DETAIL OF COURSES (ELECTRONICS ENGG TECH)

1st Semester

ELH-112	**ISLAMIC STUDIES / PROFESSIONAL ETHICS**	**(Annexure-A)**
ELS-113	**APPLIED MATHEMATICS – I**	**(Annexure-D)**
ELS-123	**APPLIED PHYSICS**	**(Annexure-C)**
ELS-133	**INTRODUCTION TO COMPUTER FUNDAMENTALS**	**(Annexure-H)**

ELT-111 ELECTRONICS WORKSHOP PRACTICES

Objectives:

The student will be able to identify electronic components

The student will be able to test the electronic components and sort faulty and good one.

The student will be able to use different electronic equipment.

The student will be able to read schematic diagram and implement it on bread board & PCB.

The student will be able to trouble shoot and align the various circuits.

Lab Outline:

Familiarization with the Electronic Instruments.

Familiarization with electronic components.

Use of multi-meter to test electronic components.

Use of bread board and circuit lay outs.

Reading Schematic Diagrams and circuit lay outs.

To make Simple electronic circuits and study its function.

To make a simple power supply.

To make an audio amplifier.

To study and verify the truth table of different logic gates using digital IC.

To study different type of transformer and there operation.

To use circuit simulation software such as Proteus and compare it with practical circuit made on bread board.

Use of logic tester to trouble shoot a digital circuit..

To make an SCR Phase control circuit and study waveforms.

To practice soldering and de-soldering on a PCB based project.

Measurement of voltage and frequency with Oscilloscope

Recommended Books:

1. Electronic Circuits: Fundamentals and applications by Mike Tooley.

2. Complete Electronics Self-Teaching Guide with Projects by Earl Boysen and Harry Kybet
3. Electronics Projects For Dummies by Earl Boysen and Nancy C. Muir
4. All New Electronics Self-Teaching Guide (Self-Teaching Guides) by Harry Kybett and Earl Boysen

ELT-124 ELECTRICAL CIRCUIT ANALYSIS

Objectives: On completion of this course the students will be able to:

Understand the concepts of Electrical Circuits with AC & DC sources.

Discuss various concepts of Laws & Theorems used in Electricity & Electronics.

Draw the equivalent circuits and circuit models.

Apply and understand the Resistive, Capacitive and Inductive circuits in series and in parallel combinations.

Determine the steady state and transient analysis of the circuits.

Explain the exponential, sinusoidal excitations and their responses.

Analyze the entire circuit before practical implementation of the network.

Confidently analyze and build simple electric circuits. Identify circuit elements and variables.

Learn different Techniques of Circuit Analysis.

Course Outline:

Introduction to Network Analysis. Importance of Network Analysis in Electrical & Electronics Technology. Laws & Theorems used in Electricity. Ohm's law, Kirchhoff's Laws. Definitions of Branch, Loop, Node, Mesh. Types of Sources. Current Sources and Voltage sources. Dependent and independent sources. Writing linearly independent (KCL and KVL) equations. Elementary network topologies. Nodal and Mesh analysis by systematic application of KVL and KCL. Series and parallel connections of two terminal circuit elements, Resistive, Capacitive and Inductive circuits. Elementary Transient Response of the Circuits. Differential and Integral forms of circuit equations, First-order circuits, Solution of single first order differential equations, second-order circuits, Exponential excitation and transformed networks, Representation of excitations by exponential functions, Driving point impedance and admittance, network theorems, Linear and non-linear networks, Superposition theorem, Maximum power transfer theorem, Thevenin's theorem, Norton's theorem, T-equivalent networks and other passive circuits. Modern approach to analyze the circuits using CAE (COMPUTER AIDED EDUCATION) Software Packages.

Lab Outline:

1. To study the Resistive Circuits Response excited by AC & DC Sources.
2. To Study the Capacitive Circuits Response excited by AC & DC Sources.
3. To study the Inductive Circuits Response excited by AC & DC Sources.
4. To study the RC Circuits Response excited by AC & DC Sources.
5. To study the RL Circuit Response excited by AC & DC sources.
6. To study the LC Circuit Response excited by AC & DC Sources.
7. To study the RLC Circuit Response excited by AC & DC Sources.
8. To study the Transient Response of RC Circuit.
9. To apply Different Theorems (Superposition, Norton, Thevenin's, Max Power Transfer etc) on passive Circuits.
10. To Apply KVL & KCL to analyze the electrical network.
11. To introduce circuit simulation in electrical network analysis.
12. To work on popular CAE Software (Electronic Work Bench, Multisim, PSICE).

Recommended Books:

1. Engineering Circuit Analysis , 7th Edition, by William H. Hayt , Jack Kemmerly , Steve M. Durbin
2. Introductory Circuit Analysis , 12th Edition, By Robert L. Boylestad.
3. Schaum's Outline of Basic Circuit Analysis, 2nd Edition, by John O'Malley.
4. Laboratory Manual for Introductory Circuit Analysis, 12th Edition, By Robert L. Boylestad, Gabriel Kousourou.
5. Desoor and K., "Basic Circuit Theory",. 6. Fitzgerald G. and Higgan botham, "Basic Electrical Engineering" McGraw-Hill

2nd Semester

ELH-122	**PAKISTAN STUDIES**	**(Annexure-F)**
ELS-143	**APPLIED MATHEMATICS –II**	**(Annexure-E)**

ELT-134 ELECTRICAL TECHNOLOGY – I

Objectives: On completion of this course the students will be able to:

1. Understand the concepts of fundamental electrical quantities, Electromagnetism and Electrostatics.
2. Apply and understand the electric and magnetic circuits.
3. Describe the relationship between the line and phase voltage, relationship between line and phase current in three phase circuits of star and delta connections.
4. Explain the construction, working & applications of electrical machines.

5. Familiarization of electric welding and its types and applications.

Course Outline:

D.C Fundamentals: Current, voltage, resistance, Ohm`s law, series and parallel circuits, effect of temperature on resistance, resistivity, work, power, energy, inductance, magnetic circuits, Faraday's laws of electromagnetic induction, Fleming's right hand rule, Lenz's law, production of electromotive force (e.m.f), dynamically and statically induced e.m.f's, self-induced e.m.f and mutual induction, capacitors, capacitance, capacitance in series & parallel circuits, types, charging and discharging of capacitors.

A.C Fundamentals: Generation of alternating current and voltage, equations of alternating current and voltage, wave form, cycle, time period, frequency, amplitude, phase, phase difference, root mean square (RMS) value, average value, form factor, R, L & C circuits, RLC series and parallel circuits, power factor, generation of poly phase voltage, phase sequence, Star and Delta connections, voltage and current in star and delta connections, power factor improvement.

D.C Generator: Constructional details, principle of operation, types, performance characteristics and applications.

D.C Motor: Motor principle, voltage equation, back e.m.f, production of torque, types, characteristics, applications, methods of speed control.

D.C Servomotor: Principle of operation, characteristics and applications.

Induction Motor: Single – phase induction motor, types, characteristics and applications, three – phase induction motor, constructional details, production of torque, speed control.

Single-phase Motor: Types, capacitors start and run motor, repulsion motor, universal motor, shaded – pole motor, A.C series motor.

Transformer: Constructional details, principle of operation, e.m.f equation, phasor diagrams on no-load/on-load, equivalent circuit, regulation, losses and efficiency; methods of cooling, O.C and S.C tests, auto transformers, instrument transformers, three- phase transformers.

Alternator: Constructional details, e.m.f equation, phasor diagram on load, concept of regulation.

Synchronous Motor: Principle of operation, vector diagrams, effect of load excitation, maximum output, method of starting.

Electric Heating: Resistance furnaces and ovens, methods of temperature control, electric arc furnaces and induction furnace, high frequency heating, induction and dielectric heating, applications.

Lab Outline:

1. Determination of Ohm's law.
2. Calculation & determination of RMS, average and peak values of periodic wave forms using oscilloscope.

3. Draw and study phasor diagrams of RL, RC & RLC series/ parallel circuits.
4. Study of star and delta connections.
5. Determination of relationship between line voltage and phase voltage/ line current and phase current in the three- phase star and delta connections.
6. Improvement of power factor by using static capacitors in a given load.
7. Study the constructional features of D.C machines.
8. Determinations of load test on D.C shunt/compound generators.
9. Determination of open circuit characteristics of D.C generator.
10. Study of constant losses of D.C shunt motor by no – load test.
11. Calculation of speed/torque characteristics of D.C motors.
12. Study and connections of servo motors.
13. Study of load test on single phase induction motor.
14. Starting and speed control of single phase, three phase squirrel cage and wound rotor motors.
15. Study and connections of single – phase shaded - pole and repulsion motors.
16. Speed control by supply voltage of universal motor.
17. Study of load test on single- phase transformer.
18. Determination of polarity of a single – phase transformer.
19. Determination of efficiency of a single – phase transformer.
20. Determination of open circuit and short circuit tests on single phase transformer.
21. Study and connection of a three - phase transformer.
22. Study the effect of field excitation on generation of voltage by an alternator.
23. Determination of regulation of three – phase alternator by direct loading.
24. Study the behavior of synchronous motor on the change of excitation.
25. Starting and running of synchronous machines as synchronous motor.

Recommended Books:

1. B.L.Theraja, A.K.Theraja - A text book of Electrical Technology,
2. Edward-Hughes- Electrical Technology.
3. Mehta V.K- Principles of Electrical Engineering and Electronics, S.Chand & Co.
4. Partab - Art and Science of Utilization of Electric Energy: Dhanpath Rai & Sons.

ELT-144 DIGITAL LOGIC TECHNOLOGY

Objectives: The in objective of the course is to provide students:

1. Basic understanding of the Digital Electronics (Digital systems and circuits).
2. Foundation for future studies in microprocessors and microcomputer interfacing.

Course Outline: Number systems & Codes ; Binary, Octal, Hexadecimal number systems and their inter-conversion; Binary Arithmetic (Addition, Subtraction, Multiplication and Division); Error detection and correction; Boolean Algebra, basic theorems and properties of Boolean Algebra, Boolean functions, Canonical and Standard forms; Digital Logic Gates; Various logic families, like TTL and CMOS, working and their characteristics; Combinational Logic Design ; The K-map method, two, three, four and five variable maps ; Sum of products and Product of Sums simplification, NAND and NOR implementation; Ex-OR and EX-NOR functions; MSI circuits: Binary adder and sub tractor, comparators, decoders, BCD-to-Seven segment decoder/drivers, seven-segment displays, encoders, code converters, multiplexers, de-multiplexers; Introduction to Sequential logic, S-R Flip-flops, JK flip-flop, D flip-flop, T flip-flop, master slave flip-flops; Classification of sequential circuits, registers, A to D and D to A converter circuits, Counters; Semiconductor memories, introduction, memory organization, classification and characteristics of memories.

Lab Outline:

1. Verification of truth tables of logic gates
2. TTL & CMOS characteristics
3. Logic family interconnection (TTL to CMOS & to TL)
4. Arithmetic circuits
5. Half adder
6. Full adder
7. Adder/subtractor
8. Combinational logic design using decoders
9. Encoders
10. MUXs & DEMUXs
11. Comparators with gates and ICs
12. Code converters and parity circuits using basic gates
13. BCD to Decimal
14. BCD to 7 segment decoder
15. Flip flop circuits (RS latch, D, JK and Master Slave) using basic gates and ICs
16. Design and verify the operation of shift registers and counters using flip flops and ICs

Recommended Books:

1. Morris Mano, “Digital Design”, Prentice Hall, Latest Edition.
2. R. J. Tocci , N. Widmer, G. Moss, “Digital Systems: Principles and Applications”, Pearson Education, 2013
3. S. Jayant, K. Ahmad, N. Ahmad, “Digital Logic Design: Its
4. T. L. Floyd, “Digital Fundamentals”, 11th Edition, Prentice Hall 2014

ELS-153 COMPUTER PROGRAMMING

Objectives: The main objective of the course is to
Familiarize students with computer processing:

Compile variety of programs in text as well as graphic user interface computer language.

Improve programming skills.

Course Outline:

Basics of C++ programming: constants and variables, keywords, identifiers, data types, variables and their types, Escape sequence, operators and statements.

Decision and control: if statements, if-else-if statement, switch statement, for loop, while loop, do-while loop, nested loops, break statement,

Functions: defining a function, types function, return statement, default argument, local and global variables, standard function and user defined functions, multifunction, arguments pass as reference or as a value.

Arrays: declaration, initialization, arrays and function, multidimensional arrays.

Structures: declaration, initialization, functions and structures, arrays of structure, nested structure, enumerations.

Classes: declaration, initialization, constructors, destructors, inline member function, static class member, friend function, defining and accessing object, arrays of class object, structure and classes, nested classes.

Inheritance: single inheritance, types of base classes, types of derivation, multiple inheritance containers. Overloading: function, operator, binary and unary

Polymorphism: early and late binding, virtual functions, pure virtual function abstract base classes, virtual destructors, virtual base classes, constructor and destructor under inheritance.

Lab Outline:

1. Study the integrated development environment for C++ language
2. Basic structure of C++ program

3. Programming experiment in C++ programming
4. Experiments in C++ to cover operators.
5. Functions, arrays and strings, control and decision, structures, classes, inheritance and polymorphism.

Recommended Books:

1. Lafore R. “Object-Oriented programming in C++” practice Hall latest edition.
2. Schildt. H. “C++ the complete Reference”, McGraw-Hill Latest Edition.
3. Deital D. “C++ how to program”, prentice Hall, Latest Edition

ELT-151 PCB DESIGN AND FABRICATION WORKSHOP

Objectives: The course is aimed at:

To make familiar with PCB design and various processes involved.
To provide in-depth core knowledge in design, performance analysis and fabrication of Printed Circuit Boards.
To provide the knowledge in PCB fabrication process and factors affecting PCB performance

Course Outline:

Introduction to PCB technology, Understanding schematics and symbols PCB Fabrication techniques-single, double sided and multiplayer PCB, Etching, chemical principles and mechanisms, Post operations- stripping, black oxide coating and solder masking, PCB component assembly processes, Specification and Manual routing, Component-placing, Artwork generation Methods - manual and CAD , General design factor for digital and analog circuits Layout and Artwork making for SS, DS and ML Boards Design for manufacturability Specification design standards. Specifying Parts, Packages and Pin Names, The Part list, The Net list, Making Net list Files, Placing Parts, Routing Traces, Adding Text, Plot and Drill Files, PCB Layout, Layer List and Selection Mask, Panning and Zooming, Projects, PCB Elements Board Outline; Parts-Anatomy of a Part, Part list, Editing Parts, Reference Designator; Mounting Holes; Nets, Ratlines and Routing; Nets- Net list; Ratlines; Modifying Traces, Swapping Pins, Importing Netlist; Copper Areas; Text; Solder Mask Cutouts; Groups, Design Rule Checking; Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins, Polylines, Schematic Diagram, Creating the Project, Importing the Netlist File, Drawing the Board Outline, Adding Mounting Holes, Placing Parts, Adding Parts and Editing Nets, Adding Copper Areas, Routing, Nets, Ratlines and Routings, Adding Text, Checking Design Rules, Making Gerber and Drill Files, Fabrication Process and Methodology.

Lab Outline:

1. To identify the various electronic components & form factor.
2. To use bread board for testing & verifying a sample circuit.
3. To draw & read schematic of a sample project.
4. To make a handmade single side PCB.
5. To use some CAD PCB making software, such as EAGLE.
6. To transfer the design on copper laminated sheet by different methods.
7. To make a setup for etching process of a finished PCB Design.
8. To understand masking, labeling, polishing PCB Design.
9. To use automated and manual drilling of PCB board.
10. To use soldering & de-soldering to complete a project.

Recommended Books:

1. Make Your Own PCBs with EAGLE by by Simon Monk
2. Build Your Own Printed Circuit Board by by Al Gibson
3. Designing Circuit Boards with Eagle by Matthew Scarpino
4. Complete PCB Design Using ORCAD Capture and PCB Editor by Kraig Mitzner.

3rd Semester

ELT-214 ELECTRICAL TECHNOLOGY – II

Objectives: On completion of this course the students will be able to: Understand the concepts of Electromagnetism and Electrostatics; Apply and understand the Inductance in simple DC Circuits; Explain the two and three-phase circuits; Describe the relationship between the line and phase voltage, relationship between line and phase current in three phase circuits of star and delta connections.

Course Outline:

Magnetic Circuits and Transformers; Self-Induction, Mutual Induction, Constructional details, principles of operation of emf equation-phasor diagram on load, equivalent circuit, regulation, losses and efficiency; methods of cooling, OC and SC test determination of equivalent circuit; Autotransformers,

DC Generators; Constructional details, principle of operation, performance characteristics and applications;

DC Motors; Production of torque, shunt, series and compound motors, performance characteristics, applications, and methods of speed control;

DC Servomotors; Principle of operation, characteristics and application,

Stepper motors

Fundamentals of Induction Motors

Single phase induction motor: types, characteristics and applications; Three phase induction motor, constructional details, production of torque, **Starters** Star delta and rotor resistance types; Methods of speed control, stator voltage, V/f control; Losses and efficiency; No load and blocked rotor tests;

Alternator& Synchronization

Constructional details, emf equation, phasor diagram on load, concept of regulation; Synchronous motor;

Power Distribution

Power Factor, Power Dissipation, Calculation and Control, Measurements of power and energy in single and three phase system;

Lab Outline:

1. Load test on single phase Transformer
2. Open circuit and Short circuit Test on Single phase transformer
3. Load test on step-up/step-down transformer
4. Speed Control of DC Shunt motor.
5. Open circuit characteristics of DC generator
6. Synchronization and parallel operation of Alternators
7. Load Test on single phase Induction motor
8. Study of stepper and servomotors.
9. To study various type of meters.
10. Measurement of power by 3 voltmeter / 3 ammeter method.
11. Measurement of power in a 3 phase system by two watt meter method.

Recommended Books:

1. Basic Electrical Engineering (2nd Edition): Kothari &Nagarath, TMH
2. Electrical Technology (Vol-I): B.L Theraja& A K Theraja, S.Chand
3. Electrical Engineering Fundamentals: Deltoro, PHI
4. Network Analysis: Valkenburg, PHI

ELT-224 ELECTRONIC DEVICES & TECHNOLOGY

Objectives: After completing this course, the students will be able to understand about:

1. The importance of insulators.
2. To differentiate the conductor and insulator.
3. Working of semi-conductor diode and types of diodes.
4. The commonly used semiconductors and formation of PN Junction.
5. Half wave and full wave rectifier.
6. Construction, working, applications and characteristics of transistors.
7. Construction working and application of field effect transistors (FET's).
8. Working and characteristics of MOSFET.

Course Outline:

Charged Particles, Field Intensity, Potential, Energy, Mobility and conductivity, Intrinsic and Extrinsic semiconductors, Electrons and Holes, Electrical Properties of Ge & Si, Thermocouples, PN Junction as a Rectifiers, Volt Ampere characteristics, Diode Resistance, Breakdown Diode, Junction Diode Switching Timing, Sehottky, zener diode, photodiode, light emitting diode (LED's), varactor diode and tunnel diode, junction Transistor, Transistor current components, Transistor as an Amplifier, Common Base, common collector and common Emitter configuration, CE cut off currents. The CE saturation Region, Integrated circuit Technology, Basic Monolithic Technology, Masking and Etching, Diffusion of Impurities, Transition for Monolithic circuits, Metal Semiconductor contact, Digital operation of a system, OR gate, And Gate, NOT Gate, Exclusive OR Gate, Diode-Transistor Logic (DTL) Gates, Transistor Logic (TTL)Gates, Emitter coupled Logic (ECL), High speed logic, Junction Field effect Transistor, Fabrication of JFET, Metal oxide semiconductor Field effect transistor (MOSFET), MOSFET Inverter, Dynamic MOS Shift Register, RAM, ROM, EPROM, PLD's, Charged Couple devices(CCD), Diode Circuits applications, Half wave, full wave and Bridge rectifier circuits, Capacitor Filters.

Lab Outlines:

1. Characteristics of PN junction Diode
2. Rectifiers-half wave
3. full wave rectification
4. Bridge with and without filter- ripple factor and regulation
5. Clipping and clamping circuits
6. Characteristics of Transistors (CE , CB & CC)
7. Characteristics of FETs & MOSFETs
8. RC Coupled (CE) amplifier using transistors -frequency response characteristics
9. FET amplifier (CS) - frequency response characteristics.

Recommended Books:

1. Microelectronics b Mill-man
2. Floyd
3. Boylsted

ELH- 213 COMMUNICATION SKILLS (Annexure – B)

ELT-233 MICROPROCESSORS

Objective: The main objective of the course is t o teach students:

1. Simplified architecture & Programming Model of 8085, 8600 and 8086 microprocessors and their organization.

2. Hardware Issues such as Power supply, Clock Oscillators, Fan-out. Fan-in , etc.
3. Various Programming Languages to Program Microprocessor.
4. Assembly language and high level language such as C language.
5. Study Hardware & Software Interrupts.
6. Interfacing the microprocessor to the Real Analog world.

Course Outline:

Introduction to microprocessors, microprocessor architecture and programming techniques; structure of 8080/8085 Microprocessors and their organization, pin configuration and their functions, data sheet description, hardware and software interrupts, maskable and non maskable interrupts, 8085 instruction set, programming techniques, addressing modes, Memory Organization & Address Decoding, . Addressing Modes, structure of MC 6800/MC6809 microprocessor and its organization, pin diagram and functions, the 6800 instruction set, programming techniques; interfacing, interfacing with ROM & RAM, interfacing with practical I/O ports (serial and parallel); 8255A programmable Peripheral interface, Serial Communication Interface, Intel Microprocessor used in Personal Computers,, PC Mother board Architecture, single board computers, real world applications.

Lab Outline:

1. Familiarization of 8085 trainer development board hardware.
2. Introduction to Assembly language.
3. Use of Assembler and manual assembling a code.
4. Entering a code on a Microprocessor Development board & Debugging.
5. Study of Microprocessor Internal Registers and Intel Hex file format, Computer aided assembly language program.
6. Use of assembler, linker and simulator.
7. Use of Cross Assembler.
8. To make a Program to Add/Subtract two 8 Bit Numbers.
9. To make a Program to Add/Subtract two 16 Bit Numbers.
10. To make a Program to Multiply /Divide Numbers.
11. To make a Program to read interrupts and dealing ISR.
12. Programming using DMA.
13. Programming examples using PPI.
14. Serial EEPROM, Interface an LED array and 7-segment display through 8255 and display a specified bit pattern/character.
15. Real world interfacing with Sensors.
16. Analog to Digital & Digital to Analog Interfacing.
17. To understand Memory Organization.
18. Use of Logic Analyzer & Oscilloscope to visualize timing diagrams.
19. Use of tools to trouble shoot Microprocessor based boards.

20. Interface the given microprocessor kit to a personal computer through R.S-232C.

Recommended Books:

1. Tokheim R., "Microprocessor Fundamentals", Schuam's Series.
2. Dotty T.L., "Fundamental Principles of Microcomputer Architecture"
3. Bishop R., "Basic Microprocessors and the 6800" ZAKS R., "Microprocessor from Chips to System", SYBEX Inc.
4. The Intel Microprocessors, 8th Edition, By Barry B. Brey.
5. Microprocessors and Interfacing, 2nd Edition, By Douglas V. Hall.
6. Microprocessors and Microcomputers, 5th Edition, By Ronald J. Tocci.

ELT-244 INSTRUMENTATION & MEASUREMENT

Objectives: The main objective of the course is to make students familiar with fundamentals of measurements and instruments, their calibrations and error compensation methods.

Course Outline:

Introduction to electrical measurements – Classification of analog instruments – Galvanometers – vibration, tangent and d'Arsonval type. Principle of operation, construction, sources of errors and compensations in PMMC – Moving iron – Dynamometer and induction type instruments. Extension of ranges and calibration of ammeters & voltmeters.

Power measurement – Voltmeter ammeter method, Electrodynamics wattmeter – Theory, errors and compensation methods – Low power factor wattmeter – Power measurement in poly-phase systems-Energy measurement – Single phase and poly phase induction type energy meter – theory and adjustments –DC energy meter – Testing of energy meters – Calibration of wattmeter and energy meter.

Low Resistance: Kelvin's double bridge and Ductor Ohmmeter method – Medium Resistance: Voltmeter Ammeter method – Substitution method – Wheatstone bridge method v High Resistance: Meager– Direct deflection method – Megohm bridge method – Earth resistance measurement. Introduction to A.C. bridges, Sources and Detectors in A.C. bridges. Maxwell's bridge – Hay's bridge, and Anderson's bridge. Measurement of Mutual Inductance: Heaviside M.I. bridge – Measurement of Capacitance: Schering's bridge – De- Sauty's bridge Measurement of frequency using Wien's bridge. CRO – General purpose and advanced type – Sampling and storage scopes – Signal and function generators – Noise generators – Pulse and square wave generator –Sweep generator, Signal recorders – X-Y recorder – Magnetic tape recorders – Digital recording and data loggers – Basic wave analyzer – Frequency selective and heterodyne spectrum analyzer .

Recommended Books:

1. A Course in Electrical and Electronics Measurements and Instrumentation Sawhney A.K
2. Electrical Measurements and Measuring Instruments Golding. E. W, and Widdis F.C,
3. Electronic Instrumentation Kalsi.H.S
4. Modern Electronic Instrumentation and Measurement Technique Copper. W.D and Hlefrick. A.D

4th Semester

ELH-223 TECHNICAL REPORT WRITING (Annexure- J)

ELT-254 COMMUNICATIONS SYSTEMS AND TECHNIQUES

Objective: The main objective of the course is to teach students the basics of communication systems like modulation both in analog and digital domain, baseband and pass band communication, error probability and some basic concepts related to information theory.

Course Outline:

Introduction to communications systems, random signals and stochastic process, components, signals and channels, sampling, quantization, pulse amplitude modulation (PAM), pulse code modulation (PCM), quantization noise, time division multiplexing, delta modulation. Digital communications: baseband signals, digital PAM, eye diagram, equalization, correlative coding, error probabilities in baseband digital transmission, band pass transmission, digital amplitude shift keying (ASK), frequency shift keying (FSK), phase shift keying (PSK) and quadrature shift keying (QPSK), error probabilities in band pass digital transmission, a case study of digital communication systems. Introduction to information theory: fundamental limits in communications, channel capacity and channel coding, signal compression.

Recommended Books:

1. Communication Systems Simon Haykin and Michael Moher
2. An Introduction to Digital Communications Kurzweil Communication Systems
3. Communication Systems Engineering Proakis and Salehi Title: Communication Systems
4. Modern Digital and Analog Communication Systems B. P. Lathi

ELT-263 CONTROL TECHNOLOGY

Objective: The main objective of the course is to make students understand the basic concepts in control systems, like transfer functions,

systems' stability, gain and phase margins, root locus, observers and compensators.

Course Outline:
Modeling of physical systems using state space, differential equations, and transfer functions, dynamic response of linear time invariant systems and the role of system poles and zeros on it, simplification of complex systems, stability of feedback systems and their steady state performance, Routh-Hurwitz stability criterion, sketching of root locus and controller design using the root locus, Proportional, integral and derivative control, lead and lag compensators, frequency response techniques, Nyquist stability criterion, gain and phase margins, compensator design in the frequency domain, state space design for single input single-output systems, pole placement state variable feedback control and observer design.

Recommended Books:
1. Control Systems Engineering Norman S. Nise
2. Automatic Control Systems Benjamin C. Kuo
3. Modern Control Engineering Katsuhiko Ogata

ELT-272 ELECTROMAGNETIC FIELD THEORY

Objective:
After completion of this course the students should be able to:
1- Know and understand the basics of e.m.f theory.
2- To differentiate the various types of Electromagnetic waves and their characteristics.

Course Outline:
Introduction; review of vector analysis, scalar & vector products, gradient, divergent and curl of a vector and their physical explanation; transformation amongst rectangular, cylindrical and spherical co-ordinate system; Electrostatics: coulomb's law, electric field intensity from point charges, field due to continuous distribution of charges, gauss's law, Laplace's and poison's equations; Magneto statics:, magnetic field intensity and magneto motive force, ampere's circuital law, energy stored, Biot-savart law, vector potential, magnetic dipole; Maxwell's equations and their interpretations, boundary conditions; wave equations, sinusoidal time varying fields, uniform plane wave in dielectric and conductor media, skin effect and depth of penetration, reflection and refraction of plane waves at boundaries for normal and oblique incidence surface impedance; pointing theorem; transmission lines, Transmission line theory from the circuit concept, properties; constants; transmission line equations; standing wave ratio; impedance matching, Smith chart.

Recommended Books:

1. Electromagnetic waves & radio system by Jorden R.F.
2. Principle and applications of Electromagnetic fields by Ptonsey R and Collin R.P
3. Applied Electromagnetic by Planus M.A.

ELT-283 AMPLIFIERS AND OSCILLATORS

Objectives: After the study of this course students will be able to:

1. Design the small modules that include amplifier at input and output side with load
2. Use Feedback circuits to stabilize gain, improve impedances; reduce noise & distortion, bandwidth increment etc.
3. Use oscillator circuits different applications

Course Outline

The operating Point of BJT, Emitter Bias, Stabilization against ICO, Approximate Signal BJT Model, Transistor Trans conductance, Linear Analysis of a Transistor circuit, common Emitter (CE), and common Base Amplifier, Comparison of BJT Amplifier configuration, Accurate Small Signal BJT Model, The JFET or MOSFET Small Signal Model, Classification of Amplifiers, Feed Back concept, Negative Feed Back Amplifiers, Input and output Impedance, Voltage series Feed Back, Current Series Feed Back, Current Shunt and voltage Shunt Feed Back, Frequency Distortion, RC coupled Amplifier, The Hybrid Parameters Transistor Model at high Frequency, CE short circuit current Gain, Generalized voltage Gain Function, Multistage CE Amplifier at High Frequencies, common source Amplifier at High Frequencies, Common Drain Amplifier at High Frequencies, Effect of feed Back on Amplifier Bandwidth, Double Pole and three pole Transfer Function with Feedback, Voltage Shunt and Current Series Feed Back Amplifiers, Current Shunt and voltage Feed Back Pair, Stability.

Lab Outline:

1. Single stage BJET/FET amplifier.
2. 2 stage RC coupled amplifier – Frequency response
3. Cascade amplifier – Frequency response
4. Power amplifiers (Transformer less) – Class B and Class AB.
5. Measurement of Power
6. Tuned amplifiers – frequency response
7. Feedback amplifiers (current series, voltage series) – Gain and frequency response
8. Phase shift oscillator using BJT/FET, Hartley/Colpitts oscillator using BJT/FET, Crystal oscillator.

   Text Book: Microelectronics by Millman Floyd Boylested

Recommended Books

1. Cirovic M.M "Basic Electronics Devices, circuit and Systems" Prentice-Hall
2. Hayt and Neudeck, "Electronic Circuit Anaalysis and Design" Houghton Miffin Co ,Boston

ELT-293 POWER ELECTRONICS

Objective: The main objective of the course is to give students familiarization of power electronics circuits and their applications.

Course Outline:

Introduction to power electronic converters and systems; applications of power electronic converters; power semiconductor devices; uncontrolled rectifiers: single- and three-phase; non-isolated dc-dc converters: buck, boost and buck-boost; isolated dc-dc converters; single- and three-phase; uninterruptible power supplies; battery chargers and renewable energy systems; electric and hybrid electric vehicles technologies, design of converters and systems, single phase voltage source invertors, three phase voltage source invertors, current source invertors, closed loop operation of invertors , AC/AC voltage controllers, Cyclo converters, Matrix Converter.

Recommended Books:

1. Power Electronics: Converters, Applications and Design N Mohan, T M Undeland and W P Robbins
2. Power Electronics Handbook Muhammad H. Rashid
3. Introduction to Modern Power Electronics AM Trzynadlowski
4. Modern DC-to-DC Switch mode Power Converter Circuits R P Severns and G E Bloom
5. Practical Design of Power Supplies R Lenk
6. Solid-State Power Conversion Handbook R E Tarter

5th Semester

ELT-314 INDUSTRIAL DRIVES

Objective: The main objective of the course is to make students understand the functionality and requirement of the industrial drives.

Course Outline:

Electric Drives and their Classification, Requirements of Electric Drives, Power electronics improvements, DC Motor Speed and Position Control,

Inverter – Current Hysteresis Controlled PWM, Induction Motor Drives, d-q Model of Induction Motors, Power Semiconductor Devices, DC Motor Drives including conventional, Modeling of DC Machines, brushless and modern PM motors, AC Motor Drives including Induction Motor Drives and Synchronous Motors Drives, Servo Drives, Stepper Motor Drives, Reluctance Motor Drives, Vector and Direct Torque Controlled Drives, Vector Control Model and Structure, Artificial Intelligence Based Drives, Fuzzy Logic in Electric Drives, Simulation of Motor Drives.

Recommended Books:

1. Fundamentals of Industrial Drives B. N. Sarkar
2. Modern Power Electronics and AC Drives Bimal K. Bose
3. Electric Motor Drives, Modeling, Analysis and Control R. Krishnan
4. Electric Machines and Drives - A First Course N. Mohan
5. Power Electronics Handbook Muhammad H. Rashid

ELT-324 VLSI TECHNOLOGY

Objective:

This course covers in detail the technology that is behind VLSI circuits. The course starts with an introduction to integrated circuit technology and then covers device modelling in detail. Basic gate circuits using MOS technology are thoroughly discussed. The course also gives an overview of ultra-fast VLSI circuits and systems.

Course Outline:

1. Review of Integrated Circuits. Basic terminologies, size and complexities, overview of IC design process, economics, yield, trends in VLSI design.
2. Integrated Circuit Technology. IC production process, semiconductor processes, design rules and process parameters, layout techniques and practical considerations.
3. Device Modelling. Small signal model, MOS model, diode model, BJT model, passive component models (monolithic capacitors and resistors).
4. Introduction to MOS Technology. MOS technology, basic MOS transistors, NMOS and PMOS enhancement and depletion mode transistors, nMOS fabrication, CMOS fabrication, thermal aspect of processing, BiMOS technology, basic electrical properties of MOS and BiMOS.
5. Integrated Circuit Parameters. Sheet resistance, area capacitance of layers, inverter delays, propagation delays, wiring capacitances.
6. Overview of Utra-Fast VLSI Circuits and Systems. Submicron CMOS technology, Gallium Arsenide (GaAs) VLSI technology,

Gallium arsenide devices, Metal semiconductor FET (MESFET), GaAs MESFET classes of logic.

7. Overview of Utra-Fast VLSI Circuits and Systems. Submicron CMOS technology, Gallium Arsenide (GaAs) VLSI technology, Gallium arsenide devices, Metal semiconductor FET (MESFET), GaAs MESFET classes of logic.

Lab Outline:

1. Introduction to SPICE
2. Overview of Device Simulation using SPICE
3. Diode Modelling and Simulation
4. BJT Modelling and Simulation
5. BJT Noise Model
6. MOSFET Modelling and Simulation
7. Gate Realization using MOS devices
8. A Simple 4-bit ALU design and analysis
9. Mini Project

Recommended Books:

1. S.M. Kang & Y. Leblibici, "CMOS Digital Integrated Circuits-Analysis & Design", TMH, Ed. 2003.
2. B.G. Streetman & S. Banerjee, "Solid State Electronic Devices", PHI.
3. K. Eshraghian & Pucknell, "Introduction to VLSI", PHI.
4. B. Razavi, "Design of Analog CMOS Integrated Circuits", TMH.
5. N.H.E. Weste & K. Eshraghian, "Principles of CMOS VLSI Design: A System Perspective", McGraw Hill Pub.
6. Zainalabedin Navabi, "Verilog Computer-Based Training Course", First Edition, 2002 McGraw-Hill.

ELT-334 APPLIED ANTENNA AND WAVE PROPAGATION

Objective: The main aim of the course is to give students understanding of Radio Frequency concept, basic understanding of antenna elements and polarization.

Course Outline:

Basic RF Concepts

Review of fundamental RF Concepts

Basic design and performance requirements of a wireless communication system

Basic Antenna Concepts

Definitions of basic antenna properties - impedance, VSWR, bandwidth, directivity, gain, radiation patterns, polarization, etc.

types of Antennas

Resonant antennas
Traveling wave antennas
Frequency Independent antennas Aperture antennas
Phased arrays
Electrically small antennas
Circularly polarized antennas
Classification of Antenna
Types By frequency
By size
By directivity
Fundamental Antenna Elements
The monopole
The dipole
The loop
The folded dipole
The slot
Micro strip Antennas
Element types
Micro strip element design
Design trade-offs
Designing and 802.11 micro strip patch Baluns
Ground Plane Considerations
horizontally polarized antennas
Vertically polarized antennas
The impact of the surrounding environment on antenna performance
Circularly Polarized Antennas
Achieving circular polarization
The helix antenna
The crossed dipole antenna
The micro strip patch
The quad rifilar helix
Aperture Antennas
Aperture design concepts
The horn antenna
The reflector antenna
The corner reflector
Impedance Matching
Impedance matching networks
Broadband Antennas

- Monopole configurations
- Feed considerations

Dipole configurations

- Bandwidth improvement techniques Frequency Independent Antennas The log-periodic antenna

The spiral antenna

Electrically Small Antennas

- Impedance, bandwidth and quality factor of antennas Defining electrically small
- Fundamental performance limitations The small dipole

The small loop

- Design and Optimization of small antennas Antenna Arrays
- Fundamental array theory
- Types of antenna arrays
- Feed network design considerations
- Beam steering and shaping concepts
- Performance trade-offs
- Microstrip patch arrays
- Dipole element arrays
- Friis and Link Budget
- The communication link

Understanding and calculating path loss

- Receiver Sensitivity and antenna noise figure Link budget calculations

Receive Properties of Antenna

- How does an antenna capture power Aperture area and efficiency
- Coupling between antennas
- Fractal Antennas

Fractal antenna types

- Performance properties of fractal antennas RFID Antennas

RFID system basics

- Performance properties of RFID antennas
- Ultra Wideband (UWB) Antennas

Time domain considerations in antenna design

- Antenna performance requirements in UWB systems Low Profile Antennas

The inverted L and inverted F antennas

The planar inverted F antenna
(PIFA) Device Integrated Antennas
Antennas commonly used in wireless device applications
Propagation Channel Considerations
RF path loss
Reflection, multipath and
fading Noise and interference
Polarization distortion
Diversity implementation
MIMO
Types of Antennas used in Communications Systems
Wireless base station antennas
Wireless handset and portable device
antennas GPS antennas
HF, UHF and VHF communication antennas
Earth station and satellite communication
antennas Numerical Modeling of Antennas
Software packages
Comparison with measurements
Antenna Design and Simulation Examples Using
Commercial Antenna Design Software

Recommended Books:

1. John D. Krauss;Antennas for all applications 3rd edn TMH
2. K.D Prasad; Antenna & wave Propagation ,Satyaprakashan 2000 New Delhi
3. R.E Collin;Antenna & Radio wave propagation Mc -Graw-Hill
4. Terman; Electronics & Radio Engineering Mc-Graw-Hill
5. E.C Jordan & KG Balmain Electromagnetic waves & radiating system 2nd ed PHI

ELT-343 INDUSTRIAL ELECTRONICS APPLICATIONS

Objective: After completing this course the students will be familiar with the applications of the industrial electronics. They will understand different phenomenon, sensors to sense those and control of those phenomenon with actuators.

Course Outline:

Electric heating: Principles and applications; induction and dielectric heating; high-frequency welding. Spot welding control. Industrial control: Speed control of DC, AC, and servo motors. Process control. Measurement of non-electrical quantities: Temperature, displacement,

pressure, time, frequency; digital industrial measuring systems. Ultra sonic generation and applications. X-ray applications in industry. Photo-electric devices. Industrial control using PLCs, Basics of PLC Programming, Developing Fundamental PLC Wiring Diagrams and Ladder Logic Programs, Program Control Instructions, Timers and Counters, Data acquisition, Distributed control system in process industries, SCADA Systems.

Recommended Books:

1. Programmable Logic Controllers Frank D. Petruzella
2. Industrial Electronics Frank D. Petruzella
3. Principles of Industrial Instrumentation Patranabis. D

ELT-353 RENEWABLE ENERGY TECHNOLOGY

Objectives:

On completion of this course the student will be able to:

Describe the fundamentals and main characteristics of renewable energy sources and their differences compared to fossil fuels.

Explain the technological basis for harnessing renewable energy sources.

Recognize the effects that current energy systems based on fossil fuels have over the environment and the society.

Describe the main components of different renewable energy systems.

Course outlines: Introduction to Renewable Energy: energy and society, types of renewable energy, advantages and disadvantages, energy and power, Pakistan and world energy consumption and demand, Environmental impact assessment and sustainability issues.

Solar Energy: introduction, sources and uses, solar thermal electricity, concentrating solar power, solar thermal Molten salt technology, Photovoltaic cell materials, Principle of photovoltaic, conversion of solar energy, V-I characteristics of solar Photovoltaic cell, types of solar cells and fabrication. Photo voltaic applications.

Wind Energy: introduction, wind resource, wind turbine and shear, wind speed monitoring, Betz limits, construction, types, conversion system, harvesting energy form wind, small and large wind system, storage of electricity, grid connection, characteristics and applications.

Biomass: biomass resources, feedstock collection, feedstock preprocessing and treatment methods, biomass conversion technologies, thermo-chemical platform, combustion technology, Gasification technology, pyrolysis technology, biodiesel technology, biomass into ethanol, waste to energy, recent advances and applications of bioenergy technology.

Hydropower: introduction, construction methods, turbines and their types, small and large hydroelectric power system, efficiency.
Wave and Tidal energy: introduction, water power, Wave power, tidal current energy, tidal Barrage method, principle of operation, tidal turbines and their types, Ocean Thermal Energy Conversion(OTEC), components of OTEC system
Geothermal energy: introduction, resource, types of geothermal resource, heat pumps, geothermal electricity, applications.

Lab Outline:
Study of thermal performance of solar water heater, solar dryers, solar PV cell characterization and its networking, solar cooker, solar still, Building dueling solar cells.
Study of thermal performance and efficiency of biomass downdraft gasifier and sampling and analysis of air and flue gas from biomass energy systems i.e. gasifier, combustor and cook stoves using gas chromatography technique. Biogas production by anaerobic digestion and analysis.

Fuels: Density, Viscosity, Flash-point, Fire-point, ASTM (American society for testing and materials) distillation of liquid fuels.

Power Plant Visit (At least one visit to Thermal/Hydro-electric/Nuclear/Wind Power Plant).

Recommended Books:
1. Renewable energy Fourth Edition by Bent Sirensen.
2. Fundamental of renewable energy process Third Edition by Aldo Vieira Da Rosa.
3. Renewable Energy Conversion, Transmission, and Storage By Bent Sorensen
4. Wave Energy Conversion By John Brooke
5. Alternative Energy Sources By Efstathios E. Stathis Michaelides

6th Semester

ELT-364 INDUSTRIAL AUTOMATION AND ROBOTICS

Objective:

Learn about basic control theory and automation process in industry.

Implementation of transducers, sensors and actuators in control mechanism.

Generate interest amongst students in applying robotic tools to problems.

Learn the basics of Transducers/Sensors, Actuators, Analyzers and Drives.

Course Outline:

Introduction to Electromechanical Engineering. Fundamentals of control system. Theory of Automation, introduction to automatic control systems, implementation of industrial control systems, Feedback and feed-forward systems, study of various analog sensors, types of sensors ,motion, position s, force, hydraulic, pneumatic, ultrasonic, proximity, infrared, temperature, humidity , light, radiation sensors. Non linearity of sensors. Analog-to-digital conversion of sensors output. computer controlled machines, computer interfacing, digital input/output processing, control of dc and ac motors, stepper motor control, servo motors control, position control friction, backlash and resilience machine tool control, remote position control; process control, pneumatic controllers, analog and digital electronic process controllers, hybrid systems; hydraulic control systems, hydraulic pumps and valves, actuators, PI Controllers, PD Controllers, PID Controllers, introduction to Robotics, requirement of a robot, types of Robot, Robot hard ware, Joint arrangements; Grippers and tools, encoders, motors and control, path control, kinematics, Robot sensors and vision systems, Color Recognition, Image processing involved in Robotics, Robot Mechanics, Robot control Electronics by Micro controllers, Arduino and various modules, Robot applications.

Lab Outline:

1. Introduction to Robot Basics & Anatomy of a Robot.
2. Use of proper Tools in making Robots.
3. Common Electronic Components, their Identification & testing.
4. To learn Electronic Construction Techniques (Prototyping & PCB)
5. Introduction to Programming Concepts.
6. Building a Robot Platform from different materials.
7. Use of batteries & solar panels to Power up the Motors and electronics.
8. Different Robot Locomotion Principles.
9. Working with DC Motors, Stepper Motors, Servo Motors, and Encoders.
10. Experimenting with Gripper Designs, Arm System,
11. Use of Computers and Microcontrollers Control system.
12. Use of Arduino , Raspberry Pi & other similar boards.
13. To build Remote Control Systems.
14. Experiments with Sensors and Navigation control.
15. How to make Collision Avoidance and Detection system.
16. To Study Mechanism of actuators.
17. To make Sound Output and Input systems.
18. Introduction to common PLCs used in industrial Automation.
19. To design and apply PID Controllers in automation.
20. To experiment with color recognition & image processing.

Recommended Books:

1. R.R. Hunter, "Automated process control systems", Prentice Hall Inc.
2. N.M. Morris, "Control Engineering", Mc-Graw-Hill.
3. Dr. Malcolm Jr., "Robotics and introduction", Breton Publishers.
4. W.E. Snyder, "Industrial Robots Computer Interface and Control, Prentice Hall Inc.
5. Robot Builder's Bonanza, 4th Edition, By Gordon McComb.
6. Robot Building for Beginners , 2nd Edition, By David Cook.
7. Practical Arduino Engineering By Harold Timmis

ELT-374 FPGA BASED SYSTEMS

Objective:

After completion of this course students should be able to:

1. Fully understand the fundamental of designing techniques.
2. Gain knowledge to design digital system.
3. Understand fully the Hardware Description Language (HDL)
4. Use HDL to design hardware components and systems
5. Gain sufficient knowledge to simplify a complex logic design using software tools.
6. Acquire sufficient knowledge and inner working of programmable logic devices.
8. Implement the designs and verify the complete system.

Course Outline:

1. Course organization and requirements, Overview of digital systems design, testing and verification.
2. Hardware Description Languages (HDL); Selection of HDL Language, Fundamentals of theLanguage, Design and Modeling Recommendations , Design Simulation, Synthesis of Designs
3. Design Implementation Technologies; Programmable Array Logic, Programmable Logic Array,Complex Programmable Logic Devices (CPLD), Field Programmable Gate Array (FPGA)Technologies
4. System Arithmetic Algorithms and Hardware Designs
5. Electronic Design Automation; Usage of CAD Tool , Programmable Device Design Flows
6. Physical Design Automation -- Systems; Partitioning; Placement; Routing
7. Clock Design Considerations -- Timing Margins, Clock Skew, Clock Distribution
8. Logic Circuit Testing and Testable Design; Design of a test bench , Digital Logic Circuit Testingand Test Vector Generation, Combinational and Sequential Logic Circuit Testing

9. System-on-chip (SOC) design and intellectual property (IP) cores
10. Digital Design Examples and Applications
11. Programmable Logic Devices : Introduction to SPLD, CPLD, FPGA

Lab Outline:

1. Introduction to Verilog HDL gate-level modeling
2. Data flow modeling, behavioral modeling; design
3. Simulation, synthesis and fitting of combinational circuits
4. Design and implementation of FSM and memory
5. Verilog simulation and hardware implementation of combinational circuits such as MUX/DEMUX, encoder/decoder, arithmetic logic unit (ALU)
6. Verilog simulation and hardware implementation of sequential circuits such as flip-flops, shift registers, counters
7. Realization of simple digital circuits using VHDL
8. Familiarization of FPGA trainer kits
9. Realizations of digital circuits using FPGA.

Recommended Books:

1. Wayne Wolf, "FPGA-Based System Design," with CD-ROM, 2004, Prentice Hall, ISBN: 0131424610.
2. Samir Palnitkar, "Verilog HDL", Prentice Hall, ISBN: 0130449113.
3. Michael D. Ciletti, "Advanced Digital Design with the Verilog HDL", Prentice Hall, ISBN: 0130891614.
4. Michael John Sebastian Smith, "Application-Specific Integrated Circuits", Addison Wesley, ISBN: 0201500221.

ELT-384 COMMUNICATION NETWORKS

Objective:

1. To provide students the basic understanding of the principles of network communication.
2. Understanding of the operation of the protocols that are used inside the Internet

Course Outline:

Networks, Network Types, Protocol Layering, TCP/IP Protocol Suite, The OSI Model, Analog and Digital Signals and their conversions, Transmission Media, Switching, Data link layer, Wired and Wireless Networks, Network Layer, Internet Protocol, Transport Layer and its Protocols, Application Layer Protocols.

Lab Outline:

1. Ethernet Cabling: straight cable and cross over cable
2. PC network TCP/IP configuration

3. Connecting two computers using cross over cable
4. Setting up a small Network
5. Network Emulators &simulators
6. Basic Switch Configuration
7. Basic Router Configurations

Recommended Books:

1. Behrouz A. Forouzan, "Data Communications and Networking, 5/e", MacGraw- Hill, 2013
2. Ata Elahi "Network Communications Technology", Latest Edition
3. J. Kurose and K. Ross, "Computer Networking: ATop-Down Approach", Peason / Addison Wesley, 6th Edition, 2014

ELM-313 PROJECT MANAGEMENT (Annexure - I)

ELT-393 PROJECT
ELT-3103

Objectives:

To develop the ability of exercising the problem analysis, design & its validation, prototype production on economical scale.

Course Outline: Project work is basically to complement Engineering Technology study. The student is in close consultation with department faculty will complete the project using Library, Computer or Laboratory facilities. It shall be considered as Engineering Technology Subject to a minimum of 06 Credit Hours work that entails the following activities in general:-

i. Detailed problem analysis
ii. Project timeline Schedule
iii. Literature Review
iv. Conceptual and actual Design
v. Design validation
vi. Material selection
vii. Manufacturing / Fabrication (Economical Prototype / Model production if required)
viii. Assembly, test & Trials and logging of results
ix. Report writing and presentation

Note:

The student(s) to undertake project during 6th semester and its following summer. Six credit hours academic work be undertaken as follows:-

Three credit hours work during 6th Semester under the

guidance of departmental faculty. The work that entails supervised work entails problem analysis, timeline & Schedule, Literature Review, conceptual / Actual design, design validation and material selection.

Three credit hours during summer where student(s) will work independently and may seek guidance from the concerned Faculty / Project Supervisor. The independent working of student(s) entails Manufacturing / Fabrication (Economical Prototype / Model production if required), Assembly, test & Trials and logging of results, Report writing and presentation.

(ANNEXURE-A)

ISLAMIC STUDIES

Objectives:

This course is aimed at:

1 To provide Basic information about Islamic Studies
2 To enhance understanding of the students regarding Islamic Civilization
3 To improve Students skill to perform prayers and other worships
4 To enhance the skill of the students for understanding of issues related to faith and religious life.

Course Outline:

Introduction to Quranic Studies

1) Basic Concepts of Quran
2) History of Quran
3) Uloom-ul -Quran

Study of Selected Text of Holy Quran

1) Verses of Surah Al-Baqra Related to Faith(Verse No-284-286)
2) Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)
3) Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)
4) Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)
5) Verses of Surah Al-Inam Related to Ihkam(Verse No-152-154)

Study of Selected Text of Holly Quran

1) Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)
2) Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
3) Verses of Surah Al-Saf Related to Tafakar,Tadabar (Verse No-1,14)

Seerat of Holy Prophet (S.A.W) I

1) Life of Muhammad Bin Abdullah (Before Prophet Hood)
2) Life of Holy Prophet (S.A.W) in Makkah
3) Important Lessons Derived from the life of Holy Prophet in Makkah

Seerat of Holy Prophet (S.A.W) II

1) Life of Holy Prophet (S.A.W) in Madina
2) Important Events of Life Holy Prophet in Madina
3) Important Lessons Derived from the life of Holy Prophet in Madina

Introduction to Sunnah

1) Basic Concepts of Hadith
2) History of Hadith
3) Kinds of Hadith
4) Uloom –ul-Hadith
5) Sunnah & Hadith
6) Legal Position of Sunnah

Selected Study from Text of Hadith

Introduction To Islamic Law & Jurisprudence

1) Basic Concepts of Islamic Law & Jurisprudence
2) History & Importance of Islamic Law & Jurisprudence
3) Sources of Islamic Law & Jurisprudence
4) Nature of Differences in Islamic Law
5) Islam and Sectarianism

Islamic Culture & Civilization

1) Basic Concepts of Islamic Culture & Civilization
2) Historical Development of Islamic Culture & Civilization
3) Characteristics of Islamic Culture & Civilization
4) Islamic Culture & Civilization and Contemporary Issues

Islam & Science

1) Basic Concepts of Islam & Science
2) Contributions of Muslims in the Development of Science
3) Quranic & Science

Islamic Economic System

1) Basic Concepts of Islamic Economic System
2) Means of Distribution of wealth in Islamic Economics
3) Islamic Concept of Riba
4) Islamic Ways of Trade & Commerce

Political System of Islam

1) Basic Concepts of Islamic Political System
2) Islamic Concept of Sovereignty
3) Basic Institutions of Govt. in Islam

Islamic History

1) Period of Khlaft-E-Rashida
2) Period of Ummayyads
3) Period of Abbasids

Social System of Islam

1) Basic Concepts of Social System of Islam
2) Elements of Family,
3) Ethical Values of Islam

Recommended Books:

1) Hameed ullah Muhammad, "Emergence of Islam" , IRI, Islamabad
2) Hameed ullah Muhammad, "Muslim Conduct of State"
3) Hameed ullah Muhammad, „Introduction to Islam
4) Mulana Muhammad Yousaf Islahi,"
5) Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.
6) Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad (1993)
7) Mir Waliullah, "Muslim Jrisprudence and the Quranic Law of Crimes"Islamic Book Service (1982)
8) H.S. Bhatia, "Studies in Islamic Law, Religion and Society" Deep & Deep Publications New Delhi (1989)
9) Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad (2001)

PROFESSIONAL ETHICS

Objectives:

The objective of the course is to familiarize the students to:

1. Identify the nature of Professional Ethics in terms of Legal, Historical and Personal definitions
2. Understanding the value of professional ethics
3. Resolving the ethical dilemmas using common ethical values and identifying possible actions to be taken in response
4. Assessing the probable consequences

Course Outline:

Introduction:

Definitions/Importance/Kinds

Factors/Sources of Islamic Ethics

Islamic Ethical System

Ethics in Business:

Enforcement of Ethical environment/factors

Principles & Decision Making
Islamic rules for business
Lawful and unlawful behavior in Islam

Engineering Ethics:

Scope & Aims, Theories,
responsibilities IEEE code of Ethics
Ethical code for Engineers
Ethical code for software Engineers

Moral Courage

Moral courage, its importance and how to
improve? Attributes of morally courageous leaders

Relevant Case Studies:

To be decided by the Teacher/Instructor.

(ANNEXURE-B)

COMMUNICATION SKILLS

Objectives:

To understand the importance and basic concepts of communications.

Recognize the importance of communicating effectively in technical writing and presentation.

Course Outline:

Characteristics of Writing at Work. Writing for your Readers, Understand and apply the purpose, problems, and processes of written technical communications in the Workplace, Writing Ethically, Achieving a Readable Style, Analyze and adapt to various technical writing situations, Designing Documents, Designing Illustrations, Understand and apply the key phases of project management communication, Create documents that are grammatically and stylistically correct and effectively anticipate the audience's, information needs, Use the concepts of technical writing to self-assess your documents and critically evaluate others' work, Meet deadlines similar to those found in technical workplaces, Create and present professional presentations, including PowerPoint slides.

Recommended Books:

1. Elizabeth Tebeaux and Sam Dragga- The Essentials of Technical Communication. 2nd Edition, Oxford University Press.
2. Ron White- Writing. Advanced. Oxford Press.
3. John Langan- College Writing Skills. 9th Edition Connect Writing.

(ANNEXURE- C)

APPLIED PHYSICS

Objectives: The main objective of the course is to provide basic information about Electricity, Magnetism, Electromagnetism, waves and oscillations, optics, Electronics and Mechanics to the students.

Course Outline:

Waves & Oscillations : Periodic motion & Simple Harmonic Oscillation (SHO), Simple Pendulum, Transverse & Longitudinal Waves, Speed of a traveling Wave, Damped Harmonic Oscillator, EM waves.

Electricity: Basic terms & definitions; Electric Forces and Fields, Electric Flux, Coulomb's Law, Electric field due to the Point and Various Charges, Gauss's Law and its Applications, , Conductors in Electric Fields, Parallel Metal Plates ,Capacitance , Resistance, Electric Potential and Potential Energy, Ohms' Law, practice problems

Magnetism: Magnetic Field, Flux and Flux density (B), B-H loop, Hysteresis, Retentively, Magnetic Force on moving charges, Torque on Current Loop, Ampere's Law, Magnetic Dipole Moment. Earth's Magnetic Field, practice problems,

Electromagnetic Induction: Induced Current and EMF, Faraday's Law of Electromagnetic induction, Lenz's Law, Mutual and self-Inductance, Motional EMF, Inductor and Inductance, RL circuits

Electronics: Semiconductor materials, conduction in conductors, insulator and semiconductors, doping, N-type and P-type semiconductors, energy band diagrams of conductors, insulators, intrinsic and extrinsic Semiconductors, PN junction, basic diode operation, forward and reverse operating modes, Diode applications. Light and Optics. Oscillating Electric and Magnetic Fields, Light as EM Wave, Reflection, Refraction, Interference, Young's Double Slit Experiment, Equivalent Optical Path, Diffraction,

Mechanics: Definitions of Work, Energy & Power, Work – Energy Theorem and its applications, Mechanical Energy of System, Conservation of Mechanical Energy, practice problems, Gravitational potential energy, Hook's Law & Restoring force. Review of Angular Variables, K.E. Energy of Rotation and moment of Inertia, Torque and Newton's Second Law of Rotation, Work and Rotational K.E., Angular momentum, Angular Momentum for System of Particles.

Lab Outline:

1. Measuring magnitude and direction of Earth's a) magnetic field. b) To measure Dip angle.
2. Examining Lenz's and Faraday's Law. Studying the production of EMF using fix coil or fix magnet
3. Measurement of Current, Voltage drop and Power in a Resistance circuit
4. Diode; identification of Diode terminals using Ohm meter series circuits, Diode series circuit, Diode Parallel circuits
5. Half Wave rectification and Full Wave rectification
6. Measurement of wavelength of sodium light using diffraction Grating and Spectrometer
7. Study of diffraction minima and maxima using single and multi-slits.
8. Verification of Law of Conservation of Energy by measuring potential and kinetic energies in various arrangements a) Determine relationship between force and spring deformation using Hook's law. b) Investigating both spring compression and extension.

Recommended Books:

1. Halliday, Resnick and Walker, "Fundamental of Physics" (Latest Ed.)
2. Electrical Technology, Edward Hughes ,Longman Latest edition,
3. Principles of Electrical Engg.,B.R Gupta ,S. Chand and Company Ltd. India

(ANNEXURE- D)

APPLIED MATHEMATICS – I

Objectives:

Course Outline:

Complex numbers, Argand diagram, De Moivre‟s theorem, hyperbolic and inverse hyperbolic functions. Algebra of vectors and matrices, systems of linear equations. Derivative as slope, as rate of change (graphical representation). Extreme values, tangents and normals, curvature and radius of curvature. Differentiation as approximation. Partial derivatives and their application to extreme values and approximation. Integration by substitution and by parts, integration and definite integration as area under curve (graphical representation). Reduction formulae. Double integration and its applications. Polar and Cartesian coordinates, polar curves, radius of curvature, cycloid, hypocycloid, epicycloids and involutes of a circle.

Recommended Books:

1. Calculus and analytical Geometry, 11th **Edition** *By Thomas Finney* John Wiley & Sons.
2. Advanced Engineering Mathematics 5th **Edition** *By C. R. Wylie* McGraw-Hill Education.
3. Advanced Engineering Mathematics, 8th **Edition** *By* HT*Erwin Kreyszig* TH John Wiley & Sons.

(ANNEXURE- E)

APPLIED MATHEMATICS – II

Objectives:

Course Outline:

Differential equation; basic concepts and ideas; geometrical interpretation of first and second order differential equations; separable equations, equations reducible to separable form, exact differential equations, integrated factors. Linear first order differential equations, Bernoulli"s differential equation.

Families of curves, orthogonal trajectories and applications of differential equations of first order to relevant engineering systems. Homogeneous linear differential equations of second order, homogeneous equations with constant coefficients, the general solutions, initial and boundary value problems, D-operator, complementary functions and particular integrals. Real, complex and repeated roots of characteristics equations. Cauchy equation, non-homogeneous linear equations. Applications of higher order linear differential equations. Ordinary and regular points and corresponding series solutions; introduction to Laplace transformation

Recommended Books:

1. Advanced Engineering Mathematics **5th Edition** *By C.R. Wylie* McGraw-Hill Education
2. Advanced Engineering Mathematics,**8th Edition** *By* HT*Erwin Kreyszig*TH John Wiley & Sons.

(ANNEXURE- F)

PAKISTAN STUDIES

Objectives:

1. Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
2. Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

Course Outline:

1. **Historical Perspective**
   a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah.
   b. Factors leading to Muslim separatism
   c. People and Land
      i. Indus Civilization
      ii. Muslim advent
      iii. Location and geo-physical features.

2. **Government and Politics in Pakistan**
   Political and constitutional phases:
   a. 1947-58
   b. 1958-71
   c. 1971-77
   d. 1977-88
   e. 1988-99
   f. 1999 onward

3. **Contemporary Pakistan**
   a. Economic institutions and issues
   b. Society and social structure
   c. Ethnicity
   d. Foreign policy of Pakistan and challenges
   e. Futuristic outlook of Pakistan

Recommended Books:

1. Burki, Shahid Javed. *State & Society in Pakistan,* The Macmillan Press Ltd 1980.
2. Akbar, S. Zaidi. *Issue in Pakistan's Economy.* Karachi: Oxford University Press, 2000.
3. S.M. Burke and Lawrence Ziring. Pakistan"s Foreign policy: An Historical analysis. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. *Pakistan Political Roots & Development.* Lahore, 1994.
5. Wilcox, Wayne. *The Emergence of Banglades.,* Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. *Pakistan Kayyun Toota,* Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.

(ANNEXURE - H)

INTRODUCTION TO COMPUTER FUNDAMENTALS

Objectives:

To assemble or disassemble computers and plug-in devices. Enable students to design an optimal computer system environment as per need of customer. Pros and cons of computer business and applications.

Course Outline:

Basic terminology: computer, user, hardware, software, chip, program, Input: data, instructions (programs, commands, user responses), Output: text, graphics, video, audio, Types of computers: personal, notebook, handheld, PDA, internet appliance, server, mainframe, supercomputer, Programming languages, Machine, assembly, High-level, Key terms: VLSI, microprocessor, microcomputer, Computer Software: Terms: file, menu, font, voice recognition, FAQ, online help, wizard, software suite, single-user license, site license, application window, dialog box, clip art, cross-platform application, Application software, Word processing, Spreadsheet: cell, function, recalculation, charting, Database: record, field, query, Other: accounting software, Computer Aided Design (CAD), desktop publishing, paint/image, multimedia, web authoring, System software, Operating System (OS), Booting (startup), Cold vs. warm, BIOS, Steps in booting, Utility programs: file viewer, file compression, backup, screen saver, disk scanner, disk defragmenter, Computer hardware, System unit Terms: motherboard, chip, memory, storage, expansion slot (plug and play), port (serial vs parallel), bus (expansion bus), power supply, Central Processing Unit (CPU), Machine cycle (fetch, decode, execute, store), Memory, Volatile vs. nonvolatile, RAM vs ROM, Cache, Hard disk, Tracks, sectors, platters, RAID (mirroring and striping), Internet hard drive, Compact disks (and drives), PC Cards, Miniature mobile storage (Compact Flash, Memory Stick, Microdrive, Smart Media), Input Devices: Keyboard, Pointing Devices, Others: trackball, touchpad, pointing stick, light pen, touch screen, stylus, Handwriting recognition software, Sound, Image: Digital camera, Scanners (flatbed, optical readers), Optical readers, Optical character recognition (OCR), bar code scanner, Optical Mark Recognition (OMR), Video: Web cam, PC Video camera, Output Devices, Display device, CRT monitor, Liquid Crystal Display (LCD) – passive versus active matrix, Gas plasma monitor, Printer and its types: Impact printers, Dot-matrix printer, Line printer, Plotter, Non-impact printers, Ink-jet, Laser, data projector, fax machine (fax modem), Internet, E-commerce, Ethics and social issues, Privacy and security

Lab Outline:

1. Basic machines organization including motherboard, memory, I/O cards, networking devices
2. Use of flow charts
3. Computer peripheral devices
4. Operating Systems
5. Microsoft Windows
6. Microsoft Office i.e. MS Word, MS PowerPoint, MS Excel
7. Office Tools & Overview of different browsers with emphasis on power point
8. Microsoft Visio

Recommended Books:

1. Peter Norton, “Introduction to Computers”, Latest Edition
2. Misty E. Vermaat, “Discovering Computers”, Shelly Cashman Series, Latest edition.

(ANNEXURE - I)

PROJECT MANAGEMENT

Objective:
To enable students to learn necessary managerial skills related to industrial requirement.

Course Outline:

1. Introduction to management: History of management, management functions, organizational structure, types of organizations, organizational hierarchy, properties of narrow and wide organizations
2. Production Processes: Types of production, scale of production, selection of technology, input requirements, capacity utilization, productivity basic concepts, classification, quantitative measurement, productivity improvement.
3. Project Management: Properties of projects, project life cycle, project network analysis, resource requirements, monitoring and control, computer tools.
4. Inventory Management: Inventory replenishment, economic lot size, re-order point, safety stock level, JIT, computer tools.
5. Human Resource Management: Management styles, psychological types, recruitment and training, job evaluation, performance appraisal, motivation and incentives.

Recommended books:

1. Babcock d. L. Managing engineering and Technology, Prentice Hall, UK.
2. Zuberi M. H. Industrial management, Rabbani Printing Press, Lahore.
3. Bateman T. S. and Snell S. A. Management: building competitive advantage. Times Mirror Higher Education Group, USA.
4. Spinner M. Elements of project management. Prentice Hall, UK.

(ANNEXURE – J)

TECHNICAL REPORT WRITING

Objectives: The main objective of the course is to help students learn the basic concepts in technical writing and familiarize students with standard templates used in modern technical documents.

Course Outline:

Essay writing: Descriptive, narrative, discursive, argumentative. Academic writing: How to write a proposal for research paper/term paper. How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency). Technical Report writing. Progress report writing. Technical document creation with tools and technique to improve quality. Structure, layout and writing style for various technical documents for both print and digital media. Document review process and assessment of written report and documents. Technical Communication Basics, A General Definition of Technical Communication, Major Traits of Technical Communication, Globalization and Cultural Awareness. The Technical Communication Process. An Overview of the Process, Planning Document, Drafting and Finishing Document, Editing. The Uses of Visual Aids, Planning the Mechanism Description, Writing the Mechanism Description. The Elements of a Formal Report, Planning the Recommendation Report, Drafting the Recommendation Report, Planning the Feasibility Report, Writing the Feasibility Report, Ethics and Proposals. Writing the Internal Proposal, Planning the Manual, Writing the Manual, Making an Effective Presentation.

Recommended Books:

1. "Technical Report Writing Today" by Daniel Riordan, 10th Edition
2. "Technical Writing and Professional Communication", Leslie Olsen and Thomas Huckin, 2nd Edition