

# GC UNIVERSITY, FAISALABAD



## Scheme of Studies

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### BS Honors in Electrical Technology

8 Semesters / 4 years degree program  
for the year 2015 and onwards

**Department of Electrical Engineering**

## GOVERNMENT COLLEGE UNIVERSITY FAISALABAD

## Scheme of Studies

BS Honors in Electrical Technology

Sr.No.	Course Code	Credit Hours	Subjects
1	ET 111	2+0	Communication Skills
2	ET 112	3+1	Electrical Technology
3	ET 113	3+1	Applied Chemistry
4	ET 114	3+1	Applied Physics
5	ET 115	3+0	Applied Math-1
<b>Total=17</b>			
<b>Grand Total=17</b>			
Sr.N o.	Course Code	Credit Hours	Subjects
1	ET121	3+1	Computer Fundamentals
2	ET122	3+0	Islamic & Pakistan Studies-I
3	ET123	3+0	Applied Mathematics-II
4	ET124	0+1	Technical Drawing
5	ET125	0+2	Workshop Practice
<b>Total =13</b>			
<b>Grand Total=30</b>			
Sr.N o.	Course Code	Credit Hours	Subjects
1	ET231	3+0	Communication skills-2
2	ET232	3+1	Electrical Machines-1
3	ET234	3+1	Network Analysis
4	ET235	3+1	Digital Logic Design
5	ET236	3+1	Electronics-1
<b>Total= 19</b>			
<b>Grand Total=49</b>			
Sr.N o.	Course Code	Credit Hours	Subjects
1	ET241	3+0	Applied Mathematics-III
2	ET242	3+1	Electronics- II
3	ET243	3+1	Electrical Machines-II
4	ET244	3+0	Power Generation & Utilization
5	ET245	3+1	Measurements & Instrumentation
<b>Total =18</b>			
<b>Grand Total=67</b>			
Sr.N o.	Course Code	Credit Hours	Subjects
1	ET351	3+1	Microcontrollers
2	ET352	3+0	Power Transmission Techniques
3	ET353	3+1	Networking Technologies
4	ET354	3+1	Communication systems
5	ET355	3+1	Electrical Appliances & Safety Techniques
<b>Total = 19</b>			
<b>Grand Total=86</b>			
Sr.N o.	Course Code	Credit Hours	Subjects
1	ET362	3+1	Industrial Electronics
2	ET363	3+0	Power System Protection Techniques
3	ET361	3+1	Fundamentals of Space & Communication Technology
4	ET365	3+1	Electrification and Energy Auditing
5	ET364	3+1	Power Plants Technology
<b>Total =19</b>			
<b>Grand Total=105</b>			
Sr.N o.	Course Code	Credit Hours	Subjects
1	ET471	3+0	Renewable Energy Technologies
2	ET472	3+0	Technology Management
3	ET473	3+1	Power Electronics
4	ET474	3+1	High Voltage Technology
5	ET478	3+1	Linear Control Systems
<b>Total = 18</b>			
<b>Grand Total=123</b>			
Sr.N o.	Course Code	Credit Hours	Subjects
1	ET481	17	Industrial Training
<b>Total = 17</b>			
<b>Grand Total=123</b>			

## Scheme of Studies for BS Honors in Electrical Technology

### First Year

#### 1<sup>st</sup> Semester

##### 1. ET-111 Communication Skills-I

Importance, Theories, Barriers and Components of Communication, The Seven C's of Effective Communication, Listening Skills, Thinking and Feeling, Notes Taking, Giving Feedback, Active Reading Techniques, Skimming, General and Careful Reading, Planning, Drafting and Editing, Emphasis and Connections in Writing, Technical and Business Vocabulary, Constructing Formal Sentences.

#### Recommended Text Book (s):

- Murphy H. A. Hildebrandt and Thomas J. P, "Effective Business Communications", McGraw Hill, USA, 1997.
- Thomas A.J and Martinet A.V, "A Practical English Grammar", Oxford University Press, UK, 1986.

##### 2. ET-112 Electrical Technology

Concepts of Voltage, Current, Energy, Power, Introduction to Ammeter and Voltmeter, Difference between AC & DC Sources, Understanding of different types of Current and Voltage Sources (Dependent & Independent), Series-Parallel Combination of Resistors, Basic Concepts of Network Topologies (Node, Branch & Loop), Explanation of Ohm's Law and Kirchhoff's Voltage and Current Laws, Y-Delta Transformations, Voltage and Current Division Rules, Maximum Power Transfer Theorem, Introduction to various Circuits Elements (R, L & C), Response of R, L & C to DC Sources, Inductance and Capacitance Combinations, Sinusoidal Functions, Phasors, Semiconductor Concepts, Basics of PN-Junction Diodes, Rectifier Circuits, Basics of Digital Electronics, Various Number Systems, Various Logic Gates, Faraday's Law of Electromagnetic Induction, Lenz's Law, Basic Concepts of Magnetic Circuits.

#### Recommended Text Book (s):

- William D. Stanley, John R. Hackworth and Richard L. Jones, "Fundamentals of Electrical Engineering & Technology", Thomson Delmar Learning, 2007

### 3. ET-113 Applied Chemistry

Properties of Solutions and Liquids like Surface Tension, Viscosity, Osmosis, Osmotic Pressure, pH-Buffer Solution, Spectro-photometry, Basic Concepts of Colloidal Chemistry, Classification, Purification (Dialysis), Chemical Thermodynamics, Hess's Law, Heat of Reaction, Relationship between H and U, Measurement of Heat of Reaction, Bomb Calorimeter, Laws of Electrolysis, Corrosion, Sources of Water, Impurities, Hardness, Water Softening, Purification of Water for Portable and Industrial Purposes, Electro Dialysis, Introduction to Environmental Pollution, Main Sources and Effects of Pollution, Sewerage Treatment.

#### **Recommended Text Book (s):**

- John E. McMurry, Robert C. Fay, "General Chemistry-Atoms First", Pearson Prentice Hall.
- Gesser H.D., "Applied Chemistry-A Text Book for Engineers & Technologists".
- Linus Pauling, "General Chemistry".

### 4. ET-114 Applied Physics

Concepts of Conservative & non Conservative forces, potential energy of a system in Conservative Field, Kinetic Energy, Work & Power, Oscillations and SHM, Superposition of Waves and interference of waves, Heat Transfer Mechanisms, Mean Free Path and distribution of Molecular speeds, The Carnot Engine, Heat Pumps and Refrigerators, Electric Field, Coulomb's Law, Gauss's Law, Types of Capacitors, Energy Stored in a capacitor, Ohm's Law and its microscopic view, Dielectrics, Electrostatic Shielding, Importance of Earthing, Introduction to Lightning & lightning protection system.

#### **Recommended Text Book (s):**

- Halliday, Resnick & Walker, "Fundamentals of Physics", 8<sup>th</sup> Ed, Jhon Willey & Sons Inc, USA, 2007.
- Serway & Jewett, "Principles of Physics", 3<sup>rd</sup> Ed, Thomas Learning, USA, 2005.

### 5. ET-115 Applied Mathematics-I

Functions: Even and Odd Functions, Graph of Functions, Limit and Continuity, Derivatives, Rules of Differentiation, Derivatives of Trigonometric Functions, Inverse Trigonometric Functions, Exponential and Logarithmic Functions, Composite functions, Chain Rule, higher Order derivatives, Integration and its fundamentals formulas, Integration by substitution, by

parts and by partial fractions, Definite Integrals and their simple Properties, Area under a Curve, Analytic Geometry of Straight Lines, Circles, Parabolas, Polar Coordinates and Polar Curves, Determinants and their simple Properties, Matrices, Inverse of a Matrix, Solution of System of Linear Equations, Complex Numbers, Exponential and Polar Forms, De Moivre's Theorem, Roots of Complex Numbers, Hyperbolic Functions.

**Recommended Text Book (s):**

- Thomas G.B and Finney, R.L, "Calculus and Analytical Geometry", Addison Wesley, 1995.
- Stroud K.A., "Engineering Mathematics", Industrial Press Inc, 2007.

## First Year

### 2<sup>nd</sup> Semester

#### 1. ET-121 Computer Fundamentals

Introduction, History of Computers, Hardware/Software, Computer Organization, Introduction to Operating Systems, Introduction to Binary, Hexadecimal, Decimal and Octal Number Systems, Binary Arithmetic, Machine Language, Assembly Language, High-Level Languages, Structured Programming, Object oriented programming, Introduction and Basics of a Typical C Program Development, Some simple C programming Examples, Basics of Structured Programming, Pseudo-code Development, if/else statements, Introduction to loops, Counter-controlled Repetition, for/while and do-while loops, Introduction to Microsoft Office.

#### Recommended Text Book (s):

- Al Kelley, Ira Pohl, "A Book on C (Programming in C)", 4<sup>th</sup> Ed, Pearson Education, 2009

#### 2. ET-122 Islamic & Pakistan Studies-I

Significance of the Holy Quran, Compilation of the Holy Quran, Textual Study of Surah Al-Hujurat (Complete with Translation & Explanation): Manners with the meeting of the Holy Prophet (PBUH), Brotherhood, Equality, Backbiting, Blame and Foolery; Textual Study of Surah Al-Maidah (Verses: 1-26 with Translation and Explanation): Commands of Halal and Haram, The importance of Cleanliness in Islam, The relations between Muslims and Ahl-e-Kitab, Attitude if Ahl-e-Kitab towards Muslims; Textual Study of Surah Al-Fur'qan (Verses: 63-77 with Translation and Explanation): Characteristics of Ibad-ur-Rahman; The Need and Importance of Hadith, Textual Study of Hadith (Arbaeen-e-Navavi, 1-21 with Translation and Explanation); Tawheed: Fundamentals and types of Tawheed; Prophet Hood and its Finality; The Day of Judgment; Serah-tun-Nabi: Life of the Holy Prophet Muhammad (Peace Be upon Him) from Prophet Hood to Hijrah; The Holy Quran as a Guide for the Modern Scientific Development, Surah Al-Baqra: Verse 164, Aal-e-Imran: Verses: 190-191; Importance of Science Education in the Modern Age; Introduction to Muslim Scientists, Contribution of Muslim Scholars towards Science; Definition, Importance and Significance of Ethics; Concepts of Ethics in the light of Holy Quran: Al-Baqra: Verses 83,169, Al-Ana'am: Verses 151-153, Al-Tauba: Verse 7, Yunus: Verse 36, Hood: Verse 18, Al-Nah'l: Verse 112, Al-Mutaffeeen Verses 1-3; Moral Values in the light of Hadith: Bulugh-ul-Maram, Kitab-ul-Jamae, Babul Tarheeb Min Msavi-al-Akhlaq, Ahadith No. 3, 4, 7, 14, 17; Ethics & Character Building in the light of Seerah: Ethical behavior of the Holy Prophet Muhammad (Peace Be upon Him), Significance of Moral Values like Truth, Honesty, Taqwa, Brotherhood and Patience; Comparative Religious Morals: Hinduism, Buddhism, Judaism, Christianity and Islam; Philosophy of Ethics in Revealed and Non-Revealed

Religions (An Analysis); Ideology of Pakistan: Definition and Explanation, Aims and Objectives of Formation of Pakistan, Ideology of Pakistan in the light of the Sayings and Speeches of Allama Iqbal and Quaid-e-Azam; A Brief History of Muslim Society in Subcontinent: The arrival of Muhammad Bin Qasim, the Afghan Invasions from the North, The Domination of Islam in Sub Continent, the Down Fall of Muslim Rules and Renaissance of Muslim Rule in Sub Continent; Historical Back-Ground of the Ideology of Pakistan, National & Reformative Movements: Shiekh Mujaddad Alf-Sani (Biography, Social and Religious Services, Jihad against Non-Islamic Fundamentals, Difficulties of Imprisonment, Effects of the Movement); Shah Wali Ullah (Biography, Jihad against Non-Islamic Fundamentals, Reforms, Social and Religious Services, Jamaa't-e-Mujahideen); Sayyed Ahmad Shaheed (Biography, Jihad against Sikhs, Opposition from Afghan Tribes, martyrdom at Balakot); Mujahiddeen Movement; Educational Efforts: Aligarh, Deoband, Nadwa, Anjuman Hamayt-e-Islam, Sind Madrasa-tul-Islam, Islamia College of Peshawar and other Educational Institutions, Political Struggles, Constitutional Reforms and Muslims Separate Elections; The Pakistan Movement: Muslim Nationalism, Evolution of the Two-Nation Theory, Independence of Pakistan and India, Presidential Address of Allama Iqbal at Allah Abad in 1930, Elections of 1937, Congress' Behavior, The Pakistan Resolution, Elections of 1946 & Transfer of Power, How to Safeguard the Ideological State in Present Era.

**Recommended Text Book (s):**

- Prof. Abdul Hafeez and Hafiz M. Israel Farooqi, "Baloogh-al-Maram"
- Prof. Abdul Hafeez and Malik Zafar Iqbal, "Arbain-e-Navavi"
- Allama Shibli Naumani, "Seera-tun-Nabi"
- M. Ikram Rabbani, "A Comprehensive Book of Pakistan Studies"
- Hafeez Malik, "Muslim Nationalism in India and Pakistan"

**3. ET-123 Applied Mathematics-II**

Application of Differentiation: Velocity, Acceleration, Tangents, Normals, Taylor & McLaurin Series, Maxima and Minima, Applications of Integration: Plane Areas, Arc Lengths, Surface Area & Volume of Solids of Revolution, Moments & Centroids of Plane Areas, Functions of two or more Variables, Partial Derivatives, Higher Order Derivatives, Chain Rule, Maxima & Minima of Functions of two Variables, McLaurin & Taylor Series for Multi-Variable Functions, Basics of Ordinary Differential Equations (ODE), First-Order ODE, Secod-Order ODE with constant Coefficients, Application to relevant Engineering problems, Scalars & Vectors, Vector Algebra, Scalar & Vector Products, Triple Products, Evaluation of Double Integrals & their application in finding the Areas & Volumes, Double Integral in Polar Coordinates.

**Recommended Text Book (s):**

- Thomas G.B and Finney, R.L, "Calculus and Analytical Geometry", Addison Wesley, 1995.
- Stroud K.A., "Engineering Mathematics", Industrial Press Inc, 2007.
- Shah N.A., "Elementary Vector Analysis", A-one Publishers, Urdu Bazar, Lahore.
- Shah N.A., "Ordinary Differential Equations", A-one Publishers, Urdu Bazar, Lahore, 2010.

#### **4. ET-124 Technical Drawing**

Introduction to the subject, use of instruments, Projection of simple solids in simple positions, Oblique and auxiliary plans, Lettering, dimensioning, Principle of requirements of a working drawing, Isometric and pictorial projection of solid figures, Orthographic projections, Projection of points, lines and planes, Development of Surfaces, Section of solids, Tangent planes to surface in contact, Inter-section of surfaces and inter-penetration of solids, Screw-thread systems, Key and cotters, Couplings and simple bearings, Preparation of detailed and few assembly drawing.

#### **Recommended Text Book (s):**

- A. C. Parkinson, “Engineering Drawing”

#### **5. ET-125 Workshop Practice**

Machining and Machine Tools, Fitting and Fabrication Techniques, Basic Processes in Wood Workshop, Basic Electrical Technology



## Second Year

### **3rd Semester**

#### **1. ET-231 Communication Skills-II**

Organization Structure, International Communication, Non-discriminatory Communication, Communication Channels, Presentation, Graphics and Word Processing, Fax, E-mail, Internet and Voice Mail, CD-ROM and Online Databases, Teleconferencing, Audio-Visual Aids, Presentation Skills like Define the Objective, Audience Analysis, Style and Tone, Credibility, Opening, Closing and Main Ideas, Use of Audio-Visual Aids, participating in Meetings, Chairing a Meeting, Asking and Answering Questions in Meetings, Preparing Resumes, Preparing for Interviews, Asking and Answering Questions in Interviews, Formats, Positive and Negative Messages, Persuasive Communication and Requests through Letters and Memos, Introduction to Technical Report Writing and its Importance with General Formats, Short and Long Reports, Proposals and Quoting References.

#### **Recommended Text Book (s):**

- Murphy H. A. Hildebrandt and Thomas J. P, "Effective Business Communications", McGraw Hill, USA, 1997.
- Morrisey G. L., Sechrest T.L. and Warman W. B, "Loud and Clear", Addison-Wesley Publishing Company, USA, 1997.
- Beebe S. A. and Beebe S. J, "Public Speaking", Allyn and Bacon, USA, 2008.

#### **2. ET-232 Electrical Machines-I**

Review of Magnetic Circuits as applied to AC & DC Machines, Principle of Operation, Types and Applications of DC Machines, Parallel Operation of Generators, Transformer Theory, Open & Short Circuit Tests, Common faults and their Remedies, Auto and Instrument Transformers, Electric Breaking, Tractions Motors, Common Faults in DC Machines, Starters for Motors, Calculation of Starting Resistance, Common types of Starters used.

#### **Recommended Text Book (s):**

- Stephen J. Chapman, "Electrical Machinery Fundamentals", McGraw Hill, 2003.

### 3. ET-234 Network Analysis

Sinusoidal Steady State Analysis, Phasor Concept and Complex Impedance, R, L & C Circuits with Sinusoidal Excitation, Average and RMS Values of Current, Voltage and Power, Loop Current and Node Voltage Methods of Circuit Analysis, Concept of Power Factor, Causes and Effects of Low Power Factor and Methods of Power Factor Correction, Application of Matrices in Nodal and Mesh Analyses, Network Theorems like Thevenin, Norton, Reciprocity, Superposition and Maximum Power Transfer Theorems, Transient Response of Circuits under R, L and C, Source-Free RL, RC and RLC Networks, Unit Step and Impulse Responses, Magnetically-Coupled Circuits, Dot Convention, Methods of Formulating Equations of Magnetically-Coupled Circuits, Fourier Series and its Applications in Network Analysis.

#### **Recommended Text Book (s):**

- William D. Stanley “Network Analysis”, Pearson Education

### 4. ET-235 Digital Logic Design

Switches, Relays, Logic Gates, AND, OR, NOT, NAND and NOR Gate Circuits, Modular implementation of Combinational Logic Circuits, K-Maps, Truth Tables, Switching Algebra, Different Logic Families like TTL, ECL, NMOS, CMOS, Adder and Subtractor Circuits, Multiplexers and De-multiplexers, Encoders, Decoders, ROMs, PLAs, Flip Flops, Transition Tables for Sequential Circuit Design, Troubleshooting of Digital Circuits, Introduction to Digital System, Microprocessors.

#### **Recommended Text Book (s):**

- Morris Mano, “Digital Logic Design”, 3<sup>rd</sup> Ed, Prentice Hall, 2001.

### 5. ET-236 Electronics-I

Introduction to p-n Junction, Characteristics of p-n Junction, Forward and Reverse Biasing, Introduction to Diodes, Characteristics and Applications of Diodes, Types of Diodes, Rectifier Circuits, Half-Wave Rectifiers, Full-Wave Rectifiers, Full Wave Bridge Rectifiers, Clipper Circuits, Clamper Circuits, Applications of Clipper and Clamper Circuits, Introduction to BJT Transistors, Applications of BJTs, Characteristics of BJTs, DC Design and Analysis of BJTs, Common-Emitter, Common-Base and Common-Collector Configurations of BJTs, Modes of Operations of BJTs, Troubleshooting of Analog Electronics Circuits.

#### **Recommended Text Book (s):**

- Albert Malvino, “Electronic Principles”, 6<sup>th</sup> Ed, Career Education, 1998.

## **4th Semester**

### **1. ET-241 Applied Mathematics-III**

Fourier series: Periodic functions, Fourier series for functions of period  $2\pi$ , Even and odd functions, half-range expansions, Laplace transforms: Laplace transforms of elementary functions, Unit step function, Periodic functions, Inverse Laplace transforms, Applications to initial-value problems and Physical problems, Complex Variables: Functions, Derivatives, Analytic functions, Cauchy-Riemann equations, Elementary complex functions, Complex integrations, Mathematical statistics: Probability and its theorems, Mean and standard deviations, Binomial, Poisson and Normal Distributions.

#### **Recommended Text Book (s):**

- Erwin Krayzig, "Advanced Engineering Mathematics", Wiley, 2006
- B. Creighton Buck, "Advanced Calculus", Waveland Pr In, 2003.
- Glyn James, "Advanced Modern Engineering Mathematics", Prentice Hall, 2005.

### **2. ET-242 Electronics-II**

Review of BJTs, DC-Analysis of BJTs, Various Configurations and Modes of Operations of BJTs, AC Design and Analysis of BJTs, AC-Characteristics of BJTs, Transferring of Resistance from Base to Emitter and Vice Versa, Applications of BJTs, Introduction to FETs, Principle of Operation of FETs and their Applications, DC and AC Design and Analysis of FETs, Various Modes and Configurations of FETs, Introduction to some Higher Types of Transistors like MOSFETs, their Characteristics and Applications and AC Analysis, Troubleshooting of various Circuits.

#### **Recommended Text Book (s):**

- Albert Malvino, "Electronic Principles", 6<sup>th</sup> Ed, Career Education, 1998.

### **3. ET-243 Electrical Machines-II**

Construction of Poly-Phase Induction Motors and their Principle, Types and Applications, Construction of Alternators and their Principle of Operation, Field Excitation, Parallel Operation and Regulation Installation, Construction of Synchronous Motors and their Principle of Operation, Characteristics and Applications as Synchronous Condensers, Characteristics and Applications as Synchronous Generators, Construction of Single Phase Induction Motors and their Principle, Types and Applications, Single-Phase Capacitor-Start Motors, Single-Phase Permanent-Capacitor Motors, Shaded-Pole Motors, Reluctance Motors, Stepper Motors, Universal Motors, Hysteresis Motors.

#### **Recommended Text Book (s):**

- Stephen J. Chapman, "Electrical Machinery Fundamentals", McGraw Hill, 2003.

#### **4. ET-244 Power Generation and Utilization**

Conventional and non-conventional sources of energy, various types of plants and their efficiencies, Hydro Electric 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 energy utilization: Design techniques for electrical wiring for domestic and industrial applications, Cable selection, Electrical heating: Resistive, inductive and dielectric heating, electric furnaces.

#### **Books Recommended:**

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

#### **5. ET-245 Measurements and Instruments**

AC & DC Voltmeters, Ammeters, Watt meters, Watt- Hour Meters, Power Factor Meters, Frequency Meters, KVAR Meters, Oscilloscope, Digital Volt Meters, Ammeters, Multi-meters, Digital Counters, Measurements, Errors and their Compensation, Calibration of Instruments, Resistance, Inductance, Capacitance, Uses of Bridge Circuits, Sensors and Transducers, Measurement of Non-Electrical Quantities like Temperature, Pressure, Motion, Strain, Speed and Vibration.

#### **Recommended Text Book (s):**

- Alan S. Morris, "Measurements and Instrumentation Principles", Butterworth-Heinemann Publishers, 2001.
- Berlin, "Electronic Instruments & Measurements", Prentice Hall, 1988.

## **Third Year**

### **5<sup>th</sup> Semester**

#### **1. ET-351 Microcontrollers**

Use of Microcontrollers in embedded industry, Introduction to 8051 Architecture, Introduction to Assembly Language of 8051, Basic Arithmetic Instructions, Logical Instructions, Loop Instructions, Input-Output using I/O Ports, Timers and their use in generating Timing Events, Serial-Port Programming, Introduction to Interrupts, Use of Timers and Serial Port in Interrupt Mode. MCU Interfacing with peripherals/User Interface.

#### **Recommended Text Book (s):**

- Muhammad Ali Mazidi, Janice Mazidi and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded Systems", 2<sup>nd</sup> Ed., 2005.

#### **2. ET-352 Power Transmission Techniques**

Parameters of Overhead Transmission Lines, Resistance, Inductance and Capacitance of various Transmission Lines, Solution of Small, Medium and Long Transmission Lines, Underground System for Power Transmission, DC Transmission System, Per-Unit System, Modeling and Analysis of Power System in Per-Unit, Voltage, Current and Power (Active and Reactive) in a Transmission System, Surge Impedance Loading, Types of Insulators and Voltage Distribution across them, String Efficiency and methods to improve it, Calculation of Sag in Transmission Lines, Voltage Improvement in Transmission Lines, Corona, Ferranti Effect, Types and Applications of Cables.

#### **Recommended Text Book (s):**

- William D. Stanelly and John J. Grainger, "Power System Analysis", McGraw Hill, 1994.
- Turan Gonen, "Electrical Power Transmission System", CRC, 2009.

#### **3. ET-353 Networking Technologies**

Introduction to Cellular Systems, Hata Model, Lee Model, Indoor Propagation Models, Fading, Geometry of Hexagonal Cell, Co-Channel Interference, CCI-Reduction Techniques, Cell Splitting, Microcells, Picocells and Fiber-Optic Mobile Systems, Fading Mitigation via Diversity, Components of a GSM Network, Mobile Station, Base Station Subsystem (BSS), the Network and Switching Subsystem (NSS), Operation and Support Subsystem (OSS), Interfaces Power Supply System at Site, the Preventive and Protective maintenance, International Color Coding Scheme, System Outage, System Commissioning, Components of a Microwave Transmission, Communication Ring, Hard Looping.

#### **Recommended Text Book (s):**

- P.M. Shankar, "Introduction to Wireless Systems".
- HUAWEI Technologies Practical Handbook

#### **4. ET-354 Communication Systems**

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; AM Transmitters; AM Receivers; FM Transmitters; FM receivers; Basic concepts of digital modulation techniques; Telephony and Television; Radar, half duplex and full-duplex transmission.

#### **Recommended Text Book (s):**

1. B.P. Lathi, Communication System
2. Bruce Carlson, Communication System
3. Principle of Communication Systems by Taub and Schilling

#### **5. ET-355 Electrical Appliances & Safety Techniques**

The Television System, Television Receivers, Electronic Components, Test Equipment and Servicing Aids, Basic Troubleshooting and Repair Techniques, Power Supplies, Vertical Deflection Circuits, Horizontal Sweep Generators and Control Circuits, Sync Stages, Horizontal Drivers, Output, and High Voltage, Shutdown/Startup Systems, Tuners and Remote Controls, Video IF, Detector, and AGC, Video Amplifiers, Chroma Signal Processing, Chroma Switching and Color Sync, Working with CRTS, Television Sound, Digital Television, Monitors, and Picture Enhancement, Videocassette Recorders, VCR Troubleshooting, Maintenance, and Repair, Projection Television, Camcorders, Satellite Television, HDTV, Microwave oven, Principles of operation, the magnetron, construction of the microwave oven, troubleshooting and safety of the microwave ovens. Electrical safety culture, hazard awareness, design considerations, electrical safety program, training, calculation of short-circuit currents, arc flash hazard analysis methods, PPE, and equipment maintenance, Practice methods for accident prevention and electrical hazard avoidance, Current safety regulations, Coverage of safety equipment , Grounding, Shielding etc, Information on low-, medium-, and high-voltage safety systems, guidelines on safety audit, Rescue and First Aid Procedures, Electrification, Wiring, Illumination and Electrical Protection of various Buildings.

**Recommended Text Book (s):**

- Bill C. Langley, “Major Appliances: Operation, Maintenance, Troubleshooting and Repair”, Prectice Hall
- Charles G. Buscombe, “Television and Video Systems: Operation, Maintenance, Troubleshooting, and Repair”, 2<sup>nd</sup> Edition, Prentice Hall
- Palmer Hickman, “Electrical Safety-Related Work Practices”, 2nd Edition, Jones & Bartlett Publishers, 2<sup>nd</sup> Ed., 2009.
- Trevor Linsley, “Basic Electrical Installation Work”, 4th Ed., 2005.

## **Third Year**

### **6<sup>th</sup> Semester**

#### **1. ET-362 Industrial Electronics**

Electromechanically Controlled Relays, Solid-State Relays, Timing and Latching Relays, relay Logic, magnetic Contactors, Solenoids, Magnetic Motor Starters, Solid-State Contactors, Hydraulic & Pneumatic Actuators, Sensors & Transducer based Systems, Interfacing with Micro Controllers, Programmable Logic Controllers (PLCs), Ladder Logic Diagram, Programming of PLCs, Computer-Controlled Interfacing of PLCs.

#### **Recommended Text Book (s):**

- James A. Rehg, "Industrial Electronics", Prentice Hall, 2005.

#### **2. ET-363 Power System Protection Techniques**

Elements of Protection System, Relay-Operating Principles, Current and Voltage Transformers, Over-current Protection of Transmission Lines, Distance Protection of Transmission Lines, Rotating Machinery Protection, Transformer Protection, Bus, Reactor and Capacitor Protection, Power System Phenomena and Relaying Considerations.

#### **Recommended Text Book (s):**

- Stanley H. Horowitz and Arun G. Phadke, "Power System Relaying", 3rd Ed, Wiley, 2008.

#### **3. ET-361 Fundamentals of Space & Communication Technology**

Introduction to space, Methods and technology of motion in space, space navigation techniques, safety in space motions, Propulsion technology in space, satellite and space vehicles. Introduction to Amplitude Modulation, Frequency Modulation, FM Transmitter and Receiver, Introduction to Radio Transmission AM/FM/SW/MW, Mobile Communication Equipment, Base-Station Transceiver System, Master Control Centre, GSM Interface, Call Interface, Soft Handover, Cells, Segments and Type of Antennas for GSM, UHF/VHF Communication, Basics of Satellite Communication.

#### **Recommended Text Book (s):**

- August E. Grant and Jennifer H. Meadows, "Communication Technology Update and Fundamentals", 12th Ed., Focal Press, 2010.



#### **4. ET-365 Electrification and Energy Auditing**

Electrification: Domestic Wiring, Commercial Building Wiring, Industrial Wiring, Town Electrification Design, Plaza Electrification Design; Illumination; Energy Auditing: Voltage Measurement, Current Measurement, Power Measurement, Power Factor Calculation and Methods to Improve Power Factor, Calculation of Utility Bill, Harmonic Analysis of the Equipment, Base and Peak Load Measurement, Loss Measurements, Power Quality Monitoring Techniques, Power Quality Improvement, Optimizing Power Loss, Maximum Efficiency Calculations.

#### **Recommended Text Book (s):**

- Barney L. Capehart, William J. Kennedy and Wayne C. Turner, "Guide to EnergyManagement", 5th Ed., International Version, CRC Press, 2008.
- Shirley J. Hansen and James W. Brown, "Investment Grade Energy Audit: Making Smart Energy Choices", the Fairmont Press, Inc, 2004.
- Trevor Linsley, "Basic Electrical Installation Work", 4th Ed., 2005.
- Brian Scaddan, "Electric Wiring: Domestic", 12th Ed., 2003.

#### **5. ET-364 Power Plants Technology**

Introduction to conventional & non-conventional power plants, Modern steam plants, reheat and regenerative Turbines, flow through steam nozzles, Impulse and reaction turbines, pressure compounding, Velocity compounding, extraction and back pressure turbines, Boiler makeup and treatment, Practical Gas turbine cycle, Isentropic efficiency of compressor and turbines, inter-cooling and reheating General-combined cycle with heat recovery boilers Aircraft Jet engine, efficiency and performance of turbojet plant, ram jet comparison.

## Fourth Year

### 7<sup>th</sup> Semester

#### **1. ET-471 Renewable Energy Technologies**

Introduction, Types of energies (Solar, Wind, Geothermal, Ocean thermal, Biomass, Tidal wave), Fuel cell and heat pump systems, Energy efficiency issues and energy storage, Potential of using renewable energy resources as supplement of conventional energy resources, Renewable and non-renewable energies used as hybrid energy systems, Modern renewable energy plants, Wind energy, Wind turbine design specifications, Compatible electric generators and major operational issues of the wind mill for electric power generation, Wind mills design usage for pumping water, Biomass energy conversion methods, Detailed description of biomass energy conversion plant, Operational and maintenance problems and their remedies.

#### **2. ET-472 Technology Management**

Introduction to organization, planning and decision aids, project planning techniques, organization structure, human resource management, leadership, total quality management, project management techniques, managing information system, managing operation, PERT, CPM, tools.

#### **3. ET-473 Power Electronics**

Semiconductor power switching devices; characteristics of Triac & Diac; introduction to new power semiconductor devices, power diode, power transistor, IGBT, GTO & Power MOSFET; phase controlled converters; bridge circuit with line commutation; single-phase & three-Phase full converters; 3DC Choppers, principle of Chopper operation & control strategies; Types of Choppers; inverters; dc motor speed control; basic machine equations; braking modes, schemes for dc motor speed control; single-phase separately excited drives; braking operation of rectifier; control of separately excited motor; single-phase series motor drives; dc Chopper drives; closed loop control of dc drives; ac drives; induction motor characteristics & principle of operation; synchronous drives.

#### **4. ET-474 High Voltage Technology**

Introduction to high voltage technology, 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, Overvoltage phenomenon and insulation coordination in power systems, Testing of high voltage electrical apparatus.

## 5. ET-478 Linear Control Systems

Introduction to control systems, open and close loop control systems. Principle of feed back systems, Modeling of electrical and mechanical control systems, time and frequency domain analysis, Block diagram, transfer function, unit and impulse response, signal flow graphs, Control system components, gear trains, levers, servo mechanism; study of feed back system for automatic control of physical quantities such as voltage, speed and mechanical position. Industrial application of servo mechanism, Overview of PID controllers, Stability, Routh-Hurwitz stability criteria, compensation techniques, steady state error.

## 8<sup>th</sup> Semester

### 1. ET-481 Industrial Training

Through a supervised learning plan, student will work in industry, government organization or private laboratories to gain practical experience of applying knowledge and skills acquired in electrical technology subjects for real time problems and exploring solutions.

***The End***