Price Rs. 100/=

DEPARTMENT OF ELECTRONIC ENGINEERING

SYLLABI OF COURSES
FOR
B.E. (ELECTRONIC ENGINEERING)
DEGREE PROGRAMME
(APPLICABLE FROM BATCH 2017-2018)

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
2017-2018

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

Issued by the
Registrar

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

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B.E. (ELECTRONIC ENGINEERING)
COURSES OF STUDIES
Applicable for Batches: 2017-18

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-111	Functional English	2	0	2	EE-121	Circuit Analysis	3	1	4
EE-120	Basic Electrical Engineering	3	1	4	EL-103	Basic Electronics	3	1	4
MT-171	Differential & Integral Calculus	3	0	3	MT-227	Differential Equations	3	0	3
EL-104	Electronic Engineering Drawing & Workshop	0	2	2	ME-110	Basic Mechanical Engineering	2	0	2
PH-122	Applied Physics	3	1	4	CY-110	Applied Chemistry for Engineers	2	1	3
CS-113	Introduction to Computing	1	1	2	HS-105/ HS-127	Pakistan Studies / Pakistan Studies (For Foreigners)	2	0	2
	Total	**12**	**5**	**17**		**Total**	**15**	**3**	**18**

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-236	Electronic Devices and Circuits	3	1	4	EL-239	Analog Integrated Circuits	3	1	4
EL-255	Programming Languages	2	1	3	CS-216	Data Structure & Algorithms	3	0	3
HS-214	Academic Writing	3	0	3	EE-223	Instrumentation & Measurement	2	1	3
TC-202	Signals and Systems	2	1	3	EE-246	Electrical Machines	2	1	3
EE-382	Electromagnetic Fields	2	0	2	HS-205/ HS-209	Islamic Studies OR Ethical Behavior	2	0	2
MT-272	Linear Algebra and Geometry	3	0	3	TC-201	Digital Logic Design	2	1	3
	Total	**15**	**3**	**18**		**Total**	**14**	**4**	**18**

Third Year									
Spring Semester					**Fall Semester**				
Course Code	**Course Title**	**Credit Hours**			**Course Code**	**Course Title**	**Credit Hours**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
MT-331	Probability and Statistics	3	0	3	EF-304	Occupational Safety & Health	2	0	2
TC-307	Communication Systems	3	1	4	CS-430	Microprocessor Programming & Interfacing	3	1	4
TC-212	Digital Signal Processing	2	1	3	HS-304	Business Communication & Ethics	3	0	3
EF-305	Engineering Economics & Management	3	0	3	EL-344	Power Electronics	3	1	4
EL-301	Industrial Electronics	3	1	4	EE-374	Feedback Control Systems	3	1	4
	Total	**14**	**3**	**17**		**Total**	**14**	**3**	**17**

Final Year									
Spring Semester					**Fall Semester**				
Course Code	**Course Title**	**Credit Hours**			**Course Code**	**Course Title**	**Credit Hours**		
		Th	**Pr**	**Total**			**Th**	**Pr**	**Total**
MT-442	Numerical Methods	3	0	3	TC-421	Telecommunication Networks	3	1	4
EL-408	VLSI Systems Design	3	1	4	EL-xxx	Elective-II	3	1	4
HS-405	Organizational Behavior	3	0	3	HS-403	Entrepreneurship	3	0	3
EL-xxx	Elective-I	3	1	4	EL-401	Electronic Engineering Project	0	6	6
EL-401	Electronic Engineering Project*	---	---	---					
	Total	**12**	**2**	**14**		**Total**	**9**	**8**	**17**

Elective Courses				
Course Code	**Course Code**	**Credit Hours**		
		Th	**Pr**	**Total**
EL-433	Solid State Device	3	1	4
EL-421	Embedded Electronics	3	1	4
EL-422	Robotics	3	1	4
EL-485	Opto Electronics & Microwave Systems	3	1	4

HS-111 FUNCTIONAL ENGLISH

Objectives of the Course

- The course aims at improving the four language skills –listening, speaking, reading and writing.
- The functional aspect of language will be stressed further through development of students' vocabulary and use of grammar.

Speaking and Listening

- Listening actively through the use of skills and sub skills, and in a variety of situations.
- Speaking: Fluency and confidence building through group discussions, role plays and public speaking.

Vocabulary development

- Tips / strategies in vocabulary enhancement
- Practice in vocabulary development

Reading

- Reading skills, Sub skills
- Reading strategies
- Reading practice through variety of reading texts and comprehension exercises
- Précis writing

Writing

- Note taking: Techniques for taking notes from lectures, from books (integrated with listening & reading)
- Process of Writing with practice in pre writing strategies, in revising, and in, editing for grammar.
- Writing well- structured and effective paragraphs, essays and letters (routine communication) using proper writing mechanics. Writing descriptions, narrations, cause and effect, compare and contrast etc.

EE 120 BASIC ELECTRICAL ENGINEERING

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

Voltage and Current Laws: Nodes, Paths, Loops and Branches, Kirchhoff's Current Law, Kirchhoff's Voltage Laws, the single Loop Circuits, the single node-pair circuits, 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, The venin and Norton Equivalent Circuits, Maximum Power Transfer, Delta-Wye Conversion

Capacitors and Inductors: Capacitors, Inductor, Inductance and Capacitance Combination

Basic RL and RC Circuits: The Source-Free RL Circuit, Properties of the Exponential Response, the Source-Free RC Circuits, the Unit-Steps Function. Driven RL Circuits, Natural and Forced Response, Driven RL Circuits.

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

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' Hospitals 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, centoroid, 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 .

EL-104 ELECTRONIC ENGINEERING DRAWING & 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

PH 122 APPLIED PHYSICS

INTRODUCTION: Types of errors and error calculation, Graphical Techniques (Log, semi-log and other non-linear graphs)

VECTORS: Review of vectors, vector differentiation (ordinary and partial differentiation)

MECHANICS: Motion under constant acceleration, Newton laws and their application, frictional forces, Work and Energy Theorem, Law of conservation of energy, Angular momentum .

ELECTROSTATICS AND MAGNETISM: Coulombs Law. Electrostatic potential energy of discrete charges, Continuous charge

distribution, Gauss's Law . Electric field around conductors, Magnetic fields, Magnetic force on current, Hall effect, Biot-Savart Law. Ampere's Law, Fields of rings and coils. Magnetic dipole, Diamagnetism, Paramagnetism and Ferromagnetism .

SEMICONDUCTOR PHYSICS: Energy levels in a semiconductor, Hole concept, Intrinsic and Extrinsic regions, Law of Mass Action, P-N junction, Transistor.

WAVES AND OSCILLATIONS: Simple Harmonic oscillation, Damped harmonic oscillation, Forced oscillation and Resonance, Types of waves and superposition principle, wave speed on a stretched string.

OPTICS AND LASERS: Two-slit interference. Huygens Principle, Single-slit diffraction. Resolving power of optical instruments Principals of laser action, Types of Laser, Application of laser .

MODERN PHYSICS: Planck's explanations of black body radiation Photoelectric effect, Compton effect. Bohr theory of Hydrogen atom, Atomic spectra, Reduce mass, De-Broglie hypothesis , Electron microscope, Atomic nucleus and property of nucleus, Radioactive Decay and Radioactive, Radiation detection instruments, Nuclear reaction and Nuclear Reactors, Nuclear Fusion.

CS-113 INTRODUCTION TO COMPUTING

Number Systems; Digital Logic Gates; Classification of Computer Systems; Structure and Organization of Computers and Computer Systems; Computer Peripherals; Classification of Software Systems; Introduction to Software Development Process; Levels of Programming Languages.

EE 121 CIRCUIT ANALYSIS

AC Circuits: Sinusoids and phasors, phasor relationships for circuits elements, impedance and admitted, Kirchhoff's laws in the frequency domain, impedance combinations

Sinusoidal steady state analysis: Nodal analysis, Mesh analysis, Superposition theorem, source transformation. Theve in and Norton equivalent circuits. Op Amp AC Circuits

AC Power Analysis: Instantaneous and average power, Maximum average power transfers, Effective or RMS value. Apparent power and power factor, Complex power, Conservation of AC power, Power factor correction.

Three-Phase Circuits: Balance three-phase voltages, Balanced Wye-Wye Connections, Balanced Wye-Delta Connections, Balanced Delta-Delta Connections, Balanced Delta-Wye Connections, Power in Balanced systems, Unbalanced Three-Phase Systems.

Magnetically Coupled Circuits: Mutual inductance, Energy in a Couple circuits, linear transformers, Ideal transformers, Ideal autotransformers, Three-Phase transformers

Two-Part Networks: Impedance parameters, admittance parameters, hybrid parameters, transmission parameters, Relationship between parameters, interconnection of networks.

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 .

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 .

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.

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, RungeKutta method of order 4.

2nd and Higher Orders Equations

Special types of II nd 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.

Lap lace 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.

ME 110 BASIC MECHANICAL ENGINEERING

Thermodynamic Properties: Working Substance, System, Pure Substance, PVT Surface, Phases, Properties And State, Units, Zeroth Law, Processed 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 for Steady Flow, System Boundaries, Perpetual Motion of the First Kind.
Energy and Property Thermodynamic Equilibrium, Reversibility, Specific Heats and their Relationship.

Relations: 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, Thermodynamic Processes. Fundamentals of Conduction and Convection, Radiation, Thermal Conductivity, Overall Heat.

Heat Transfer: Transfer Coefficients, Practical Equations.

Thermodynamic Cycles: Cycle Work, Thermal Efficiency Carnot Cycle, Reversed and Reversible Cycles, Most Efficient Engine.

Two-Phase Systems: Two-Phase System of a Pure Substance, Changes of Phase at Constant Pressure, Steam Tables, Superheated Steam, Liquid and Vapour Curves, Phase Diagrams, Rankine Cycle, Components of Steam Power Plant.

Internal Combustion Engines: Otto Cycle, Diesel Cycle, Dual Combustion Cycle, Four-stroke and Two-stroke Engines, and Types of Fuel. Reciprocating Compressors: Condition for Minimum Work, Isothermal Efficiency, Volumetric Efficiency, Multi-Stage Compression, Energy Balance for a Two-Stage Machine with Intercooler.
Introduction To Heating and Cooling Load and its calculations, Comfort Charts, Outline of A.C. Air-Conditioning and Systems, Consideration for Air – Conditioning in Buildings, Natural Ventilation.

Refrigeration: Insulating Materials.

CY 110 APPLIED CHEMISTRY FOR ENGINEERS

Gases: Gas Laws, Kinetic gas equation, Vandar Waal's Equation, Critical phenomenon, liquidification of gases, specified heat (molar heat capacity). Properties of Solution Surface Tension, Viscosity, Osmosis,

Osmotic Pressure, pH-Buffer solution, & Liquids: Spectrophotometer, 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 & protection)

Water & 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 & 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, Class Organic engineering materials, Polymers, Rubbers, Plastics and Paints, Semiconductors and Dielectric materials.

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 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.

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. 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 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.

HS 214 ACADEMIS 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 essays
- Developing an effective essay using thesis statement, adequate development and argument, supporting details, and conclusion
- Writing short reports (technical reports)

TC 202 SIGNALS AND SYSTEMS

LTI Systems: Elementary Continuous-Time and Discrete-Time Signals and Systems, Linear Time-Invariant Systems, Differential and Difference LTI Systems.

Transforms: Continuous time Fourier series, Continuous time Fourier Transform, Discrete Time Fourier Series, Discrete Time Fourier Transform, Discrete Fourier Transform, Laplace Transform, Z-Transform.

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

Lab work: Lab work will be based on above mentioned contents.

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, semiconductors, 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.

MT 272 LINEAR ALGEBRA & 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) .

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

CS 216 DATA STRUCTURES AND ALGORITHMS

Introduction and classification of Data Structures; Basic operations; Classification of Algorithms, Classification by implementation; Classification by design paradigm . Basics of Complexity of Analysis; Rate of growth of Complexity of Algorithms; Asymptotic notations; Time-Space Tradeoffs .

String Processing-Operations on strings; word processing; Pattern Matching Algorithms
Array-One–dimensional Arrays: Insertion, Deletion; Multi-dimensional Arrays: Matrix Multiplication, Sparse Matrices. Stacks, Queues and Recursion; Basic Concepts and functions; Polish Notation; 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.
Tree; Terminology; Representation in memory; Binary search tree, Heaps; Heap-sort algorithm . Graphs; Terminology; Representation in memory, Traversal Algorithms; Shortest path Algorithms Sorting and searching; Searching and sorting Algorithm; Hashing .

EE 223 INSTRUMENTATION AND MEASUREMENT

General Theory: Classification of instruments. Block diagram of various instrumentation schemes. Performance characteristics of instruments

Measurement of Electrical Quantities: Basics of electromechanical instruments, moving coil and electrodynamometer instruments as ammeter, voltmeter and ohmmeter, Extension of ranges.

Instrument 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

Measurement of resistance by bridge method and meggar , Measurement of Inductance and capacitance. Measurement of dielectric strength of insulators, high voltage surges.

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 transformer (LVDT), capacitive photoconductive and piczo-electric transducers, thermos electric transducers

Measurement of Nonelectrical Quantities: Measurement of temperature, pressure flow strains, thermal conductivity, motion speed and vibrations.

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.

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 (for Non-Muslims)

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

TC-201 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.

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, 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 network, Introduction to design of NAND and NOR Networks, Switching expressions for NAND and NOR Networks, Transient response of combination 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.

Introduction to Verilog HDL and VHDL Lab work:

The Practical work will be based on the above courses.

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.

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.

Analog Communication: Baseband and carrier communication, Linear CW (AM, SSB, DSB, VSB) Modulation and demodulation techniques, modulator and demodulator Circuits, AM and SSb Transmitter 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.

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

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, and Quantization effects.
Design of Digital Filters – General Considerations, FIR and IIR Filters, Techniques of FIR and IIR filter Design .

Multi rate Signal Processing – Down sampling and Up sampling, Decimation and Interpolation.

EF 305 ENGINEERING ECONOMICS & MANAGEMENT

Introduction: Basic Concepts and principles of Economics, Micro- and Macro-economic theory, the problem of scarcity. Basic concepts of Engineering Economy, Financial effectiveness and non-monetary factors

Economic Environment: Consumers and producer goods, Goods and services, Demand & Supply concept. Market Equilibrium, Elasticity of demand, Elasticity of Supply, Measures of Economics 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 once a year; Present Value, Future Value and Annuities concepts, Uniform gradient and geometric sequence of cash flow.

Depreciation and Taxes: Depreciation concept, Economic life, Methods of depreciation, Gain (loss) on the disposal of an asset, Depreciation as a tax shield.

Basic cost concepts and Break Even Analysis: Types of costs and cost curves; Determination of Cost/Revenues. Numerical and graphical presentations. Practical applications, BEA as a management tools for achieving financial/operational efficiency

Linear Programming: Mathematical statement of linear programming problems, Graphical solutions, Simplex method, Duality Problems.
Business Organizations and financial Institutions: Type of ownership, single ownership, partnerships, corporation, type of stocks and joint stock companies, Banking and specialized credit institutions.

Project Management: Integration of Organization Strategy with Projects, Defining the project, developing a network plan, managing risk,

reducing project time, project selection and comparing alternatives techniques scheduling resources:

Introduction to Projection Management and Production Concepts: Basic production function, stages of production, returns to scales, Production lead time, Production rate, capacity, operations, planning and control, order processing, Scheduling, Material requisitions planning, line of balance

EL 301 INDUSTRIAL ELECTRONICS

Introduction: Industrial world, safety, preventive measurements, industrial system components, sensors in detail, actuators in detail, controller's definitions, measurement and accuracy

Data acquisition and communication: V to C and C to V conversion, filters, industrial transmitter and receivers, MICRO CONTROLLER based data system, industrial communication standards and protocols

Process control: why control, on-off control, P control, PI control, PD control, PID control, stability, case study to control motors (actuators)

PLC: Introduction, architecture, I/O s detail, memory detail, programming details, Ladder logic based control programming, interfacing with PLC

SCADA and DCS: introduction, specification, working principle, telemetry system

Robotics: introduction, history, types, transformations, Kinematics, dynamics, trajectory planning, obstacle avoidance, moving robots, case study

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 Pressures, Electrical, Fire, Radiation, Chemical and Material, Noise and Vibration, Computers and Automation related Hazards, Industrial Hygiene and Confined Spaces; Case Studies

Hazards Analysis, Concepts of Risks, Incidents and Accidents, Accidents Prevention and Control, Personal Protective Equipment, Management Responsibilities, Accident Causation, reporting and Investigation; Case Studies.

Developing and maintaining Codes, Standards and Regulations, ISO Standards 14001 and 45001/BS OHSAS 18001

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 Function, Addressing Modes, Instruction Set Architecture: (Data Transfer Instructions, Arithmetic & logic instructions, Branch instruction), Assembler Directives, Macros, Procedures, Instruction Encoding, Bus Cycles, Reset Circuit, Clock generation circuits, Wait states, Memory interfacing, Memory Speed Requirement, I/O Interfacing, Programmable Peripheral Interface, Programmable interval Timer, Programmable interrupt Controller, Microprocessor System Design, Recent Microcontroller Architectures.

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 344 POWER ELECTRONICS

Introduction and scope of power electronics: Solid state devices used in power electronics, such as power diode, power transistor, power MOSFET, SCRs, DIACs and TRIACs etc. SCRs turn on techniques, elementary and advanced firing schemes of power devices, VTA analysis.

Protection analysis: Safety and importance of protection for power devices, Over voltage/surges/transients (dv/dt), overcurrent/ surges / transients (di/dt), heat sinks and fuse etc.

Uncontrolled and controlled rectifiers: Single phase half wave uncontrolled /controlled rectifiers with R, RL and Pure inductive loads, three phase and semi convertors, full convertors, dual convertor, analysis and performance parameters as harmonic factor, utilization factor, distortion factor and etc., rectifiers with pulley resistive and highly inductive and RL loads.

Introductions to AC Voltage controllers: Single phase unidirectional and bi directional AC Voltage regulators

Thyristors Commutation: Self-commutation, impulse commutation, series capacitor commutation, parallel capacitor commutation and etc.

DC Choppers: Principle of step up and step down choppers with their respective operations, buck regulator, boost regulator, buck and boost regulator, Cuck regulators, choppers using SCRs.

Inverters: Principle of half and full bridge inverters, constant pulse width modulation (PWM), variable PW modulation, SPWM and MSPWM techniques and etc.

Introduction to variable speed drives: Elementary discussion on DC/AC drives, transfer functions with open loop and closed loop control

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.

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.

EL 408 VLSI SYSTEMS DESIGN

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

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 and Domino Logic

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

Interconnect, Power Distribution & Timing Consideration: Interconnect RC Delays, Interconnect coupling Capacitances, Power Distribution Design, Clocking and Timing Issues. Layout of digital circuits

HDL: Programming in Verilog

VLSI Architectures for digital signal processors, adders and multipliers

HS 405 ORGANIZATIONAL BEHAVIOR

Introduction to organizational behavior, Structure and control in organization . Individual and work learning, Stress. Individual differences, Motivation and job satisfaction, Group and work, Group and inter-group behavior . Leadership, Patterns of work. Conflict and consent in work. Organizational culture

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.

TC 421 TELECOMMUNICATION 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

HS 403 ENTREPRENEURSHIP

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.

ELECTIVE COURSES

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.

EL 421 EMBEDDED ELECTRONICS

Integrated Electronics: An introduction to fundamental concepts, principles and techniques for designing integrated electronic systems, which include analog, radio, mixed-signal and digital blocks. Most common integration approaches are given using examples

Sensor enabled Systems: An introduction to sensor enabled systems, with an emphasis on embedded platforms. Areas covered include broad sensor technologies, the physical properties they measure, and how they are used in embedded designs.

Embedded Systems Design Techniques: Introduction to techniques for system design and implementation. Introduction to hardware description languages. Modeling systems with VHDL.

Hardware and Software Algorithms: The logic/FSM and algorithm implementation as Embedded Hardware in a SOC Architecture realized

as ASICs or FPGAs. The implementation methodology will be based on logic and high-level synthesis. Coherent knowledge and practical hints of relevant issues of physical (hardware) architecture design (at printed circuits board level & higher levels) of complex electronic systems.

EL 422 ROBOTICS

Introduction: The topics include Fundamentals of Robotics including definitions, types, uses, history, key components, applications and future developments in the field.

Actuators and Drive Systems: The topic covers Control Components, Embedded Robot Controller, I/O Interface, and PWM Amplifiers, Control Software, Controller Software and Sensor Inputs

Sensors: The topics covered are Basic Sensor based Controls; Plan Strategy.

Robot Mechanisms: Overview and analysis of robot mechanisms.

Planar Kinematics: The topics include Displacements are rotations or translations. Rotation centers. Kinematic mechanisms. Four-bar linkages, Centrodes.

Differential Motion: The final location of the end effecter, but also with the velocity at which the end-effecter moves.

Statics: Energy Method, Hybrid Position-force Control, Compliance, End-effecter Design, Non-holonomic Systems, Legged Robots, Multi-fingered Hands

Dynamics: Computed Torque Control, sesnors-2, computer vision, Navigation.

Force and Compliance Controls: complex tasks, including assembly of parts, manipulation of tools, and walking on a terrain, entail the control of physical environment, Interactions and mechanical contacts with the environment.

EL 485 OPTO ELECTRONICS & MICROWAVE SYSTEMS

Basic Principles of Opto Electronics: Optical rays: Reflection, Refraction and Snell's Law, Total internal Reflection, Diffraction, Mode propagation, Skew Waves, Acceptance angle and Numerical Aperture.

Optical Fiber, Modes of Optical Fiber and Fiber Losses: Modes of Optical Fiber, Step-Index: Multimode Fibers, Graded Index Fiber, Step-Index: Single-mode Fibers. Fiber losses definition, Material losses, Scattering, waveguide and Microbend losses, Dispersion, Intermodal dispersion and Intramodal dispersion.

Physical Operation of LEDs, Laser, Photodiodes: LEDs and its types, modulation capabilities and conversion efficiency, LED drive circuits, Stimulation Emission in Semiconductors, Population inversion and pumping threshold conditions, Laser modes, classes of lasers, single mode operation, Lasing conditions in semiconductors, semiconductors Laser Diodes (SLDs), Types of Semiconductors Laser Diodes, Spectral and output Characteristics, SLD Drive circuits. Photo-detection in semiconductors, Semiconductor photodiodes and its response, PIN and APDs photodiodes.

Power Theorem and Impedance Matching Networks using Lumped Components: Maximum power transfer theorem, Matching network using lumped components (L-matching, pi-matching, T-matching and LL-matching networks)

Transmission Line theory and impedance matching using stubs: The lumped-Element circuit model for a transmission line, wave propagation on a transmission line, the lossless line, Special cases of lossless terminated lines.

Smith Chart: Introduction to Smith Chart, Impedance Smith Chart, Admittance Smith Chart and Combined Impedance and Admittance Smith Chart, Impedance View point (Quarter wave transformer), Generator and Load mismatch.

Microwave Network Analysis: Impedance and Equivalent Voltages and currents, impedance and Admittance Matrices, The scattering Matrix.

Department of Electronic Engineering

Inter Disciplinary Courses

Following courses are offered by the Department of Electronic Engineering to other disciplines

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.

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); F.E.(Food Engineering) and S.E. (Applied Physics) degree programs.

EL 240 ELECTRONIC DEVICES & CIRCUITS

Semiconductor Basics - Conduction, N and P Types;

Diode – Biasing, V-I Characteristics, Equivalent circuits, Diode as full and half Wave Rectifier, Limiting and Clamping Circuits, Zener and Optical Devices, and their applications;

BJTs – Structure, Operation, Characteristics and Parameters, BJTs as amplifier and switch, Biasing Circuits;

FETs – Basics, Characteristics and Parameters, Biasing, FET as amplifiers;

Power Amplifier – their classes and application;

Operational Amplifier - Input modes and parameters, Negative feedback, Bias Current and offset voltage, Open and Closed Loop Response;

Basic Op-Amp Applications – Comparators, Summing Amplifiers, Integrators and Differentiators, Instrumentation Amplifiers

This course is offered in S.E. (Electrical) 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, VariablePW modulation, 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 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. (CS) and S.E. (Industrial Chemistry) degree program.

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.

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

EL 236 ELECTRONIC DEVICES & 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 like CS-CS, CS-CG (Cascode amplifier) etc.

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

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 .

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.

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.

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

EL 104 ELECTRONIC ENGINEERING DRAWING & 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

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

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

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

EL 134 BASIC 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 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) and S.E. (Applied Physics) degree program.

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 go to 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.

This course is offered in F.E. (Applied Physics) 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. Differential amplifiers, BJT and FET, 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 application like comparator, Signal generator, wave shaping circuit . Bipolar transistor inverter analysis, noise margins, TTL gate circuit analysis, ECL gates, The NMOS and CMOS inverter analysis, MOS gate circuits, BICMOS Logic Circuits .

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

EL 231 ELECTRONIC DEVICES & CIRCUITS

PN Junction Diode: Semiconductor theory, PN Junction, Ideal diode, Terminal characteristics, Small signal model, Analysis of diode circuits (using different diode models), Applications (Logic gates, Rectifiers, Clippers, Clampers, Multipliers, Filters), Zener regulators.

BJT: Structure, Transistor as amplifier, Transistor DC Biasing, Types of DC biasing, Small signal Models, Single stage mid frequency amplifier, Feedback in amplifiers

BJT: Multistage amplifiers, High frequency response of single stage amplifier, BJT as a switch

MOSFET: Structure and physical operation, Current voltage characteristics of MOSFET, MOSFET at DC, MOSFET Biasing, MOSFET as amplifier and basic single stage amplifiers, FET switches, Frequency response of common source amplifier, FET switches.

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

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.

This course is offered in B.E. (Applied Physics) degree program.

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, Vectors, 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.

This course is offered in B.E. (Applied Physics) degree program.

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.

This course is offered in B.E. (Applied Physics) degree program.