



DEPARTMENT OF ELECTRICAL
ENGINEERING TECHNOLOGY
(BSc Electrical Engineering Technology)
Updated (February 2018)
Course Outline

B. Sc Electrical Engineering Technology Scheme of Studies

| Sr# | Course Code | Subject | Credit Hours |
|-------------------|-------------|--------------------------------------|--------------|
| Semester 1 | | | |
| 1 | EET-111 | Applied Technology Mathematics-1 | 3(3-0) |
| 2 | ACH-321 | Applied Chemistry | 3(2-1) |
| 3 | EET-112 | Computing Applications in Technology | 3(2-1) |
| 4 | EET-113 | Engineering Drawing | 3(1-2) |
| 5 | ISL-321 | Islamiat /ethics | 1(1-0) |
| 6 | EET-114 | Linear Circuit Analysis | 2(2-2) |
| | | Total | 17 |
| Semester 2 | | | |
| 1 | PHY-301 | Mechanics-1 | 3(2-1) |
| 2 | PST-321 | Pakistan studies | 1(1-0) |
| 3 | EET-121 | Applied Technology Mathematics-2 | 3(3-0) |
| 4 | EET-122 | DC Machines and Transformers | 4(2-2) |
| 5 | EET-123 | Power Generation Systems | 2(2-0) |
| 6 | EET-124 | Workshop Technology | 1(0-1) |
| | | Total | 14 |
| Semester 3 | | | |
| 1 | EET-231 | AC Circuit Analysis | 4(2-2) |
| 2 | EET-232 | Digital Electronics | 4(2-2) |
| 3 | EET-233 | Electronics | 4(2-2) |
| 4 | EET-234 | Safety and Health studies | 2(2-0) |
| 5 | EET-235 | Technical Communication Skills | 3(3-0) |
| | | Total | 17 |
| Semester 4 | | | |

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| 1 | EET-241 | AC Machines | 4(2-2) |
| 2 | EET-242 | Electrical Instrumentations and Measurements | 4(2-2) |
| 3 | EET-243 | Electrical Power Transmission | 3(2-1) |
| 4 | EET-244 | Renewable Energy Technology | 3(3-0) |
| 5 | EET-245 | Technology Ethics | 2(2-0) |
| | | Total | 16 |
| Semester 5 | | | |
| 1 | EET-351 | Control Technology | 3(2-1) |
| 2 | EET-352 | Communication Technology | 3(2-1) |
| 3 | EET-353 | Industrial Drives and PLC | 3(2-1) |
| 4 | EET-354 | Microprocessor theory and Interfacing | 3(2-1) |
| 5 | EET-355 | Power System Protection | 3(3-0) |
| 6 | EET-356 | Total Quality Management | 2(2-0) |
| | | Total | 17 |
| Semester 6 | | | |
| 1 | EET-361 | Electrical Power Distribution and Utilization | 3(2-1) |
| 2 | EET** | Elective ** | 3(2-1) |
| 3 | EET-363 | Energy Management and Conservation | 2(2-0) |
| 4 | EET-364 | Power Electronics | 4(2-2) |
| 5 | EET-365 | Technical Report Writing | 2(2-0) |
| 6 | EET-366 | Technology Entrepreneurship | 3(3-0) |
| | | Total | 17 |
| Semester 7 | | | |
| 1 | EET-471 | Project-1 | 3(0-3) |
| 2 | EET-472 | Industrial Training-1* | 16(0-16) |
| | | Total | 19 |
| Semester 8 | | | |
| 1 | EET-481 | Project-2 | 3(0-3) |
| 2 | EET-482 | Industrial Training-2 | 16(0-16) |
| | | Total | 19 |

*In order to ensure transparency and fair evaluation, there will be a training report of 1 credit hour, seminar of 3 credit hour and viva examination of 1 credit hour, whereas the evaluation against 11 credit hours will be accomplished by various committees of faculty members for by Incharge for said purpose

****Electives:**

Elective I

EET 362 High Voltage Technology

EET 367 Digital Communication

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| EET-111 | Applied Technology Mathematics-1 |
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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 *HTErwin Kreyszig* TH John Wiley & Sons.

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| ACH-321 | Applied Chemistry |
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Objective:

The course aims at elucidating principles of applied chemistry in industrial systems, water treatment, engineering materials and analytical techniques.

Course outlines:

Chemical kinematics and catalysis: Introduction to rate equation and reaction order, reaction mechanism, relation between rate equation and reaction mechanism, First order & Second order. Dependence of temperature on reaction rates. Arrhenius theory, collision theory, Transition – state theory, Physical adsorption, chemisorption, Freundlich's expression, Langmuir adsorption isotherm, Heterogeneous catalysis, examples of heterogeneously catalysed reactions.

Features of Coordination Chemistry & Organic Reaction Mechanism: Coordination chemistry, coordination number, chelate effect, coordination complexes and their applications. Electrophilic substitution reactions in aromatic systems. Some Name reactions viz. Hoffman's rearrangement, Beckman's reaction, Riemer-Tiemann reaction, Skraup synthesis, etc.

Thermodynamics and electrochemical Phenomenon: Heat, work and energy, reversible and irreversible processes, work done in an isothermal reversible expansion of ideal gas. Enthalpy. Entropy. Electrochemical and galvanic series, polarization, decomposition potential, over

voltage. Theories of corrosion. Differential aeration theory. Factors influencing corrosion. Types of corrosion Control of corrosion: Design and material selection, anodic and cathodic protection, protective coatings, corrosion inhibitors. Fuel Cells.

Analytical aspects of water: Sources, conservation of water, impurities in water and their effects. WHO guideline and BIS guideline for drinking water. Chemistry involved in sedimentation, coagulation and sterilization. Softening of water, lime-soda, ion-exchange process and numerical problem. Boiler troubles, causes and effects, methods of prevention.

Engineering Materials: Glass, ceramics, refractory, composites, magnetic materials, Polymers & structure property relationship. Thermoplastic & thermosetting plastics. Preparation, properties & applications of some commodity and engineering polymers. Conducting polymers.

Interaction of radiation with matter: Molecular spectroscopy, vibrational, rotational, absorption, emission and light scattering phenomenon.

Recommended Books:

1. Dara, S.S.; A Text Book of Engineering Chemistry (Tenth edition); S. Chand, 2003.
2. Kuriacose, J.C., Rajaram, J.; Chemistry in Engineering and Technology (Vol. 1&2); McGraw Hill, 1984.
3. Barrow, M. Gordon; Physical Chemistry (Fifth edition); McGraw-Hill, 1992.
4. March, Jerry.; Advance Organic Chemistry Reaction Mechanism and Structure (Fourth edition); John Wiley & Sons New York, 2004.
5. W. Kemp; Organic spectroscopy (III Edition) PALGRAVE, 2002.
6. Puri B.R., Sharma L.R., Pathania M.S; Principles of Physical Chemistry; Vishal Publishing Co. (42nd Edition).

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| EET-112 | Computing Applications in Technology |
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Objectives:

Computer Science concepts and applications in our society as well as a look at the hardware that makes up a computing machine; office automation tools such as word processing, databases, spreadsheets; internet; current trends in computer science.

Course Outline:

Basic Definitions & Concepts, Major Components of Computer, Parts of Computer, Input and Output Devices, Storage Devices , Introduction to Programming Languages, Social Impact of Computer ages, Computers in Offices, Industry and Education Purpose of Information System, Office Automation System and Tools, Word Processing, Spread Sheet, Preparing a Power Point Presentation, Editing and Formatting a PowerPoint Presentation. Adding Animation, To Presentations Computer Graphics and Design, Working with Images, Graphics Software. The Internet & Online Resources, Internet Basics, Email, Collaborative Computing and Social Networking. Introduction to various operating system including windows, Linux and android applications

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| EET-113 | Engineering Drawing |
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Objectives:

To enable students to learn and develop engineering drawing skills.

Course Outline:

MECHANICAL DRAWING: Use of drafting instruments. Basic drafting techniques, drawing and lettering, dimensioning, projections and section of solids, Orthographic projections, Isometric views with particular reference to piping and ducting, Practice of assembly drawing. **CIVIL DRAWING:** Plan, Elevations (front, left and right) and details of buildings .Elements of perspective drawings. **ELECTRICAL DRAWING:** Electrical safety drawings, Electric substation equipment layout, Schematic Diagrams of substations, lighting and power distribution boards in contrast with house and industrial wiring diagrams, Electrical Symbols and one line diagrams of a typical power system and its parts using all details.

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| ISL-321 | Islamiat /ethics |
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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-Ihzaab 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

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

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

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| EET-114 | Linear Circuit Analysis |
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Objectives:

To enable the students to analyze simple electric circuits with DC sources and learn basic circuit solving skills.

Course Outline:

ELECTRICAL ELEMENTS AND CIRCUITS: Resistance, inductance, and capacitance, laws of resistances, Ohm's law, Kirchhoff's laws, The R circuit, The L-circuit, The C-circuit PHASOR QUANTITIES: Phasors; representation of Phasors by „J“ notation, Addition, Subtraction and Multiplication of Phasors. Complex expression for current, voltage, Power and impedances.

SERIES AND PARALLEL CIRCUITS: RL, RC and RLC Series circuits, Parallel circuits. Solution of simple RL, RC and RLC series and parallel circuits. Resonance in series and parallel RLC circuits.

DC NETWORK THEOREM: Mesh/Loop Analysis, Nodal analysis of resistive network with DC voltage sources and DC current sources, Conversion of sources, *Ideal Constant current sources and Ideal constant voltage sources*, *Network Theorems*- Superposition, Thevenin's, Norton, Reciprocity and Maximum Power Transfer Theorems with resistive Networks and DC Sources

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| PHY-301 | Mechanics-1 |
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Objectives:

To familiarize the students with concepts of Physics

Course Outline:**PHYSICS OF ATOMIC STRUCTURE AND ELECTRICITY**

Basics of Mechanics, Moment of inertia, simple harmonics motion.

Atomic structure, Atomic bonding. Electromotive force and potential difference. Current. Effects of electric current. Conductor. Insulator. Semiconductor. Electrical quantities. Resistance. Alternating Current.

ELECTROSTATICS AND CAPACITANCE

Coulomb's law. Electric charge. Electric field. Electric field strength and Electric Flux. Gauss's law. Electric potential. Dielectric. Capacitance. Charging and Discharging of Capacitor. Capacitors in series and in parallel. Energy in capacitor.

ELECTROMAGNETISM

Magnetic fields. Characteristic of lines of magnetic flux. Magnetic fields due to currents. Electromagnet. Force on current carrying conductor in magnetic field. Electromagnetic induction. Magneto motive force., Permeability. Reluctance.

Self-inductance. Inductance of a coil, Air core and Iron cored inductor. L/R Time constant. Energy stored in inductance. Mutual inductance. Electromagnetic oscillations.

SEMICONDUCTOR PHYSICS

Energy levels in a semiconductor. Hole concept. Intrinsic and Extrinsic regions. PN junction. Doppler effect

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| PST-321 | Pakistan studies |
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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.

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| EET-121 | Applied Technology Mathematics-2 |
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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 *HTErwin Kreyszig* TH John Wiley & Sons.

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| EET-122 | DC Machines and Transformers |
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Objectives:

To comprehend students about construction and working principles of DC machines and transformers

Course Outline:

ELECTROMAGNETIC INDUCTION AND BASIC CONCEPTS IN ROTATING MACHINES:

Introduction to magnetic circuits, magnetically induced e.m.f. and force, AC operation of magnetic circuits, Hysteresis and Eddy current losses. Magnetic fields in rotating machines, generated voltages, torque.

DC GENERATORS: Constructional features and principle of operation, EMF equation, excitation types, load and no-load characteristics, commutation, armature reaction.

DC MOTORS: Principle of operation, back e.m.f., torque equation, types of DC motors, speed-torque characteristics, speed control, applications.

TRANSFORMERS: Principle of operation, constructional features of single and three phase transformers, EMF equation, transformer on no-load and load, three phase transformer connections, auto-transformers.

Recommended Books:

1. Stephen J. Chapman. Electrical Machinery

Fundamentals

2. B.L Theraja. Electrical Technology

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| EET-123 | Power Generation Systems |
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Objectives:

To familiarize students with conventional and non-conventional methods for Electrical Power Generation.

Course Outline:

Conventional and non-conventional sources of energy, various types of plants and their efficiencies.

Hydroelectric power plant: Site selection, plant layout, types of dams and turbines.

Thermal power plant: Site selection, plant layout, steam and gas turbines; flue gas, coal and ash flow diagrams.

Nuclear power plant: Basic theory of nuclear energy, reactors, shielding, generating station layout, safety and health hazards

Electrical Power Generation Through PV Cells

Recommended Books:

1. S. L. Uppal, Electric Power
2. Soni, Gupta, A course in Electrical Power

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| EET-124 | Workshop Technology |
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Objective: To develop practical skills in the use of workshop tools and equipment.

Course Outline:

Introduction to various technical facilities in the workshop including mechanical and electrical equipment. Concepts in electrical safety, safety regulations, earthing concepts, electric shocks and treatment. Use of tools used by electricians, wiring regulations, types of cables and electric

accessories including switches, plugs, circuit breakers, fuses etc., symbols for electrical wiring schematics e.g. switches, lamps, sockets etc., drawing and practice in simple house wiring and testing methods, wiring schemes of two-way and three-way circuits and ringing circuits, voltage and current measurements. Electric soldering and soldering tools; soldering methods and skills, PCB designing, transferring a circuit to PCB, etching, drilling and soldering component on PCB testing.

Recommended Books:

- Choudhury, "Elements of Workshop Technology", Vol. 1, MPP.
- Chapman, "Workshop Technology", Part-I,II,III, CBS.

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| EET-231 | AC Circuit Analysis |
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Objectives:

To enable the students to learn advanced circuits solving skills

Course Outline:

A.C. FUNDAMENTALS: Sinusoidal wave form, Cycle, Time period, RMS, average and maximum values of sinusoidal current and voltage. Solution of simple RL, RC and RLC circuits using instantaneous values of currents and voltages

AC CIRCUIT ANALYSIS: Loop Analysis of AC Networks and nodal analysis of AC Networks,. Transients in RL, RC and RLC circuits.

AC NETWORK THEOREMS: Superposition, Thevenin's, Norton's, Reciprocity and Maximum Power Transfer Theorems with AC sources

POLY-PHASE CIRCUITS: Introduction to three Phase system. Star and Delta connections and Transformation. Voltage, Current and Power calculations for three phase loads, Power Factor, causes of low Power Factor, Power Factor improvement,

ELECTRIC FILTERS: RC low pass and high pass filter circuits, band pass and band stop filters.

Recommended Books:

1. Boylested, Introductory Circuit Analysis.
2. Floyd, Circuit Analysis
3. W. Hayt, Engineering of Circuit Analysis
4. K. Y. Tang, Circuit Analysis

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| EET-232 | Digital Electronics |
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Objectives:

This subject covers the basics of digital logic circuits and design. Through the basic understanding of Boolean Algebra and Number systems, it introduces the student to the fundamentals of combination logic design and then to sequential circuits (both synchronous and asynchronous).Memory systems are also covered.

Course Outline:

Number Systems, operations and codes. Digital Electronic Signals and Switching devices, Logic Gates, AND, OR, NOT, NAND, NOR, XOR, XNOR.

Boolean Algebra and Logic Simplification, Modular implementation of combinational logic circuits. Karnaugh maps & truth tables.

Different logic families: TTL, Emitter Coupled Logic, NMOS, CMOS.

Combinational logic circuits: adders, subtractors, comparator, encoder, decoder, multiplexer, de-multiplexer, A/D and D/A converter.

Components of sequential circuits: Flip flops, their characteristics and transition tables for sequential circuit design, registers, counters, Multi-vibrators, Memories

Recommended Books:

1. T. L. Floyd, Digital Fundamentals.
2. M. M. Mano, Digital Circuits and Computer Logic.
3. William Kleitz, Digital Electronics A Practical Approach

4. Digital Computer Electronics by A.P. Malvino

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| EET-233 | Electronics |
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Objectives:

To enable the students to understand fundamentals of Electronic principles and devices.

Course Outline:

Semi-conductor Diodes: Conduction in Solids – Donors and acceptors, Impurities, Simple Diode Circuits, Biasing and applications.

Rectifiers and power supplies, Diode clipper, Diode Clamper, diode multipliers, special purpose diodes, Zener diodes.

Bipolar Junction (BJT) and field effect transistors (FET) – JFET, MOSFET, Construction, Biasing and working as amplifiers.

Operational amplifiers and relevant circuits such as summer, integrator, differentiator etc.

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| EET-234 | Safety and Health studies |
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Safety Application on the Job: Safety Rules and Regulations, Example of Safe Work Procedures, Jobsite Inspections, Accident Prevention, Medical and First Aid Facilities and Services, Protection of the General Public, Fire Protection, Substance Abuse, Personal Protective Equipment, Site Safety and Hazard Analysis, Safety Communications, Accident Reporting and Investigation, Recording Injuries and Illnesses, Training, Emergency Response.

Strategic Safety Improvement: Promoting Safety by Example, Employee Participation in Promoting Safety, Safety Training, Safety Committees, Employee and Management Participation, Incentives, Teamwork Approach to Promoting Safety, Establishing a Safety-First Corporate Culture, Total Safety and its Components, a Brief Discussion of Zero Accident Strategies, Continuous Safety Improvement.

Safety Management Techniques: Accident prevention, health and safety policy, safe systems of work, first aid provisions, health and safety training, spill response protocols, accident investigation, recording and analysis, communicating safety measures, techniques of inspection, Health and safety regulations at work place.

Recommended Books:

1. Mark Friend, Fundamentals of Occupational Safety and Health.

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| EET-235 | Technical Communication Skills |
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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.

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| EET-241 | AC Machines |
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Objectives:

To enable the students to learn advanced circuits solving skills

Course Outline:

A.C. FUNDAMENTALS: Sinusoidal wave form, Cycle, Time period, RMS, average and maximum values of sinusoidal current and voltage. Solution of simple RL, RC and RLC circuits using instantaneous values of currents and voltages

AC CIRCUIT ANALYSIS: Loop Analysis of AC Networks and nodal analysis of AC Networks,. Transients in RL, RC and RLC circuits.

AC NETWORK THEOREMS: Superposition, Thevenin's, Norton's, Reciprocity and Maximum Power Transfer Theorems with AC sources

POLY-PHASE CIRCUITS: Introduction to three Phase system. Star and Delta connections and Transformation. Voltage, Current and Power calculations for three phase loads, Power Factor, causes of low Power Factor, Power Factor improvement,

ELECTRIC FILTERS: RC low pass and high pass filter circuits, band pass and band stop filters.

Recommended Books:

1. Boylested, Introductory Circuit Analysis.
2. Floyd, Circuit Analysis
3. W. Hayt, Engineering of Circuit Analysis
4. K. Y. Tang, Circuit Analysis

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| EET-242 | Electrical Instrumentations and Measurements |
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Objectives:

To enable the students to develop measuring skills with different types of instruments.

Course Outline:

MEASUREMENT FUNDAMENTALS: Classification of measuring instruments – according to construction and working principle, measurements, errors and their compensation, accuracies and tolerances, probability of error and noise.

ELECTRO MECHANICAL INSTRUMENTS: Galvanometer, AC ,DC voltmeter, ammeter, wattmeter, watt hour meter, power factor meter, frequency meter, KVAR meters.

ELECTRONIC INSTRUMENTS: Digital volt meters, ammeters and multi meters, Digital counters, Oscilloscope.

Calibration of instruments. AC and DC bridges, sensors and transducers, measurement of non-electrical quantities.

INSTRUMENT TRANSFORMERS: Theory and construction of current and potential Transformers and their characteristics.

Recommended Books:

1. Berlin, “Electronic Instruments & Measurements”.
2. An introduction to electrical instrumentation by B.A. GREGORY.

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| EET-243 | Electrical Power Transmission |
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Objectives:

To familiarize students with the elements of Electrical Power transmission systems

Course Outline:

TRANSMISSION LINES: Purpose of transmission, choice of frequency and voltage, parameters of overhead transmission lines, types and calculations of transmission lines. Ferranti, corona and skin effects on transmission lines.

MECHANICAL DESIGN OF OVERHEAD LINES: Line supports, sag and tension calculations, effect of wind pressure and ice loading, conductor vibration and use of dampers.

INSULATORS: Insulator material, types of insulators, voltage distribution over insulator string, string efficiency, methods of improving the string efficiency, testing of insulators.

Recommended Books:

1. AT Starr, Transmission and Distribution.
2. Turan Gonan, Transmission and Distribution
3. Power System By V.K Mehta, Rohit Mehta.

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| EET-244 | Renewable Energy Technology |
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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.

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| EET-245 | Technology Ethics |
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Objectives:

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

Identify the nature of Professional Ethics in terms of Legal, Historical and Personal definitions

Understanding the value of professional ethics

□ Resolving the ethical dilemmas using common ethical values and identifying possible actions to be taken in response

□ Assessing the probable consequences

Course Outline:

Introduction:

- a. Definitions/Importance/Kinds
- b. Factors/Sources of Islamic Ethics
- c. Islamic Ethical System

Ethics in Business:

- a. Enforcement of Ethical environment/factors
- b. Principles & Decision Making
- c. Islamic rules for business
- d. Lawful and unlawful behavior in Islam

Engineering Ethics:

- a. Scope & Aims, Theories, responsibilities
- b. IEEE code of Ethics
- c. Ethical code for Engineers
- d. Ethical code for software Engineers

Moral Courage

- a. Moral courage, its importance and how to improve?
- b. Attributes of morally courageous leaders

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| EET-351 | Control Technology |
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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

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|---------|-----------------------------|
| EET-352 | Communication Technology |
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Objectives:

- To provide basic understanding of the Analog Communication Systems.
- To introduce and develop technical expertise in various modulation techniques as applicable in Analog and Digital Communication Systems.

Course Outline:

Various frequency bands used for communication ; types of communication and need of modulation; Modulation techniques: introduction to AM, FM and PM, frequency spectrum of AM waves, representations of AM, power relation in AM waves, need and description of SSB, suppression of carrier, suppression of unwanted side bands, Independent side band system, vestigial side band system, mathematical representation of FM, frequency spectrum of the FM waves, Phase modulation, comparison between analog and digital modulation, wide band and narrow band FM, Sampling theorem, frequency division multiplexing and time division multiplexing; Pulse Modulation: Sampling and Quantization, Pulse

Amplitude Modulation, Pulse Position and Pulse width Modulation, Quantization Noise, Signal to Quantization Noise Ratio, Pulse code Modulation, half duplex and full-duplex transmission. Various types of Receivers.

Recommended Books:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press
2. Electronic communication Systems by George Kennedy.
3. Principle of Communication Systems by Taub and Schilling.
4. Electronic communication Systems by Dennis Roddy and John Coolen

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| EET-353 | Industrial Drives and PLC |
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Objectives:

The students will be able to run PLC for the industrial drives.

Course Outline:

Introduction to Electrical Drives: Concept of Electric drive, Types of drive, Trends in Drive Technology, Classification of Drives

Motor Characteristics: DC Motors, AC Motors

Electric Braking: Requirements of Braking System, Types of Braking.

Selection of Motors: Electrical Characteristics, Mechanical Characteristics

Programmable Logic Controller: Introduction to PLC, Ladder logic diagram and programming of PLC, Computer controlled machine interfacing of PLC.

Recommended Books:

1. Fundamentals of Industrial Drives by B.N. Sarkar
2. Electric Motors and Drives by Austin Hughes and Bill Drury
3. M. Birmingham, K. Brown, Programmable logic controllers
4. Automating Manufacturing Systems with PLCs by Hugh Jack

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| EET-354 | Microprocessor theory and Interfacing |
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Objectives:

- Describe Microprocessor's Architecture.
- Describe basic Assembly language Instructions.
- Interface using I/O Ports.
- Program a basic Microprocessor control system

Course Outline:

MICROPROCESSOR FUNDAMENTALS:

Introduction, simplified CPU organization and instruction set, Bus systems.

MICROPROCESSOR ARCHITECTURE AND PROGRAMMING TECHNIQUES:

Structure of Intel 8086/88 microprocessor and its architecture, pin diagram and functions, data sheet descriptions, Interrupts, 8086/88 Instruction set, programming techniques. Assembly language programming of Intel microprocessor.

INTERFACING THE MICROPROCESSORS:

Interfacing concepts, Interfacing of Microprocessor with RAM & ROM, Basic of I/O Interfacing with I/O ports (serial and parallel), Memory Map and Address Decoding, D/A & A/D interfaces, Study of CD – ROM, controllers.

MICROPROCESSOR CONTROLLED SYSTEMS:

Closed loop control systems – temperature monitoring and control system, washing machine controller, diesel generator set controller, stepper motor controller.

Recommended Books:

1. Douglas V. Hall., Microprocessor's interfacing. (Latest Edition)
2. Berry B. Bari., Intel Microprocessors. (Latest Edition)

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| EET-355 | Power System Protection |
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Objectives:

- To discuss the causes of abnormal operating conditions (faults, lightning and switching Surges) of the apparatus and system.
- To understand the characteristics and functions of relays and protection schemes.
- To understand the problems associated with circuit interruption by a circuit breaker

Course Outline:

Importance of protective schemes for electrical apparatus and power system. Qualitative review of faults and fault currents - relay terminology – definitions - and essential qualities of protection.

Operating Principles and Characteristics of Relays

Electromagnetic relays – over current, directional and non-directional, distance, differential and under frequency relays – Introduction to

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static relays.

Circuit Breakers

Circuit Breakers, Principle of operation, arc phenomena and arc interruption – re-striking voltage and recovery voltage - rate of rise of recovery voltage, Types of circuit breakers – Air circuit b the secondary. Carryout the performance test of Breakers, Oil circuit breakers , SF6 circuit breakers and vacuum circuit breakers ,Apparatus Protection

Main considerations in apparatus protection - transformer, generator and motor protection, bus bar protection. Transmission line protection, zones of protection. CTs and PTs and their applications in protection schemes.

Protection Against Over Voltages

Protection against over voltages due to lightning and switching - arcing grounds - Peterson Coil - ground wires –Lightning Arresters - surge absorber and diverters- Power System earthing – neutral Earthing

Recommended Books:

1. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, ‘A Text Book on Power System Engineering’, Dhanpat Rai& Co., 1998. (For All Chapters 1, 2, 3, 4 and 5).
2. R.K.Rajput, A Texbook of Power System Engineering. Laxmi Publications, First

Edition Reprint 2007.

3. Sunil S. Rao, ‘Switchgear and Protection’, Khanna publishers, New Delhi, 1986.
4. C.L. Wadhwa, ‘Electrical Power Systems’, Newage International (P) Ltd., 2000.
5. B. Ravindranath, and N. Chander, ‘Power System Protection & Switchgear’, Wiley Eastern Ltd.1977.
6. Badri Ram, Vishwakarma, ‘Power System Protection and Switchgear’, Tata McGraw-Hill, 2001.
7. Y.G. Paithankar and S.R. Bhide, ‘Fundamentals of Power System Protection’, Prentice Hall of India Pvt. Ltd., New Delhi–110001, 2003

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| EET-356 | Total Quality Management |
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Objectives:

- To enable students to develop quality management skills.

Course Outline:

1. Introduction to Quality: Quality concepts, types and aspects, Significance of quality.
2. Commitment and Leadership: Commitment and Policy, Creating or changing the culture, effective leadership.
3. Quality Planning: Flow charting, process charting, purchase planning, planning for JIT.
4. Design for Quality: Innovation, Quality Function Deployment and the house of Quality.
5. Quality Related Costs: Prevention, Appraisal and Failure Costs, Models for Quality Costing.
6. Quality Measurement: Significance, Methods
7. Tools and Techniques for Quality Improvement: Basic

Tools, Advanced Tools.- Quality Management System (ISO 9000 series): Significance, Documentations, Implementation and Certification, Audits, Expected Problems

8. Environmental Management System (ISO 14000 series): Significance, Documentations, Implementation and Certification, Audits, Expected Problems.

Recommended Books:

1. Oakland J. S. TOTAL QUALITY MANGEMENT, Bulterworth HeinemannLtd. UK.
2. ISO 9000 series of standards
3. ISO 14000 series of standards
4. Feigenbaum, TOTAL QUALITY CONTROL. McGraw Hill Book Co.,USA.
5. Gillow H. S. and Gillow S. J.

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| EET-361 | Electrical Power Distribution and Utilization |
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Objectives:

To familiarize students with the elements of Electrical Power distribution and Utilization systems.

Course Outline:

DC AND AC DISTRIBUTORS: Pointed and uniform AC and DC distributors, distributors fed at one and both ends, ring mains, stepped mains, unbalanced loading of three-phase AC distributors.

UNDERGROUND CABLES: Cable resistance, inductance and capacitance, methods of cable installation, voltage drop and power loss, types of cables used in industries, cable fault localization.

STATIC SUBSTATION: Substation location and layout, classification of substations, bus bar arrangement, grounding of star neutral point.

UTILIZATION: Illumination, Electrical heating- Resistive, induction and dielectric heating, electric furnaces. Electrical Traction systems, classification and layout

Recommended Books:

1. AT Starr, Transmission and Distribution.
2. Turan Gnan, Transmission and Distribution
3. Power System By V.K Mehta, Rohit Mehta.

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| EET-363 | Energy Management and Conservation |
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Value of energy management

b. Energy management careers and certifications

c. Suggested principles

1. Cost control of energy factors not energy

2. Cost control of energy functions as product cost

3. Control and meter major functions

II. Developing Energy Management and Auditing Programs

a. Corporate structure

b. Parts of energy management programs

1. Policy

2. Audit plans

3. Educational plans

4. Reporting systems

5. Strategic plans

c. Energy Data Analysis

1. Modeling energy consumption

2. Regression Models

3. Time series representations

4. Cumulative sum of variance plots

d. Energy Auditing

1. Tools and preparations

2. Safety

3. Site inspections

4. Identifying energy conservation opportunities

5. Reporting

III. Electric theory, systems and measurements

a. Power systems characteristics

1. Basic electric theory

2. Single phase ac power

3. Active and reactive power

4. Three phase ac systems and power

5. Efficiency

6. Power calculations

b. Power factor

1. Calculating power factor

2. Power factor correction

c. Electric power and energy measurements

1. Single phase power measurement

2. Three phase power measurement

3. Two-watt meter measurement methods

4. Instrumentation transformers

5. Energy meters

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| EET-364 | Power Electronics |
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Course Outline:

INTRODUCTION TO POWER SEMICONDUCTOR DEVICES: Power diodes, Power Transistors, Power MOSFET, Insulated Gate Bipolar Transistor (IGBT) and their characteristics, Diodes with RC, RL, LC and RLC loads.

THYRISTORS: Principle of operation, characteristics, two transistor model of SCR, Thyristor types, ratings, protection and cooling, thyristor turn-on and turn-off, series and parallel operation of thyristors, thyristor firing circuits.

THYRISTOR CONVERTERS: AC voltage controllers, controlled rectifiers, inverters, DC link converters, DC choppers, cyclo-converters.

Recommended Books:

1. B. W. Williams, Power Electronics
2. M. H. Rashid, Power Electronics
3. Power Electronics by P S Bhimbra, Khanna Pub

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| EET-365 | Technical Report Writing |
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Objectives:

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

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| EET-366 | Technology Entrepreneurship |
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Objective: Entrepreneurship is an important component in the process of economic development. The purpose of this course is to analyse the theories of entrepreneurship and to go for case studies of successful entrepreneurs.

Course Contents:

Introduction: The concept of entrepreneurship, The economist view of entrepreneurship, The sociologist view, Behavioural approach, Entrepreneurship and Management.

The Practice of Entrepreneurship: The process of entrepreneurship, Entrepreneurial Management, The entrepreneurial business, Entrepreneurship in service institutions, The new venture

Entrepreneurship and Innovation: The innovation concepts, Importance of innovation for entrepreneurship, Sources of innovative opportunities, The innovation process, Risks involved in innovation

Developing Entrepreneur: Entrepreneurial profile, Trait approach to understanding entrepreneurship, Factors influencing entrepreneurship, The environment, Socio cultural factors, Support systems

Entrepreneurship Organization: Team work, Networking organization, Motivation and compensation, Value system

Entrepreneurship and SMES: Defining SMEs, Scope of SMEs, Entrepreneurial managers of SME, Financial and marketing problems of SMEs

Entrepreneurial Marketing: Framework for developing entrepreneurial marketing, Devising entrepreneurial marketing plan, Entrepreneurial marketing strategies, Product quality and design

Entrepreneurship and Economic Development: Role of entrepreneur in the economic development generation of services, Employment creation and training, Ideas, knowledge and skill development, The Japanese experience

Case Studies of Successful Entrepreneurs

Recommended Books:

1. Paul Burns and Jim Dew Hurst: Small Business and Entrepreneurship
2. P.N. Singh: Entrepreneurship for Economic Growth
3. Peter F. Drucker: Innovation and Entrepreneurship Peter F. Drucker
4. John B. Miner: Entrepreneurial Success

ELECTIVES

EET 362 High Voltage Technology

Objectives:

To provide knowledge about effects of increasing transmission voltage level and different breakdown mechanism
To enable students to familiarize with theory and practices in High voltage technology.

Course Outline:

Introduction to high voltage technology.

Ionization, Townsend theory, cathode process, decay process, streamer breakdown.

Conduction and Breakdown in gases, liquid dielectrics, breakdown in solid dielectrics.

Applications of Insulating materials in power transformers, rotating machines, circuit breakers, cables.

Generation of high voltage and currents, measurement of high voltage and currents, need of high voltage, voltage levels, transient voltage.

Overvoltage phenomenon and insulation coordination in power systems.

Testing of high voltage electrical apparatus.

EET 367 Digital Communication

Objective: The objective of the course is to prepare students for engineering work and research in the telecommunication industry. The course covers concepts and useful tools for the design and performance analysis of a digital transmitter and receiver at the physical layer of a communication system.

Course Outline:

Significance of digital communication, overview of signals, spectra, probability and random variables, SNR and E_b/N_0 , Sampling and quantization (uniform & non-uniform), Signal to quantization noise ratio (SQNR). Detection of a binary signal in Gaussian noise, Matched filters and correlators, Baye's decision criterion, Maximum likelihood detector, Error performance, Inter-symbol interference (ISI), Root raised cosine pulse, Eye-patterns, Equalization techniques. Vectorial representation of signals, Gram-schmidt orthogonality principle, Performance analysis of M-ary signaling techniques. Error correcting codes: block codes, design and analysis of convolutional codes, Advanced techniques for digital communication (e.g. DS-CDMA, FH-CDMA, OFDM, MIMO techniques).

Recommended Books:

1. John G. Proakis and Masoud Salehi, "Digital Communications", 5th Edition, McGraw-Hill, 2007.
 2. William C. Lindsey, Marvin K. Simon and Sami Hinedi, "Digital Communication Techniques – Signal Design and Detection", Prentice Hall, 1994.
 3. S. Benedetto and E. Biglieri, "Principles of Digital Transmission: With Wireless Applications", Plenum, 1999.
 4. E. A. Lee and D. G. Messerschmitt, "Digital Communications", Kluwer Academic, 2003.
 5. J. G. Andrews, A. Ghosh and R. Muhamed, "Fundamentals of WiMax – Understanding Wireless Broadband Networking", Prentice Hall, 2007.
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