Title of Subject: COMPUTER APPLICATIONS & E-LEARNING
Discipline: B.E. Electrical Engineering
Term: 1st Term
Effective: 09EL-Batch and onwards
Pre-requisites: 
Assessment: Sessional work: 20%
Written Examination: 80%
Term: 1st Term
Effective: 09EL-Batch and onwards
Marks: Theory: 100 Practical: 50
Credit Hours: 4 2
Minim Contact Hrs: 52 26

Aims: To acquire knowledge of computer, C++ languages, E-learning, Professional softwares

Objects: To know basics of information technology being used in electrical technology

Contents:
Introduction to computing
History, Overview of Digital Computer, IDE, Basic Structure, Central Processing Unit, Arithmetic and Logic Unit, Control Unit, Memory Devices I/O, Mass storage Devices, Computer Sizes

Storage Media
Introduction, Data Organization, Compilation, Data types, Paper Media, Magnetic media

Computer Operating Systems
File Maintenance Procedure, I/O system and procedures, teleprocessing, Hierarchy of High level Languages, Compilers, Operating system, Programs and Utilities, Word Processing.

Windows
Basic concept of Windows, Introduction to user Interface, Using start Button & Taskbar, Multitasking, Minimizing & Restoring Windows, Use of My COMPUTER and RECYCLE BIN, Add program to “START” Button, Moving & Arranging windows & Icons, Arrange Icon Command, Control Panel. Creating New Folders and Shortcuts, Finding Files, Folders, Installation of Software. Ms Office( word, excel & power point)

C ++ Programming
C ++ programming Words, Bytes, Character and Numerical, variable, Data Names, Programming statements, Loops, Arrays. IDE, Basic program, Logic control structure, Compilation, data types, Declaration and Initialization statement, Input Output statements. Operators (Arithmetical, Relational and Logical), Control Statements Decision Making and Iterative statements, Arrays structures, Functions, Filings, Graphics.

INTERNET
E-mail, academic e-groups, teleconferencing, teameeting, E-presentation

E - LEARNING
Search engines, search techniques, Use of digital library; extraction of research papers, journals, reports, tutorial, lectures, and E-books. Concept of plagiarism: prevention of plagiarism and use of anti plagiarism software.

PROFESSIONAL SOFTWARES
Introduction to Electronic work bench, P-spice, Matlab

Practical laboratory work
- Computer Architecture
- Windows operating system
- Ms office (word, excel, power point)
- C ++ programming
- Internet applications
- Applications of Matlab, Electronic work bench and P-spice
- E-learning, search engines, use of digital library and use of anti plagiarism softwares.

E-learning: A case study
Books:
Recommended
Introduction to Computers, By Peter Norton- 7th Edition.
How to program with C++, Deitel & Delite- 2nd Edition

Approval:
Board of Studies, EL. Engg Res. No. Dated : 15-05-2009
Board of Faculty of EECE Res. No. Dated : 18-12-2009
Academic Council Res. No. 73.13 Dated : 23-12-2009
Title of Subject: APPLIED CALCULUS  
Discipline: B.E. Electrical Engineering  
Term: 1st Term  
Effective: 01EL-Batch and onwards  

Pre-requisites: Co-requisite:  
Assessment: Sessional work: 20%  
Written Examination: 80%  
Marks:  
Theory (100)  
Practical: 0  
Credit hours: 4  
Minim Contact Hrs: 52  

Aims: To give the idea of calculus and its applications in the engineering field  
Objects: After completion of this course the student should be able to  
- Know the derivative as a rate measure. Slope of a straight line etc and integration as the area under curve  
- Solve the application problems related to their field  
- Know the vector algebra and vector calculus  

Contents:  
• Introduction to Functions  
Mathematical and physical meaning of functions, graphs of various functions. Hyperbolic functions.  
• Introduction to limits  
Theorems of limits and their applications to functions. Some useful limits, right hand and left hand limits. Continuous and discontinuous functions and their applications.  
• Derivatives  
• Higher Derivatives  
Leibnitz theorem, Rolles theorem, Mean value theorem. Taylors and Maclaurins series.  
• Evaluation of limits using L’Hospital’s rule  
Indeterminate forms (0/0), (∞/∞), (0 x 0), (α - α), 1∞, ∞0, 00  
• Application of Derivatives  
Asymptotes, tangents and normals, curvature and radius of curvature, maxima and minima of a function of single variable (applied problems), differentials with application.  
• Applications of Partial Derivatives  
Euler’s theorem, total differentials, maxima and minima of two variables.  
• Integral Calculus  
Methods of integration by substitutions and by parts. Integration of rational and irrational algebraic functions. Definite integrals, improper integrals, Gamma and Beta functions, reduction formulae.  
• Applications of Integral Calculus  
Cost function from marginal cost, rocket flights, area under curve.  
• Vector Algebra  
Introduction to vectors, Scalar and vector product of three and four vectors. Volume of parallelepiped and tetrahedron  
• Vector Calculus  
Vector differentiation, vector integration and their applications. Operator, gradient, divergence and curl with their applications.  

Books Recommended:  
Yusuf, S.M., Calculus and Analytical Geometry, Ilmi Kitab Khana, Lahore, latest edition  
Daniel. D. Benice; Brief Calculus and its Applications; Houtton Mifin Comp. Boston, lated  

Approval:  
Board of Studies, EL. Engg  
Res. No.  
Dated: 15-05-2009  
Board of Faculty of EECE  
Res. No.  
Dated: 18-12-2009  
Board of Studies, Department of Electrical Engineering  
Res. No. 01 (b)  
Dated: 10-08-2006  
Board of Faculty of Engineering  
Res. No.  
Dated:  
Academic Council  
Res. No.  
Dated: 09-12-2002
Title of Subject : ENGLISH  
Discipline : B.E. Electrical Engineering  
Term : 1st Term  
Effective : 01EL-Batch and onwards  
Pr-requisites :  
Co-requisite:  
Assessment : Sessional work : 20 %  
Written Examination : 80%  
Marks : Theory (100)  
Practical: 0  
Credit Hours : 4  
Minim Contact Hrs : 52  
Aims : To remove out the difficulties / deficiencies in communicating skills  
Objects :  
- Raising the level of standard in comprehending speaking reading and writing good English  
- Providing an opportunity of exposure to learn and use English well  
Contents :  
- Themes/ Topics  
  Orientation to functional grammar  
  (a) Parts of Speech  
  (b) Tenses  
  (c) Sentence Structure (Syntax)  
- Vocabulary  
  (a) Compound words  
  (b) Conversions  
  (c) Verb to adjective  
  (d) Noun to adjective etc  
  (e) Word-attack skills: a Homonyms b. context  
- Listening and Comprehension  
  (a) Grasping the gist  
  (b) Identifying the specific and extracting relevant information  
  (c) Following Stress/ Tone/ pace of the speaker  
  (d) Correcting the pronunciations  
  (e) Understanding instructions  
  (f) Answering oral questions  
  (g) Note-making skill/ Dictation  
  (h) Reproducing interviews/ Reports/ Articles  
  (i) Comprehending Interviews/ Reports/ Articles  
  (j) Reading Handouts/ Describing Pictures.  
- Speaking and oral Instruction  
  To present ideas effectively in front of groups.  
  To give interviews for job and career advancement  
  To demonstrate self-confidence in public speaking.  
- Reading Speaking and Writing  
  Combined activities based on different skills  
  Grammatical functions  
  Vocabulary exercises  
  Individual Presentations  
  Re-writing/ Reproducing oral- written texts  
Books :  
Recommended  
  i. How to teach English , Johns Baker, Cartole Boardman, Ruuqia Jafri, Machael Mdley & Zakia  
  ii. Grammar Practice Activities ( Cambridge University Press), iii Penny Ur Teaching & Learning Grammar(Longmans). Jeremy Harmer  
  iv. Function in English, OUP John Blundell, John Higgens, Higel Middlemiss  
  v. Sportlight Communicative Skills, Pitman Publishing Ltd. Don Robinson & Ray Power  
  vi. Explorations (GUP} Series 1-6  
  vii. Reading skills. Christine Nuttal  
  /iii. Advanced speaking skills(Longman) Singapore Jeremy Harmer & John Arnold  

Approval:  
Board of Studies, EL. Engg  
Res. No. _____  
Dated : 15-05-2009  
Board of Faculty of EECE  
Res. No.  
Dated : 18-12-2009  
Board of Studies Deptt. of Electrical Engg.  
Res. No.  1 (a)  
Dated: 10-08-2006  
Academic Council  
Res.No  
Dated:
Aims: To familiarize the students with Basic laws, components, circuits of Electrical Engineering

Objects:
- To know the characteristics of resistor, inductor & capacitor.
- To know the behavior of voltage and current in single phase circuits

Contents:
- **Electricity Fundamentals & Basic Laws**

- **Electrostatics and Capacitance**

- **Electromagnetism, Magnetic Circuit & Inductance**

- **A.C Fundamentals**
  Generation of alternating e.m.f in a rotating coil. Slip rings. Relationship between frequency. Speed and number of pole pairs. Two-segment and four-segment commutator action. Typical d.c and a.c waveforms. Instantaneous, peak, average and r.m.s value of sinusoidal waveform. Form- factor and peak factor. Double subscript notation for d.c and ac circuits.

- **Single phase circuits**
  A.C Phasor representation, addition & subtraction of two quantities relationship between current & voltage in purely resistive, inductive, & capacitive circuits, RL, RC & RLC circuits, natural frequency, responses in series & parallel circuits, active power, apparent power, power factor and its correction.

Note: Practical work is based on the above theoretical course

Books Recommended:
- Electrical technology, Edward Hughes ,Longman Latest edition
- Principles of Electrical Engg.,B.R Gupta, S. Chand and Company Ltd. India
- Basic Electrical Engg. , Mc Kenzie Smith,Longman
- Introductory Electrical Engineering , Ali Asghar Memon, Dr. M.R Abro, Dr. M.K Burdi, Dr. M.A Uqaili

Approval:
- Board of Studies, EL. Engg Res. No. Dated : 15-05-2009
- Board of Faculty of EECE Res. No. Dated : 18-12-2009
- Academic Council Res. No. 73.13 Dated : 23-12-2009
Title of Subject : WORK SHOP PRACTICE
Discipline : B.E. Electrical Engineering
Term : 1st Term
Effective : 09EL-Batch and onwards (Practical works based upon theory)
Prerequisites : Co-requisite:
Assessment : Sessional work : 20 %
Mark : Theory : 00
Credit Hours : 0
Minim Contact Hrs : 52

Aims : To give the know-how of mechanical workshop and its application in the relevant fields.

Objects :
- General understanding about the operational techniques of machine tools, Use of various tools, equipment and machines, their working techniques and processes related to the basic field of machines, Woodworking, Foundry, Fitting, Forging and Welding.

Contents :

Books Recommended :
- Wood Working Part- II Fundamentals By: W.D Wolansky
- General Engineering Workshop Practice , Odham Boo.

Approval: 
Board of Studies, EL. Engg
Board of Faculty of EECE
Board of Studies Mechanical Engg.
Board of Faculty Engineering
Academic Council

Res. No. Dated : 18-12-2009
Title of Subject: LINEAR ALGEBRA AND ANALYTICAL GEOMETRY
Discipline: B.E Electrical Engineering
Term: 2nd Term
Effective: 09 EL Batch and onward
Pre-requisites: Co-requisite:
Assessment: Sessional work 20 %  Written Examination : 80%
Marks: Theory: 100  Practical : 0
Credit Hours: 4
Minimum Contact Hrs: 52

Aims: To develop the knowledge of matrix algebra, the system of linear equations, analytic geometry of three dimension and multiple integrals.

Objectives: After completion of the course, student should be able to:
- Perform the basic operations of matrix algebra
- Solve the system of linear equations
- Have concept of two and three dimensional geometry
- Find the area volumes of bounded regions by using multiple integrals.

Contents:
- Introduction to matrices, elementary row operations and vector spaces:

- System of linear equations:

- Determinants:
  Introduction to determinants. Properties and applications of determinants.

- Analytic geometry of 3-dimensions:
  Line. Coordinates of a point dividing a line segment in a given ratio. Straight line in R³: Vector form, parametric form and symmetric form of equation of a straight line, direction ratios and direction cosines, angle between two straight lines, distance of a point from a line. Planes. Equation of a plane, angle between two planes, intersection of two planes, a plane and a straight line, shortest distance between two lines, skew lines. Cylindrical and spherical coordinate.

- Multiple integrals

Books Recommended:
  iii. Foreign Autors

Approval:
Board of Studies BSRS  Res. No. 02 (01)  Dated: 29.05.2001
Faculty of Engineering:  Res. No. 23 (09)  Dated: 08.03.2002
Board of Studies, EL. Engg  Res. No.  Dated : 15-05-2009
Board of Faculty of EECE  Res. No.  Dated : 18-12-2009
Academic Council  Res. No.  Dated:
MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF ELECTRICAL ENGINEERING

Title of Subject : PAKISTAN STUDIES
Discipline : B.E. Electrical Engineering
Term : 2nd Term
Effective : 09EL-Batch and onwards
Pre-requisites : Co-requisite:
Assessment : Sessional work 20 %  Written Examination : 80 %
Marks : Theory : 50  Practical: 0
Credit hrs : 4
Minim Contact hrs

Aims : To provide proper knowledge based on national historical facts. Ideology of Pakistan and Islam which is the basis of the “Two nation Theory” taken from documents and books of Freedom of Pakistan Movement.

Objects :
- Freedom Movement in the full scope and perspective
- History, outline, geography and economy of Pakistan and political institution, which flourish during the last 55 years after inception of Pakistan
- Why the country has had failed in achieving national integrits, unity and cohesion among the people of Pakistan
- The foremost purpose of the study to achieve good democracy, national integration unity and cohesion.

Contents :

Books Recommended :
i. M. Ikram Rabbani, Pakistan Studies, Carvan Book house, Lahore 2001
ii. Muhammad Asif Malik, Pakistan Affairs, publishers Emporium, 1999
iii. K. Ali, Urdu Bazar Lahore, 1995, A New History of Indo-Pakistan,

Approval: Board of Studies, EL. Engg  Res. No.  Dated : 15-05-2009
Board of Faculty of EECE  Res. No.  Dated : 18-12-2009
Board of Studies of Deptt: of BSRS  Res. No. 02 (01)  Dated: 29-05-2001
Board of Faculty of Engineering  Res. No. 23 (09)  Dated: 08-03-2002
Academic Council  Res. No. 53.12 (54)  Dated: 09-12-2002
Title of Subject: APPLIED MECHANICS
Discipline: B.E. Electrical Engineering
Term: 2nd Term
Effective: 09 EL Batch & Onwards

Aims: This subject deals with laws and principles of Engineering Mechanics and their application to Engineering problems.

Objects:
- Basic concept of an Engineer is to be a good planner, designer and supervisor for fulfilling these requirements. An Engineer must pursue the study of engineering mechanics in a systematic and scientific manner.

Contents:
- **Part A: Mechanics**

- **Part B: Strength of Materials**
  Stress and strain, hooks law, modulus of elasticity, poison’s ratio, Shear stress, Complementary shear stress, Shear strain, modulus of rigidity. Shear forces and bending moments in beams. Relationships between rate of loading, shearing force and bending moment, shear force and bending moment diagrams. Simple treatment of flexible string. Stresses in overhead electric lines.

- **Part C: Fluid Mechanics**
  Stress at a depth in fluid, pressure head. Simple treatment of manometers and pressure gauges. Equation of continuity and Bernoulli’s equation for all incompressible fluid. Flow through venturimeters and orifices, relevant coefficient, Main features of important types of pumps and hydraulic turbines.

Note: Practical work is based on the above theoretical course

Books Recommended:
- i. F.L. Singer, Engg: Mechanics,
- iii. F.L. Singer: Strength of Materials,
- iv. Khurmi , Strength of Materials,
- v. Strength of Materials, Timosshenko
- vi. Donglas , Solution of Problems I fluid Mechanics,
- vii. Dr. Modi, Fluid Mechanics,
- viii. R.S Khurmi , Fluid Mechanics,

Approval:
- Board of Studies, EL. Engg Res. No. _______ Dated : 15-05-2009
- Board of Faculty of EECE Res. No. _______ Dated : 18-12-2009
- Board of Studies, Department of Civil. Engg. Res. No. 03 Dated: 11-06-2002
- Board of Faculty of Engineering Res. No. 24.4 Dated: 20-02-2002
Title of Subject: BASIC CIVIL ENGINEERING
Discipline: B.E. Electrical Engineering
Term: 2nd Term
Effective: 09EL-Batch and onwards
Pre-requisites: 
Co-requisite:
Assessment:
Sessional Work : 20%
Written Examination : 80%
Marks:
Theory : 100
Practical : 50
Credit hrs: 4
Minim contact hrs: 52

Aims:
To give adequate understanding of drawings, designs (working plan, elevation and cross-section)

Objects:
- Upon successful completion of this course student will be able to draw different working plans, elevations, cross-sections and measurements.

Contents:
Section-I
- Surveying
  Introduction to surveying and surveying instruments, their construction, uses, handling and care, Chain surveying-Prismatic Compass Traversing and leveling, Applications of theodolite.
Section-II
- Civil Engineering Drawing
  Object of Drawing. Scales and Dimensions. Preparing Drawings for planes, Elevation cross-section of single and Multi storeyed Buildings such as Bungalow, School, Hospital, Office, Mosque and Flats etc. foundation of electric poles and Rotating machines, Demarkation of a line man.

Note: Practical work is based on the above theoretical course

Books Recommended:
1. T.P. Kanetkar, Surveying and leveling,
2. James M. Anderson, Introduction to Surveying,
3. Gurcharn Singh, Basic Civil Engineering,

Approval:
Board of Studies, EL. Engg Res. No. Dated: 15-05-2009
Board of Faculty of EECE Res. No. Dated: 18-12-2009
Board of Studies, Department of Civil Engg. Res. No. Dated: 11-03-2009
Title of Subject : ELECTRICAL ENGINEERING -II  
Discipline : B.E. Electrical Engineering  
Term : 2nd Term  
Effective : 09EL-Batch and onwards  
Pre-requisites : Co-requisite :  
Assessment : Sessional Work : 20%  
Written Examination: 80 %  
Marks : Theory : 100  
Practical : 50  
Credit hrs : 4  
Practical : 2  
Minim Contact hrs : 52  
Aims : To familiarize the students with three phase system, measuring instruments & electrical machines  
Objects :  
- To know the difference between delta and star connections  
- To know the working principles and construction of electrical measuring instruments  
- To know the working principle and construction of electrical machines and devices  
Contents :  
- Polyphase Circuits  
  Generation of three-phase e.m.f, Delta and star connections, Line and phase voltages and currents in star and delta connections, Power in balanced 3-phase loads, Measurement of power in 3-phase systems, Faults detection and removal, Earthing.  
- Measuring Instruments  
  Constructional features, deflecting, controlling and damping devices, types of ammeters, voltmeters, and wattmeter’s, Principle of working of permanent magnet moving coil instrument (PMMC), moving iron, thermocouple, dynamometer, electrostatic, electrostatic, rectifier and electronic instruments, Graphical symbols on dials, Working and operation of cathode ray oscilloscope, ohm-meter, multimeter (AVO)  
- AC/DC Machines Fundamentals  
  Rotating machine structures, self and mutual inductance of stator and rotor windings, general equation for induced e.m.f, general expression of torque, the alignment fundamentals of d.c machines, three phase synchronous and induction machines and universal motor.  
- Single-Phase Transformer  
- Power and Power Factor  
  Apparent power, active power, reactive power, leading and lagging power factor, power factor improvement.  
- IT applications in electrical technology  
  Practical laboratory work  
  (1) Star-delta transformation and calculation of voltages and currents  
  (2) Basic operating principles of measuring instruments, their constructional parts  
  (3) Use of digital technology in measurement  
  (4) Measuring electrical parameters of AC machines  
  (5) Power factor measurement and improvement  
  (6) Electrical fault detection and removal  
  (7) Earthing  
  Note : Practical work is based on the above theoretical course  

Books :  
- Edward Hughes , Electrical Technology Longman,  6th edition  
- B.R Gupta, S Chand & Company Ltd. India, Principle of electrical Engg., New Edition  
- Kenzie & Hiosie, Basic Electrical Engineering, Science , - New Edition  

Approval Board of Studies, EL. Engg Res. No. ____ Dated : 15-05-2009  
Board of Faculty of EECE Res. No. ______ Dated : 18-12-2009  
Academic Council Res. No. 73.13 Dated : 23-12-2009
MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF ELECTRICAL ENGINEERING

Title of Subject : Islamic Studies
Discipline : B.E. Electrical Engineering
Semester : 2nd Term
Effective : 09EL-Batch
Pre-requisites : Co-requisite:
Assessment : Sessional Work : 20 %
Written Examination 80 %
Marks : Theory : 50
Practical: 0
Credit hrs : 2
Minim Contact hrs : 26

Aims :
To provide proper knowledge based on Holy Quran and Hadith

Objects :
After completing this course student should be able to:
  ● Effectively maintain his identity in multicultural world
  ● To find solutions to his problems from within his own cultural practices rather than be influenced by external ideologies

Contents :


Approval:
Board of Studies, EL. Engg Res. No. Dated : 15-05-2009
Board of Faculty of EECE Res. No. Dated : 18-12-2009
Board of Studies of Deptt: of BSRS Res. No. 02 (01) Dated: 29-05-2001
Board of Faculty of Engineering Res. No. 23 (09) Dated: 08-03-2002
Academic Council Res. No. 53.12 (54) Dated: 09-12-2002
Title of Subject: Linear Circuit Analysis
Discipline: B.E. Electrical Engineering
Term: 3rd Term
Effective: 07EL-Batch and onwards
Pre-requisites: Co-requisite:
Assessment: Sessional Work: 20 % Written Examination: 80 %
Marks: Theory (100) Practical (50)
Credit hrs: 4 2
Minim Contact hrs: 52 26

Aims: To give the knowledge of single phase and three phase circuits

Objects: Upon successful completion of this course the students will be able to
- Work under PSpice MATLAB, ORCAD and Electronic Work Bench Software environment
- Describe various circuits theorems
- Describe the behavior of inductor and capacitor during charging and discharging

Contents:

Note: Practical work is based on the above theoretical course

Books Recommended:
- Electric Circuits. Schaum’s outline series

Approval:
Board of Studies, EL. Engg
Board of Faculty of EECE
Academic Council

Res. No. ________ Dated: 15-05-2009
Res. No. ________ Dated: 18-12-2009
Res. No. 73.13 Dated: 23-12-2009
Title of Subject : Computer Aided Engineering Drawing
Discipline : B.E. Electrical Engineering
Term : 3rd Term
Effective : 07EL-Batch and onwards

Pre-requisites : Co-requisite:
Assessment : Sessional work : 20 %
Written Examination : 80 %
Marks : Theory: 100
Practical : 50
Credit hrs : 4
Minim Contact hrs : 52

Aims : To give adequate understanding of orthographic projection and CAD

Objects : Upon successful completion of this course students will be able to
- To draw different lines with their usage
- To give dimensions in drawing
- To differentiate various projections
- To find true length and its angle with reference planes
- To draw the various threads and joints
- Work under Auto Cad software environment

Contents :

**Drawing instruments and their uses.** Types of lines and usage. Dimensioning lettering. Sheet planning Orthographic. First angle and Third angle projection. Isometric projection. Sectional drawing and assemble drawing. Introduction to computer aided drawing. **Introduction to Auto CAD: interface and co-ordinate system, creating objects in Auto CAD, drawing with precision by using o SNAP and Aut SNAP. Editing commands adding text and dimensioning in drawing layers, colours and line types and blocks, controlling drawing display and pulling drawing. Computer Aided Geographical Information System (GIS).**

- The course consists of scale drawing, CAD and Auto CAD.
- Drawing sheets will be prepared on drawing board and on Auto CAD.

Note : Practical work is based on the above theoretical course

Books Recommended :
- First Year Engineering Drawing, A. C. Parkinson
- Engineering Drawing, N.D. Bhatt

Approval:
- Board of Studies, EL. Engg
- Board of Faculty of EECE
- Board of Studies of Deptt. of Civil Engg.
- Board of Faculty of Engg:
- Academic Council

Res. No. ______ Dated : 15-05-2009
Res. No. ______ Dated : 18-12-2009
Res. No. _03 (b) Dated: 11-03-2009
Res. No._24(a) Dated:
Res. No. Dated:
Title of Subject : Electronic Devices & Circuits
Discipline : B.E. Electrical Engineering
Term : 3rd Term
Effective : 07EL-Batch and onwards
Pre-requisites : Co-requisite:
Assessment : Sessional work : 20 % Written Examination 80 %
 Marks : Theory: 100 Practical: 50
Credit hrs : 4 2
Minim Contact hrs : 52 26

Aims : To give adequate and understanding about electronic devices

Objects : Students will be able to
- Understand different electronic circuits
- Easy approach to understand the power electronics which is very important and efficient technique to control and operate the respective machines
- Understand about integrated circuits
- Understand different techniques and methods necessary for regulated dc power supplies
- Understand about transistor and SCR used as switch in different circuits and applications

Contents :

Semiconductor Diodes
P-N junction Ideal diode large and small signal operation, Half-wave and full-wave rectification, Zener diode, Photo Diode, Tune diode, LEDs and LCDs.

Transistors
Junction transistor, Static characteristic, Cut off current, Break down voltage, Hybrid parameters, Model of transistor, equivalent circuit, common base amplifiers. Characteristics of JUTs, BJTs, THYRISTORS. FET characteristics, D.C biasing, Parameters. CMOS, MOSFET characteristics. Development of Integrated circuits.

DC Power Supplies
Regulated power supplies, series and shunt regulators, constant voltage and constant current supplies, over current protection

Filters
Passive filters, low pass, high pass, Band pass and Band – stop filters

Note : Practical work is based on the above theoretical course

Books Recommended :
- Basic Electronic devices, Circuits and Systems, M.M Sirvoic, prentice Hall

Approval:
- Board of Studies, EL. Engg
- Board of Faculty of EECE
- Academic Council

Res. No. : _______ Dated : 18-12-2009
Res. No. : 73.13 Dated : 23-12-2009
Title of Subject: Applied Thermodynamics  
Discipline: B.E. Electrical Engineering  
Term: 3rd Term  
Effective: 07EL-Batch and onwards  
Pre-requisites: Co-requisite  
Assessment:  
- Sessional work: 20%  
- Written Examination: 80%  
Marks:  
- Theory: 100  
- Practical: 50  
Credit hrs:  
- Theory: 4  
- Practical: 2  
Minim Contact hrs:  
- Theory: 52  
- Practical: 26

**Aims:** To familiarize the students with Basic Mechanical equipment

**Objects:**
- To understand various energy conversion systems and the construction of various thermodynamic equipments
- Understand how mechanical equipment have application in producing electrical energy

**Contents:**
- Air compressor, Fundamentals of reciprocating and rotary compressor with emphasis on construction, operation, characteristics and applications.
- Thermodynamic properties of steam, steam tables, steam charts and steam nozzles.
- Boilers and condensors **Heat Exchanger, super heater, pumps & valves.** Coal, oil and gas fired boilers, their auxiliaries and fittings.
- Steam and Gas Turbines & classification.
- Principle of refrigeration and Air conditioning, household refrigerators and automatic controls.

**Note:** Practical work is based on the above theoretical course

**Books Recommended:**
- Thermodynamics, V.M Fires.
- Heat Engines, D.A Wremghem

**Approval:**
- Board of Studies, EL. Engg  
  Res. No.  
  Dated: 15-05-2009
- Board of Faculty of EECE  
  Res. No.  
  Dated: 18-12-2009
- Board of Studies Mechanical Engg.  
  Res. No.  
  Dated: 05-09-2009
- Board of Faculty of Engineering  
  Res. No.  
  Dated:

- Academic Council
Title of Subject: Differential Equations and Fourier Series

Discipline: Electrical Engineering

Term: 3rd Term

Effective: 07 Batch and onward

Pre-requisites: Co-requisite:

Assessment: Sessional 20 % Written Examination: 80 %

Marks: Theory: 100 Practical: 0

Credit hrs: 4

Minim Contact hrs: 52

Aims: To give an idea about the formation, solution and the physical application of Ordinary and Partial Differential Equations. The concept of series, Infinite series and Fourier series.

Objectives: After completing this course, the student should be familiar with:

- The formation and the solution methods of first order linear and non-linear differential equation.
- Their geometrical and physical application.
- The Higher order and Partial DE’s and their solutions.
- The Infinite series, testing their convergence and divergence by different tests. The concept of Fourier series. Fourier series of periodic functions with period 2\pi and with arbitrary period 2L as well as half range Fourier series.

Contents:

First order linear and non-linear differential equations: Introduction, formation and solution of first order, first degree and first order higher degree DE’s.


Introduction to partial differential equations: Solution of Laplace equation, Wave equation, and Heat equation by variable separable method (simple case).

Infinite series: Introduction to sequence and series, testing the convergence and divergence of infinite series by using different tests.


Books Recommended:


Approval:

Board of Studies, EL. Engg

Board of Faculty of EECE

Board of Studies BSRS:

Faculty of Engineering:

Academic Council:

Res. No. _____ Dated: 15-05-2009

Res. No. Dated: 18-12-2009

Res. No. 02 (01) Dated: 29.05.2001

Res. No. 23 (09) Dated: 08.03.2002

Dated:
# DC Machines

**Title of Subject**: DC Machines  
**Discipline**: B.E. Electrical Engineering  
**Term**: 4th Term  
**Effective**: 07EL-Batch and onwards  
**Pre-requisites**

**Co-requisite**:  

**Assessment**:  
**Marks**:  
Theory: 100  
Practical: 50  
**Credit Hours**:  
4  
2  
**Minim Contact hrs**:  
52  
26  

## Aims
To provide the basic knowledge of rotating electrical Machines and Transformers. To differentiate between transformer and rotating electrical machines. Learning principles of conversion of mechanical energy into electrical energy and vice versa.

## Objects
- The objective of teaching the subject of D.C Machines is to put strong foundation of basic conventional machines in to minds of young engineers. They may be taught the subject in such a way that they can understand other subjects and advanced rotating machine topics.

## Contents

### D.C MACHINES FUNDAMENTALS

### D.C GENERATORS
- Equivalent circuit, Back emf and generator characteristics. Separately excited, shunt, series and compound generators. Parallel operation.

### D.C MOTOR

### TRANSFORMER FUNDAMENTALS

### ELECTROMECHANICAL ENERGY CONVERSION

### MATLAB & Simulink programming

Note: Practical work is based on the above theoretical course.

## Books Recommended
- Electric Machinery, Fitzgerald, Kingsley and Uman, latest edition, Mc Graw Hill,

## Approval
- Board of Studies, EL. Engg  
- Board of Faculty of EECE  
- Academic Council  

Res. No.  
Dated : 15-05-2009  
Res. No.  
Dated : 18-12-2009  
Res. No. 73.13  
Dated : 23-12-2009
Title of Subject: Theory of Electromagnetic Fields
Discipline: B.E. Electrical Engineering
Term: 4th Term
Effective: 07EL-Batch and onwards
Pre-requisites: Co-requisite:
Assessment: Sessional 20 %
Marks: Theory (100)
Credit Hours: 4
Minim Contact hrs: 52

Aims: To important give knowledge about EMF.
Objects: On completion of this course student will be able to understand
· About electromagnetic fields, Forces and energy in the fields
· Application of different theorems and laws
· About wave propagation

Contents:
ENERGY & POTENTIAL
Scalar & vector analysis, coordinate system Work done in moving a, point charge in an electric field, potential difference, potential at a point charge and a charge distribution, potential gradient, relation between E & V. Equipotential surfaces.

MAGNETIC FORCES:
Force on a moving charge & a differential current element, force & torque in a closed circuit, Magnetization & permeability.

MAGNETIC FIELD
Steady current and current density in a conductor. Forces between current carrying conductors, definitions of magnetic flux density, magnetic field strength, Ampere’s circuital law, Biot-Savart’s Law Stoke’s theorem. Magnetic materials, dielectric materials.

ELECTROMAGNETISM
Faraday’s law of electromagnetic induction. Self and mutual inductance. Shielding of magnetic field, skin effect.

WAVE PROPAGATION
Statement of Maxwells equations, derivations of the equations for wave propagation in space and in lines with sinusoidal excitation.

Books Recommended:

Approval: Board of Studies, EL. Engg Res. No. Dated : 15-05-2009
Board of Faculty of EECE Res. No. Dated : 18-12-2009
Academic Council Res. No. 73.13 Dated : 23-12-2009
Title of Subject: Applied Electronics  
Discipline: B.E. Electrical Engineering  
Term: 4th Term  
Effective: 07EL-Batch and onwards  
Pre-requisites: Co-requisite:  
Assessment: Sessional 20 %  
Marks: Written Examination 80 %  
Credit Hours: Theory: 100  
Minim Contact hrs: Practical: 50  
Credit Hours: 4  
Minim Contact hrs: 52  
Credit Hours: 2  
Minim Contact hrs: 26

Aims: To provide adequate information about basic electronic devices and circuits along with their applications and working  
Objects: Upon successful completion of this course the students will be able to  
- Work under electronic workbench software environment  
- Describe various electronic devices and circuits  
- To study the use of operational amplifiers and (active) filter circuits in many applications  
- To design and analyze the electrical heat transfer model  
- To understand the working of Multi-vibrators  
- To describe in detail the photo conductive devices  

Contents:  
**ELECTRONIC DEVICES**  
Photo transistor, Thermistor, Light Dependent Resistor(LDR), Photocells and Cathode ray tubes.  

**AMPLIFIERS**  

**OSCILLATORS AND PULSE GENERATORS**  

**COOLING AND HEATING SINKS**  

**INTERFERENCE AND NOISE**  
Electromagnetic Interference (EMI) conducted and radiated noise. Electromagnetic, electrostatic and common impedance coupling. Methods of elimination and minimization of Interference and noise  

**WIRELESS ENGINEERING**  
Fundamental principle, working, basic wireless circuit with amplifiers, basic transmitter and receiver circuit.  

Note: Practical work is based on the above theoretical course  

Books:  
Recommended: Basic Electronic Devices Circuits and Systems, M.M Sirvoic ,Printice Hall

Approval: Board of Studies, EL. Engg  
Board of Faculty of EECE  
Res. No. Dated : 18-12-2009  
Academic Council  
Res. No. 73.13 Dated : 23-12-2009
MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF ELECTRICAL ENGINEERING

Title of Subject: Statistics & Probability
Discipline: B.E. Electrical Engineering
Term: 4th Term
Effective: 07EL-Batch and onwards
Pre-requisites: Co-requisite:
Assessment: Sessional work: 20 %
Written Examination 80 %
Marks: Theory: 100
Practical: 00
Credit Hours: 4
Minim Contact hrs: 52

Aims:
Introduce the concept of descriptive and inferential statistics and probability

Objects:
After completing this course, the student should be familiar with
- Different statistical methods to obtain the measures of central values of a data and their interpretation.
- Probability and its rules. Different probability distributions and their uses
- Estimations and hypothesis

Contents:
Introduction.

Data Organization
Frequency distribution and graphs

Descriptive Measures
Measures of central tendency, measures of dispersions.

Probability
Introduction to probability, counting techniques, dependent and independent events, conditional probability, additive rule of probability and its applications. Contingency tables, joint and marginal probabilities, the multiplication rule. Baye’s theorem

Probability Distributions
Normal distribution, area under the normal curve Standard normal distribution, inverse use of tale of areas under the normal curves, applications.

Curve Fitting by Least Square Method
Goodness of fit fitting a straight, parabola and higher degree curves.

Simple Regression and Correlation
Regression analysis by least squares method, testing the significance of slope, simple correlation analysis, coefficient of correlation & coefficient of determination, testing the significance of r, Rank correlation.

Sampling Distribution
Sampling distribution of means with replacement and without replacement. Central Limit theorem.

Tests of Hypothesis
Testing a statistical Hypothesis. Type I & II error. One tailed and Two tailed test, tests concerning means and variance.
Testing the difference between two means. Goodness of Fit test, test of independence.

Estimation of Parameters

Time Series
The essence of time series analysis in business, measurement of trend (T), measurement of seasonal variations (S), measurement of cyclical variations (C), random variation (R).
Books Recommended

- Statistics Vol. I & II, Sher Muhammad Choudary
- Elements of Statistics, Iqbal Bhatti
- Applied Statistic and Probability for engineering, Douglas C. Montgomery

Approval:

- Board of Studies, EL. Engg: Res. No. ______ Dated : 15-05-2009
- Board of Faculty of EECE: Res. No. Dated : 18-12-2009
- Board of Studies BSRS: Res. No.02 Dated: 18-03-2002
- Faculty of Engineering: Res. No. 23 (08) Dated: 28-03-2002
- Academic Council: Res. No. Dated:
Title of Subject : Complex Variables and Transforms
Discipline : B.E. Electrical Engineering
Term : 4th Term
Effective : 01EL-Batch and onwards
Pre-requisites : Co-requisite:
Assessment : Sessional Work : 20% Written Examination: 80 %
Marks : Theory: 100 Practical: 00
Credit Hours : 4 0
Minim Contact hrs : 52 0

Aims : Introduce the concept of complex numbers, complex variables. Laplace and inverse Laplace Transformations. Integration in series and Fourier Transforms

Objects : After completing this course the student should be familiar with
- The complex number and complex variables. Complex differentiation and integration
- Transformations Laplace and Fourier. Their geometrical and physical application
- Integration in series, series solution of the Differential equations.

Contents :
Complex numbers system and Complex Variable Theory.
Introduction to complex number systems. Argands’ diagram, modulus and argument of a complex number, polar form of a complex number. De Moivre’s theorem and its applications. Complex functions, analytical functions. Harmonic and conjugate Harmonic functions Cauchy-Reimann equations in Cartesian and polar coordinates). Line integrals, Green’s theorem, Cauchy’s theorem, Cauchy’s integral formula, singularities, poles, residues and contour integration and applications.
Laplace Transforms
Definition Laplace transform of elementary functions. Properties of Laplace transforms, Laplace transforms of derivatives and integrals. Multiplication by \( t^n \) and division by \( t \) properties. Periodic functions and their Laplace transforms.
Z Transform & Their application.
Series Solution of Differential Equations.
Introduction. The solution of \( P_{n} (x) y + p_{i} (x)y + p_{j} (x) y = 0 \), when \( p_{0}(0) \neq 0 \). Validity of series solution. Ordinary point. Singular point. Forbenius method, indicial equation. Bessel’s differential equation, its solution of first kind and its recurrence formulate. legenrdre differential equation and its solution. Rodrigues formula.

Fourier Transforms.
Definition, Fourier transform of simple function, magnitude and phase spectra, Fourier transform theorems. Inverse Fourier transform, Solution of differential equations using Fourier transform.

FET & their applications

Books :

Approval: Board of Studies, EL. Engg Res. No. 23 (09) Dated : 08-03-2002
Board of Faculty of EECE Res. No. 02 (i ) Dated: 29-05-2001
Board of Studies of Deptt: of BSRS Faculty of Engineering Academic Council
Title of Subject : A.C MACHINES
Discipline : B.E. Electrical Engineering
Term : 5th Term
Effective : 07EL-Batch and onwards
Pre-requisites : Co-requisite:
Assessment : Sessional Work : 20 % Written Examination : 80 %
Marks : Theory: 100 Practical: 50
Credit hours : 4 2
Minim Contact Hrs : 52 26

Aims : To give adequate knowledge & clear understanding about Electrical machines, their construction, principle of operation, characteristics, types and over all performance.

Objects : Upon successful completion of this course the students will be able to:
- Describe the parallel operation, inrush & exciting currents of autotransformers.
- Discuss & connect different types of Connections of three-phase transformers.
- Describe the construction principle of operation, performance, starting & speed control of 3-phase induction motors & synchronous motors.
- Describes the construction, principle of operation & performance of single-phase induction motors.
- Describe the construction, operating characteristics, voltage regulation, synchronization of synchronous generators.

Contents:
Transformers:

Three Phase Induction Motor:

SINGLE-PHASE INDUCTION MOTORS:
Construction, types, principles of operation, reversing direction of rotation and performance analysis of single-phase induction motors.

SYNCHRONOUS GENERATOR:

SYNCHRONOUS MOTORS:
MATLAB & Simulink programming

Note:- Practical work is based on above theoretical course.

Books:

Approval:
- Board of Studies, EL. Engg Res. No. 73.13 Dated : 15-05-2009
- Board of Faculty of EECE Res. No. Dated : 18-12-2009
- Academic Council Res. No. 73.13 Dated : 23-12-2009
**Title of Subject**: INSTRUMENTATION & MEASUREMENT  
**Discipline**: B. E. Electrical Engineering  
**Term**: 5th Term  
**Effective**: 07EL-Batch and onwards

**Pre-requisites**: Co-requisite:  

**Assessment**:  
Sessional Work: 20 %  
Written Examination: 80 %  

**Marks**:  
Theory: 100  
Practical: 50  

**Credit hours**:  
Theory: 4  
Practical: 2  
Minim Contact Hrs: 52  

**Aims**: To impart sufficient knowledge about Electrical and Electronic measuring instruments and understanding about their construction and their principles of Operation.

**Objects**:  
Successful completion of the course will enable the student to:  
- Understand basic terminology used in the field of instrumentation and types of errors occurring during measurements.  
- Understand the working principle and construction features of analogue electromechanical as well as digital electronic indicating, integrating and recording instruments.  
- Describe and discuss the methods of measuring non-electrical quantities with electrical/electronic measuring instrument by using various transducers.  
- To make connections of various instruments in the circuits.  
- Also understand application and usage of various bridges and potentiometers for a.c. and d.c. circuits.  
- Analyze waves generated due to harmonics and the distortions etc.

**Contents**:

**MEASUREMENT AND ERRORS**:  
Measuring Instruments, their feature, torque types. Ammeters, voltmeter & watt meter construction, working principles in PMMC, moving iron, thermocouple, dynamo meters, electrostatic, rectifier & electronic type instruments. Graphical symbols on dial, cathode Ray oscilloscope & its use as volt meter.  
Definition, Accuracy, precision, sensitivity, resolution Decibel. Bandwidth, significant figures. Types of errors.

**ELECTROMAGNETIC INSTRUMENTS**:  

**BRIDGES AND POTentiOMETERS**:  

**ELECTRONIC INSTRUMENTS**:  
Amplified D.C. meters. Average, peak, and true r.m.s responding A.C. voltmeters. Signal conditioning Digital Instruments. Electronic multimeters. Considerations in choosing and analogue voltmeter, Q meter. Dual trace and storage oscilloscopes. Introduction to digital instruments. Phase angle measurement, function generators.

**MEASUREMENT OF NON ELECTRICAL QUANTITIES**:  
Classification of transducers. Measurement of temperature, pressure, displacement, vibration, speed and acceleration.

**SIGNAL ANALYSIS: DIGITAL INSTRUMENTS**  
D/A, A/D Converters  
Signal Conditioning  
Interfacing with computers  

Note: practical work is based on the above theoretical course.

**Books Recommended**:  
- Fundamentals of Electrical Measurements, B.A. Gragory Latest edition  
- Electronic Measurement and Instrumentation, Olivar Latest edition

**Approval**:  
Board of Studies, EL. Engg  
Res. No.  
Dated : 15-05-2009  
Board of Faculty of EECE  
Res. No.  
Dated : 18-12-2009  
Academic Council  
Res. No. 73.13  
Dated : 23-12-2009
**Title of Subject**: NETWORK ANALYSIS  
**Discipline**: B. E. Electrical Engineering  
**Term**: 5th Term  
**Effective**: 07EL-Batch and onwards  

**Pre-requisites**: Co-requisite:  

**Assessment**:  
- Sessional Work : 20 %  
- Written Examination : 80 %  

**Marks**:  
- Theory : 100  
- Practical : 00  

**Credit hours**:  
- Theory : 4  
- Practical : 0  
- Minim Contact Hrs : 52  

**Aims**: To give adequate knowledge and clear understanding about Analysis of Networks.  

**Objects**:  
- Describe the concept of state-space  
- To study the use of Laplace Transformation technique for the analysis of networks.  
- To study and analyze the transformed networks, transfer functions and to give the concept of effects of change of frequency on the transfer functions of networks.  
- Study the conversion of non-sinusoidal periodic functions into sinusoidal functions by the use of fourier series.  
- Give the introduction of conversion of non-periodic non-sinusoidal functions into Sinusoidal functions by the use of Fourier transform.  

**Contents**  

**POLYPHASE CIRCUITS**  
Generation of 3-phase emf, delta & star connections, relationships between line & phase voltages in star & delta, power in balanced 3-phase systems, by 2 & 3 wattmeter methods.  

**STATE SPACE**:  
Network topology, incident matrix, outset and loop matrices. E and I shift, concept of states, state equation of dynamic systems with continuous signals and continuous data, state equations of general higher order systems, state transition matrix and equation, discrete state equation, state equation of electrical network, state equation by means of equivalent sources.  

**ANALYSIS OF NETWORKS BY LAPLACE TRANSORMATION**:  

**NETWORK FUNCTIONS AND FREQUENCY RESPONSE**:  

**NON-SINUSOIDAL ANALYSIS**:  

**Books Recommended**:  
- Electric Circuits By Joseph A. Edminister, Schaum’s Outline Series McGraw Hill Company  

**Approval**:  
- Board of Studies, EL. Engg  
- Board of Faculty of EECE  
- Academic Council  

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<td>Academic Council</td>
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Title of Subject: COMMUNICATION SYSTEMS
Discipline: B. E. Electrical Engineering
Term: 5th Term
Effective: 07EL-Batch and onwards
Pre-requisites: Co-requisite:
Assessment: Sessional Work : 20 %  Written Examination : 80 %
Marks: Theory : 100  Practical : 50
Credit hours: 4  2
Minim Contact Hrs: 52  26

Aims: To provide background knowledge of the communication subject to the students of electrical engineering about the various communication modes and mediums and their application in electrical power industry.

Objects: Upon successful completion of this course the students will be able to:
- Describe the basic concepts of communication systems
- Explain the salient features of radio transmitter and receivers, television and telephony and telegraphy
- Discuss the microwave and satellite communication
- Explain the concepts of information theory
- Elaborate and overview the optical fiber communication
- Discuss the applications of multi media system in electrical engineering

Contents:
INTRODUCTION TO COMMUNICATION SYSTEMS:

MODULATION TECHNIQUES:

RADIO TRANSMITTERS, RECEIVERS AND TELEVISION:
Block diagrams for AM and FM. special characteristics and features. Scanning and synchronization. Modulation of Video and Audio signals. Block diagram and typical circuits.

MICROWAVE AND SATELLITE COMMUNICATION:

FIBER – OPTIC COMMUNICATIONS:

EMERGING TECHNOLOGIES:

Note: Practical work is based on the above theoretical course

Books Recommended:
- Electronic Communications Systems. WAYNE TOMASI (Prentice Hall) Latest Edition

Approval:
Board of Studies, EL. Engg  Res. No. ______  Dated : 15-05-2009
Board of Faculty of EECE  Res. No. Dated : 18-12-2009
Academic Council  Res. No. 73.13  Dated : 23-12-2009
Title of Subject: ELECTRICAL POWER TRANSMISSION
Discipline: B.E. Electrical Engineering
Term: 5th Term
Effective: 08EL-Batch and onwards
Pre-requisites:
Co-requisite:
Assessment: Sessional Work: 20 % Written Examination : 80 %
Marks: Theory : 100 Practical : 50
Credit hours: 4 2
Minim Contact Hrs: 52 26

Aims: To provide adequate knowledge and understanding of Electrical Power Transmission its types, design analysis and performance as a part of electric network.

Objects:
- To know about various transmission and sub transmission systems and their voltage levels and standard voltage used in Pakistan.
- To evaluate line parameters such as resistance, inductance and capacitance for single phase and three phase lines.
- To derive equations for voltage and current in TL and represent the TLs as part of the electric supply network.
- To analyze current voltage power flow, and voltage regulation in TLs.
- To design TLs mechanically and calculate Sags tension and conductor length in overhead TLs.
- To know the types properties construction and application of O/H line insulators.
- To describe the constructional features of underground cable, their types, ratings and their application.
- To determine capacitance of U/G cables and various tests done on them.
- To know fault locating and jointing techniques in U/G cables.
- To understand occurrence of Corona on EHV lines its causes and its implications.
- To know the merits and demerits of AC interconnection and introduction of HVDC transmission to overcome some of demerits of A/C transmission and to learn about major components used in HVDC.

Contents:
Basic Concepts:
Phasor notation, complex power, power triangle, direction of power flow, current and power in balanced three-phase circuits, Percent and Per-Unit quantities, Selection of base and change in base of p.u. quantities, One-line diagram, impedance and reactance diagrams.

System of Transmission:
System of DC and AC Transmission; Transmission and sub-transmission, standard voltages in and abroad for transmission and subtransmission, WAPDA & KESC practices. Effect of voltage on transmission efficiency choice of system voltage.

Series Impedance of Transmission Lines:
Conductor types, Resistance, Skin effect, Line inductance based on flux considerations. Inductance of single phase 2-wire line, Inductance of composite conductor line, Inductance of 3-ph line with equilateral and unsymmetrical spacing, transposition. Inductance of Bundled conductors. Use of tables.

Capacitance of Transmission lines:
Review of Electric field on a long straight conductor, capacitance of two wire, 3-ph line; Effect of Earth on capacitance; capacitance of bundled conductors, Parallel circuit lines.

Current and Voltage Relations on a transmission line:
Representation of lines; the short, medium and long transmission lines, solution of equation and their interpretation, Travelling waves, Hyperbolic form of the equations, equivalent circuits, power flow through the line, voltage regulation and power circuit diagram, line surges.

Mechanical Design of Overhead Lines:
Line supports, sag and tension calculations, total length of conductor, supports at different levels, factor of safety, effect of wind pressure and ice loading, conductor vibration and use of dampers.

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

Corona:
The phenomenon of corona, disruptive critical voltage and visual critical voltage, conditions effecting corona, power loss due to corona, radio interference

Underground:

HVDC Transmission:
Introduction and classification of HVDC transmission limitations of AC interconnection and advantages of DC interconnection Components of HVDC transmission. Converting and inverting stations.

Note: Practical work is based on the above theoretical course
Books

Recommended:
- Power system Analysis by Ashfaque Hussain
- HV Transmission by Rao
- Electric Power Transmission System Engg. by Turan Gonen

Approval:
- Board of Studies, EL. Engg: Res. No. ________ Dated: 15-05-2009
- Board of Faculty of EECE: Res. No. ________ Dated: 18-12-2009
- Academic Council: Res. No. 73.13 Dated: 23-12-2009
Title of Subject : FEEDBACK CONTROL SYSTEMS
Discipline : B.E. Electrical Engineering
Term : 6th Term
Effective : 07EL-Batch and onwards
Pre- requisites : Co-requisite:
Assessment : Sessional Work: 20 % Written Examination : 80 %
Marks : Theory : 100 Practical : 50
Credit Hours : 4 2
Minim Contact hrs : 52 26

Aims : To give adequate knowledge & understanding about the concept of Control System.

Objectives : On completion of this course the students will be able to:
- Discuss various types of control systems.
- Mathematically formulate electromechanical devices and systems.
- Discuss Transfer functions, Block diagram, signal flow graph representation of basic electrical, mechanical and electromechanical devices and systems.
- Understand the concepts of polar and Bode Plots of transfer function.
- Learn the application of methods for the analysis of control system.
- Use Analogue computers for the simulation of the control systems.

Contents :
1. Basic concept of open loop and closed-loop (feedback) control systems, Control System Components, Control System Terminology.
2. Review of complex variable and plane, singularities of functions, Pole Zero of functions, applications of Laplace Transform,
4. Transfer functions of some basic electrical, mechanical and electro-mechanical devices and systems. Block diagram representation, signal flow graphs.
5. Polar plot of Transfer function, Bode plot of Transfer function. Stability criteria.
7. PID Controller.

Note: Practical work is based on the above theoretical course.

Books Recommended :
- Feedback & control systems, Stefano, Stubberud and Williams Schaum’s out line series. (Latest edition)
- B Feedback control System, by BC. Kuo

Reference Books :
- Linear Control System Melsa & Schultz, McGraw Hill
- Feedback control system, by OGATA.

Approval:
- Board of Studies, EL. Engg Res. No. Dated : 15-05-2009
- Board of Faculty of EECE Res. No. Dated : 18-12-2009
- Academic Council Res. No. 73.13 Dated : 23-12-2009
Title of Subject : POWER GENERATION SYSTEMS
Discipline : B.E. Electrical Engineering
Term : 6th Term
Effective : 07EL-Batch and onwards
Pre-requirements : Co-requisite:
Assessment : Sessional Work: 20 % Written Examination: 80 %
Marks : Theory: 100 Practical: 00
Credit Hours : Theory: 4 Practical: 0
Minim Contact hrs : 52 0

Aims : To impart knowledge about conversion of different kinds of energy into electrical energy, physical and engineering aspects and arrangement of different components in a power station where this energy conversion takes place.

Objectives : On completion of the above course the student will be able to:
- Understand conversion of different types of energy into electrical energy.
- Know about the energy conversion techniques.
- Understand the equipment and arrangement of different equipment used for this conversion.

Contents :
ENERGY RESOURCE & DEVELOPMENT:
Energy Resources available in Pakistan, Methods of harnessing them and their development. Relative cost of various power plants. Environmental issues of power generation.

CONVENTIONAL POWER PLANTS:
a. Working principles, design and general layout of thermal power plant and gas power plants. Operation and maintenance of these plants. Combined cycle & Co-generation.
b. Hydro-electric power station:
   Energy estimation, types of the plant, working principle, design and layout of the plant.
c. Nuclear power station:
   Review of nuclear physics, Nuclear reactions, advantages and disadvantages of nuclear energy and types of reactors. Working principle, design layout of nuclear power plant. Safety issue. Control system of radio active waves and plant problems, nuclear disposal of waste and management
d. Diesel Electric Power Station:
   Cost and heat estimation of diesel fuel. Working principle and design of the Diesel Electric Power Station. Coal gasification

INTERCONNECTION OF DIFFERENT POWER STATIONS:

RENEWABLE ENERGY & CONVERSION :
Wind, Solar, MHD, Ocean wave and Geo-thermal power plants.

POWER GENERATION FOR SPECIAL PURPOSES:
Power plant for ships and aeroplanes. ENERGY STORAGE & FUEL CELLS

Books Recommended :
- Elements of Electrical Power Station Design, M. U. Deshpande, Latest Edition,
- Principles of Energy conversion AU clup

Approval:
Board of Studies, EL. Engg Res. No. Dated : 15-05-2009
Board of Faculty of EECE Res. No. Dated : 18-12-2009
Academic Council Res. No. 73.13 Dated : 23-12-2009
Title of Subject: Numerical Analysis
Discipline: B.E. Electrical Engineering
Term: 6th Term
Effective: 08EL-Batch and onwards
Pre-requisites: Co-requisite:
Assessment: Sessional Work: 20% Written Examination: 80%
Marks: Theory (100) Practical: 50
Credit Hours: 4 2
Minim Contact hrs: 52 26

Aims:
Introduce the concept about numerical computation.

Objects:
After completing this course the student should be familiar with:
- Root of a non-linear equation f(x) = 0 and its computation
- Iterative methods for the solution of simultaneous linear algebraic equations
- Interpolation and extrapolation
- Numerical differentiation and integration
- Numerical solution of ordinary and partial differential equation

Contents:


Note: Practical work is based on the above theoretical course

Books:
- Numerical Methods for Engineers, Canal & Chapra
- Applied numerical Analysis, Curits F. Generald
- Advanced Engineering Mathematics, Evvien Cryzigg
- Applied Numerical Methods for the Solution of Partial Differential Equations, Chung Yau Lam
- A First Course in Numerical Analysis, Dr. Saeed Akhtar Bhatti.
- Ordinary Differential Equations with numerical Techniques, John L. Van Iwaarden,
- How to programming with C++, Deiliet & Delite

Approval:
Board of Studies BSRS Res. No. 02 (01) Dated: 29-05-2001
Board of Studies, EL. Engg Res. No. Dated : 15-05-2009
Board of Faculty of EECE Res. No. Dated : 18-12-2009
Faculty of Engineering Res. No. 23 (09) Dated: 08-03-2002
Academic Council Res. No. Dated:
Title of Subject: MACHINE DESIGN AND EQUIPMENT TRAINING
Discipline: B.E. Electrical Engineering
Term: 6th Term
Effective: 07EL-Batch and onwards
Pre-requisites: Co-requisite:
Assessment: Sessional Work: 20 % Written Examination: 80 %
Marks: Theory: 100 Practical: 50
Credit Hours: 4 2
Minim Contact hrs: 52 26

Aims: To produce clear understanding of Electrical machine design principles and requirements of safety before, during and after operation and accident. The subject teacher must train electrical engineering students in the complete process of design, from drawing table to manufacturing and utilization of the electrical machines and equipment.

Objectives: The student must learn all techniques to enable him in maintaining and repairing the equipment during service of the machine.
- To open and re-assemble machines.
- To design electrical machines.
- To overhaul the machine.
- To prepare maintenance schedule.
- To explain machine operation and repair of machines.

Contents: (The students will have to submit case studies on machines for sessional evaluation. Theory will be from A & B parts only)

PART (A) MACHINE DESIGN
- Industrial standardization reasons and benefits from standardization. National and international standards, codes and testing laboratories in Electrical Engineering.
- **Role of Electric Inspector, NEPRA, safety rules, legal issues.**
- Manufacturing and operating systems, Design considerations for electrical machines. Properties and applications of materials of magnetic and insulation systems of electrical machines and their design considerations, Thermal time constant. Duty cycles. Ratings and temperature rise.
- Specific loading and output equations of power transformer, induction motor and other machines. Design of electrical machines.
- Application of computer Aided Design (CAD) and computer aided manufacturing (CAM) of Electrical Machines.

PART (B) INSTALLATION, MAINTENANCE AND TROUBLE SHOOTING OF ELECTRICAL MACHINES
Safety in electrical machines, Trouble shooting and emergency repairs, installation, commissioning, testing, maintenance and trouble shooting of (i) Transformers and (ii) Induction motors and (iii) AC generators.

PART (C) EQUIPMENT TRAINING (PRACTICAL)
Measurement of magnetic flux, inductance and reluctance of a part of Electrical Machine. Study of transformer and rotating machine parts. Understanding operating principles, ratings and applications of following equipment:
- Power supplies, Magnetic contactors, Thermal overload Relay, miniature circuit breaker (MCB), Metallic Clad circuit breaker (MCCB), Earth leakage circuit breaker (ELCB), clip on ammeters, Cable Fault Locators, Meggers, Earth tester, Relay testers, Oil testers, Motor controllers, Tachometers, Phase testers (L.V and H.V).

Note:- At least one substation and one motor and Transformer manufacturing factory are to be visited by students.

Books Recommended:

Approval:
- Board of Studies, EL. Engg Res. No. Dated : 15-05-2009
- Board of Faculty of EECE Res. No. Dated : 18-12-2009
- Academic Council Res. No. 73.13 Dated : 23-12-2009
Title of Subject: DIGITAL ELECTRONICS & FUZZY LOGIC
Discipline: B.E. Electrical Engineering
Term: 6th Term
Effective: 01EL-Batch and onwards
Pre-requisites: Co-requisite:
Assessment: Sessional Work: 20 %
Marks: Theory: 100
Credit Hours: 4
Minim Contact hrs: 52

Aims: To give adequate knowledge and clear understanding about Digital Electronics, their principle of operations, logics, characteristics and overall performance

Objectives: Upon successful completion of this course the students will be able to:
- Describe the operation of logic gates, their timing diagrams, and trouble shooting
- Describe the basic laws, rules and theorems of Boolean algebra and their applications to digital circuits.
- Describe construction, operation and types of flip-flops.
- Discuss and connect the flip-flops together to perform counting operations of different types of counters.
- Describe the principle of operations, constructions, types of the registers.
- Describe the characteristics, types of semiconductor and magnetic memories.
- Describe the operation and applications of D/A & A/D converters.
- Describe the Digital Systems and their applications.

Contents:
LOGIC GATES:
AND gate, OR gate, Inverter and Buffer. NAND, NOR gates, Exclusive OR gate, Exclusive NOR gate, NAND, NOR gates used as Universal gates, Circuit configurations.

APPLICATION OF LOGIC GATES:

FLIP-FLOPS:
RS, JK, D, T Flip Flops, Schmitt Trigger.

COUNTERS TYPES:
Ripple, Decade, Synchronous, Up/Down counters.

SHIFT REGISTERS:

ENCODING AND DECODING:
8421 BCD Code, ASCII Code. Encoders used in Digital systems. Seven segment LED displays. Decoders used in digital systems.

MEMORY CIRCUIT CONFIGURATIONS:
Random-access memory (RAM), Read-Only-Memory (ROM), Programmable Read-Only-Memory (PROM) read only memory, Magnetic Core Memory, Computer Bulk storage Devices.

A/D & D/A CONVERTERS:
Simple Ladder type D/A converters, OPM-type D/A converter, BCD D/A converters. A/D converters, Successive approximation A/D converters.

DIGITAL SYSTEMS DEVELOPMENT:
Calculator, computer, digital clock, frequency counter, digital multimeter.

FUZZY SETS:
Restriction of Classical Set Theory and Logic Membership Functions Representations of Membership Functions, Constructing Fuzzy Sets, Operations on Fuzzy Set. Basic concepts properties, Fuzzy relationships applications

NEURO-FUZZY LOGIC:
Simple neural networks, neural network as directed graphs.
Note: Practical work is based on the above theoretical course.
Books Recommended

- Fuzzy Sets Theory Foundations and Applications, George J. Klir & Bo. Yuan

Approval:

- Board of Studies, EL. Engg Res. No. _______ Dated : 15-05-2009
- Board of Faculty of EECE Res. No. Dated : 18-12-2009
- Academic Council Res. No. 73.13 Dated : 23-12-2009
**Title of Subject**: MICROPROCESSOR SYSTEMS  
**Discipline**: B.E. Electrical Engineering  
**Term**: 7th Term  
**Effective**: 01EL-Batch and onwards  
**Pre-requisites**: Co-requisite:  
**Assessment**: Sessional Work : 20 %  
**Marks**: Theory : 100  
**Credit Hrs**: 4  
**Minim Contact Hrs**: 52  
**Pre-requisites**: Written Examination : 80 %  
**Practical**: 50  
**Credit Hrs**: 2  
**Minim Contact Hrs**: 26  

**Aims**: To provide adequate knowledge and clear understanding about construction, principle of operation, characteristics and applications of Microprocessor systems and its applications.  

**Objectives**: Upon successful completion of this course that student will be able to:  
- Describe how the microcomputer fetches and executes an instructions and overall working of micro-computer  
- Describe the details of architecture, instruction set, I/O and system design with 8085, 6800, 6502, 8086/8088 respectively and its programming  
- Describe the operation and interfacing of microprocessor with ROM, RAM and I/O ports and to understand that how different techniques considered for specific interfacing with systems  
- Describe the operation and types of different types of micro controllers such as Intel 8051 and Motorola 68HC 11 and their applications.  

**Contents**:

**MICROCOMPUTER FUNDAMENTALS**:
Introduction, Simplified Microcomputer Architecture, Simplified CPU organization and Instruction Set, Microcomputer Operation.

**MICROPROCESSOR ARCHITECTURE AND ITS PROGRAMMING**:
Architecture Pin diagram and description, Instruction and addressing modes, Interrupts and Programming of INTEL 8085 microprocessor.
Architecture Pin diagram and description, Instructions and addressing modes, Interrupts and Programming of MOTOROLA6800 microprocessor. Comparison B/W 6800 and 6502 Microprocessors.
Study of other 16-bit Microprocessors such as INTEL 8086 /8088 microprocessors and upgraded versions.

**INTERFACING THE MICROPROCESSOR**:
Basic Interfacing concepts, Interfacing of Microprocessor with RAM & ROM , Memory mapped I/O and Isolated I/O techniques. Basics of I/O Interfacing with I / O Ports (Serial and Parallel), Memory map and Address Decoding. D/A & A/D Interfaces.

**MICROCONTROLLERS**:
Introduction to Micro controllers, pin functions and description and working of Intel 8051 & Motorola 68HC11 micro controllers. Consideration for selecting the Microcontroller.

**APPLICATIONS**:
Traffic Light Signal, Temperature, monitoring control System, Washing machine controller, Diesel generator set controller, Stepper motor controller, Programmable Logic Controllers (PLCs).

**Books Recommended**:
- Microprocessor fundamentals, Roger Tokheim  
- Microprocessors Principles Applications ,Charles M. Gilmore  
- Microprocessor Theory and Applications, M. Rafiquzzaman  
- Microprocessor Architecture Programming and Applications, Goankar With the 8085 / 8080A  
- User manual of Microprocessor Application Trainer MAT 385  
  Volume: I, II III Feedback  

**Approval**:
- Board of Studies, EL. Engg Res. No. 73.13 Dated : 23-12-2009  
- Board of Faculty of EECE Res. No. 73.13 Dated : 18-12-2009  
Title of Subject : POWER SYSTEM ANALYSIS
Discipline : B.E. Electrical Engineering
Term : 7th Term
Effective : 01EL-Batch and onwards
Pre-requisites : Co-requisite:
Assessment : Sessional Work: 20 % Written Examination : 80 %
Marks : Theory : 100 Practical : 50
Credit Hrs : 4 2
Minim Contact Hrs : 52 26

Aims : This course will lead the students to:
- Learn to represent the power system components into their equivalent parameters.
- Be able to analyse various symmetrical as well as electrical faults and calculate fault
current levels for various systems.
- Be able to understand and use and compare various iterative methods of load flow analysis
for determining various node voltages and power flows in lines.
- To learn about the methods of voltage profile control.
- To understand the electromechanical behaviour of various components of power system
and effects of various disturbances.
- To learn about machine dynamics and stability of the system.

Objectives : The objective of this course is to impart adequate knowledge of representing the principal
power system equipment and the methods of analysis. Knowledge of operation of the
system and analysis of various faults are also to be provided.

Contents :
REPRESENTATION OF POWER SYSTEM:
Single-phase solution of balanced three-phase network. The impedance and reactance diagrams. Short Circuit KVA
calculations, per unit & percentage methods.

SYMMENTRICAL COMPONENTS:
Analysis of symmetrical Components. Power in terms of Symmetrical Components. Sequence impedance of transmission
lines. Sequence impedance and network of Synchronous machine, Sequence impedance and network of transformers.
Construction of sequence network of a power system.

FAULT ANALYSIS:
Line to line faults, line to ground faults, unsymmetrical faults on power systems, fault through impedance, Comparison of
faults on grounded and ungrounded systems.

LOAD FLOW STUDIES:
Review of network equations and solutions, network model equations and their formulation, load flow problems, Gauss
Seidal iterative method and algorithm for load flow solution. Newton-Raphsan Method, NR-Algorithm for load flow
solution. De coupled load flow methods, comparison of load flow methods, control of voltage profile. Computer
Applications.

POWER SYSTEM STABILITY:
Steady state and Transient Stability. The swing equation , Application of swing curve & solution of problems using
digital computers, stability of loads, Effects of mechanical and electrical time lag and delays, Electromechanical behavior
of machine/lines/busbar systems. Equal area criterion in machine dynamics.

Note : Practical work is based on the above theoretical course
Books Recommended :
- Electrical Power System & Analysis, Mohammad E.El-Harwary,(Reston), Turan GOENIN

Approval:
- Board of Studies, EL. Engg Res. No. Dated : 15-05-2009
- Board of Faculty of EECE Res. No. Dated : 18-12-2009
- Academic Council Res. No. 73.13 Dated : 23-12-2009
Title of Subject: POWER ECONOMICS AND MANAGEMENT
Discipline: B.E. Electrical Engineering
Term: 7th Term
Effective: 07EL-Batch and onwards
Pre-requisites: Co-requisite:
Assessment: Sessional Work: 20 %, Written Examination: 80 %
Marks: Theory: 100, Practical: 00
Credit Hrs: 4, 0
Minim Contact Hrs: 52, 0

Aims: This subject aims to provide skills and knowledge to the students on power systems planning, execution of power projects, and management of power system. It also helps students acquire methods of economic analysis of investment in power section and supplying economical power to consumers.

Objectives: After completing this course, the student will be able to:
- Learn power system planning including load forecasting
- Acquire skills of financial investment in power sector
- Understand the management process of power system including power generation, transmission and distribution
- Acquire methods of economic analysis of investment in power sector and supplying economical power to consumers.
- Learn theory and practice of economic laws applicable to power system
- Apply optimization techniques to increase reliability of power supply and reduce tariffs and power losses
- Understand the application of safety engineering in power system
- Learn IT applications in planning, execution and management of power system
- Know about the economic, managerial, technical and financial aspects of power supply to consumers

Contents:
INTRODUCTION OF ECONOMICS:
History of economic thought. Definition of economics, Macro and Microeconomics. Economics laws and applications.
Concept of Engineering Economics
LOAD ANALYSIS AND MANAGEMENT:
FINANCIAL MANAGEMENT AND COST ANALYSIS:
TARIFFS:
FEASIBILITY STUDIES:
Feasibility study of power generation, transmission and distribution, electrification of houses, multi-story buildings and industries, project documentation.
MANAGEMENT OF POWER SYSTEM:
PROCUREMENT, TENDERING AND CONTRACTS:
Project planning & preparation of project cycle 1 to 5 (PC-1 to PC-5)

Books Recommended:
- Power Station Engineering and Economy, Skrotzi and Vapat
- Power System Economics , Openshaw , Edward Arnold , London
- Economics Operation of power systems, Kirchmayer ; John Wiley and sons

Approval:
Board of Studies, EL. Engg Res. No. Dated: 15-05-2009
Board of Faculty of EECE Res. No. Dated: 18-12-2009
Academic Council Res. No. 73.13 Dated: 23-12-2009
MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF ELECTRICAL ENGINEERING

Title of Subject : ELECTRICAL POWER DISTRIBUTION & UTILIZATION
Discipline : B.E. Electrical Engineering
Term : 7th Term
Effective : 07EL-Batch and onwards
Pre-requisites : Co-requisite:
Assessment : Sessional Work : 20 % Written Examination : 80 %
Marks : Theory : 100 Practical: 50
Credit Hrs : 4 2
Minim Contact Hrs : 52 26

Aims
Objectives : Upon successful Completion of this course the student will be able to:
  • Understand the concept of distribution systems.
  • Describe the neutral grounding and earthing practices.
  • Describe the importance of power factor and its improvement.
  • Understand the electric heating and welding and their types.
  • Understand the design and development of illumination schemes and their method.
  • Learn about construction and working of electric lamps.
  • Learn about electrochemical processes and working of storage batteries

Contents
DISTRIBUTION:

GROUNDING AND EARTHING:

POWER FACTOR:
Disadvantages and causes of low Power Factor Methods for improvement. Application of shunt capacitors in distribution network.

Batteries & Electrochemical Processes:
Importance of DC systems in industry Main types of batteries and their working, Battery charging, Electroplating, Electrolysis, Electro metallurgical processes, Cathodic protection of poles, gas pipes and water structures. UPS(Un-Interruptable Power Supplies) & its importance.

HEATING AND WELDING:
Electric Welding: Resistance welding and its types.

ILLUMINATION:
Fundamentals of illumination Engineering, laws, units, terms used. Requirements for good lighting. Illumination schemes or various situations (Street lighting, Commercial/Industrial lighting, stadium/flood/stage/spot lighting etc). Types of lamps, their working and relative merit.

Note : Practical work is based on the above theoretical course

                    Electrical Technology, B. L. Theraja.

Approval: Board of Studies, EL. Engg Res. No. 73.13 Dated : 15-05-2009
          Board of Faculty of EECE Res. No. Dated : 18-12-2009
          Academic Council Res. No. 73.13 Dated : 23-12-2009
MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO
DEPARTMENT OF ELECTRICAL ENGINEERING

Title of Subject : ADVANCE MACHINES & DRIVES
Discipline : B.E. Electrical Engineering
Term : 7th Term
Effective : 07EL-Batch and onwards
Pre-requisites : Co-requisite:
Assessment : Sessional Work : 20 %  Written Examination : 80 %
Marks : Theory : 100  Practical : 50
Credit Hrs : 4  2
Minim Contact Hrs : 52  26

Aims : To provide knowledge and clear understanding about the construction, principle of operation, characteristics & applications of single phase motors and drive systems.
Objectives : Upon successful completion of this course, the student will be able to:

- Describe principle of operation, construction, characteristics and principle of operation of single-phase motors.
- Describe the application of elect. Drive systems for the mechanical operation.
- Understand and apply transient principles of Rotating Electric Machines.

Contents : Generalized Circuit Theory (GCT) of Machines
Importance of G.C.T in Electrical Machines. Steady- State & Transient Dynamic behavior of Electrical Machines. Formation of Generalized Circuit and Equations of Transformer from its T equivalent circuit, Behaviour of inductance of individual windings with respect to angular displacement of Rotor, Determination of parameters in AC & DC Machines. Electrical conversion, voltage & torque equations of Singly & Doubly excited rotating Electrical Machines, GCT voltage, torque & Electromechanical conversion equations of 1-phase induction Motor having 1,2,3 windings on stator & 1,2,3 windings on rotor. Understanding of cross field Theory & other relations, 3-phase Induction Machines, Universal motor.
MATLAB program of a typical Electrical Machine for its transient behaviour simulation.

SPECIAL MACHINES:

DRIVE SYSTEMS:

Note: Practical work is based on the above theoretical course.

Books Recommended :
Latest available editions)

Approval:  Board of Studies, EL. Engg  Res. No. ______  Dated : 15-05-2009
Board of Faculty of EECE  Res. No.  Dated : 18-12-2009
Academic Council  Res. No. 73.13  Dated : 23-12-2009
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<td>Assessment</td>
<td>Sessional Work : 20 %       Written Examination : 80 %</td>
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**Aims:**
To develop the skills of student and provide adequate knowledge about the concepts of automated power system control. The course will equip student with the understanding of SCADA and various other application functions used in the modern power system.

**Objectives:**
Upon successful Completion of this course the student will be able to:
- Describe the objectives of power system control and various power system operation modes
- Describe SCADA and its functions
- Explain various control structures and their families
- Discuss the organization of power system operations
- Elaborate the technical realization of power system control and system maintenance
- Provide the application of various power system function

**Contents:**

**INTRODUCTION:**
Need and objective of power system control. Automated power system control concept. Main Features of centralized control system in Pakistan, Power system operation modes, Organization and operator activities

**SCADA:**
Supervisory control, Data acquisition, Monitoring and event processing, Control functions, Disturbance data collection and analysis, Man-Machine communication methods

**POWER SYSTEM CONTROL STRUCTURES:**
Control Structures, Sub system: Local system, communication system, central system, and System classes

**SYSTEM INTERACTION:**
Operation organization, Allocation of functions in hierarchical control systems, Control system configurations

**TECHNICAL REALIZATION:**
Local system, Communication system, Central system, Control system supervision, System maintenance

**APPLICATION FUNCTIONS:**
Power system security and management, Active power and frequency control, Reactive power and voltage control, Economic dispatch, Energy Management System.

Note: Practical work is based on the above theoretical course

**Books Recommended (Latest available editions):**
- Power System Control Technology ,Trosten Cegrel ,Publisher Prentice/Hall International

**Approval:**
- Board of Studies, EL. Engg
- Board of Faculty of EECE
- Academic Council

Res. No. Dated : 18-12-2009
Res. No. 73.13 Dated : 23-12-2009
### Title of Subject: POWER SYSTEM PROTECTION

#### Discipline: B.E. Electrical Engineering

#### Term: 8th Term

#### Effective: 01EL-Batch and onwards

#### Pre-requisites:

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<td>Theory</td>
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#### Marks:
- Theory: 100
- Practical: 50
- Sessional Work: 20 %
- Written Examination: 80 %

#### Credit hours:
- Theory: 4
- Practical: 2
- Minim Contact hrs: 52

### Aims:
After completion of the course the student will be able to:
- Learn to represent the power system components into their equivalent parameters.
- Understand various causes of overvoltage resulting in insulation failure and principles of protection against over voltages.
- Learn about very basic protection equipment, from the fuses to very complex and robust circuit breakers, their construction and their working principle, their types and their ratings etc.

### Objectives:
The objective of the course is to give the student the knowledge of construction, principle of operation, and ratings of various protective equipment used in power system along with clear understanding of various protection schemes for major components of power system.

### Contents:

#### OVERVOLTAGES:
- Causes of overvoltages
- Propagation of surges
- Insulation co-ordination
- Determination of system voltages produced by travelling wave surges
- Protection against lightning
- Surge arresters and deviators
- Interference with communication circuits

#### FUSES:
- Fuse performance
- Selection of fuse material
- Types of fuses
- Main features of H.R.C. fuses
- Selection and co-ordination of fuses

#### REACTORS:
- Purpose and construction of various types of Reactors
- Location of reactors
- Selection of reactors

#### RELAYS:
- Protective Relays
- Fundamental requirement of protective relaying Operation and Principle of Electromagnetic, Electromechanical and Static Relays
- Microprocessor controlled relaying system

#### SWITCH GEAR:
- Arc phenomenon
- Initiation & extinction of arc
- Arc recovery voltage and Restriking voltage
- Classification of circuit breakers: Oil circuit breakers, Air blast circuit breakers, SF6 circuit breakers, Vacuum Circuit breakers
- Metal clad switch gears
- H.V. Load breaking switches
- Maintenance of circuit breakers

#### PROTECTION SCHEMES:
- Overcurrent, Ground fault, Impedance and Differential protection
- Distance Protection
- Unit protection schemes
- Generator protection
- Power transformer & Feeder protection
- Bus bar protection
- Motor Protection

Note: Practical work is based on the above theoretical course

### Books

#### Recommended:
- Power System Protection Vol. 1,2,3, 2nd ed. 1990. The Electricity Council
- Switch gear and protection, Sunil, S. Rao, Khanna Book Publishing House
- Power System Protection with Microprocessor Application, T.S. Mathava Rao
- Power System Protection, Patria, Basti, and S Chouthuria

### Approval:
- Board of Studies, EL. Engg
- Board of Faculty of EECE
- Academic Council
Title of Subject: POWER ELECTRONICS
Discipline: B.E. Electrical Engineering
Term: 8th Term
Effective: 01EL-Batch and onwards

Pre-requisites:
Assessment:
Marks:
Credit hours:
Minim Contact hrs:

Aims: After completion of the course the student will be able to:
- To provide adequate Knowledge and clear understanding about the construction, principle of operation, characteristics, protection, problems and applications of various Power electronic Semiconductor devices and their Control Circuits.

Objectives:
- Upon successful Completion of this course the student will be able to:
  - Describe principle of operation, construction, characteristics and applications of various Power Semi Conductor Devices.
  - Describe Ratings, protection, Cooling, Commutation techniques, firing circuits, Series & Parallel operation of Thyristors.
  - Describe applications of thyristors as static switches, voltage controllers, Converters, Inverters, Choppers & Cyclo converters.
  - Understand how to start and control speed of various types of Electric motors through various Power Electronic circuitries.
  - Understand clearly the problems and remedial methods of the generation of harmonics caused due to Power Electronic Circuitries in Systems networks.

Contents:
INTRODUCTION:

THE THYRISTER:
Principle of operation, characteristics, two transistor model of SCR, Thyristor types, Ratings, Protection and cooling, Thyristor Turn-on & Turn off, Commutation techniques, Series & Parallel operation of thyristors, Thyristor firing circuits. Triacs and GTOs

STATIC SWITCHES:
Single phase & three phase A.C switches, Three phase reversing switches, AC switches for bus transfer, DC switches, Solid state relays, Design of static switches.

THYRISTOR CONVERTERS:
AC voltage controllers, controlled rectifiers, Inverters, DC link converters, DC Choppers, Cyclo converters.

ELECTRIC DRIVES:
Thyristor starting & speed control of Induction motors, Direct current motors & synchronous motors, Brushless excitation system.

MISCELLANEOUS APPLICATIONS AND PROBLEMS:
Some special applications, Harmonics generation & their problems. Analysis of harmonics & their remedial methods. Instrumentation for nonsinusoidal waveforms.

COMPUTER APPLICATIONS:
Modeling & Simulation of various Power Electronic Circuitries & their Control.

Note: Practical work is based on the above theoretical course

Books
Recommended
Power Electronics Circuits, Devices & Applications, M.H. Rashid
Power Electronics Thyristor Controlled, R.S. Ramshah, Power for Electric motors.

Approval:
Board of Studies, EL. Engg
Board of Faculty of EECE
Academic Council

Res. No.
Res. No.
Res. No. 73.13

Dated: 15-05-2009
Dated: 18-12-2009
Dated: 23-12-2009
Title of Subject : HIGH VOLTAGE ENGINEERING
Discipline : B.E. Electrical Engineering
Term : 8th Term
Effective : 07EL-Batch and onwards
Pre-requisites : Co-requisite:
Assessment : Sessional Work : 20 %
Marks : Theory : 100
Credit hours : 4
Minim Contact hrs : 52

Aims : To provide knowledge about effects of increasing transmission voltage level on the insulation of electrical system/ electrical equipment in the system, different breakdown mechanisms in insulating materials, generation measurement and nondestructive testing of insulation.

Objectives : Upon successful Completion of this course the student will be able to:
- Describe reasons of increasing transmission voltage level from time to time
- Differentiate between different voltage levels
- Describe breakdown mechanisms in different insulating materials (Gas, liquids and solids)
- Describe different methods of generating high voltages (a.c, d.c, impulse)
- Describe methods of testing insulation without damaging it

Contents :
ELECTRICAL BREAKDOWN IN GASES:

BREAKDOWN MECHANISM IN SOLIDS AND LIQUIDS:
Solid and liquid insulating materials. Intrinsic, Electromechanical, Streamer, Thermal Erosion, Chemical Breakdown, Cavitation Breakdown, Suspended particle mechanism, in circuit breakers and uses.

GENERATION OF HIGH VOLTAGE:

MEASUREMENT OF HIGH VOLTAGE:
Method of measurement of alternating high voltage, impulse voltage and direct voltage. Sphere gaps, ammeter in series with high impedance, Series capacitance voltmeters (Clubb and Protecupe circuit.), potential dividers.

NON DESTRUCTIVE INSULATION TEST TECHNIQUES:

Note : Practical work is based on the above theoretical course

Books
Recommended (Latest available editions) :
- High Voltage Engineering Fundamentals ,E.Kuffel,W.S. Zaengl
- High Voltage Engineering, E.Kuffel, M. Abdullah

Approval:
Board of Studies, EL. Engg Res. No. 73.13 Dated : 15-05-2009
Board of Faculty of EECE Res. No. Dated : 18-12-2009
Academic Council Res. No. 73.13 Dated : 23-12-2009