilinear square, physical modules, current analogies, fluid flow maps the iteration method.

Poisson's and Laplace's Equations:
Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solution of Laplace's equation, examples of the solution of poison, product solution of Laplace's equation.

The Steady Magnetic Field :
Biot Savart's Law, Amperes circuit law, curl, Stoke's theorem, Magnetic flux and magnetic flux density, the scalar and vector magnetic potentials, derivation of steady magnetic field laws.

Magnetic Forces Materials and Inductance :
Force on a moving charge, force on a differential current element, force between differential current element, force and torque on a closed circuit, the nature of magnetic materials, Magnetization and permeability, magnetic boundary conditions, the magnetic circuit, potential energy and forces on magnetic materials, inductance and mutual inductance.

Time Varying fields and Maxwell's Equations:
Faraday's Law, displacement current, Maxwell's equation in point form, Equation in integral form, the related potentials

The Uniform Plane Wave:
Wave motion in free space, wave motion in perfect dielectric, plane waves in loose dielectrics. The Pointing vector and power considerations, propagation in good conductors, skin effect, reflection of uniform plane waves standing wave ratio.

Lab work:
The practical work will be based on the above course

FIRST YEAR (FALL SEMESTER)

EL-103   **Basic Electronics**

PN Junction Diode:
Introduction, PN junction diode, Unbiased diode, Barrier potential, Diffusion & drift current, Forward & reverse bias, Minority carrier current. Diode models: Ideal, practical & complete, Diode characteristics, Load line, Diode current equation. Capacitive effect

on diode operation at high-frequency, Transient current, Temperature effect on diode operation. Diode applications; Rectifier, Switch, Communication, Wave-shaping, Voltage multiplier etc. Breakdown diode, Voltage regulator, Power Supply

BJT:
Physical structure and operation mode of BJT, operation in the active mode, large-signal model, DC analysis of BJT, BJT as an amplifier, small signal equivalent circuit models, biasing techniques for discrete circuit design, BJT as switch; operation of NPN in cutoff and saturation modes, basic BJT inverter

Operational Amplifiers:
Terminal characteristics only, ideal op-amp characteristics, inverting and non-inverting configurations, op-amp applications like weighted summer, difference amplifier, instrumentation amplifier, differentiator, integrator, logarithmic amplifier etc. Non ideal characteristics like slewing, DC input offset voltage, input biasing current etc.

Lab work:
The practical work will be based on the above course

CY-109   Applied Chemistry

Gases
Kinetic Gas Equation, Vander Waal's Equation, Critical phenomenon, Liquefaction of gases, Specific heat ratio between C_p/C_r.

Properties of Solution & Liquids
Surface Tension, Viscosity, pH-Buffer solution, Spectrophotometer, Basic concepts of Colloidal Chemistry, Classification purification (dialysis).

Thermochemistry
Heat of reaction, Relation between H and U measurement of heat reaction, Bomb Calorimeter.

Electrochemistry
Laws of Electrolysis, E.M.F. series, corrosion (Theories, inhibition & protection).

Water & Sewage
Impurities, hardness, water softening by ion exchange method, purification of water for potable and industrial purposes, Sewage treatment, Osmosis, Osmotic Pressure.

Fuels
Types of fuels, classification of fossil fuels. Calorific Values

Metals & Alloys
Properties and general composition of metals and alloys such as Iron, Copper, Aluminum, Chromium, Zinc used in engineering field.

Engineering Materials
Inorganic Engineering materials: Cement, Glass Organic Engineering Materials: Polymers, Rubbers, Plastics and Paints.

Lab work:
The practical work will be based on the above course

EE-121   **Circuit Analysis**

AC Circuits:
Sinusoids and Phasors, Phasor Relationship for Circuit Elements, Impedance and Admittance, Kirchhoff's Laws in the Frequency Domain, Impedance Combinations

Sinusoidal Steady State Analysis:
Nodal Analysis, Mesh Analysis   Superposition Theorem, Source Transformation, Thevenin and Norton Equivalent Circuits, Op Amp AC Circuits

AC Power Analysis:
Instantaneous and Average power, Maximum Average power Transfer, Effective or RMS Value, Apparent Power and power Factor, Complex power, Conservation of Ac power , power Factor Correction

Three-Phase Circuits:
Balanced Three-Phase Voltages, Balanced Wye-Wye Connection, Balanced why- Delta Connection, Balanced Delta-Delta Connection, Balanced Delta-Why Connection, Power in Balanced System, Unbalanced Three-Phase Systems

Magnetically Coupled Circuits:
Mutual Inductance, Energy in a Coupled Circuit, Linear Transformers, ideal Transformers, Ideal Autotransformers, Three-phase Transformers

Two-Port Network:
Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission Parameters, Relationship between Parameters Interconnection of networks

Lab work:
The practical work will be based on the above course

EL-104   **Electronic Engineering Drawing and Workshop**

PCB Design & Workshop:
PCB design and layout drawings using PCB software, From Schematic & Layout to Machine File generation. PCB technologies, single layers and multi-layer boards, PCB testing, Switches, PCB standards, Routing. Fabricating PCB, Assembling & soldering components on PCB, PCB Processes; CNC Drilling, Electroplating, Photo-plotting, Laminating, Developing and Exposing

Electronic Workshop:
Introduction to Operations of Voltmeters, Ohmmeters, Power supplies, Function generators & Oscilloscopes. Measuring parametric values of discrete passive components. Fabricating simple electronic circuits on breadboard. Simulate an electronic circuits using pspice/ multisim/ simulink

MT-227   Differential Equations

1st Order Differential Equations
Basic concept; Formation of differential equations and solution of differential equations by direct integration and by separating the variables; Homogeneous equations and equations reducible to homogeneous from; Linear differential equations of the order and equations reducible to the linear form; Bernoulli's equations . Application in relevant Engineering: orthogonal trajectories: Numerical approximation to solutions ; Solution in series. Euler method, Euler modified method, Runge Kutta method of order 4**.**

2nd and Higher Orders Equations
Special types of 2nd order differential equations with constant coefficients and their solutions; The operator D; Inverse operator l/D ; Solution of differential by operator D methods; Special cases, Cauchy's differential equations; Simultaneous differential equations; simple application of differential equations in relevant Engineering

Partial Differential Equation
Basic concepts and formation of partial differential equations; Linear homogeneous partial differential equations and relations to ordinary differential equations; Solution of first order linear and special types of second and higher order differential equations; D' Alembert's solution of the wave equation and two dimensional wave equations; Lagrange's solution: Various standard forms**.**

Laplace Integral &Transformation
Definition, Laplace transforms of some elementary functions, first translation or shifting theorem, second translation or shifting theorem, change of scale property, Laplace transform of the nth order derivative, initial and final value theorem Laplace transform of integrals. Laplace transform of functions tn F(t) and F(t)/ t, Laplace transform of periodic function, evaluation of integrals, definition of inverse Laplace transform and inverse transforms, convolution theorem, solutions of ordinary differential using Laplace transform

TC-105   Programming Languages

The Turbo C Programming environment:
Setting up the Integrated Development Environment, File used in C program Development, using the Integrated Development Environment, the Basic Structure of C programs, Explaining the printf() Function.

C Building Blocks:
Variables, Input/ Output, Operators, Comments.

Loops:
The for Loop, The while loop, The do while loop.

Decisions:
The if statement, the if-else statement: the else-if construct. The switch statement, the Conditional operator. goto statement.

Functions:
Simple Functions, Functions that return a value, using arguments to pass data to a function, using more than one functions, external variables, prototype versus classical K and R, Preprocessor directives

Arrays, string & Pointers:
Arrays, Referring to individual Elements of the Array, String. Pointer Overview, Returning data from functions, pointers and Arrays, Pointers and Strings, Double Indirection, Pointers to Pointers

Introduction to Object Oriented Programming:
Introduction to Object oriented programming and software development, defining classes, selection statements, repetition statements, exceptions and assertions, arrays and collections, File I/O

Lab work:
The practical work will be based on the above course

SECOND YEAR (SPRING SEMESTER)

HS-205   Islamic Studies

Quranic Verses: Tauheed: Al–Ambiya – 22, Al–Baqarah – 163 & 164**.**
Prophet hood: Al–Imran **–** 79, Al – Huda – 7, Al–Maidah – **Here-After:** Al–Baqarah – 48, and one Hadith**. Basic Islamic Practices:** Al–Mu' minun-1-11, and two Ahadith

Amer–Bil – Ma ' Roof Wa-Nahi Anil Munkar:
The concept of Good & Evil, Importance and necessity of Da'wat-e-Deen Al-Imran – 110, Method of Da'wat-e-Deen An-Nehl-125, Al-Imran-104, and two Ahadith

Unity of the Ummah:
Al-Imran-103, Al-Hujurat-10, Al-Imran-64, Al-An' am –108, and two Ahadith .

Kasb-e-Halal:
Ta ha-81, Al- A'raf-32-33, Al-Baqarah-188, and two Ahadith**.**

Haquq-ul-Ibad:
Protection of life (Al-Maidah-32), Right to Property (Al-Nisa-29), Right to Respect & Dignity (Al-Hujurat –11-12), Freedom of Expression (Al-Baqarah-256), Equality: (Al-Hujurat-13) , Economic Security: (Al-Ma' arij – 24-25), Employment Opportunity on Merit: (An-Nisa-58), Access to Justice: (An- Nisa-135)

Women's Rights:
An-Nehl - 97, Al-Ahzab - 35, An-Nisa - 07. Relations with Non-Muslims: Al-Mumtahanah-8-9, Al-Anfa'al –61 and The last sermon of Hajj of Holy Prophet (PBUH): Relevant extracts

Seerat (life) of the Holy Prophet (PBUH):

Birth, life at Makkah, declaration of prophet hood, preaching & its difficulties, migration to Madina, brotherhood (Mawakhat)& Madina Charter, The Holy Wars of the Prophet (Ghazwat-e-Nabawi), Hujjat-ul-Wida, The last sermon of Khutbatulwida, Translation and important points

Islamic Civilization:
a) In the sub-continent: pre- Islamic civilizations. The political, social & moral impacts of Islamic civilization (b) EEin the world: academic, intellectual, social & cultural impact of Islam on the world

HS-209   Ethical Behaviour

Introduction to Ethics:
Definition of Ethics, Definition between normative and positive science, Problem of freewill, Method of Ethics, Uses of Ethics

Ethical Theories:
History of Ethics, Greek Ethics, Medieval, Modern Ethics, Basic concept of right and wrong: good and evil, Utilitarianism, hedonism, self-realization: egoism, intuitionism, rationalism, rationalism, Kant's moral Philosophy.

Ethics & Religion:
The relation of Ethics to religion, Basic ethical principles of major religions: Hinduism, Judaism, Buddhism, Zoroastrianism, Christianity, and Islam.

Ethics, Society and moral theory:
Ethical foundation of Rights and Duties, Applied Ethics, Society as the background of moral life, Universalism and Altruism, Theories of punishment.

TC-204   Signals and Systems

Signals and Systems:
Continuous time and discrete time signals, periodic signals, even and odd signals, exponential and sinusoidal signals, the unit impulse and unit step functions, continuous time and discrete time systems, system properties, causality, BIBO stability, time invariance, linearity, convolution and correlation

Linear Time Invariant (LTI) systems:
Continuous time LTI system(convolution integral), Discrete time LTI system (convolution sum), properties of LTI system, causal LTI systems, difference equation.

Transforms: Continuous time Fourier series, Properties of Continuous time Fourier series, Discrete Time Fourier Series , Properties of , Discrete time Fourier series , Continuous time Fourier Transform, Properties of Continuous time Fourier Transform, Discrete Time Fourier Transform, Properties of Discrete Time Fourier Transform, Laplace Transform, inverse Laplace Transform, Properties of Laplace Transform, region of convergence, pole-zero plot, Z-Transform, inverse Z-Transform, Properties of Z-Transform, region of convergence, pole-zero plot

Time and Frequency characterization of LTI System:
Introduction to Time and Frequency Analysis of Continuous time LTI System, Introduction to Time and Frequency Analysis of Discrete-time LTI System.

Sampling:
Sampling theorem, aliasing, sampling the discrete time signals

Lab work:
The practical work will be based on the above course

EL-236   Electronic Devices and Circuits

MOSFET:
FET as amplifier, Pi model and T-model for FET, basic configurations of single stage amplifiers, CMOS logic inverter structure, analysis and noise margin calculations.

BJT:
Physical structure & operation modes of BJT, operation in the active mode, Large-signal model. DC analysis of BJT. BJT as an amplifier, Small-signal equivalent circuit models, Biasing techniques for discrete-circuit design. BJT as switch: Operation of NPN in the cut-off &saturation modes, Basic BJT inverter.

Differential Amplifier:
MOS differential pair operation with differential and common mode input voltage, large signal analysis, small signal analysis, differential and common mode gain calculations, brief description of BJT differential pair and its analysis, Non-ideal characteristics of both MOS and BJT based differential pairs Current Sources: Simple MOS current sources and mirrors, MOS based current steering circuits.

Active Loading and Multistage amplifiers:
Active loaded MOS differential pair, differential and common mode gains of actively loaded MOS differential pair, Useful cascades of single stage MOS amplifiers likeCS-CS, CS-CG (Cascode amplifier) etc.

Lab work:
The practical work will be based on the above course

TC-203   Digital Logic Design

Computer Operations:
Evaluation of the computer, basic organization of digital computer, instruction formats, some different types of computers, special purpose and general purpose computers. Difference between Analog and Digital systems. Logic Gates

Number Systems:
Conversion between bases, arithmetic with bases other than ten, negative numbers, binary coded decimal numbers, octal and hexadecimal number systems.

Boolean Algebra and Simplification:

Binary connectives, evaluation of truth functions, Truth functional calculus as Boolean Algebra, duality, fundamental theorems of Boolean Algebra, examples of Boolean simplifications. Morgan's theorems, graphical simplification methods, Karnaugh map, product of sums expressions.

Combinational Logic Design:
Basic combinational Logic circuits, Basic Adders, Parallel Binary Adders, Comparators, Decoders, Encoders, Code converters, Multiplexers, DE multiplexers

Sequential Logic Design:
Asynchronous and synchronous counters Flip Flops and Latches: S-R Latch, Edge Triggered flip flops, One shot, and 555 timers. Shift Registers and SRAM.

Introduction to Logic Families:
TTL NAND Gate. Logic family characteristic parameters

Introduction to Programmable Logic Devices:
PAL, GAL and FPGAs. Introduction to programming with Verilog HDL.

Lab work:
The practical work will be based on the above course

MT-272   Linear Algebra and Geometry

Linear Algebra:
Linearity and linear dependence of vectors, basis, dimension of a vector space, field matrix and type of matrices (singular, non- singular, symmetric, non- symmetric, upper, lower, diagonal tri-diagonal matrix), Rank of a matrix using row operations and special method, echelon and reduced echelon forms of a matrix, determination of consistency of a system of linear equation using rank, transitions matrix.

Euclidean Spaces and Transformation:
Geometric representation of vector, norm of vector, Euclidean inner product, projections and orthogonal projections, Euclidean n spaces n properties Cauchy-Schwarz inequality, Euclidean transformations, apply geometric transformations to plane figure, composition of transformations.

Application of linear Algebra:
Leontief Economic models, Electrical Networks, Scaling, translation, rotation, and projection etc.

Eigen values & Eigen Spaces:
Interpret eigenvectors and eigenvalues of a matrix in terms of transformation it represents, convert a transformation into a matrix eigen value problem, find the eigenvalues and eigenvectors of order not more than 3×3 matrices algebraically, determine the modal matrix for a given matrix, reduce a matrix to diagonal (form and Jordan form, state the Cayley-Hamilton theorem and use it to find powers and the inverse of a matrix, understand a simple numerical method for finding the eigenvectors of a matrix, use appropriate software to compute the eigenvalues and eigenvectors of a matrix, Define quadratic form and determine its nature using eigenvalues.

Solid Geometry:
Coordinate Systems in three dimensions. Direction cosines and ratios, vector equation of a straight line, plane and sphere, curve tracing of a function of two and three variables, Surfaces of revolutions. Transformations (Cartesian to polar & cylindrical)

EE-382   **Electromagnetic Fields**

Vector Analysis:
scalars and vectors, vector algebra, the Cartesian coordinate system, vector components and Unit vectors, the vector field, the dot product the cross product, other coordinate systems, circular cylindrical coordinates, the spherical coordinate system, transformations between coordinate systems

Coulomb's Law and Electric Field Intensity:
The experimental law of coulomb, Electric field intensity, field of a point charge, field due to a continuous volume charge distribution, field of line charge, field of sheet charge, streamlines & sketches of fields.

Electric Flux Density Gauss's Law and Divergence:
Electric flux density, Gauss's law, application of Gauss's law, some symmetrical charge distributions, differential volume element, divergence, Maxwell's first equation, electrostatics, the vector operator and the divergence theorem

Energy and Potential:
Energy expanded in moving a point charge in an electric field, the line integral, definition of potential difference and potential, the potential field of a point charge, the potential field of a system of charges, conservative property, potential gradient, the dipole, Energy density in the electrostatic field

Conductor Dielectrics and Capacitances:
Current and current density continuity of current metallic conductors, conductor properties and bounded conditions, semi conductors, the nature of dielectric materials, capacitance, several capacitance examples, of a two wire lines. Curvilinear square, physical modules, current analogies, fluid flow maps the iteration method

SECOND YEAR (FALL SEMESTER)

TC-212   **Digital Signal Processing**

Overview of Discrete-time Signals and Systems:
Sampling, Aliasing, Quantization, Convolution, Correlation, Properties of Discrete time Signals and Systems;

Discrete Fourier Transform:
Frequency Domain Sampling, DFT Properties, Inverse DFT, Windowing and DFT Leakage, Direct Computation of DFT;

Fast Fourier Transform: Divide and Conquer, Radix algorithms; Inverse FFT, Applications of FFT

Discrete time systems implementation:
Overview of z-transform, Structures of Discrete time systems, Fixed and Floating number types, Quantization effects.

Design of Digital Filters:
General Considerations, FIR and IIR Filters, Techniques of FIR and IIR filter Design.

Multirate Signal Processing:
Down sampling and Up sampling, Decimation and Interpolation.

Lab work:
The practical work will be based on the above course

CS-216   Data Structure and Algorithms

Basic Concepts :
Introduction and classification of Data Structures; Basic operations,

Classification of Algorithms:
Classification by implementation; Classification by design paradigm.

Basics of Complexity Analysis
Rate of Growth of Complexity of Algorithms; Asymptotic notations; Time Space Trade Offs.

String Processing:
Operations on strings; Word Processing; Pattern Matching Algorithms.

Arrays:
One dimensional Arrays: Searching and Sorting Algorithms; Multidimensional Arrays: Matrix Multiplication, Sparse Matrices.
Stacks,

Queues and Recursion:
Basic concepts and functions; Polish Notation; Quicksort; Deques; Priority Queues; Factorial Calculation; Fibonacci Series; Ackermann Function, Towers of Hanoi.

Linked Lists:
Definition and Representation; Traversal and Searching; Insertion; Deletion; Circular Lists; Doubly Linked Lists.

Trees Terminology:
Representation in memory; Binary Trees: Traversal Algorithms; Binary Search Trees, Heaps; Heapsort algorithm. Graphs Terminology; Representation in memory;

Traversal Algorithms:
Shortest Path Algorithms. Sorting and Searching ,Sorting Algorithms; Hashing

EL-239   Analog Integrated Circuits

Output Stages:
Introduction to classes (A, B, C, AB etc),

Frequency Response:
Introduction, High frequency small-signal model of MOSFET, Miller's Theorem, open circuit and short circuit time constants methods, Analysis of Common-Source, Common-Gate, Common-Drain.

Feedback:
General consideration of feedback circuits, feedback topologies Two-port networks, properties of negative feedback.

Oscillators:
Introduction to feedback and s-plane, Birkhausen criterion, amplitude limiter, different types of oscillators.

Review:
Review of modern MOS device physics and MOS secondary effects. Integrated Circuits: Introduction to IC processing for MOS integrated circuits, modeling and integration of passive devices.

Op-amp:
One and Two-stage CMOS Op Amps, input common mode range, voltage gain, and slew rate.

IC Packaging:
Different types of packaging and their need. Wire-bond vs. flip-chip

Lab work:
The practical work will be based on the above course

EE-223   Instrumentation and Measurement

General Theory
Classification of Instruments, block diagram of various instrumentation schemes, performance characteristics of instrumentation

Measurement of electrical Quantities
Basics of electromechanical instruments, moving coil and electrodynamometer instruments as ammeter, voltmeter and ohmmeter, extension of ranges

Instrumentation transformers:
Their burden and accuracy, clamp meter, active and reactive power measurement, Max. demand indicator, classification of energy meter, induction type KWH meter, p.f meter

Electronic Instruments:
Data Acquisition, A/D conversion, electronic and digital voltmeters, digital frequency meter, time interval measurement, power and energy meter

Transducers:
Temperature transducers, pressure transducers, variable resistance and inductance transducers, linear variable differential transformers(LVDT), capacitive photoconductive and piezo-electric transducers, thermos electric transducers

Measurement of Non electrical quantities:
Measurement of temperature, pressure, flow strains, thermal conductivity, motion, speed and vibrations

Lab work:
The practical work will be based on the above course

HS-214   Academic Writing

Writing Process
Identifying topic area, narrowing topic, planning, brainstorming, mind mapping, outlining, writing first draft, reviewing, revising, proofreading, writing final draft

Reading & Writing
Analyzing different texts: identifying point of views, claims, assumptions, differentiate facts from opinions,
Practicing Academic Language: differentiate using language of opinion and fact.
Synthesize information: developing critical write up with relevant factual information, personal views, academic evidence, examples, cause and effect etc.
Presenting and describing visuals (tables & graphs)
Avoiding plagiarism and ensuring originality: summarizing, paraphrasing and quoting sources, citing, documenting sources through a referencing system (MLA / APA / Harvard style, as suggested by the discipline)

Writing products
Writing a well-structured paragraph (topic sentence, supporting details, conclusion)Writing narrative, descriptive, expository, and argumentative essaysDeveloping an effective essay using thesis statement, adequate development and argument, supporting details, and conclusion, Writing short reports (technical reports)

MT-331   Probability & Statistics

Statistics:
Introduction, Types of data & variables, presentation to data, object, classifications, Tabulation, Frequency distribution, Graphical representation, Simple & Multiple Bar diagrams, Sartorial & Pie-Diagram, Histogram, Frequency Polygon, Frequency Curves & their types.

Measures of central tendency and dispersion:
Statistics Averages, Median Mode, Quartiles, Range, Moments, Skew ness & Kurtosis, Quartile Deviation, Mean Deviation, Standard Deviation, Variance & its coefficient, Practical Significance in related problems.

Curve fitting:
Introduction, fitting of a first and second degree curve, fitting of exponential and logarithmic curves, related problems. Principle of least squares, Second order Statistics & Time series not in bit detail.

Simple regression & correlation
Introduction, Scatter diagrams, Correlation & its Coefficient, Regression lines, Rank Correlation & its Coefficient, Probable Error (P.E), Related problems.

Sampling and sampling distributions
Introduction, Population, Parameter & Statistic, Objects of sampling, Sampling distribution of Mean, Standard errors, Sampling & Non-Sampling Errors, Random Sampling, Sampling with & without replacement, Sequential Sampling, Central limit theorem with practical significance in related problems.

Statistical inference and testing of hypothesis
Introduction, Estimation, Types of Estimates, Confidence interval, Tests of Hypothesis, Chi-Square distribution/test, one tails & two tails tests. Application in related problems.

Probability
Basic concepts, Permutation & Combination, Definitions of probability, Laws of probability. Conditional probability, Baye'snile. Related problems in practical significance.

Random variables
Introduction, Discrete & Continuous random variables, Random Sequences and transformations. Probability distribution, Probability density function, Distribution function, Mathematical expectations, Moment Generating Function (M.G.F.), Markov random walks chain/ Related problems.

Probability distributions
Introduction, Discrete probability distributions, Binomial Poisson, Hyper geometric & Negative binomial distributions. Continuous probability distribution, Uniform, Exponential & Normal distributions & their practical significance

THIRD YEAR (SPRING SEMESTER)

HS-304   **Business Communication and Ethics**

Communication Skills (oral):
Definitions and Conditions, Modes: verbal, non-verbal, vocal, non-vocal, sender, Receiver, en-coding, decoding, noise, context, emotional maturity, relationships, etc. Language, perception, Non-verbal, body language, physical appearance, cultural differences etc. Personal and interpersonal skills / perceptions, Communication dilemmas and problems; Public Speaking – speaking situation, persuasion, Making presentations, Interviews

Business Writing:
Formal / Business letters, e-mails: a) job applications and resumes/ cv, b) enquiries, c) complaints / adjustments, d) orders, e) quotations, f) banking etc.
Memos: layout, language, styleMeeting management: notice, agenda, conducting / participating, writing minutes. Contracts and agreements (basic theoretical knowledge and comprehension), Research / scientific reports : types, structure, layout / presentation, writing process etc.Tenders (basic theoretical knowledge and comprehension)

Engineering / Business Ethics:
Need and objectives for code of ethics and its importance, Type of ethics, involvement and impact in daily lifeProblems / conflicts / dilemmas in application (case studies)Sexual Harassment / discrimination in the workplacewhy it occurs,myths regarding sexual harassment,how to deal with it,gender equality, respect etc.

Codes of conduct:
Pakistan Engineering Council, Code for Gender Justice,Brief study of other codes of conduct.

EF-305   Engineering Economics & Management

Introduction:
Basic concepts and principals of economics, micro- and macro-economics theory, problem of scarcity, basic concept of engineering economics, financial effectiveness and non-monetary factors

Economic Environment:
Consumer and producer goods, goods and services, demand and supply concepts, market equilibrium, elasticity of demand, elasticity of supply, measures of economic worth, price-supply-demand relationship, revenue, cost and profit function

Elementary Financial Analysis:
Basic accounting equation, development and interpretation of financial statements-income statement, balance sheet and cash flow, working capital management, financial ratio analysis

Time Value of Money and Financial Returns:
Concepts of simple compound and effective interest rates, less often than compounding period and more than once a year, present value , future value and annuities, uniform gradient and geometric sequence of cash flow

Depreciation and Taxes:
Depreciation concepts, economic life, methods of depreciation, gain (loss) on the disposal of an asset, depreciation as tax shield

Basic Cost Concepts and Break Even analysis:
Types of costs and cost curves, determination of Cost/Revenue numerical and graphical presentation, practical application, BEL as management tool for achieving financial/operational efficiency

Linear Programming:
Methamatical statement of Linear Progranmming, problems, Graphical solutions, Simplex method, Duality problem

Business organizations and Financial Institutions:
Type of ownership, Single ownership, partnership, Corporation, types of Stocks and Joint stock companies, Banking and specialized credit institutions

Management:
Project management; Integration of Organization strategy with projects, defining the project, developing a Network plan, Managing risk, reduce project time, Project selection and comparing alternative techniques, scheduling resources

Introduction to Production Managemnt and Production concepts:
Basic production function, stages of production, returns to scale, Production lead time, Production rate capacity, operations, Planning and control, order processing, scheduling, material requisitions palnning, Line of balance

EE-374   Feedback Control Systems

Introduction to control System, Linear systems and differential equations, Time response of linear systems, Laplace transforms, z-transform, block diagram algebra, control systems characteristics, root locus, Introduction to digital controls, linear difference equations, stability analysis in z-domain, discrete equivalents of Laplace-transfer functions and PID Controller.

Lab work:
The practical work will be based on the above course

TC-313   Antenna and Microwave Engineering

Transmission Lines:
Basics, types of transmission lines, Line characteristics impedance and physical parameters. Signal propagation, Waveform distribution and frequency dispersion, Transmission line of finite Lengths, Reflection, Transmission and Propagation constants of transmission line, Transmission line couplers.

Smith Chart and Scattering Parameters:
Smith chart Impedance, Admittance manipulation on the chart, Smith chart theory and applications, Reflection coefficient, Impedance of distributed circuits, Impedance matching, S-Parameters

Basic Features of Radio Communication Systems:
Radio communication systems, Radiowave propagation techniques, Antenna properties and measurement of antenna characteristics.

Array Antennas :
Uniform linear array of Isotropic elements, Polar diagram, Broadside array of equally spaced, equal amplitude radiators, Endfire array of equally spaced, equal amplitude radiators, Scanned line array beamwidth, Optimum element spacing, Array design using

the theory of polynomials. Optimum spacing for broadside and end-fire arrays, Harsen Condition, The binomial array, Supergain array, Chebysev array, Pattern synthesis

Microwave Engineering:
Strip Lines, Microstrip Lines, Coupled Striplines/Coupled microstriplines, Microwave Filter Design, Microwave Amplifier design, Power dividers, Directional Couplers and Circulators

Lab work:
The practical work will be based on the above course

TC-307   Communication Systems

Introduction:
Introduction to Communication, elements of Communication system, Fundamental Limitations, Hartley Shannon law Needs and benefits of Modulation, electromagnetic spectrum, multiplexing and multiple access, Phasors and Line Spectra

Random Signal Analysis:
Review of probability and random variables, statistical measures, Probability models, Introduction to random processes.

Analog Communication:
Baseband and carrier communication, Linear CW (AM, SSB, DSB, VSB) Modulation and demodulation techniques, modulator and demodulator Circuits, AM and SSB Transmitters and Receivers, SSB Filters, Transmission Bandwidth for AM, Angle/ Exponential CW (FM, PM) Modulation and demodulation techniques, modulator and demodulator Circuits, FM/ PM Transmitter, FM Generation Methods, Transmission Bandwidth for FM/PM , Carson's rule, PLL Systems, Pre-emphasis and De-emphasis circuits, Narrowband and wideband FM, Demodulation of FM/PM and Receivers

Noise*:*
Mathematical representation, Signal to Noise Ratio, Noise in AM, FM, and PM systems

Digital Communication systems:
Digital transmitters and receivers, Pulse Modulation, Pulse Amplitude Modulation, Pulse Position and Pulse width Modulation, BER, Introduction to information theory , Digital CW modulation, Coherent and non Coherent systems, Digital modulation error-control coding.

Lab work:
The practical work will be based on the above course

THIRD YEAR (FALL SEMESTER)

TC-316   Telecommunications Networks

Telecommunications Management Network (TMN), Network Management Tools and Systems.

Computer Communication within the framework of the OSI and TCP/IP protocol architectures.

Network architectures and switching techniques, characteristics of transmission media. Channel access protocols and their efficiency. Link control protocols, and their efficiency. Routing algorithms and protocols. Interconnection of network at the link level and at the network level, the Internet Protocol (IP) and associated control protocols. End-to-end protocols, with TCP and UDP as examples; congestion control and flow control. Cursory view of application-level protocols, including electronic mail, HTTP and DNS. Introduction to network calculus (optional).

Lab work:
The practical work will be based on the above course

EF-304   Occupational Safety & Health

Introduction to Occupational Safety and Health, Historic development in the subject, Safety Legislations, Safety and Ethics;

Hazards − Mechanical and Machine, Falling, lifting and Vision related hazards, Temperature and Pressure, Electrical, Fire, Radiation, Chemical and Material, Noise and Vibration, Computers and Automation related Hazards, Industrial Hygiene and Confined Spaces; Case Studies

Hazard Analysis, Concept of Risks, Incident and Accidents, Accident Prevention and Control, Personal Protective Equipment, Management Responsibilities, Accident Causation, Reporting and Investigation, case Studies

Developing and maintaining Safety Culture, OSH and Environment codes, standards and regulations, ISO standards 14001 and 45001/BS OHSAS 18001.

TC-314   WIRELESS & MOBILE COMMUNICATION

Introduction to Wireless Communication Systems:
Evolution of Mobile Radio Communications, Examples of Wireless Communication Systems, Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems.

The Cellular Concept-System Design Fundamentals:
Frequency Reuse, Channel Assignment Strategies, Handoff Strategies, Interference & System Capacity, Improving Coverage & Capacity in Cellular Systems Trunking & GoS

Mobile Radio Propagation:
Large Scale Path Loss, Basic Propagation Mechanisms, Free Space propagation Model, Outdoor Propagation Models, Indoor Propagation Models, Practical Link Budget Design.

Small Scale Fading & Multipath:
Multipath Propagations, Parameters of Mobile Multipath Channels, Types of Small Scale Fading.

Modulation Techniques for Mobile Radio:
FM vs AM, Overview of Digital Modulation, Spread Spectrum Modulation Techniques, Modulation Performance in Fading & Multipath Channels.

Multiple Access Techniques for Wireless Communication:
Frequency Division Multiple Access, Time Division Multiple Access, Spread Spectrum Multiple Access, Space Division Multiple Access, Packet Radio.

Wireless Networks

Lab work:
The practical work will be based on the above course

TC-315   Optical Fiber Communication

Introduction:
Comparison between optical and electrical mediums, basic optical communication system, Snell's law, refractive index, line width, optical and electrical bandwidth.

Basics of optical fiber:
Step index fiber, graded index fiber, refractive index profiles, meridional and skew rays, acceptance angle and acceptance con, numerical aperture for meridional and skew rays.

Wave theory of light for optical fibers:
EM waves, modes, modes in planar wave guides, wave guide condition, evanescent waves, phase velocity, group velocity, group index, modes in cylindrical fibers, Parameters for single mode fiber (cutoff wavelength, mode field diameter, effective refractive index, group delay)

Transmission characteristics of optical fiber:
Attenuation due to: (i) absorption, (ii) scattering (iii) bending losses Dispersion, Reflectance and optical return losses, special types of fibers.

Elements of Optical communication system:
Optical sources, modulators and modulating schemes, line coding, optical detectors, demodulator and demodulation methods, couplers, connectors, switches, splicing, optical amplifiers and repeaters , Optical time division multiplexing, wavelength division multiplexing (techniques and devices) link budgeting w.r.t time and power.

Optical Networks:
LAN system, FDDI, SONETS and SDH, Wavelength routing based optical networks, Optical burst switching.

Lab work:
The practical work will be based on the above course

TC-311   Digital Communication and Information Theory

Introduction to Digital Communication

Why Digital? Elements Digital Communication System, Basic transmission, Bits, Baud, Timing, Distortion and Channel Capacity, Digital input-output Devices, Digital Transmission on Analog Channel

Formatting & Base Band Modulation
Analog to Digital Conversion, Sampling Theory, Quantization & its Types, Pulse Code Modulation (Linear Companded), Delta Modulation, Waveform Representation of Binary Digits, PCM Waveform Types, M-ary Modulation Waveforms

Base Band Demodulation/ Detection Theory
Basic Detection Theory & Optimum Receiver Design, Detection ofBinary Signal in Gaussian Noise, The Matched Filter, Inter SymbolInterference, Equalization

Digital Modulation Techniques
Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), andPhase Shift Keying (PSK,DPSK,QPSK), Detection of Modulated Signal, M-Ary Digital Modulation Schemes, Sampled Matched Filter

Multiplexing, Framing & Synchronization
Information Theory, Information measure, Entropy, Information rate, Shannon's Theorem, Coding for discrete memory less source. Information Transmission on Discrete Channel, Discrete Channel Capacity, Linear Block Codes, Cyclic codes

Lab work:
The practical work will be based on the above course

FINAL YEAR (SPRING SEMESTER)

MT-442   Numerical Methods

Error Analysis
Types of errors (relative, Absolute, inherent, round off, truncation), significant digits and numerical instability, flow chart. Use any Computational tools to Analysis the Numerical Solutions.

Linear Operators
Functions of operators, difference operators and the derivative operators, identities.

Difference Equations
Linear homogeneous and nonhomogeneous difference equations

Solution of Non-linear Equations
Numerical methods for finding the roots of transcendental and polynomial equations (Secant, Newton – Raphson Chebyshev and Graeffe's root squaring methods), rate of convergence and stability of an iterative method.

Solution of Linear Equations

Numerical methods for finding the solutions of system of linear equations (Gauss-Elimination, Gauss-Jordan Elimination, triangularization, Cholesky, Jacobi and Gauss Seidel)

Interpolation &- Curve Fitting

Lagrange's, Newton, Hermit, Spline, least squares approximation. (Linear and non-linear curves)

Numerical Integration & Differentiation

Computation of integrals using simple Trapezoidal rule, 1/3th Simpson's rule, 3/8th Simpson's rule, Composite Simpson's and Trapezoidal rules, computation of solutions of differential equations using (Euler method, Euler modified method, Runge Kutta method of order 4). Numerical Solutions of Partial differential Equations, Optimization problem (Simplex Method). Steepest Ascent and Steepest Descent Methods.

CS-430   Microprocessor Programming and Interfacing

Computer Architecture, Instruction Cycle, Memory Organization , Address decoding, Memory Hierarchy, Interrupts, Bus Arbitration Schemes, programmed I/O, Interrupt-Driven I/O, Direct Memory Access; General Purpose and Special purpose Processors, Internal Registers, Internal Bus Architecture, Pin Functions, Addressing Modes, Instruction Set Architecture: (Data Transfer Instructions, Arithmetic & Logic Instructions, Branch Instructions), Assembly Programming and Testing, Assembler Directives, Macros, Procedures, Instruction Encoding, Bus Cycles, Rest Circuit, Clock Generation Circuit, Wait States, Memory Interfacing, Memory Speed Requirements, I/O Interfacing, Programmable Peripheral Interface, Programmable Interval Timer, Programmable Interrupt Controller, Microprocessor System, Design; Recent Microcontroller Architectures.

Lab work:

The practical work will be based on the above course

HS-405   Organizational Behavior

Foundations of Organizational Behaviour(OB):

Management functions, roles, and skills; Effective versus successful managerial activities; replacing intuition with systematic study

Exploring OB challenges and opportunities facing globalization:

Improving quality and productivity; improving people skills; managing work force diversity; responding to globalization; empowering people; stimulating innovation and change; coping with temporariness; handling declining employee loyalty; improving ethical behaviour

Foundations of Individual Behaviour:

Individuals & Organizations: Biographical traits and ability &personality,

Perceptions and individual decision making:
Understanding perception and its significance, factors influencing perception; linking perception and individual decision making; optimizing decision making model; alternative decision making models; issues in decision making,

Values, attitudes and job satisfaction:
Importance, sources, types of values; sources and types of attitude; attitude and consistency; measuring job

FINAL YEAR (FALL SEMESTER)

HS-403   Entrepreneurship

Understanding the Entrepreneurship Mind-set ,The revolution impact of Entrepreneurship, The individual Entrepreneurship Mind-set, Corporate Entrepreneurship Mind-set ,The Social and Ethical perspectives of Entrepreneurship, Launching Entrepreneurship Ventures, Creativity and innovations, Methods to initiate ventures, Legal challenges in Entrepreneurship, The search for Entrepreneurship Capital, Formulation of Entrepreneurship Plan, The assessment of function with opportunities, The marketing aspects of new ventures, Financial statements in new ventures, Business plan preparation for new ventures, Strategic Perspectives in Entrepreneurship, Strategies growth in Entrepreneurship, Valuation challenges in Entrepreneurship, Final harvest of a new venture

TC-485   Telecommunication Switching System

Circuit Switching System Fundamental: Introduction, Space Division Switch (Cross bar switch & Multistage switch), Time Division Switch (Time Slot Interchange & TDM Bus), Space and Time division switch combination.

The Public Switched Telephone Network (PSTN): Network Topology, PSTN Hierarchy, Network Timing, Central Office, Evolving the PSTN to the Next Generation.

Signaling System 7: Pre-SS7 Systems, Introduction to SS7, SS7 Network Architecture, SS7 Protocol Stack, Message Transfer Part 2, Message Transfer Part 3, ISDN User Part, Signaling Connection Control Part, Transaction Capabilities Application Part

Implementation of Signaling system 7 over Cellular Network: Network Architecture, Interfaces and Protocols (BSSAP, MAP), Mobility Management and Call Processing.

Intelligent Networks (IN): Intelligent Network, Service Logic and Data, IN Services, IN and SS7 Protocol, IN/1, Advanced Intelligent Network, intelligent Network Application Protocol.

IP Telephony: Introduction VOIP, Transport of Voice over IP, IP Signaling Protocols (H.323/ SIP).

Integration of PSTN and IP Telephone Network: Next Generation Architecture, Media Gateways, Media Gateway Protocol, SIGTRAN, SS7 and SIP/H.323 Internetworking.

Lab work:
The practical work will be based on the above course.

TC-493   **Satellite Communication**
Origin of Satellite Communication, Current state of Satellite Communication, Overview of satellite systems engineering, Orbital mechanics, Look angle determination, Orbital perturbations, Orbital effects in communication system performance space craft and its subsystem, Earth station (brief description). Space Link, Satellite Access and Services.

Lab work:
The practical work will be based on the above course.

TC-481   **Navigational Aids and Radar Systems**

An Introduction to Radar: Basic Radar, The simple form of the Radar Equation, Radar block diagram, Radar frequencies, Application of the Radar, Origin of the Radar.

Radar Equations: Introduction, detection of signals in noise, receiver noise and signal to noise ratio, Probability density function, Probability of detection and false alarm, Integration of the Radar pulses, Radar cross section of targets, Transmitter power pulse repetition frequency.

MTI and Doppler Radar: Introduction to Doppler and MTI radar, Delay line cancellors, Staggered pulse repetition frequencies, Limitation to MTI performance. Tracking Radar: Tracking with Radar, Monopulse tracking, Conical scan and sequential lobing.

Radar Transmitters: Introduction, Linear beam power tubes, Solid state RF power sources, Magnetron, Cross field amplifiers, Other RF power sources, Other aspects of Radar transmitters.

Radar Receivers: The Radar receiver, The receiver noise figure, Super Heterodyne receiver, Duplexers and receiver protectors, Radar displays. Propagation of the
Radar Waves: Introduction, Forward Scattering from a flat earth, Scattering from the round earth surface, Atmospheric Refraction, Standard propagation, Non standard propagation, Diffraction, Attenuation by atmospheric gases, External environmental noise, Other propagation effects.

Navigational aids: Terminology used in navigational Systems, Direction finding, GPS, Laser Gyro, Decca, Loran, Beacon system.

Lab work:
The practical work will be based on the above course.

TC-424   **Digital Image Processing**

Introduction: Definitions, and applications

Image Fundamentals:
Models, sampling, quantization and basic operations, Image Enhancement, Point processing, Histogram equalization and specification, spatial domain filtering: Smoothing, Median, & Sharpening. 1-D and 2-D.

Discrete Cosine Transform (DCT):
Properties of DCT, Comparison with DFT, Different forms of DCT, Application of DCT in image processing

Color Fundamentals:
Models, transformation, and enhancement, Image restoration: Degradation and observation models, Inverse filtering, Geometric transformation,

Image Compression:
Fundamentals, information theory and entropy concept, Huffman and run-length coding, Compression Standards, Compression of frame Sequences and color images, Image segmentation: Detection of discontinuities, point, line, and edge detection,

Image Segmentation:
Thresholding, global and optimal. Region-oriented and Motion-based segmentation, Representation and Description, Computer Vision principles, Practical

Applications:
Videoconferencing and Internet applications

Lab work:
The practical work will be based on the above course

TC-425   Mobile and Pervasive Computing

Introduction:
Introductory Mobile Concepts, Emerging Wireless Technologies & Applications, PDAs & smart phones, Vision of Next generation, Location Awareness, HCI, Smart Dust, AURA, Grid, Wireless technologies, frequency & spread spectrum,mobile Services, Wireless PAN, LAN & MAN, Mobile Terminal Platforms, Hardware platforms

Pervasive Computing- Principles, Characteristics- interaction transparency, context aware, automated experience capture. Architecture for pervasive computing- Pervasive devices-embedded controls.- smart sensors and actuators -Context communication and access services

Protocols:
Open protocols- Service discovery technologies- SDP, Jini, SLP, UpnP protocols–data synchronization- SyncML framework - Context aware mobile services - Context aware sensor networks, addressing and communications- Context aware security.

Technologies:
Past, Present and Future-Device Technology-Device Connectivity-Web application Concepts-WAP and Beyond-Voice Technologies-Personal Digital Assistants

Architecture:
Server side programming in Java-Pervasive Web application Architecture-Example Application- Access via PCs-Access via WAP-Access via PDA and Voice

Examples:
Smart Tokens, Heating Ventilation and Air Conditioning, Set Top Boxes, Appliances and Home Networking, Residential Gateway, Automotive Computing, On Board Computing Systems, In Vehicle networks, Entertainment Systems

Lab work:
The practical work will be based on the above course

List of Telecommunication Engineering Course Offered in Other Departments

S#	Course Code	Course Title	Offered in (Department)	Offered in (Year)	Semester
1	TC-307	Communication Systems	Electrical Engg. (EE)	Third (TE)	Fall
2	TC-204	Signals and Systems	Electronic Engg. (EL)	Second (SE)	Spring
3	TC-307	Communication Systems	Electronic Engg. (EL)	Third (TE)	Spring
4	TC-212	Digital Signal Processing	Electronic Engg. (EL)	Third (TE)	Spring
5	TC-316	Telecommunication Networks	Electronic Engg. (EL)	Final (BE)	Fall