Price Rs. 100/=

DEPARTMENT OF ELECTRONIC ENGINEERING

SYLLABI OF COURSES FOR B.E. (ELECTRONIC ENGINEERING) DEGREE PROGRAMME 2010-2011 & ONWARDS

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY, KARACHI-75270, PAKISTAN

B.E. (ELECTRONIC) DEGREE PROGRAMME

AT

NED UNIVERSITY OF ENGINEERING AND TECHNOLOGY, KARACHI

COURSES OF STUDIES

Detailed Syllabi
2010-2011 & ONWARDS

DEPARTMENT OF ELECTRONIC ENGINEERING
NED UNIVERSITY OF ENGINEERING & TECHNOLOGY,
KARACHI-75270, PAKISTAN

Issued by the
Registrar

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY,
KARACHI-75270, PAKISTAN

Tel: 9261261- 68 Fax: (92-21) 9261255
E-mail: registrar@neduet.edu.pk
Website: http://www.neduet.edu.pk

B.E. (ELECTRONIC ENGINEERING)
COURSES OF STUDIES
Applicable for Batches: 2010-11 & ONWARDS

First Year									
Spring Semester					**Fall Semester**				
Course Code	**Course Title**	**Credit Hours**			**Course Code**	**Course Title**	**Credit Hours**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
El-101	Electronic Engineering Drawing & Workshop	1	2	3	EL-102	Basic Electronic	3	1	4
EE-114	Basic Electrical Engineering	3	1	4	MT-111	Calculus	3	0	3
PH-121	Applied Physics	3	1	4	CY-105	Applied Chemistry	3	1	4
HS-101	English	3	0	3	CS-101	Introduction to Computers	2	1	3
ME-101	Engineering Mechanics	3	1	4	ME-105	Applied Thermodynamics	3	1	4
					HS-105/ HS-127	Pakistan Studies / Pakistan Studies (For Foreigners)	2	0	2
	Total	**13**	**5**	**18**		**Total**	**16**	**4**	**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**
EL-233	Electronic Devices and Circuits	3	1	4	EL-234	Amplifiers and Oscillators	3	1	4
EL-255	Programming Languages	2	1	3	MT-224	Complex Variable and Fourier Analysis	3	0	3
EE-222	Instrumentation and Measurement	3	1	4	EE-246	Electrical Machines	2	1	3
EE-211	Circuit Theory-I	3	1	4	CS-205	Logic Design and Switching Theory	3	1	4
MT-222	Linear Algebra and Ordinary Differential Equations	3	0	3	EE-281	Electromagnetic Fields	3	0	3
					HS-205/ HS-209	Islamic Studies OR Ethical Behavior	2	0	2
	Total	**14**	**4**	**18**		**Total**	**16**	**3**	**19**

Third Year									
Spring Semester					**Fall Semester**				
Course Code	**Course Title**	**Credit Hours**			**Course Code**	**Course Title**	**Credit Hours**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
EL-302	Analog Integrated Circuits	3	1	4	EL-303	Digital Integrated Circuits	3	1	4
EL-343	Power Electronics	3	1	4	EL-304	Industrial Electronics	3	1	4
EL-386	Introduction to Biomedical Engineering	2	1	3	TC-391	Communication Systems-I	3	1	4
CS-305	Computer Architecture and Organization	3	1	4	EE-312	Circuit Theory-II	3	1	4
EF-303	Applied Economics for Engineers	3	0	3	HS-304	Business Communication & Ethics	3	0	3
MT-331	Probability and Statistics	3	0	3					
	Total	**17**	**4**	**21**		**Total**	**15**	**4**	**19**

Final Year									
Spring Semester					**Fall Semester**				
Course Code	**Course Title**	**Credit Hours**			**Course Code**	**Course Title**	**Credit Hours**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
EL-433	Solid State Devices	3	1	4	CS-418	Computer Communication Networks	2	1	3
EL-407	VLSI Systems Design	3	1	4	EE-474	Feedback Control Systems	3	1	4
TC-492	Communication System-II	3	1	4	EL-484	Opto Electronics and Microwave systems	3	1	4
EE-493	Digital Signal Processing	3	1	4	CS-410	Microprocessor and Assembly Language	3	1	4
EL-401	*Electronic Engineering Project	---	---	---	MT-442	Numerical Methods	3	0	3
					EL-401	Electronic Engineering Project	0	6	6
	Total	**12**	**4**	**16**		**Total**	**14**	**10**	**24**

B.E. (ELECTRONIC ENGINEERING)
COURSES OF STUDIES
For Term Batches

First Year									
Spring Term					**Fall Term**				
Course Code	**Course Title**	**Marks**			**Course Code**	**Course Title**	**Marks**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
EL-101	Electronic Engineering Drawing & Workshop	50	100	150	EL-102	Basic Electronic	100	50	150
EE-114	Basic Electrical Engineering	100	50	150	MT-111	Calculus	100	----	100
PH-121	Applied Physics	100	50	150	CY-105	Applied Chemistry	100	50	150
HS-101	English	100	----	100	CS-101	Introduction to Computer	100	50	150
ME-101	Engineering Mechanics	100	50	150	ME-105	Applied Thermodynamics	100	50	150
					HS-105/ HS-127	Pakistan Studies / Pakistan Studies (For Foreigners)	100	----	100
	Total	**450**	**250**	**700**		**Total**	**600**	**200**	**800**

Second Year									
Spring Term					**Fall Term**				
Course Code	**Course Title**	**Marks**			**Course Code**	**Course Title**	**Marks**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
EL-233	Electronic Devices and Circuits	100	50	150	EL-234	Amplifiers and Oscillators	100	50	150
EL-255	Programming Languages	100	50	150	MT-224	Complex Variable and Fourier Analysis	100	----	100
EE-222	Instrumentation and Measurement	100	50	150	EE-246	Electrical Machines	100	50	150
EE-211	Circuit Theory-I	100	50	150	CS-205	Logic Design and Switching Theory	100	50	150
MT-222	Linear Algebra and Ordinary Differential Equations	100	----	100	EE-281	Electromagnetic Fields	100	----	100
					HS-205/ HS-209	Islamic Studies OR Ethical Behavior	100	----	100
	Total	**500**	**200**	**700**		**Total**	**600**	**150**	**750**

Third Year									
Spring Term					**Fall Term**				
Course Code	**Course Title**	**Marks**			**Course Code**	**Course Title**	**Marks**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
EL-302	Analog Integrated Circuits	100	50	150	EL-303	Digital Integrated Circuits	100	50	150
EL-343	Power Electronics	100	50	150	EL-304	Industrial Electronics	100	50	150
EL-386	Introduction to Biomedical Engineering	100	50	150	TC-391	Communication Systems-I	100	50	150
CS-305	Computer Architecture and Organization	100	50	150	EE-312	Circuit Theory-II	100	50	150
EF-303	Applied Economics for Engineering	100	----	100	HS-304	Business Communication & Ethics	100	----	100
MT-331	Probability and Statistics	100	----	100					
	Total	**600**	**200**	**800**		**Total**	**500**	**200**	**700**

Final Year									
Spring Term					**Fall Term**				
Course Code	**Course Title**	**Marks**			**Course Code**	**Course Title**	**Marks**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
EL-433	Solid State Devices	100	50	150	CS-418	Computer Communication Networks	100	50	150
EL-407	VLSI Systems Design	100	50	150	EE-474	Feedback Control Systems	100	50	150
TC-492	Communication System-II	100	50	150	EL-484	Opto Electronics and Microwave systems	100	50	150
EE-493	Digital Signal Processing	100	50	150	CS-410	Microprocessor and Assembly Language	100	50	150
EL-401	*Electronic Engineering Project	----	----	----	MT-442	Numerical Methods	100	----	100
					EL-401	Electronic Engineering Project	----	200	200
	Total	**400**	**200**	**600**		**Total**	**500**	**400**	**900**

EL 101 ELECTRONIC ENGINEERING DRAWING AND WORKSHOP

PCB Design: PCB design and layout drawings using PCB software: From Schematic & Layout to Machine File generation. PCB parameters in detail, PCB technologies, single layers and multi-layer boards, PCB testing, Switches, PCB standards, Routing.

Workshop: Operations of Voltmeters, Ohmmeters, Power supplies, Function generators & Oscilloscopes. Measuring parametric values of discrete passive components. Fabricating simple electronic circuits on breadboard, Fabricating PCB , Assembling & soldering components on PCB. PCB processes: CNC Drilling, Electroplating, Photo-plotting, Laminating, Developing and Exposing.

The practical work will be based on the above course.

EL 102 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.

FET: Field effect transistor; Device, Structure & Physical operation of the MOSFET, Current-voltage characteristics. DC analysis of MOSFET circuits, MOSFET as an amplifier and as a switch, Biasing in MOS amplifier circuits.

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.

The practical work will be based on the above course.

EE 114 BASIC ELECTRICAL ENGINEERING

Electrical Elements and Circuits: Energy and energy transfer, Electric Charge, Electric current, Potential difference & voltage, Electric power and energy, Electric circuit sources and elements, Resistance, Ohm's law, Inductance, Capacitance, Fundamental circuit laws, Kirchhoff's Laws, Direct application of fundamental laws to simple resistive networks, Introduction to node voltage and loop current methods.

Steady State AC Circuits: An introduction to periodic functions, RMS or effective, Average and maximum values of current and voltage for sinusoidal signal wave forms, The phasor method of analysis an introduction, Application of phasor methods to simple AC circuits, Power and reactive power, Maximum power conditions.

Magnetic Circuits and Transformers: Magnetic effects of electric current, Magnetic circuit concepts, Magnetization curves, Characteristics of magnetic materials, Magnetic circuits with DC excitation, Magnetically induced voltages, Self inductance magnetic circuits with AC excitation, Hysteresis and Eddy current losses, Introduction to transformer the Ideal transformer.

Electromechanical Energy Conversion: Basic principles, Generated voltage, Electromagnetic torque, Interaction of magnetic fields, Alternating current generators, Commutator actions, DC machine, Direct current generators, Electric motors, Losses and efficiency, Machine application considerations.

The practical work will be based on the above course.

CS 101 INTRODUCTIONS TO COMPUTERS

Development of the Modern Computers: Basic computer structure and operations. Data representation and data structures, Coding, computer arithmetic, organization & operations of the processor, Memory and I/O of a minicomputer.

Introduction to Computer Science: Programming and problem solving (a) Algorithms (b) Step-wise refinement, Basic High-level programming languages, Basic construction of FORTRAN and PASCAL, Programming examples, Models of control, Grammar, Reasoning about program.

The practical work will be based on the above course.

ME 101 ENGINEERING MECHANICS

Statics of Particles: Forces in a plane, Newton's First Law, Freebody diagram, Forces in space (rectangular components), Equilibrium of a particle in space.

Kinematics of Particles: Rectilinear and curvilinear motion of particles, Components of velocity & acceleration, Motion relative to a frame in translation.

Kinetics of Particles: Newton's Second Law, Dynamic equilibrium, Rectilinear and curvilinear motion, Work and energy, Kinetic energy of particle, Principle of Work and Energy, Conservation of energy, Impulse and momentum, Impulsive forces and conservation of momentum, Impact Direct and oblique, Conservation of angular momentum.

Rigid Bodies: Equivalent systems of forces, Principle of Transmissibility, Moment of a force, Couple, Varignous Theorem. Centre of gravity of a three-dimensional body and centroid of a volume, Moments of inertia, Radius of Gyration, Parallel axis theorem.

Equilibrium of Rigid Bodies: Free-body diagram, Equilibrium in two and three dimensions, Reaction of support and connections, Equilibrium of two-force and three-force bodies.

Kinematics of Rigid Bodies: General Plane motions, Absolute and relative velocity and acceleration.

Plane Motion of Rigid Bodies: Force and acceleration, Energy and momentum, Conservation of linear and angular momentum.

Friction: Laws of dry friction, Angles of friction, Wedges, Square-threaded screws, Journal and thrust bearings.

Analysis of Structures: Internal forces and Newton's Third Law, Simple and space trusses, Joints and sections, Frames and machines, Forces in cable.

The practical work will be based on the above course.

ME 105 APPLIED THERMODYNAMICS

Thermodynamic Properties: Introduction, Working substance, System, Pure substance, PVT surface, Phases, Properties and state, Zeroth Law, Processes and cycles, Conservation of mass.

Energy and its Conservation: Relation of mass and energy, Different forms of energy, Internal energy and Enthalpy, Work, Generalized work equation, Flow

and non-flow processes, Closed systems, First Law of Thermodynamics, Open systems and steady flow, Energy equation of steady flow, System boundaries, Perpetual motion of the first kind.

Energy and Property Relations: Thermodynamics equilibrium, Reversibility, Specific heats and their relationship, Entropy, Second Law of Thermodynamics, Property relations from energy equation, Frictional energy.

Ideal Gas: Gas laws, Specific heats of an ideal gas, Dalton's Law of Partial Pressure, Third Law of the Thermodynamics, Entropy of an ideal gas, Thermodynamics processes.

Thermodynamics Cycles: Cycle work, Thermal efficiency and heat rate, Carnot cycle, Stirling cycle, Reversed and reversible cycles, Most efficient engine.

Consequences of the Second Law: Calusius's inequality, Reversibility and irreversibility, Steady flow system.

Two-phase Systems : Two-phase system of a pure substance, Changes of phase at constant pressure, Steam tables, Superheated steam, Compressed liquid, Liquid and vapor curves, Phase diagrams, Phase roles, Processes of vapors, Mollier diagram, Rankine cycle, Boilers and ancillary equipment.

Internal Combustion Engines: Otto cycle, Diesel cycle, Dual combustion cycle, Four-stroke and Two-stroke engines, Types of fuels.

Reciprocating Compressors: Condition for minimum work, Isothermal efficiency, Volumetric efficiency, Multi-stage compression, Energy balance for a two-stage machine with intercooler.

CY 105 APPLIED CHEMISTRY

Gases: Gas Laws, Kinetic Gas Equation, Van Der Vaal's Equation, Critical Phenomenon, Liquification of gases, Specific heat (molar heat capacity)

Properties of Solution and Liquids: Surface Tension, Viscosity, Osmosis, Osmotic Pressure, pH-Buffer Solution, Spectrophotometry, Basic concepts of Colloidal Chemistry, Classification purification (dialysis).

Thermochemistry: Chemical Thermodynamics, Hess's Law, 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 and Protection).

Water and Sewage: Sources of water, Impurities, Hardness, Water softening, Purification of water for potable and industrial purposes, Electro dialysis, Introduction to environmental pollution, Main sources and effects, Sewage treatment.

Fuels: Types of fuels, Classification of fossil fuels.

Metals and 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, Paints, Semiconductors and Dielectric materials.

Practical: Determination of total alkalinity of a given sample, Determination of total acidity of a given sample, Determination of the amount of ferrous ion in a given sample, Determination of total hardness of a given sample of water, Determination of surface tension of a given sample, Determination of coefficient of viscosity of a given sample, Determination of chloride ion in a given sample, Determination of Bicarbonate and Carbonate ions in a given sample, Determination of turbidity in a given sample by precipitation, Determination of turbidity in a given sample by spectrophotometer, Plotting of titration curve and determination of total alkalinity in a given sample, Plotting of titration curve and determination of acidity in a given sample, Plotting a calibration curve and determination of ions present in a given sample.

MT 111 CALCULUS

Set and Functions: Define rational, irrational and real numbers**;** rounding off a numerical value to specified number of decimal places or significant figures; solving quadratic and rational inequalities involving modulus with graphical representation; Definition of set, set operations, Venn diagrams, DeMorgan's laws, Cartesian product, Relation, Function & their types (Absolute value, greatest integer & combining functions). Graph of well-known functions, Limit of functions, Continuous & discontinuous functions with graphical representation.

Proportional Logic: Definition of proposition, Statement & Argument. Logical operators. Simple and compound proposition, various types of connectives. Truth table, Tautology, Contradiction, Contingency and Logical equivalence.

Boolean Algebra: Definition, Boolean function, duality, some basic theorems and their proofs. Two value Boolean algebra. Truth functions. Canonical sum of product form. Digital logic gates and switching circuit designs.

Complex Number: Argand diagram. De Moivre formula, root of polynomial equations, curve and regions in the complex plane, standard functions and their

inverse ((exponential, circular and hyperbolic functions)

Differential Calculus: Differentiation and successive differentiation and its application. Leibniz theorem. Taylor and Maclaurin theorems with remainders in Cauchy and Lagrange form. Power series. Taylor and Maclaurin series. L'Hospitals rule. Extreme values of a function of one variable using first and second derivative test, asymptotes of a function. Curvature and radius of curve, partial differentiation. Exact differential and its application in computing errors. Extreme values of a function of two variables with and without constraints. Solution of non-linear equation using Newton Raphson method.

Integral Calculus: Indefinite integrals with computational techniques. Reduction formulae. Definite integrals with convergence. Beta & Gamma functions; their identities. Integration application. Centre of pressure and its depth.

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.

PH 121 APPLIED PHYSICS

Introduction: Scientific notation and significant figures, Types of errors in experimental measurements, Units in different systems, Graphical techniques.

Vector: Review, Vector derivations, Line & surface integrals, Gradient of a scale.

Mechanics: The limit of Mechanics, Coordinate systems, Motion under constant acceleration, Newton laws and their applications, Galilean invariance, Uniform circular motion, Frictional forces, Work and Energy, Potential Energy, Energy Conservation, Energy and our environment, Angular momentum.

Electrostatic and Magnetism: Coulombs Law, Electrostatic potential energy of discrete charges, Continuous charge distribution, Gauss's Law, Electric field around conductors, Dielectrics, Dual trace oscilloscope with demonstration, Magnetic fields, Magnetic force on current, Hall effect, Biot-Sevart Law, Ampere's Law, Fields of rings and coils, Magnetic dipole, Diamagnetism, Paramagnetism, Ferromagnetism.

Semiconductor Physics: Energy Levels in Semiconductors, Hole concept, Intrinsic & Extrinsic SC, Law of Mass action, PN junction, BJT, Simple circuits

Waves and Oscillations: Free oscillation of systems with one and more degrees of freedom, Solution for modes classical wave equation, Transverse modes of

continuous strings, Standard waves, Dispersion relation for waves, LC network and coupled pendulums, Plasma Oscillations.

Optics and LASER: Harmonic traveling waves in one dimension near and far fields, Two-slit interference, Huygens Principle, Single-slit diffraction, Resolving power of instruments, Diffraction grating, Lasers, Population inversion, Resonant cavities, Quantum efficiency, He-Ne, Ruby and CO2 lasers, Doppler Effect and sonic boom.

Modern Physics: Inadequacy of classical physics, Planck's explanation of black body radiation, Photoelectric effect, Compton effect, Bohr theory of hydrogen atom, Atomic spectra, Reduce mass, De-Broglic hypothesis, Bragg's Law, Electron microscope, Uncertainty relations, Model atomic models, Zeeman effect, Atomic nucleus, Mass energy relation, Binding energy, Nuclear forces in a chain, Secular equilibrium, Nuclear stability, Radiation detection instruments, Alpha, Beta and Gamma decay attenuation, Nuclear radiation hazards and safety, Medical uses of nuclear radiation, Fission Energy, Nuclear reactors, Breeder reactors, Nuclear Fusion.

The practical work will be based on the above course.

HS 101 ENGLISH

Study Skill, Advanced reading Skills using variety genre and texts, Listening & Speaking, Skill, Oral communication Skills Development, Précis Writing, Controlled & guided writing, Essay Writing, Writing book & informal Reports, Informal & formal Letters and memos, Creating advertisements, Applied Grammar, Sentence Correction Sentence Completion, Transformation of sentences, Question tags, Homonyms/Homophones, Sentence making, Punctuation, Extracts, Conversations etc., Use of idioms.

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 of Pakistan.

Land of Pakistan: Geo-physical conditions, Geo-political and strategic importance of Pakistan, Natural resources-mineral, 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,Recent Constitutional developments.

Contemporary Issues in Pakistan: A brief survey of Pakistan 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 & solution, Pakistan's role in preservation of nature, Through international conventions/efforts.

Foreign Policy: Pakistan Relations with neighbors, Super powers, Muslim world.

Human Rights: Conceptual foundation of Human rights, Human rights; Definition, significance and importance, Comparative analysis of Islamic and Western Perspectives of Human Rights, UN System for Protection of Human rights, Overview, UN Charter, International Bill of Human rights, Implementation mechanism, Other important international treaties & conventions, The Convention on the elimination of all forms of discrimination against woman, International Convention on the rights of child, Convention against torture, 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 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.

EL 233 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.

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.

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 and BJT based current sources.

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 like CS-CS, CS-CG (Cascode amplifier) etc.

The practical work will be based on the above course.

EL 234 AMPLIFIERS AND OSCILLATORS

Output Stages: Introduction to classes (A, B, C, AB etc), different circuit topologies employed for implementation of different classes.

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, CS-CS cascade, CS-CD cascade, Cascode, Folded-cascode, Super-source follower circuits for mid-band gain, lower and upper-cut off frequencies.

Active and Passive Filters: Ideal filter characteristics, Passive filters, first and second order active filters. Higher order filters such as Butterworth, Chebysgev etc.

Oscillators: Introduction to feedback and s-plane, Birkhausen criterion, Amplitude limiter, Wein-Bridge oscillator, Phase-shift oscillator, Quadrature oscillator, Colpitts and Hartley, Crystal Oscillator and 555 timer operation.

Feedback: Two-port networks, properties of negative feedback, detailed analysis of the four basic feedback topologies.
The practical work will be based on the above course.

EL 255 PROGRAMMING LANGUAGES

The Turbo C Programming Environment: Setting up the Integrated Development Environment, File used in C program development, Use of Integrated Development Environment, The basic structure of C program, 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.

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 and Strings: Arrays, Referring to individual elements of the array, String, String functions, Multidimensional arrays.

Pointers: Pointer overview, Returning data from functions, Pointers and arrays, Pointers and strings, Double indirection, Pointers to pointers, Structures, Unions and ROM BIOS.

Turbo C Graphics Functions: Text-mode functions graphics - Mode functions, Text with graphics.

Files: Types of disk I/O, Standard, Input/output binary mode and text mode, Record, Input/Output, Random access, Error conditions, System-level Input/ Output, Redirection.

Advanced Variables: Storage classes, Enumerated data type, Renaming data type with typedef, Identifiers and naming classes, Type conversion and casting, Labels and goto statement.

C++ and Object Oriented Programming: Object oriented programming, Some useful C++ features, Classes and objects, Constructors and memory allocations, Inheritance, Function overloading, Operator overloading. Practical design through object oriented programming.

The practical work will be based on the above course.

EE 211 CIRCUIT THEORY- I

Introduction to Circuit Concepts: Basic two terminal circuit elements, Linear time invariant resistor, Linear time invariant capacitor, Linear time invariant inductor, Energy concepts in two terminal elements, Energy dissipated in a resistor, Energy stored in an inductor and capacitor, Ideal independent voltage and current sources.

Kirchhoff's Law: Basic definitions of branch, Loop and node, Statements of Kirchhoff's voltage and current laws, Linearly independent KCL and KVL, Equation of KVL and KCL laws, Series and parallel conceptions of two terminal one port circuit elements, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem and Reciprocity theorem.

Elementary Transient Analysis: Differential and integral forms of circuit equation, Initial voltage on a capacitor, Initial current in an inductor, First order circuits, Solution of single first order differential equations, Particular and total solution of second order linear time invariant differential equations.

Sinusoidal Steady State Analysis: Network response to sinosoidal driving functions, Complex impedance and admittance functions, Development of concept of phasors, Power consideration, Complex power, Maximum power transfer, Tuned circuits, Series and parallel RLC tuned circuits, Definition of quality factor.

Exponential Excitation and Transformed Network: Representation of excitations by exponential functions, Single element responses, Forced response with exponential excitation, Introduction to the transformed network, Driving point impedance and admittance.

Nonsinusoidal Periodic Analysis: Fourier Series and it's uses in Circuit Analysis, Evaluation of Fourier Coefficients, Waveform symmetries, Exponential form of Fourier series, Steady state response of periodic signals.

Magnetically Coupled Circuits: Mutual inductance, Dot conventions, Energy considerations, The linear transformer and ideal transformer.

The practical work will be based on the above course.

EE 222 INSTRUMENTATION & MEASUREMENT

Functional Description and Performance Characteristics of Instruments: Analog and Digital mode of operations, Static and Dynamic characteristics**,** Resolution, Sensitivity, Accuracy, Hysteresis, Uncertainty, Range, Repeatability, Reproducibility, Engineering Units and Standards.

Data Conversion: Sampling, DAC, ADC, V/f and f/V converters.

Measuring Instruments: Principle, construction and working of DC and AC AVO meters, power meters, power factor meters, DC & AC Bridges.

Electronic Instruments: Working principle of analog, digital and sampling oscilloscope, frequency generator, frequency counter and logic analyzer.

Transducer Principles and Types:
Variable Resistance and inductance transducers, Hall effect, Linear variable differential transformer (LVDT), Capacitive, Photoconductive, Piezo-Electric Transducers, Thermo electric transducers, optical transducers.

The practical work will be based on the above course.

EE 246 ELECTRICAL MACHINES

Three Phase Circuits: Three phase voltages, Currents and power, Star and Delta connected circuits, Analysis of balanced three phase circuits, Line diagram, Power and power factor measurement in 3-phase circuits.

Transformer: Basic principles, Single and 3-phase transformers, Construction, General transformer equation, Voltage and current relations in transformer, Ratio of transformation, Loading a transformer, Equivalent circuits of a transformer, OC and SC tests, Regulations and methods of calculation of regulation, Efficiency and calculation of efficiency, Auto transformer, 3-phase transformer.

Direct Current Machines: Electric circuit aspects of DC machine, Magnetic circuit aspects, Types of DC generator, Performance, Types of motors, Performance, Motor speed control, Transient and dynamic responses, Transfer functions and frequency response.

Alternating Current Machines: Rotating magnetic field, Induction motor action, Induction motor characteristics and performance, Synchronous generator characteristics and performance, Synchronous motors, Induction motor, Speed control elementary AC two phase control motors, Constructional features of fractional horse power AC motors.

Direct Current Machines Winding: Gramme Ring winding, Simple lap and wave windings, Diagrams and developments and elementary calculations.

Control Systems: Motor drive systems, Introduction to feedback control systems, System aspects and classification, Elements of analysis of feedback

control systems, Digital control systems.

The practical work will be based on the above course.

EE 281 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 a line charge, Field of a sheet of charges, Stream-lines and 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 in 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: Poison's and Laplace's equations, Uniqueness theorem, Examples of the solution of Laplace's equation, Examples of the solution of Poison's equation, Product solution of Laplace's equation.

The Steady Magnetic Field: Biot Savart's law, Amperes circuital 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, Maxwell's 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.

The practical work will be based on the above course.

CS 205 LOGIC DESIGN AND SWITCHING THEORY

Computer Operations: Evaluation of the computer, Basic organization of digital computer, Instruction formats, some different types of computers, Special purpose and general purpose computers.

Number Systems: Conversion between bases, Arithmetic with bases other than ten, Negative numbers, Binary coded decimal numbers, Octal, and Hexadecimal number systems.

Truth Function: Binary connectives, Evaluation of truth functions, many statement compounds, Physical realizations, sufficient sets of connectives, digital computer examples.

Boolean Algebra: Truth functional calculus as Boolean algebra, Duality, Fundamental theorems of Boolean algebra, Examples of Boolean simplifications, Remarks on switching functions.

Switching Devices: Switches and relays, Logic circuits, Speed and delays in logic circuits and Integrated logic circuits.

Minimization of Boolean Functions: Standard forms of Boolean functions, Minterm and maxterm, Designation of Boolean functions, Karnaugh map representation of Boolean functions, Simplification of functions on Karnaugh maps, Map minimization of product of sums expressions, Incompletely specified functions.

Tabular Minimization: Cubical representation of Boolean functions, Determination of prime implicants, Selection of an optimum set of prime implicants, Design of NAND and NOR networks and properties of

combinational networks, Switching expressions for NAND and NOR networks, Transient response of combinational Networks.

Introduction to Sequential Networks: Latches, Sequential networks in fundamental mode, Introduction to the synthesis of sequential networks, Minimization of the number of states, Clocked networks.

The Practical work will be based on the above course.

MT 222 LINEAR ALGEBRA & ORDINARY DIFFERENTIAL EQUATION

Linear Algebra & Matrices: Linearity and dependence of vectors, Basis, Dimension of a vector spaces, Fields, Linear matrix and type of matrices (Singular, Non-singular, symmetric, non-symmetric, Upper, Lower, Diagonal), Rank of a linear matrix using row operations and special method, Echelon and reduced echelon forms of a matrix, Determination of a consistency of a system of linear equation using rank, Matrix of linear transformations, Eigen values and eigen vectors of a matrix, Diagonalization, Applications of linear algebra (Scaling, translation, rotation and projection) with graphical representation.

Introduction to Ordinary Differential Equations: The concepts and terminologies, Order and degree, Linearity and non-linearity, A brief classification of ODEs, Concrete examples, Solutions; general and particular, Concrete examples and application Initial value problems and boundary value problems, Introduction to issues relate to existence and uniqueness to solutions.

The First Order ODEs, Linear and Non-linear: Variable, Separable cases & application, Growth and decay problems, Newton's laws of cooling, Torricelli's law, Simple kinematical dynamical applications, exact and non-exact ODEs, Solution procedures and integrating factors, The standard linear differential equation of First order, Solution procedures and applications to RL-Circuits and RC-Circuits, Bernoulli's equations and Logistical growth models. Direction fields and Euler's and Picard's iterative schemes for First order ODEs.

The Linear Second Order ODEs, Homogenous and Non-Homogenous Cases: Linear Second Order Homogenous and ODE with constant coefficients, Solution procedures and the principle of linear superposition and application – Mechanical systems and electrical systems. Undamped and Damped Harmonic Oscillators, Linear Second Order Non-Homogenous ODEs with constant coefficient, Solution procedures and Principles of general linear superposition, Complementary functions & particular solutions – The method of undermined coefficients and variation of parameters. Application spring mass systems – Undampeds and Damped Harmonic Oscillators with forcing terms and their ODEs and solutions, RLC-Circuits and their ODEs and solutions, The Physics and Mathematics of a phenomenon of Resonance in Mechanical and Electrical

systems, Cauchy-Euler ODEs and their solution procedures.

Partial Differential Equations: Formation of partial differential equations, Solution of First Order Linear and Special types of Second and higher ODEs, Homogenous partial differential equations of order one, Lagrange's multiplier.

Advance Calculus and Vector Calculus: Double and Triple integration with applications (area, centroid, moment of inertia) Vector differential and Vector integral with applications. Green and Stoke's theorem with applications

MT 224 COMPLEX VARIABLE AND FOURIER ANALYSIS

Infinite Series: Applications of simple convergence, Root, Ratio, Raabe's and Gauss's tests on the behavior of series.

Complex Variables: Limit, Continuity, Zeros and poles, Cauchy-Riemann equations, conformal transformations, Contour integration.

Laplace Integral Transformations: Laplace transform of some elementary functions, First and second translations or Shifting theorems, Change of scale property, Laplace transform of the nth order derivative, Initial and final value theorem, Laplace transform of integrals, Laplace transform of functions $t^n F(t)$ 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 and partial differential equations using Laplace transform (I. V. P.'s and B. V. P's.). Z and inverse Z-transformations, Properties of Z-transformation and application.

Fourier Series: Introduction to Euler-Fourier formulae, Even and odd functions, Application of Fourier series. Properties of Fourier Transform and Fast Fourier Transform with applications.

HS 205 ISLAMIC STUDIES

Thematic study of Holy Quran: Basic Islamic Believes, Tauheed, Al-Ambiya22, Al-Baqarah-163-164, Prophet hood, Al-Imran-79, Al-Hashr-7, Al-Madah-3, Here-After, Al-Hajj-5, Al-Baqarah-48, Two Hadith, Basic Islamic Practices, Al-Mu' minun-I-II, Amre-Bil-MA' Roof WA-Nahi Anil Munkar, The concept of Good & Evil, Importance & necessity of DA' Wat-e-Deen Al-Imran-110, Method of DA' Wat-e-Deen, An-Nehl-125, Al-Imran-104, Two Hadith, Unity of the Ummah,Al-Imran-103, Al-Hujurat-10, Al-Imran-64, Al-An'am-108, Kasb-e-Halal, Taha-81,Al-A'raf-32-33, Al-Baqarah-188, Two Hadith, Huquq-ul-Ibad, Right to Property, Al-Maidah-32, Right to Property, An-Nisa-29,Right of Respect & Dignity, Al-Hujurat-11-12, Freedom of Expression, Al-

Baqarah-256, Right of Equality, Al-Hujurat-13, Economic Security , Al-Ma'arij-24-25, Employment Opportunity on Merit, An-Nisa-58, Excession Right to Justice, An-Nisa-135, Women Rights, An-Nehl-97, Al-Ahzab-35, An-Nisa-07, Relations With Non-Muslims, Al-Mumtahanah-8-9, Al-Anfal-61, Last sermon of Hajj at Arafat on 10th Zil-Hajj, Translation & the important points of the sermon.

Serat Life of the Holy Prophet: Birth, Life at Makkah, Declaration of Prophet hood, preaching & its difficulties ,Migration to Madina, Brotherhood (Mawakhat) & Madina Charter, The Holy War of the prophet (Ghazwat-e-Nabawi), Hujjat-ul-Wida.

Islamic Civilization: Impacts of Islamic civilization on the sub-continent, The civilization of sub-content before Islam, The Political, Social & Moral Impacts of Islamic Civilization on sub-continent, Academic, Intellectual, Social & cultural Impacts of Islam on the World..

HS 209 ETHICAL BEHAVIOR (Alternate Course for Non-Muslim Students)

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

Ethical Theories: History of Ethics: Greek Ethics, Medieval, Modern Ethics, Basic concepts of right and wrong: good and evil, Utilitarianism, hedonism, self-realization: self-realization: egoism, intuitionism, 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 publishment

EL 302 ANALOG INTEGRATED CIRCUITS

Review: Review of MOS device physics and MOS amplifier circuits.

Integrated Circuits: Introduction to IC processing for Bipolar and MOS Transistors integrated circuits, Integration of other circuit elements and devices.

Feedback: General consideration of feedback circuits, feedback topologies.

Operational Amplifiers: One and Two-stage CMOS Op Amps, input common mode range, voltage gain, and slew rate, The 741 Op-Amp circuit, dc and ac analysis.

Bandgap References: general considerations, Temp independent references, PTAT current generation.

Phase-Locked Loops: Basic PLL topology, dynamics of simple PLL,

The practical work will be based on the above course.

EL 303 DIGITAL INTEGRATED CIRCUITS

MOS Inverter Circuits: Voltage transfer Characteristics, Noise Margins, NMOS as load device, Pseudo NMOS and CMOS Inverters.

Static MOS Gate Circuits: CMOS gate circuits, Flip-Flops & Latches

Bipolar & BiCMOS Logic Gates: TTL, ECL & Current Mode Logic, BiCMOS Logic Gates.

High Speed CMOS Logic Design: Switching time analysis, load capacitance, Gate Sizing, Optimization.

Transmission gate and Dynamic Logic: Pass Transistor, CMOS Transmission gate Logic, Dynamic D- Latches, Domino Logic

Semiconductor Memory Design: Memory Organization, Address Buffers & Decoders, Static RAM Cell Design, SRAM Column I/O Circuits.

Interconnect, Power Distribution & Timing Considerations: Interconnect RC Delays, Interconnect coupling Capacitances, Power Distribution Design, Clocking and Timing Issues

The practical work will be based on the above course.

EL 343 POWER ELECTRONICS

Introduction and scope of Power Electronics:

Solid state devices used as switches in power electronics, Power diodes, Power transistors, Power MOSFETS, Thyristors, Triacs, Diacs, Characteristics of GTO, RCT, etc. Series and parallel operation of SCR, LASCR, Thyristor turn on, Integral cycle control and phase angle control, Elementary and advanced firing schemes, Sequence and close loop control.

Thyristor Commutation: Self commutation, Impulse commutation, Series capacitor commutation, Parallel capacitor commutation.

Uncontrolled and Controlled Rectifiers: Single phase, Three phase, Semi converter, Full converter, Dual converter; analysis & performance, Parameters as harmonic factor, Utilization factor, Power factor, Distortion factor, etc. Rectifiers with purely resistive, highly inductive and RL loads, AC voltage controllers.

DC Chopper: Principle, Step-up and Step-down operation, Buck regulator, Boost regulator, Buck-boost regulator, Cuck regulator, Choppers using thyristors.

Protection Analysis: Over voltage, Over current, di/dt & dv/dt protection, Heat sinks.

Inverters: Principles, Half bridge, Full bridge inverters, Constant phase width modulation,VariablePWmodulation, SinosoidalPW modulation, Modified SPWM.

Electronic Power Supplies: Design and analysis of regulated Power supplies, Switch mode power supplies, uninterrupted power supplies.

The practical work will be based on the above course.

EL 304 INDUSTRIAL ELECTRONICS

Introduction: Industrial world, measurement and accuracy, control system concept, preventive maintenance, safety fundamentals.

Signal Conditioning and Data Communication: Voltage to current conversion and current to voltage conversions, filtering, Industrial Communication standards and practices.

Process Control Systems: On-off control system, proportional control system, proportional and integral control system, PID control system.

Programmable Logic Controllers (PLC): Basic controller operation, hardware components, CPUs, addressing, memory organization, PLC programming.

Microcontrollers: Internal Architecture, addressing modes, data movement instructions, control instructions, microcontroller programming, hardware interfacing.

Motor Control Systems: Braking dc motors, speed control of dc motor, stepper motor, braking ac motor, speed control of ac motor.

Introduction to Robotics: Introductory aspects of robotics, homogeneous transforms, robot arm kinematics, robot configurations, inverse kinematics, robot arm dynamics, robot control, trajectory planning, work-space considerations, obstacle avoidance.

Overview of SCADA and DCS: Definitions, Architecture, Hardware specifications, working principles, communication mediums for a telemetry system.

The practical work will be based on the above course.

EL 386 INTRODUCTIONS TO BIO MEDICAL ENGINEERING

Bio Chemistry: Physio-chemical phenomena & its importance in Biochemistry, Chemistry & metabolism of carbohydrates, Lipids, Proteins, Vitamins, Hormones, Enzymes.

Bio Physics: Biophysics of neural spike, Nervous system, Radiation and Radiobiology, Origin of Bio-potentials, Electrocardiograms and Electric shocks, Bioenergetics.

Physiological Processes: Introduction to Physiology, Cardiovascular, Respiratory, Renal and digestive Physiology, Nervous system and muscle function, Special senses.

Bio Instrumentation: Introduction to Biomedical Instrumentation, Measurement of Cardiovascular system and Respiratory system, Noninvasive diagnostic instrumentation, Biotelemetry, X-ray and Radioisotope instrumentation, Electrical safety of medical equipment.

Bio Materials: Properties of biological materials, Implant materials - Metal, ceramic and polymeric material, Corrosion, Biomechanics and bio-compatibility.

The practical work will be based on the above course

EE 312 CIRCUIT THEORY-II

Matrix Analysis: Introduction and review of matrix theory, Determinants and matrix inversion, Systematic formulation of network equations, Loop variable analysis, Node variable analysis, State variable analysis, Formulation of state

equations, Source transformations, Duality.

Elementary Time Functions: Introduction to singularity functions, Impulse function & response, Unit step function & response, Ramp function, Exponential function & response, Analysis of networks by Laplace transformations, Review of the Laplace transformation, Application to network analysis.

Two Port Network: Introduction, Characterization of linear time invariant, two ports by six sets of parameters, Relationship among parameter sets, Interconnection of two ports.

Large Scale Network: Topological description of networks, Basic definition and notations, Matrix representation of a graph, State space representation, Tellegin's theorem.

Networks Functions and Frequency Response: The concept of complex frequency, Transform impedance and transform circuits, Network functions of one and two ports, Poles and zeros of network functions, Restrictions on poles and zeros of transfer function, Magnitude and phase, Complex loci, Plots from the plane phasors.

Fourier Transform: Fourier transforms applications in circuit analysis in relation to frequency and time domain functions.

The practical work will be based on the above course.

TC 391 COMMUNICATION SYSTEMS - I

Introduction: Fundamental terms and definitions, Information, Message, Signal, Analog and digital signals, Elements of communication systems, Modulation and coding, Need for modulation, Coding methods and benefits.

Signals and Spectra: Methods of signal representation, Time and frequency domain, Mathematical representation of signals, Fourier series and Fourier transform, Power in a signal, Parseval's power theorem, Rayleigh energy theorem, Properties of Fourier transform, Convolution of signals, Some specific signals types as impulse step and signum functions.

Signal Transmission and Filtering: Linear time invariant systems, Impulse response and superposition integral, Transfer function, Block diagram analysis, Distortion and equalizers, Transmission loss and repeater, Ideal and real filters quadrature filters and Hilbert transform, Correlation and spectral density.

Probability and Random Variables: Probability functions, Probability models and distributions, Statistical averages.

Random Signals and Noise: Random process, Ensemble and time average, Stationary and ergodic process, Noise, Thermal noise, White noise and filtered noise, Noise equivalent BW, Analog base band transmission.

Linear Modulation: Band pass systems and signals, AM, DSB, SSB, VSB, Power in modulated signals modulator, Balanced modulator, Switching modulator, SSB generation, Demodulators, Synchronous detection, Homodyne detection, Envelope detection.

Transmission Lines: Fundamentals of transmission line, Theory of radio frequency, Basic theory of wave guide, Transmitting and receiving antennas, Channel characteristics.
The practical work will be based on the above course.

CS 305 COMPUTER ARCHITECTURE & ORGANIZATION

Introduction to Computers: Evaluation of computers, Hardware and firmware, Computer software - Computer programming, Operating system, Organization and architecture, Structure and functions, Types of computers.

Computer Interconnection Structures: Computer components, Computer function, Interconnective structure, Bus interconnection, Computer instruction set, Op code encoding, Addressing modes, Instruction types - Data transfer instructions, Arithmetic instructions, Logical instructions, Program control instructions, System control instructions, I/O instructions, Reduced instruction computers - RISC assignment, Rise-Pipelining.

Execution Unit: Register sections - General register design, Combinational shifter design, Flag register, Address register, ALU design, BIT slice processor, Multiplication of signed and unsigned integers, Division of unsigned integers, Coprocessors, Intelligent monitor interface, Interface using special bus signals and instructions, Coprocessor interface using special instructions.

Control Unit: Basic concepts, Design methods - Hardwired control design, Micro programmed control unit.

Memory Organization: Characteristics of memory systems, Main design;, Popular electromechanical memory devices, Memory hierarchy; Cache memory, Associative memory, Virtual memory, Memory management concepts.

Input/Output: Basic concepts, Program I/O, Standard I/O versus Memory mapped I/O, Unconditional & conditional programmed I/O, Interrupt I/O - Basic concepts, Main features of interrupt I/O, Direct Memory Access, I/O Processor.

Operating Systems: Operating system overview, Scheduling, Memory management, Recommended reading.

Fundamentals of Parallel Processing: Parallelization in conventional computers, General classification of computer architectures, Array processors - Systolic arrays, Wave front array Processors, Pipeline processing - Basic concepts, Arithmetic pipelines, Instruction pipelines, Multiprocessors - Single bus, Multi bus, Crossbar, Multiple memory, Data flow computer systems.

The practical work will be based on the above course.

MT 331 PROBABILITY AND STATISTICS

Statistics: Introduction, Types of data and variables, Presentation of data, Objects, Classification, Tabulation, Frequency distribution, Graphical representation, Simple and Multiple Bar diagrams, Sartorial and Pie diagrams, Histograms, Frequency polygons, Frequency curves and their types.

Measures of Central Tendency: Statistical averages, Median, Mode, Quartiles, Range moments, Skewness, Quartile deviation, Mean deviation, Standard deviation, Variance and its coefficients, Practical significance in related problems.

Curve Fitting: Introduction, Fitting of a first and second degree curve, Fitting of an exponential and logarithm curves, related problems, Principle of least squares, Second order statistics & Time series not in bits details.

Simple Regression and Correlation: Introduction, Scatter diagram, Correlation and its coefficient, Regression lines, Rank correlation and its coefficient, Probable error, related problems.

Sampling and Sampling Distribution: Introduction, Population, Parameter and statistics, Objects of sampling, Sampling distribution of mean, Standard errors, Sampling and Non-sampling errors, Random sampling, Sampling with and 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 tail and two tails tests, Application in related problems.

Probability: Basic concepts, Permutation and combination. Definitions and Laws of probability, Conditional probability, Baye's rule, Related problems and practical significance.

Random Variable: Introduction, Discrete and continuous random variables, Sequences and transformations, Probability distribution, Probability density function, Mathematical expectation, Moment generating functions, Markove random walks chain and related problems.

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

EF 303 APPLIED ECONOMICS FOR ENGINEERS

Introduction: Basic concepts, Engineering economy defined, Measures of financial effectiveness, No monetary values.

The Economic Environment: Consumer and producer goods, Measures of economic worth, Price, Supply, Demand Relationship.

Selection between Alternatives: Present economy, Selection among materials, Techniques designs etc. A basic investment philosophy, Alternatives having identical lives, Alternatives having different lives.

Value Analysis: Important cost concepts, Cost-benefit analysis feasibility studies, Value analysis in designing and purchasing.

Linear Programming: Mathematical statement of linear programming problems, Graphic solution, Simplex procedure, Duality problem.

Depreciation and Valuation: Types of Depreciation economic life, Profit and interest, Returns to capital, Discrete and continuous compounding, Discounting sinking fund problems.

Capital Financing and Budgeting: Types ownership, Types of stock, Partnership and joint stock companies, Banking and specialized credit institution.

Theory of Production: Factors of production, Laws of Returns, Break-even charts and relationships.

Industrial Relationship: Labor problems, Labor organizations prevention and settlement of disputes.

HS 304 BUSINESS COMMUNICATION & ETHICS

Business English: Writing formal and business letters and memos: Drafting notices and minutes; Theoretical knowledge and comprehension of contracts and agreements; preparing proposals and conducting and writing research project reports. Participating in seminars and interviews, and writing and presenting conference papers; Solving IELTS type papers.

Engineering Ethics: Introduction, Objective of the course, Definite of (a) a code (b) ethic, Defining needs for a code of ethics, Need for a code of ethics, Need for a code of ethics, For who and why, Review of Code of Ethics of international engineering and other bodies, Review of Code of Ethics of other professional bodies of Pakistan, Comparing/Contrasting, Review of PECs Codes of Ethics. Code of Conduct, Comparison b/w PEC's Codes & of similar International bodies.

EL 401 ELECTRONIC ENGINEERING PROJECT

Final year students will be required to consult the Chairman of Electronic Engineering Department regarding the offering of various projects in the department. The student or group of students will be assigned the project by teacher concerned and will carry out the assignment as required and directed by the teacher. At the end of the academic session, they will submit a written report on work of their project to the Chairman, preferably in the typed form. Students will be required to appear before a panel of examiners for oral examination.
The Project will be of the following scopes: A detailed theoretical study of some problem in an area related to Electronic Engineering. This may be of investigative research nature or it may be laboratory research oriented.

EL 433 SOLID STATE DEVICES

Quantum Mechanics: Probability and uncertainty principle, The Schrödinger wave equation, Quantum mechanical tunneling.

Semi Conductor Materials and Crystal Properties: Energy bands and charge carriers in Semi conductors, Carrier statistics, Drift, Excess carriers and diffusion.

The PN Junction and Junction Diodes: Equilibrium conditions, Forward and reverse biased junction, Reverse breakdown, Metal semiconductor junctions, Transient response, Hetero junctions, Switching diodes, Tunnel diode and photodiode.

Bipolar Junction Transistor: Charge transport in bipolar junction transistor, Minority carrier distribution and terminal currents, The coupled diode model.

Field Effect Transistors: JFET Pinch-off, Gate control and I/V characteristics the GaAs MESFET, MOS capacitor, Threshold voltage, Volt-Ampere relationship of MOSFET.

The practical work will be based on the above course.

EL 484 OPTO ELECTRONICS AND MICROWAVE SYSTEMS

Light: Historical background, the nature of light, Basic laws of light, Polarization, Interference, Diffraction, Units of light.

Optical Fiber: Propagation of light in dielectric, Propagation of light in planar dielectric waveguide, Optical fiber waveguide, Wave propagation in optical fiber, Types of optical fiber, Optical fiber bandwidth calculation, Attenuation in optical fiber, Fiber material and fabrication.

Semiconductor Light Sources: Light emission in Semiconductor, Light emitting diodes and Types of Light Emitting Diodes (LEDs), Spectral characteristics, Modulation capabilities and conversion efficiency, LED drive circuit, Stimulation emission in semiconductors, Lasering Conditions in semiconductors, Semiconductors Laser Diodes (SLDs), Types of Semiconductor Laser Diodes, Spectral and output characteristics, Semiconductors Laser Diodes drive circuits.

LASER: Emission and absorption of radiation, The Einstein relation, Absorption of radiation, Population inversion, Optical feedback, Threshold condition, LASER losses, Population inversion and pumping threshold conditions, LASER modes, Classes of LASER, Single mode operation.

Optical Transmitter: Photo detection in semiconductors, Semiconductor photodiodes, Responsivity of photodiodes, PIN photodiodes, Avalanche photodiodes (APDs), Photodiode noise considerations, Optical receivers and receiver design, Measurement and prediction of receiver sensitivity.

Microwave Devices: Transistors, Varactors, Step recovery diodes, Multipliers, Parametric amplifiers, Tunnel diodes, Negative resistance amplifier, Gunn effect, Avalanche effect diode and other microwave diodes, Klystron and Magnetron and traveling wave tube.

The practical work will be based on the above course.

EL 407 VLSI SYSTEM DESIGN

Introduction: Introduction to semiconductor industry and market trends, Moore's Law

Modeling of passive elements in IC: Modeling of parasitic and interconnect resistance, capacitance and resistance in VLSI design.

Nanotechnology design considerations: Characteristics of short channel transistors in deep submicron technology and secondary effects in MOS

transistors, latchup effect, mobility degradation, threshold voltage variation, substrate effect

Layout of digital circuits: Design rule check, electrical rule check, grid structure placement of transistors, filler cells, Eulers graph, stick diagram, folding of transistors.

Layout of analog circuits: ESD protection diodes, guard rings, resistors and capacitor structures.

HDL: Programming in Verilog.

Dynamic family logic circuits: Advantages of dynamic circuits, domino logic family, TSPC circuits.

VLSI Architectures: Half adder, full adder, Carry ripple, carry look ahead, carry save, binary tree Adder structures, Multipliers.

The practical work will be based on the above course.

TC 492 COMMUNICATION SYSTEMS - II

Exponential CW Modulation: Frequency and phase modulation, Bandwidth criteria, Generation methods, Receivers, De-emphasis and pre-emphasis filtering.

Pulse Modulation and Digital Modulation: Sampling theory, Ideal sampling and reconstruction, Aliasing, PAM, PWM, PPM, TDM, PCM, DPCM, ASK, PSK, FSK, Multi-level signaling.

Telephony: Modern telephone systems, Transmission aspects, System organization, Distribution system, Electromechanical and electronic exchanges, EPABX, Mobile phones.

Television: Scanning format of video signal, Block diagram of B/W receiver, Transmitter, Color TV fundamentals, PAL and NTSC systems.

Satellite Communication: Introductory remarks and historical C background, Orbital mechanics, Locating, Satellite in orbit and w.r.t. earth, Look angles and their determination, Effect of earth's oblateness, Sun and moon, Orbital effect in communication system performance, Transponders, Reliability, Low orbit earth satellites. Multi access formats.

Information Theory: Information contents in message, Units of information, Source coding, Entropy and information rate, Compact codes and channel capacity.

Error Detection and Correction: Linear block encoding, Humming codes, Pulse code, Pre codes and Hoffman codes etc, Automatic repeat request system (ARQ).

Microwave Tubes and Circuits: Microwave triode, Klystron types.

Semiconductor Microwave Devices: Transistors, Varactors, Gunn effect.

The practical work will be based on the above course.

EE 493 DIGITAL SIGNAL PROCESSING

Relationship between sampling frequency and Shannon's theorem, Continuous time and discrete time signals, Z-transform, Inverse Z transform, Discrete Fourier transform, Fast Fourier transform, Elements of FIR and IIR filter design, Filter structures, FFT techniques for high speed, Convolution, Windowing process, Aliasing error its reduction, Quantization effects.

The practical work will be based on the above course.

CS 410 MICROPROCESSORS AND ASSEMBLY LANGUAGE

Introduction to the Microprocessor: The evolution of the microprocessor, Basic microprocessor architecture, Memory and the microprocessor, The programming model, Real mode memory addressing, Protected mode memory addressing, Data formats, The instruction set.

Addressing Modes: Data addressing modes, Register addressing, immediate addressing, direct data addressing, Base-plus-index addressing, Register relative addressing, Base relative-plus-index addressing, Scaled index addressing, Program memory addressing modes and Stack memory addressing.

Data Movement Instructions: MOV revisited, PUSH/POP, Load-effective address, String data transfers, miscellaneous data transfer instructions, Segment override prefix, and Assembler details.

Arithmetic and Logic Instructions: Addition, Subtraction, Comparison, Multiplication and Division, BCD and ASCII arithmetic, Basic logic instructions, Shifts and rotates, String comparisons.

Program Control Instructions: The jump group, Procedures, Introduction to interrupts Machine control and miscellaneous instructions.

Programming the Microprocessor: Modular programming, Using the keyboard and video display, Data conversion, Disk files, Hooks.

Memory Interface: Memory devices, Address decoding, Memory interface of microprocessors, Dynamic RAM.

Basic I/O Interface: An introduction to data communications, Parallel I/O, Serial communications, The serial interface and the UART, Serial communication lines modems, I/O port address decoding, The programmable peripheral interface, The 8279 programmable keyboard/display interface, 8251A programmable communication interface, 8254 programmable interval timer, Analog-to-digital (ADC) and digital-to- analog converters (DAC).

Basic Interrupts: Basic interrupt processing, Hardware interrupts, Expanding and interrupt structure, 8259A programmable interrupt controller, Real time clock.

The Microcontroller: Single-chip microprocessor, An introduction to microcontrollers, The 8051 internal RAM and registers, The 8051 interrupts system, The 8051 instruction set, Other microcontrollers on the 8051 family.

Developing Microprocessor-Based Products: An introduction to the design process, preparing the specification, developing a design, Implementing and testing the design, Regulatory compliance testing and Design tool for microprocessor development.

The practical work will be based on the above course.

CS 418 COMPUTER COMMUNICATION NETWORKS

Markov chains and queuing theory, Open & closed networks of queues, Priority queuing, Scheduling, Performance models of communication networks, Network design, Protocols, Evaluating circuit and data flow graph, Routing, Local Area Networks, Satellite protocols, Broadcast networks, Ring networks.

Investigative practical laboratory work of research nature in the area of Electronic Engineering.

The practical work will be based on the above course.

MT 442 NUMERICAL METHODS

Error Analysis: Types of errors (Relative, Absolute, Inherent, Round-off, and Truncation) Significant digits and numerical instability, flow chart, Use of any computation tool to analyze the Numerical solutions.

Linear Operations: Functions of operators, Difference operators and the derivative operators, identities.

Difference Equations: Linear homogenous equations and non-homogenous 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 solutions of linear equations (Gauss Elimination, Gauss-Jordan Elimination, Triangularization, Cholesky, Jacobi and Gauss-Seidel).

Interpolation and Curve Fitting: Lagrange, Newton, Hermit, Spline Least squares approximation (Linear and non-linear curves).

Numerical Integration and Differentiation: Computation of integrals using trapezoidal rule, 1/3rd 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.

EE 474 FEEDBACK CONTROL SYSTEMS

Introduction: Introduction to control systems, Examples and classifications, Feedback and its characteristics, Nature and representation of control system problem, Block diagram fundamentals, Terminology of block diagram for a feedback control system, Block diagram representation of various control systems.

Linear Systems and Differential Equations: Methods of writing differential equations of various physical systems such as static electric circuits, Mechanical translational and rotational systems, Thermal systems, Hydraulic linear and rotational transmission systems, Electromechanical dynamic systems DC and AC speed control systems.

Time-Response of Linear Systems: Types of standardized inputs to linear systems, Steady state response and transient response of systems to standard inputs, Response of second order systems time response specifications.

Laplace Transforms: Definition, Derivation of Laplace transforms of simple functions, Laplace transform theorems, Transformations of differential equations of physical systems, Inverse transformation techniques, Stability, Routh's stability criterion.

Block Diagram Algebra: Transfer functions of physical systems, Canonical

and unity feedback forms of control system, Block diagram, Block diagram reduction techniques, Signal flow graph algebra, Block diagram reduction using signal flow graphs.

Control System Characteristics: Classification of feedback systems by type, Analysis of system types, Error coefficients, Error constants, Sensitivity.

Root Locus: Introduction, Rules for construction of root locus, Qualitative analysis of root locus, The spirule, Analysis of performance characteristic of systems in time domain, Dominant pole zero approximations, Gain margin and phase margin, Root locus compensation, Phase & gain compensation, Root locus compensation, PID controller.

Frequency Response: Introduction, Transfer function of systems in frequency domain magnitude and phase angle frequency response of plots of closed loop control systems, Correlation of response in frequency and time domain.

Bode Analysis: Introduction to logarithmic plot, Bode plots of simple frequency response functions, Bode plots of type 0, 1 and 2 systems, Phase margin, Gain margin and stability, Closed loop frequency response, Gain factor compensation.

Nyquist Analysis: Introduction to polar plots, Direct and inverse polar plots of type o, type 1 and type 2 systems, Nyquist stability criterion, Phase margin, Gain margin and stability on direct and inverse polar plots.

Performance Analysis of Systems on Polar Plots: M_m and W_w of simple second order system, Correlation of frequency and time responses, Construction of M_m and W_w contours for performance analysis on direct and inverse polar plots, Gain adjustments on direct and inverse polar plots.

Nichols Chart Analysis: The Nichols chart, Decibel magnitude and phase angle plots of type 0, type 1 and type 2 systems, Phase margin, Gain margin.

The practical work will be based on the above course.

Department of Electronic Engineering

Inter Disciplinary Courses

Following courses are offered by the Department of Electronic Engineering to other disciplines in N.E.D. University of Engineering and Technology.

EL 133 ELECRONICS-I

Conduction in Solids: Introduction, Mechanics of conduction, Mobility, Bohr's model for the elements, Energy level diagrams for solids, Conductors, Intrinsic and extrinsic semiconductors, Electron hole pairs in an intrinsic semiconductor, Distribution of electrons and holes in conduction and valence bands, Recombination and lifetime.

Semiconductors and Diodes: Donor and acceptor impurities, Zero biased, Forward biased and reverse biased junction diodes, Junction diode current equations, Depletion barrier width and junction capacitance, Zener and avalanche breakdown, Hall effect, Fabrication of p-n junction diodes.

Electron Emission Devices: Type of electron emission, Thermionic diodes, Volt ampere characteristics, Child Langmuir power law, Gas filled diode, Thermionic Triode, Parameters and characteristics, Tetrode, Pentode and beam power tubes, Parameters and characteristics.

Simple Diode Circuits and Applications: Mathematical and graphical analysis of diode circuits, The ideal and non ideal diodes, Piecewise linear models, Analysis of piecewise linear models of vacuum tube and junction diodes, The half wave rectifier, The inductance filter, The inductance capacitance filter circuits, Zener and gas diode, Voltage regulator circuits, Clipping and limiting circuits, Clamping and DC restorer, Voltage doubler circuits.

Bipolar and Field Effect Transistors: Transistor biasing and thermal stabilization, The operating point, Bias stability, Collector to base bias, Fixed bias, Emitter feedback bias, Stabilization for the self biased circuits, Field effect transistors, Basic principles and theory, Types, FET characteristics, Different configurations, Common gate, Common source and common drain, The FET, Small signal model, Parameters, Biasing of the FET.

Amplifier Circuits: Introduction to "h" parameters, Hybrid model for transistor, Elementary treatment, Low frequency transistor amplifier circuits, Stage cascade LF amplifier, The high frequency transistor amplifier circuits, H-F-H model, Common base, Short circuit frequency response, Field effect, Transistor used as an amplifier, Untuned amplifiers, Low frequency response of an RC coupled stage, Cascade CE transistor stage, Large signal power amplifier, Class A operation, Transformer coupled AF amplifiers, Push pull amplifiers, Tuned amplifier, Single tuned and double tuned, Introduction to wideband amplifier.

Feedback Amplifiers and Oscillators: Basic principles of feedback, Positive and negative feed back, General characteristics of negative feedback amplifiers, Voltage series feedback, Current series feedback, Current shunt and voltage shunt feedback, A general form of oscillator circuit, Crystal oscillator, Frequency stability, Negative resistance in oscillator.

The practical work will be based on the above course.

This course is offered in F.E. (Computer and Information Systems) degree program.

EL 134 BASCIC ELECTRONICS

Semiconductors and Diodes: Donor and acceptor impurities, Zero biased, Forward biased and reverse biased junction diodes, Junction diode current equations, Depletion barrier width and junction capacitance, Zener and avalanche breakdown, Hall effect, Diffusion Capacitance.

Power Supply Circuits: Half wave and full wave rectification, Smoothing capacitor and filters, Ripple, Regulation and regulated power supplies.

Bipolar and Field Effect Transistors: Bipolar and FET principles, Basic circuit configuration, Voltage, Low frequency and high frequency small signal models, h-pattern bandwidth, Introduction to amplifier coupling and feedback.

Oscillators: Principle of oscillation, Transistor and IC oscillators, Stability in oscillation.

The practical work will be based on the above course.

This course is offered in F.E. (BCSIT) and F.E. (Software Engineering) degree program.

EL 102 BASIC ELECTRONICS

Historical Evolution of Electronic Devices

Solid State Theory: Atomic Structure of elements, Energy Band diagram for Solids, Intrinsic and Extrinsic Semi-conductors, Electron Hole Pairs, Distribution of Electrons and Holes in a Semi-conductor.

Diode & Its Applications: Diode, PN junction Diode, Forward, Reverse characteristics of a Diode. Ideal Diode, Practical Diode, Equivalent circuit of a Diode, Current Equation of a Diode, Diode as a switch, Diode as a rectifier, Diode as Clipper, Diode as Clamper, Diode in gating circuits, Breakdown Diodes, Voltage Regulator.

Transistors: Junctions Transistors, Construction and Operation, Static characteristic, Transistors configurations, DC Biasing of a Transistor, Types of Biasing, Biasing Techniques, DC circuit analysis, Load Line, Operating Point and bias stabilization, Transistor as Amplifier, Introduction to Field Effect

Transistor, JFETS and MOSFETS.
The practical work will be based on the above course.

This course is offered in F.E. (Telecommunication) degree program.

EL 231 ELECTRONIC DEVICES AND CIRCUITS

PN Junction Diode: Ideal diode, Terminal characteristics, Small signal model, Analysis of diode circuits, Applications.

The Bipolar Junction Transistor: Structure, Transistor as amplifier, Transistor biasing, Small signal models, Single stage BJT amplifier configurations, Single stage mid frequency amplifier, Analysis and design, Feedback in amplifiers, Multistage amplifiers, High frequency response of single stage amplifier, Bipolar transistor as switch.

The Metal Oxide Semiconductor Field Effect Transistor: Structure and physical operation of MOSFET, Current voltage characteristics of MOSFET, The depletion type MOSFET, The junction field effect transistor, FET circuits at DC, FET biasing, FET as amplifier and basic configuration of single stage amplifiers, Frequency response of common source amplifier, FET switches.

The practical work will be based on the above course.

This course is offered in S.E. (Electrical) degree program.

EL 232 ELECTRONICS

Conduction in Solids: Introduction, Mechanics of conduction, Mobility, Bohr's model for the elements, Energy level diagrams for solids, Conductors, Intrinsic and extrinsic semiconductors, Electron hole pairs in an intrinsic semiconductor, Distribution of electrons and holes in conduction and valence bands, Recombination and lifetime.

Semiconductors and Diodes: Donor and acceptor impurities, Zero biased, Forward biased and reverse biased junction diodes, Junction diode current equations, Depletion barrier width and junction capacitance, Zener and avalanche breakdown, Hall effect, Fabrication of p-n junction diodes.

Electron Emission Devices: Type of electron emission, Thermionic diodes, Volt ampere characteristics, Child Langmuir power law, Gas filled diode, Thermionic Triode, Parameters and characteristics, Tetrode, Pentode and beam power tubes, Parameters and characteristics.

Simple Diode Circuits and Applications: Mathematical and graphical analysis of diode circuits, The ideal and non ideal diodes, Piecewise linear models, Analysis of piecewise linear models of vacuum tube and junction diodes, The half wave rectifier, The inductance filter, The inductance capacitance filter circuits, Zener & gas diode, Voltage regulator circuits, Clipping & Clamping circuits.

Bipolar and Field Effect Transistors: Transistor biasing and thermal stabilization, The operating point, Bias stability, Collector to base bias, Fixed bias, Emitter feedback bias, Stabilization for the self biased circuits, Field effect transistors, Basic principles and theory, Types, FET characteristics, Different configurations, Common gate, Common source and common drain, The FET, Small signal model, Parameters, Biasing of the FET.

Amplifier Circuits: Introduction, "h" parameters, Hybrid model for transistor, Elementary treatment, Low frequency transistor amplifier circuits, Stage cascade LF.

The practical work will be based on the above course.

This course is offered in S.E.(Chemical); S.E.(Industrial & Manufacturing) S.E.(Mechanical); S.E.(Textile); S.E.(Materials) and S.E. (Polymer & Petrochemical) degree programs.

EL 235 ELECTRONICS –II

Basic Single and Two Stage Amplifiers: Small signal analysis of CE, CB, CE configuration and CC-CE, CC-CC, CE-CB configuration using hybrid model.

Differential Amplifiers: Emitter coupled pair, DC transfer characteristics of differential amplifier pair, Emitter degeneration, Small signal analysis of differential amplifier.

Current Sources in ICs: Diode biasing scheme, Widler & Wilson current source.

Integrated Circuits: Monolithic and hybrid ICs, Basic processes in IC fabrication, Epitaxial growth, Masking and etching, Diffusion of impurities, Metallization, Packaging, Active devices passive components in IC, Introduction to large scale integration.

Operational Amplifier: Ideal operational amplifier, Elementary analysis of monolithic operational amplifiers.

Logic Families and Gate Circuits: BJT and FET inverters noise margins, Fan out base driver factor, Worst case design, Circuit analysis and input output characteristics of saturating logic gate circuits including RTL, DTL, TTL, ECL, and MOSFET, Specifications and comparison of various families, Introduction to merged transistor logic.

The practical work will be based on the above course.

This course is offered in S.E. (Computer and Information Systems) degree programs.

EL 234 AMPLIFIERS AND OSCILLATORS

Amplifier Analysis: Transistor as an amplifier, Hybrid model of a transistor, Small signal analysis, Large signal analysis, Gain calculation of single stage amplifier, cascading, multistage gain calculations.

Classification of Amplifier: Classification of amplifier on the basis of biasing, Class A, Class B, Class AB and Class C amplifier. Push Pull amplifier, Complementary symmetry amplifier.

Classification of amplifiers on the basis of coupling, RC coupled amplifier, Transformer coupled amplifier, Direct coupled amplifier.

Classification of amplifier on the basis of frequency, Audio frequency amplifier, Radio frequency amplifier, Tuned amplifiers.

Feed Back: Feedback concept, Feedback amplifiers, Voltage feedback amplifier, Current feedback amplifier, Effect of feedback on frequency response, Non linear distortion and noise, Series and shunt feedback amplifier.

Practical Amplifiers Consideration: Input and output impedance, Real and apparent gain, Amplifier loading, Impedance matching and cascading.

Oscillators: Basic theory of oscillators, Tank circuit, Damp and undamp oscillations, Phase shift oscillator, Colpitts oscillator, Hartley oscillator, Wein Bridge oscillator.

The practical work will be based on the above course.

This course is offered in S.E. (Telecommunications) degree program.

EL 237 DIGITAL ELECTRONICS

Operational Amplifier analysis and applications

Pulse and Digital Circuits: Design of wave shaping circuits, Sweep circuits, Electronic gates, Sample and hold circuits, Flip Flops, Counters, ADC and DAC, Principles of A/D and D/A converters, Types of charge couple devices.

Introduction to VLSI: Integrated circuit fabrication and circuit simulation. The practical work will be based on the above course.

This course is offered in S.E. (Telecommunication) degree program.

EL 238 DIGITAL ELECTRONICS

RTL and DTL circuits, Transistor-transistor logic, Integrated injection logic, MOS and CMOS, Fan in and fan out, Open collector TTL Gates, Tri state TTL gates, Schottky TTL and emitter coupled logic, Non saturated logic, Combinational circuit design, A/D and D/A conversion.

The practical work will be based on the above course.

This course is offered in S.E. (BCSIT) degree program.

EL 254 PROGRAMMING WITH C-LANGUAGE

The Turbo C Programming Environment: Setting up the Integrated Development Environment, File used in C program development, Use of Integrated Development Environment, The basic structure of C program, 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.

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 and Strings: Arrays, Referring to individual elements of the array, String, String functions, Multidimensional arrays.

Pointers: Pointer overview, returning data from functions, Pointers and arrays, Pointers and strings, Double indirection, Pointers to pointers, Structures, Unions and ROM BIOS.

Turbo C Graphics Functions: Text-mode functions graphics - Mode functions, Text with graphics.

Files: Types of disk I/O, Standard, Input/output binary mode and text mode, Record, Input/Output, Random access, Error conditions, System-level Input/ Output, Redirection.

Advanced Variables: Storage classes, Enumerated data type, Renaming data type with typedef, Identifiers and naming classes, Type conversion and casting, Labels and goto statement.

C++ and Object Oriented Programming: Object oriented programming, Some useful C++ features, Classes and objects, Constructors and memory allocations, Inheritance, Function overloading, Operator overloading.

The practical work will be based on the above course.

This course is offered in T.E. (Medical), T.E. (Bioengineering) degree program.

EL 332 INTEGRATED CIRCUITS

Introduction to IC processing for Bipolar and MOS circuit fabrication, The output stages, Analysis of class A, B and AB amplifiers, Power amplifiers, Push Pull operation, Differential amplifiers, Common and differential mode gains, Analysis of circuits containing ideal Op Amps, Non-ideal performance of Op Amps, The internal structure of general purpose IC Op Amp and its circuit analysis, Large signal operation of Op Amps, Practical Op Amp limitations, Stability and frequency compensation, Non-linear circuit applications like comparators, Schmitt Triggers, Signal generators, Oscillators and wave shaping circuits, Bipolar transistor inverter analysis, Noise margins, TTL gate circuit analysis, ECL gates, The NMOS and CMOS inverter analysis, MOS gate circuits, BICMOS logic circuits.

The practical work will be based on the above course.

This course is offered in T.E. (Electrical) degree program.

EL 335 DIGITAL ELECTRONICS

Operational amplifiers, Analysis and applications, Design of wave shaping circuits, Sweep circuits, Electronic Gates, Multi-stable circuits, Negative resistance circuits, Integrated circuit implementation and fabrication, Circuit simulation, Structured chip design, MOS logic.

The practical work will be based on the above course.

This course is offered in T.E. (Computer and Information Systems) degree program.

EL 343 POWER ELECTRONICS

Introduction and scope of Power Electronics: Solid state devices used as switches in power electronics, Power diodes, Power transistors, Power MOSFETS, Thyristors, Triacs, Diacs. Characteristics of GTO, RCT, etc. Series and parallel operation of SCR, LASCR, Thyristor turn on, Integral cycle control and phase angle control, Elementary and advanced firing schemes, Sequence and close loop control.

Thyristor Commutation: Self commutation, Impulse commutation, Series capacitor commutation, Parallel capacitor commutation.

Uncontrolled and Controlled Rectifiers: Single phase, Three phase, Semi converter, Full converter, Dual converter; analysis & performance, Parameters as harmonic factor, Utilization factor, Power factor, Distortion factor, etc. Rectifiers with purely resistive, highly inductive and RL loads. AC voltage controllers.

Protection Analysis: Over voltage, Over current, di/dt & dv/dt protection, Heat sinks.
DC Chopper: Principle, Step-up and Step-down operation, Buck regulator, Boost regulator, Buck-boost regulator, Cuck regulator, Choppers using thyristors.

Inverters: Principles, Half bridge, Full bridge inverters, Constant phase width modulation,VariablePWmodulation, SinosoidalPW modulation, Modified SPWM.

Electronic Power Supplies: Design and analysis of regulated Power supplies, Switch mode power supplies, uninterrupted power supplies.

The practical work will be based on the above course.

This course is offered in T.E. (Electrical) degree program.

EL 305 Instrumentation & Control

Introduction, instrumentation and control systems terminologies, Open loop and closed loop systems. Mathematical models of physical systems, transfer functions, interaction and non-interaction systems, and development block diagrams tachometers, signals conditioning activator. Transient response of first and second order system, steady state analysis ,transportation lag, dynamic response of a gas absorber and heat exchange .Controller design, P control, I Control ,PID Control, Stability criteria , root locus method, Frequency response of control systems control (bode diagram, Nyquit diagram) Introduction to non-linear, Simulation of Control Systems.

This course is offered in T.E. (Petroleum) degree program.