

**.MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

<u>Title of Subject</u>	: <b>COMPUTER APPLICATIONS &amp; E- LEARNING</b>	
Discipline	: B.E. Electrical Engineering	
Term	: 1 <sup>st</sup> Term	
Effective	: 09EL-Batch and onwards	
Pre-requisites	:	Co-requisite:
Assessment	: Sessional work: 20%	Written Examination : 80%
Term	: 1 <sup>st</sup> 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, telemeeting, 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- 7<sup>th</sup> Edition.  
 C++ Programming, Robert lafore- 6<sup>th</sup> Edition.  
 How to program with C++, Deitel & Delite- 2<sup>nd</sup> Edition

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

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

<u>Title of Subject</u>	: APPLIED CALCULUS	
Discipline	: B.E. Electrical Engineering	
Term	: 1 <sup>st</sup> 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**

Introduction to derivatives. Geometrical and physical meaning of derivatives. Partial derivatives and their geometrical significance. Application problems (rate of change marginal analysis).

• **Higher Derivatives**

Leibnitz theorem, Rolles theorem, Mean value theorem. Taylors and Maclaurins series.

• **Evaluation of limits using L'Hospital's rule**

Indeterminate forms  $(0/0)$ ,  $(\infty/\infty)$ ,  $(0 \times 0)$ ,  $(\alpha - \alpha)$ ,  $1^\infty$ ,  $\infty^0$ ,  $0^0$

• **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 Mifflin Comp. Boston, lated  
 George B. Thomas Calculus and Analytic Geometry; Addison Wesley Pub. Com. 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
	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

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

<u>Title of Subject</u>	: ENGLISH	
Discipline	: B.E. Electrical Engineering	
Term	: 1 <sup>st</sup> 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	:
	<ul style="list-style-type: none"> <li>• Raising the level of standard in comprehending speaking reading and writing good English</li> <li>• Providing an opportunity of exposure to learn and use English well</li> </ul>

**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
  - iii. Understand and communicate series 1-4, G.W Ngoh & Desmond. P Pereira, PEP Inierrsaions (Pak). Limited. <<Follow Me Series 1-4
  - 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. Chritine Nuttal
  - viii. 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. <u>1 (a)</u>	Dated: <u>10-08-2006</u>
		Academic Council	Res.No	Dated:

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

<u>Title of Subject</u>	: ELECTRICAL ENGINEERING - I	
Discipline	: B.E. Electrical Engineering	
Term	: 1 <sup>st</sup> Term	
Effective	: 09EL-Batch and onwards	
Pr-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 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**

Atomic structure. Atomic bonding. Electric charge, current, electromotive force and potential difference. Ohm's laws, Specific resistance, Kirchoff's laws, power, energy, Effects of electric current, sources of electricity. Circular mil, Wire table, Temperature co-efficient, types of resistors, Color Code, Resistors in series and parallel, Super conductors.

• **Electrostatics and Capacitance**

Capacitor, charging and discharging, Types of capacitors. Capacitors in series and in parallel . Electric field strength and Electric Flux. Relative Permittivity. RC time constant. Displacement current, Energy in capacitor. Force between charged plates. Dielectric strength.

• **Electromagnetism, Magnetic Circuit & Inductance**

Characteristic of lines of magnetic flux. Magnetic induction and screening. Magnetic field due to an electric current. Solenoid. Force on current carrying conductor in magnetic field. Fleming's left-hand rule. Electromagnetic induction. Fleming's Right-hand rule and Lenz's law. Magnitude of induced e.m.f.

Magnetomotive force, magnetic field strength. Permeability. Reluctance. Composite magnetic circuit. Leaking and fringing. Hysteresis. Current-ring theory.

Self inductance. Field discharge switch. Non-Resistive inductor. Coupling co-efficient, Inductance of a coil, Iron cored inductor. L/R Time constant. Energy stored. Mutual 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. Science ,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

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

<u>Title of Subject</u>	: WORK SHOP PRACTICE	
Discipline	: B.E. Electrical Engineering	
Term	: 1 <sup>st</sup> Term	
Effective	: 09EL-Batch and onwards (Practical works based upon theory)	
Pr-requisites	:	Co-requisite:
Assessment	: Sessional work : 20 %	Written Examination : 80%
Marks	: Theory : 00	Practical : 100
Credit Hours	: 0	4
Minim Contact Hrs	: 0	52

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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** :

Introduction to conventional machine tools and their operations. Lathe, Milling, Shaper, Drill Press, Planner and Grinder. Basic and elementary tools used in Workshop. Importance of Pattern making, Wood, its kind and uses. Seasoning of wood and tools for wood working/ pattern making. Introduction to Forging. Types of forging. Introduction to Foundry, Moulding and its types. Moulding Tools, Moulding Sand. Equipment used in foundry processes. Melting Furnace. Introduction to Moulding tools. Joining processes, welding, brazing and Soldering, Electric Arc, Oxy- acetylene gas Welding, Welding joints, Precautions and Safety rules for each Shop.

Books Recommended :

Machine Tools Operation By: H.D . Burghardt.  
Engineering Metallurgy (1-3) By: R.A Higgins.  
Wood Working Part- II Fundamentals By: W.D Wolansky  
General Engineering Workshop Practice , Odham Boo.

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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.		Dated: 26-11-2009
		Board of Faculty Engineering		
		Academic Council		

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO  
DEPARTMENT OF ELECTRICAL ENGINEERING

<u>Title of Subject</u>	:	LINEAR ALGEBRA AND ANALYTICAL GEOMETRY
Discipline	:	B.E Electrical Engineering
Term	:	2 <sup>nd</sup> Term
Effective	:	09 EL Batch and onward
Pre-requisites	:	
Assessment	:	Sessional work 20 %
Marks	:	Theory: 100
Credit Hours	:	4
Minimum Contact Hrs:	:	52

	Co-requisite:
	Written Examination : 80%
	Practical : 0
	0

**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:**  
Matrices and its types. Elementary row operations. Inverse of a matrix. Echelon form and reduced echelon forms. Rank of a matrix. Vector spaces. Vector subspaces. Linear combination. Linear dependence and basis. Linear transformation.
- **System of linear equations:**  
System of non-homogeneous and homogeneous linear equations. Gaussian elimination and Gauss Jordan methods. Consistency criterion for solution of homogeneous and non-homogeneous 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  $R^3$ : 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. Surfaces. Quadratic surfaces, degenerate surfaces, symmetry, traces, intercepts of the surfaces, surface of revolution. Cylinder and cone. Cylinder, directrix of cylinder, right cylinder. Sphere. General equation of sphere, great circle  
Conics: Ellipsoid, elliptic paraboloid, hyperbolic paraboloid, hyperboloid of one sheet, hyperboloid of two sheets, elliptic cone, rolled surfaces, general quadratic surfaces. Spherical trigonometry. The cosine, sine, and cotangent formulae. Latitude and longitude, direction of Qibla.
- **Multiple integrals**  
Definition, double integral as volume, evaluation of double integral, change of order of integration. Application of double integrals, area, mass of an element, moment of inertia, center of gravity. Triple integrals, evaluation of triple integrals, application of triple integrals, volume, mass of an element, center of gravity, moment of inertia by triple integrals, triple integration in cylindrical and spherical coordinates.

**Books Recommended:**

- i. Yusuf, S.M. , *Calculus and Analytical Geometry*, Ilmi Kitab Khana, Lahore, Latest Edition.
- ii. Yusuf, S.M. , *Mathematical Methods*, Ilmi Kitab Khana, Lahore, Latest Edition.
- iii. Foreign Autors

<b>Approval:</b>	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	: 2 <sup>nd</sup> 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		

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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** :

Ideology of Pakistan, Definition & Explanation in the light of Allama Iqbal & Quaid -e - Azam's sayings. Religious movement, Educational movement, Aligarh movement, Khilafat movement, Two Nation Theory, India National congress, all-India Muslim League, Pakistan resolution of 1940. Separate Electorates, 1973 elections and distribution of ministers, 1946 election and transfer of power. The nature and emergence of modern state system, Islamic concept of state, political concepts, Sovereignty, Law, Liberty, Equality, rights and duties, Forms of Governments, Monarchy, Democracy, Dictatorship, Unitary and federal. Presidential and Parliamentary, Constitutional reforms of the British Government and Growth of the political parties, Constitutional Development and political struggle in Pakistan since 1947 and efforts for promulgation of Islamic state system, A comparative and critical analysis of the 1956, 1962 & 1973 constitution of Pakistan, Foreign policy of Pakistan, world war I & II, Decolonization, Rise of the third world, Alliances Systems , NATO , SEATO, CENTO, WARSAW pact, peaceful coexistence, Nuclear politics in South Asia, Pakistan's role in regional and international organizations, Pakistan relations with its neighbors and big powers, national integration and regionalism.

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,

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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

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

<u>Title of Subject</u>	:	APPLIED MECHANICS	
Discipline	:	B.E. Electrical Engineering	
Term	:	2 <sup>nd</sup> Term	
Effective	:	09 EL Batch & 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

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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**

Parallelogram, triangle and polygon law of forces, Moments and couples, Resultant of coplanar forces. Conditions of equilibrium, Center of gravity, Movement of inertia of plane figure. Friction, wedge and screw. Lifting machines, Support reactions, beams frames, trusses, graphical solutions, moment of inertia, radius of gyration, Kinetic energy of rotation. Centripetal and centrifugal forces, banking of tracks. Free vibrations, Vibration energy. Moving foundations. Rotation of unbalanced masses, Reasons. Balancing of rotating bodies. Work, power and energy. Dynamometers. Transmission of power by belts, ropes and gears.

• **Part B: Strength of Materials**

Stress and strain, hooks law, modulus of elasticity, poisson'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 Bernouli'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
- F.L. Singer, Engg: Mechanics,
  - R.S.Khurmi. S. Chand & Company Ltd: A text book of Applied Mechanics,
  - F.L. Singer: Strength of Materials,
  - Khurmi , Strength of Materials,
  - Strength of Materials, Timosshenko
  - Donglas , Solution of Problems I fluid Mechanics,
  - Dr. Modi, Fluid Mechanics ,
  - R.S Khurmi , Fluid Mechanics ,

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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. <u>03</u>	Dated: <u>11-06-2002</u>
		Board of Faculty of Engineering	Res. No. 24.4	Dated: 20-02-2002
		Academic Council	Res. No. <u>55.3 (ix)</u>	Dated: <u>31-05-2003</u>



**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: BASIC CIVIL ENGINEERING	
Discipline	: B.E. Electrical Engineering	
Term	: 2 <sup>nd</sup> 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	2
Minim contact hrs	: 52	26

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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
- i. T.P. Kanetkar, Surveying and leveling ,
  - ii. James M. Anderson, Introduction to Surveying,
  - iii. Gurcharn Singh , Basic Civil Engineering,

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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
		Academic Council	Res. No. <u>55.3 (ix)</u>	Dated: 31-05-2003

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: ELECTRICAL ENGINEERING -II	
Discipline	: B.E. Electrical Engineering	
Term	: 2 <sup>nd</sup> Term	
Effective	: 09EL-Batch and onwards	
Pre-requisites	:	Co-requisite :
Assessment	: Sessional Work : 20%	Written Examination: 80 %
Marks	: <b>Theory</b> : 100	<b>Practical</b> : 50
Credit hrs	: 4	2
Minim Contact hrs	: 52	26

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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**

Importance of transformers: types & Construction. Ideal transformer. Theory & Operation of Single-phase transformers, phasor diagram, leakage reactance, losses, Equivalent circuit parameters, No. load and short circuit test, transformer on load, concept of transforming power from primary circuit to secondary circuit or load power consumed from secondary side to primary side. Voltage regulation and efficiency, cooling of transformers.

• **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 :

Recommended

- 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

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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	:	2 <sup>nd</sup> Term	
Effective	:	09EL-Batch	
Pre-requisites	:		Co-requisite:
Assessment	:	Sessional Work : 20 %	Written Examination 80 %
Marks	:	<b>Theory</b> : 50	Practical: 0
Credit hrs	:	2	
Minim Contact hrs	:	26	

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Aims	:	To provide proper knowledge based on Holy Quran and Hadith
Objects	:	After completing this course student should be able to: <ul style="list-style-type: none"><li>● Effectively maintain his identity in multicultural world</li><li>● To find solutions to his problems from within his own cultural practices rather than be influenced by external ideologies</li></ul>

**Contents** :

Basic beliefs (Tauheed. Prophet-hood and concept of life after death), fundamentals of Islam (Prayer. Zakat, Fasting and pilgrimage), excellence of holy quran, surah Al-Hujrat, surah Al-Furqan, importance of Hadith, twenty selected ahadith, life history of Holy Prophet (S.A.S), Ethical values of Islamic society Taqwa, Tawakal, Simplicity, Lawful earning, Social Justice, rights of parents, elders, neighbors, fear of ALLAH( swt) Truthfulness, Jihad and its kinds, contribution of Islam to human civilization.

**Books** :

- Recommended**
- i. Islam, The Universal Religion, A.A Umrani, Naseem Book dept. 1994
  - ii. Sirate-e-Mustaqeem, A.Q. Natiq, Urdu Bazar Karachi, 1992
  - iii. Islam aur Hamari Zindagi, S.M Saeed, Naseem Book Dept, 1988.
  - iv. Islamic Studies, M. Ikram Rabbani, The Carvan Book House Lahore, 2002

<b>Approval:</b>	:	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

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

<u>Title of Subject</u>	:	Linear Circuit Analysis	
Discipline	:	B.E. Electrical Engineering	
Term	:	3 <sup>rd</sup> 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

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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
		<ul style="list-style-type: none"><li>• Work under PSpice MATLAB, ORCAD and Electronic Work Bench Software environment</li><li>• Describe various circuits theorems</li><li>• Describe the behavior of inductor and capacitor during charging and discharging</li></ul>

Contents :

Basic concepts, components, and laws of electric circuits. Series and parallel circuits. Nodal analysis. Loop and mesh analysis. Network theorems. Capacitive and inductive circuits. Sinusoidal steady state time domain analysis. Phasors, impedance and admittance. 3-phase circuits. Fourier and Laplace transforms and their application to circuit analysis. Differential and Integral forms of circuit equations, Natural response, forced response and complete response. Initial conditions. Voltage across capacitor and current through inductor. **Formation of Steady- state equations of 3 to 5 loop networks using KVL & KC Laws. Conversion of steady-state equations into corresponding transient equations. Writing of transient equations in matrix form. Simulation of circuits by PSpice, MATLAB, ORCAD and Electronics Work Bench.**

Note : Practical work is based on the above theoretical course

Books	:	
Recommended	:	<ul style="list-style-type: none"><li>• Electric Circuit Fundamentals, Oxford University press, Latest Edition. By Franco</li><li>• PSpice Manual for Electric circuits Fundamentals Oxford University, press Latest Edition By. J.S Kang.</li><li>• Electric Circuits. Schaum's outline series</li></ul>

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

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

<u>Title of Subject</u>	: Computer Aided Engineering Drawing	
Discipline	: B.E. Electrical Engineering	
Term	: 3 <sup>rd</sup> 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 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
  - T.W Berghauser and P.L Slcive. Illustrated Auto CAD. Release 10, BPB publishers, Latest Edition.
  - Engineering Drawing, N.D . Bhatt
  - The Complete sequence Auto CAD 2000. David S. Cohn Tata Mc Graw. Hill Publishing Company Ltd.

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		Board of Faculty of EECE	Res. No.	Dated : 18-12-2009
		Board of Studies of Deptt. of Civil Engg.	Res. No. <u>03 (b)</u>	Dated: <u>11-03-2009</u>
		Board of Faculty of Engg:	Res. No. <u>24(a) _</u>	Dated:
		Academic Council	Res. No.	Dated:

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: Electronic Devices & Circuits	
Discipline	: B.E. Electrical Engineering	
Term	: 3 <sup>rd</sup> 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

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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

- Solid State Electronics, George. B. Ruthowski, Latest edition
- Basic Electronic devices, Circuits and Systems, M.M Sirvoic , prentice Hall

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: Applied Thermodynamics	
Discipline	: B.E. Electrical Engineering	
Term	: 3 <sup>rd</sup> 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 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 :

Basic thermodynamic concepts applicable to Heat Engine. Gas laws, First & Second Law of thermodynamics. **Thermo Process, Entropy, Enthalpy** and relevant Basic heat engine cycles & application.

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 condensers **Heat Exchanger, super heater, pumps & valves**. Coal, oil and gas fired boilers, their auxiliaries and fittings

Steam and Gas Turbines & classification.

I.C. Engines; introduction, working cycles and performances. Petrol and Diesel Engines.

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  
Board of Faculty of EECE  
Board of Studies Mechanical Engg.  
Board of Faculty of Engineering  
Academic Council

Res. No. \_\_\_\_\_

Res. No.

Res. No.

Res. No.

Dated : 15-05-2009

Dated : 18-12-2009

Dated: 05-09-2009

Dated:

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: Differential Equations and Fourier Series	
Discipline	: Electrical Engineering	
Term	: 3 <sup>rd</sup> Term	
Effective	: 07 Batch and onward	
Pre-requisites	:	Co-requisite:
Assessment	: Sessional 20 %	Written Examination: 80 %
Marks	: Theory : 100	Practical: 0
Credit hrs	: 4	0
Minim Contact hrs	: 52	

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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.

*Higher order linear differential equations:* Homogeneous linear equations of order n with constant coefficients, solutions of higher order differential equations according to the roots of auxiliary equation. Non-homogeneous linear equations. Cauchy Euler equation. Method of variation of parameters. Applications of higher order linear differential equations.

*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.

Fourier series: Fourier coefficients. Convergence of Fourier series. Fourier series of odd and even functions.

**Books Recommended:**

1. Yusuf, S.M. , *Calculus and Analytical Geometry*, Ilmi Kitab Khana, Lahore, Latest Edition.
2. Yusuf, S.M. , *Mathematical Methods*, Ilmi Kitab Khana, Lahore, Latest Edition.
3. Frank Ayres, Jr., *Theory and Problem on Differential Equations.*, Schaum Pub. Comp.; New York, Latest Edition.
4. Wilfred Kaplan; *Elements of Ordinary Differential Equations*; Addison Wesley Pub. Comp.; London.

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	Board of Studies BSRS:	Res. No. 02 (01)	Dated: 29.05.2001
	Faculty of Engineering:	Res. No. 23 (09)	Dated: 08.03.2002
	Academic Council:	Res. No.	Dated:



**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: DC Machines	
Discipline	: B.E. Electrical Engineering	
Term	: 4 <sup>th</sup> 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

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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 of 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

Mode of operation of rotating machines, structure, General operation, alignment fundamentals. Simple linear machine. A loop rotating between pole face Commutation. Armature construction. Armature windings. Armature reaction. Induced voltage and torque equations. Construction. Power flow and losses.

D.C . GENERATORS

Equivalent circuit, Back emf and generator characteristics. Separately excited, shunt, series and compound generators. Parallel operation.

D.C MOTOR

Equivalent circuit. Torque production. Separately excited, shunt, permanent-magnet, series and compound motors, Motor characteristics, Starting & Speed control methods, Ward Leonard system. Reversing, braking and jogging. Efficiency calculations.

TRANSFORMER FUNDAMENTALS

Importance of transformers. Types and construction. Ideal transformer. Theory and operation of real single-phase transformers. Phasor diagrams. Leakage reactance. Losses. Equivalent circuit parameters. No-Load and short circuit tests. Voltage regulation and efficiency.

ELECTROMECHANICAL ENERGY CONVERSION

Forces self and mutual inductance of stator & rotor windings. Torques in magnetic field systems. Energy balance. Singly excited system. Coenergy. Multiply excited system. Dynamic equations.

**MATLAB & Simulink programming**

Note : Practical work is based on the above theoretical course

Books :

Recommended

- Electrical Machinery Fundamentals , Stephen J. Chapman, latest edition Mc. Graw Hill,
- Electric Machinery , Fitzgerald, Kingsley and Umans, latest edition , Mc Graw Hill,

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: Theory of Electromagnetic Fields	
Discipline	: B.E. Electrical Engineering	
Term	: 4 <sup>th</sup> Term	
Effective	: 07EL-Batch and onwards	
Pre-requisites	:	Co-requisite:
Assessment	: Sessional 20 %	Written Examination: 80 %
Marks	: Theory (100)	Practical : 0
Credit Hours	: 4	
Minim Contact hrs	: 52	

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Aims	: To important give knowledge about EMF.
Objects	: On completion of this course student will be able to understand <ul style="list-style-type: none"><li>• About electromagnetic fields, Forces and energy in the fields</li><li>• Application of different theorems and laws</li><li>• About wave propagation</li></ul>

**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	•	Engineering Electromagnetic, W.H. Hayt. , Mc. Graw Hill
	•	Electromagnetic , John D. Kraus & K.R. Carvent , Mc. Graw Hill.

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	:	Applied Electronics	
Discipline	:	B.E. Electrical Engineering	
Term	:	4 <sup>th</sup> Term	
Effective	:	07EL-Batch and onwards	
Pre-requisites	:		Co-requisite:
Assessment	:	Sessional 20 %	Written Examination 80 %
Marks	:	Theory: 100	Practical : 50
Credit Hours	:	4	2
Minim Contact hrs	:	52	26

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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

Bandwidth, Distortion, Noise, Transistor amplifier using resistance and tuned circuit loads, Input and Output impedances. Feedback amplifier, Operational amplifiers and applications. Power amplifiers. Magnetic amplifiers.

OSCILLATORS AND PULSE GENERATORS

General condition for oscillation. Sinusoidal oscillator. Stable multi-vibrator. UJT relaxation oscillator. Synchronizing. Astable and Bistable Multivibrators.

COOLING AND HEATING SINKS

Losses and heat dissipated inside Solid State Power Devices. Junction temperature. Thermal resistance. Electrical model of Heat transfer. Design of cooling system.

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

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: Statistics & Probability	
Discipline	: B.E. Electrical Engineering	
Term	: 4 <sup>th</sup> 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	0
Minim Contact hrs	52	0

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Aims	: Introduce the concept of descriptive and inferential statistics and probability
Objects	: After completing this course, the student should be familiar with <ul style="list-style-type: none"><li>• Different statistical methods to obtain the measures of central values of a data and their interpretation.</li><li>• Probability and its rules. Different probability distributions and their uses</li><li>• Estimations and hypothesis</li></ul>

Contents :

Introduction.

Nature and importance of statistics, descriptive and inferential statistics. Populating and samples.

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

Concept of random variable, Discrete probability distribution. Case study. Continuous probability distribution with examples. Probability density function. Joint probability distribution. Examples. Mean of a random variable. Variance of a random variable. Binomial distribution. Mean and variance of Binomial distribution. Examples of Poisson distribution. Normal distribution, area under the normal curve Standard normal distribution, inverse use of tale of areas under the normal cures, 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. Good-ness of Fit test, test of independence.

Estimation of Parameters

Confidence interval of one population mean, estimating a population mean, estimating the difference between two population means. The Chi-square distribution. Estimating a population standard deviation. The F distribution. Estimating the ratio of two variances.

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
- Statistical methods & Estimations, M.U. Shaikh, M.A Solangi, Nasim Book Depot, Hyd, Latest Edition
  - Introduction to Statistics, Ronal Walpole, Macmillan Pub. Com. New York, Latest Edition
  - Statistics Vol. I & II, Sher Muhammad Choudary
  - Elements of Statistics , Iqbal Bhatti
  - Applied Statistic and Probability for engineering, Douglas C. Montgomery

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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:

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: Complex Variables and Transforms	
Discipline	: B.E. Electrical Engineering	
Term	: 4 <sup>th</sup> 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's 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.

Inverse Laplace transforms and its properties. Convolution theorem. Inverse Laplace transforms by integral and partial fraction methods. Heavisides expansion formula. Solution of ordinary differential equations by Laplace transform.

Application of Laplace transformation in various fields of engineering,

**Z Transform & Their application.**

Series Solution of Differential Equations.

Introduction. The solution of  $P_0(x)y + p_1(x)y' + p_2(x)y'' = 0$ , 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 . legendre 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** :
- Recommended**
- Erwing Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons , Latest Edition.
  - Theory and Problems of Laplace Transforms, MR. Spiegel, , Schaum's out line Series Mc Graw Hill, Latest Edition.
  - Theory and problems of complex Variables , M.R Spiegel , Schaum's out line Series, Mc Graw Hill, Latest Edition
  - Engineering Mathematics; Croft & Davison, Addison Wesley Pub. Comp. Latest Edition

Approval:	:	Board of Studies, EL. Engg	Res. No. _____	Dated : 15-05-2009
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		Board of Studies of Deptt: of BSRS	Res. No. 02 (i )	Dated: 29-05-2001
		Faculty of Engineering	Res. No.23 (09)	Dated: 08-03-2002
		Academic Council	Res. No.	Dated:

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: A.C MACHINES	
Discipline	: B.E. Electrical Engineering	
Term	: 5 <sup>th</sup> 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:

Autotransformers. Tapping. Parallel operation and load division. Inrush current Exciting current. Three phase transformer. Per unit system. Three phase connections and harmonic Suppression. Vector groups.

Three Phase Induction Motor:

Production of rotating field and torque. Reversal of rotation. Construction. Synchronous speed. Slip and its effect on rotor frequency and voltage, Equivalent circuit. Power and torque. Losses, efficiency and power factor. Torque-speed characteristic. Starting and speed control. Induction generator.

SINGLE-PHASE INDUCTION MOTORS:

Construction, types, principles of operation, reversing direction of rotation and performance analysis of single-phase induction motors.

SYNCHRONOUS GENERATOR:

Construction. Exciting system. Equivalent circuit. Phasor diagram. Power and torque. Measurement of parameters. Generator operating alone Synchronous Generator rating Capability chart (Curves). Synchronization; parallel operation with infinite bus and power sharing. Parallel operation of same size generators. Generator ratings. Loss of field excitation. Cooling systems. Shut down procedure

SYNCHRONOUS MOTORS:

Principle of operation. Starting. Shaft load, power angle and developed of torque. Counter voltage (CEMF) and armature reaction voltage, equivalent circuit of Synchronous Motor Torque speed characteristics, effect of load changes on synchronous motor, effect of field current changes on synchronous motor. V-curves. Losses and efficiency. Power factor improvement. Speed control. Ratings.

MATLAB & Simulink programming

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

Books

- Recommended
- Electric Machine, Charles I. Hubert Maxwell Macmillan, latest edition
  - Electric Machinery Fundamental, Stephan J. Chapman, Mc-Graw Hill, latest edition
  - Electric Machines, 1 Jnagrath & DP Kothari, MC-Graw Hill, 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

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

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

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 voltmeter.

Definition, Accuracy, precision, sensitivity, resolution Decibel. Bandwidth, significant figures. Types of errors.

**ELECTROMAGNETIC INSTRUMENTS:**

Temperature compensation. Extension of Instrument ranges by shunts and multipliers. Ohms per volt and loading effect for voltmeter. Calibration of D. C Instruments. Watt hour meter. Power-factor meters, Instrument transformers. Frequency meters. KVAR meters. Recording Instruments. Phase sequence measurement.

**BRIDGES AND POTENTIOMETERS:**

Wheatstone bridge. Kelvin bridge. A.C. bridges and their applications. A.C. and D.C. 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**

Wave analysis. Harmonic distortion analysis. Spectrum analysis.

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

Books

- Recommended :
- Electronic Instrumentation and Measurement Technique, W.C Cooper & A.D Helfrich Latest edition
  - Fundamentals of Electrical Measurements, B.A. Gregory Latest edition
  - Electronic Measurement and Instrumentation, Olivari Latest edition

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: 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



**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: NETWORK ANALYSIS	
Discipline	: B. E. Electrical Engineering	
Term	: 5 <sup>th</sup> 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	0
Minim Contact Hrs	: 52	0

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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 1 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 TRANSFORMATION:**

Introduction, Characterization of linear Time-Invariant two ports by six sets of parameters. Relationship among parameter sets interconnection of Two-ports.

**NETWORK FUNCTIONS AND FREQUENCY RESPONSE:**

The concept of complex frequency. Transform impedance and transform circuit. Network functions of one and two ports. Poles and Zeros of network functions. Restrictions on pole and zero location for driving point impedance and Transfer functions. Parts of network functions. Magnitude and phase plots. Complex loci-plots from s-plane phasors. **Stability analysis, stability criteria of stability & application.**

**NON-SINUSOIDAL ANALYSIS:**

Fourier series and its use in circuit analysis. Evaluation of Fourier co-efficient. Waveform symmetries. Exponential form of Fourier series. Steady state response to periodic signals. Introduction to Fourier Transforms.

Books :

- Recommended
- Linear Networks & Systems By Benjamin C. Kuo, McGraw-Hill, Electrical & Electronic Engineering series.
  - Introductory Circuit Analysis By Boylestead Latest edition, Prentice-Hall International, Inc.
  - Electric Circuits By Joseph A. Edminister, Schaum's Outline Series McGraw Hill Company
  - Network Analysis Van Valkenburg prentice Hall Inc. Latest edition.

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

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

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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:**

The elements of communication system. Types Of Electronic Communications. The electromagnetic spectrum. Bandwidth. Transmission modes. Signals and spectral analysis. Basic functions of the Telephone set. The Public Switched Telephone Network. Switching hierarchy. Transmission media for trunks. Telemetry. Telex. Fax. Telegraphic equipment.

**MODULATION TECHNIQUES:**

Amplitude modulation. Frequency modulation. Pulse modulation and encoding techniques. Multiplexing.

**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:**

Microwave links. Satellite communication links. Principles of Radar. Introduction to simple Radar system.

**FIBER – OPTIC COMMUNICATIONS:**

Introduction to Fiber – Optic system. Components in an Optical Fiber link. Advantages of Fiber – Optic communication system over wire system. Types of Optical Fiber. Optical loss and Fiber attenuation.

**EMERGING TECHNOLOGIES:**

Introduction to computer networking. Emerging technologies. Mobile / cellular communication. **Advances in wireless Communication.**

Note : Practical work is based on the above theoretical course

Books Recommended :

- Electronic Communication System. G.KENNEDY (McGraw Hill) Latest edition
- Telecommunications. WARREN HIOKI (McGraw Hill) Latest edition
- Communication electronics. FRENZEL (McGraw Hill) Latest edition
- Electronic Communications Systems. WAYNE TOMASI (Prentice Hall) Latest Edition

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: ELECTRICAL POWER TRANSMISSION	
Discipline	: B.E. Electrical Engineering	
Term	: 5 <sup>th</sup> 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** : The course enables the student:

- 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:

Conductors for cables, Insulating materials for cables. Types and constructional features of U/G cables. Electrostatic stress in single core cables and grading of cables. Three core high voltage cables EHV cables Oil filled cables, external pressure cables, gas filled cables, thermal characteristics of cables. Cable ratings and their determination, capacitance of insulated cables, Tests on cables. Fault locating and jointing techniques in cables.

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 Ashfaq Hussain  
• HV Transmission by Rao  
• Electric Power Transmission System Engg. By Turan Gonen  
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Board of Faculty of EECE Res. No.  
Academic Council Res. No. 73.13

Dated : 15-05-2009  
Dated : 18-12-2009  
Dated : 23-12-2009

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: FEEDBACK CONTROL SYSTEMS	
Discipline	: B.E. Electrical Engineering	
Term	: 6 <sup>th</sup> 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

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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,
3. Equation of physical systems, The dynamics of simple Servomechanism for angular position control, Velocity Servomechanism.
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.
6. Introduction to state variable concept. State equation of some basic linear systems. Matrix representation of state equations.
- 7. PID Controller.**
8. Analogue computers, simulation of differential equations for simple linear systems.

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)
  - Feedback control system Analysis and Synthesis by J.J.D. Azzo (C.H.Houpis), Mc Graw Hill. (Latest edition)
  - **B Feedback control System, by BC. Kuo**
- Reference Books : Linear Control System Melsa & Schultz, McGraw Hill  
: **Feedback control system, by OGATA.**

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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	: Numerical Analysis	
Discipline	: B.E. Electrical Engineering	
Term	: 6 <sup>th</sup> 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** :

Error analysis. Introduction. Floating points, errors, types of errors. Solution of non-linear equation. Bisection method. Regula-falsi method, Newton Raphson's method for one and two variables, Fixed-point iterative method. Solution of linear algebraic equations. Direct methods: Crout's method. Cholesky method. Iterative methods: Jacobi's method. Gauss-Seidel method Eigen values and Eigen vectors. Characteristics equation method. Power method interpolations and extrapolations. Differences: Forward, backward central operators and their relations. Newtons Forward interpolation Formula, Newtons Backward interpolation Formula Newtons divided Difference Formula. Lagrange's Interpolation Formula. Stirling's formula Numerical differentiation. Newton's forward and Backward differentiation Formulae. Numerical quadrature. Trapezoidal rule. Simpson's one-third rule, Simpson's three-eighth rule, Weddle's rule. Gaussian quadrature.

Numerical solution of ordinary differential equations. Taylor Series method, Euler's and its modified methods. Runge-kutta methods. Milne's method. Adam-Moltan method, Predictor Corrector method. Computer Application & programming.

Solution of Higher order differential Equations. Runge-Kutta methods. Numerical solution of partial differential equations by finite differences methods, Explicit Method, Implicit Method, Crank-Nicolson Method. ADI Method.

**Computer application & programming.**

Note : Practical work is based on the above theoretical course

- Books** :
- Recommended**
- Numerical Methods for Engineers, Canal & Chapra
  - Applied numerical Analysis, Curtis F. Gerald
  - 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,
  - Object oriented Programmin in C++ SAMS, Latest Edition, Robert Lafore
  - How to programming with C++, Deiliet & Delite

<b>Approval:</b>	:	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
		Board of Faculty of EL, ES & CS Engg.	Res. No. 24(a)	Dated: 28-05-2007
		Academic Council	Res. No. _____	Dated: _____

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: MACHINE DESIGN AND EQUIPMENT TRAINING	
Discipline	: B.E. Electrical Engineering	
Term	: 6 <sup>th</sup> 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

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**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** :
- Alternating Current Machines, M.G. Say Pitman, Latest Edition.
  - Testing Commissioning Operation and Maintenance of Electrical Equipment, S. Rao Khanna, Latest Edition.

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		Academic Council	Res. No. 73.13	Dated : 23-12-2009



**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	:	DIGITAL ELECTRONICS & FUZZY LOGIC	
Discipline	:	B.E. Electrical Engineering	
Term	:	6 <sup>th</sup> Term	
Effective	:	01EL-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 and clear understanding about Digital Electronics, their principle of operations, logics, characteristics and overall performance
- Objectives : Upon success full 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.
  - Discuss 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:**

Logic circuits from Minterm and Maxterm Boolean expansions and Truth Tables, Boolean theorem, Karanaugh Map. Simplifications of three, four variable Boolean expressions, Half Adder, Full Adder, Subtractors using NAND, NOR, XOR gates.

**FLIP-FLOPS:**

RS, JK, D, T Flip Flops, Schmitt Trigger.

**COUNTERS TYPES:**

Ripple, Decade, Synchronous, Up/Down counters.

**SHIFT REGISTERS:**

Parallel registers bit system, serial-in and serial-out serial in parallel-out, parallel-in serial out and parallel in parallel-out, shift-left and shift-right modes.

**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

- Digital Electronics, Roger L. Tokheim, McGraw Hill, 6<sup>th</sup> Edition
- Digital Computer Theory, Louis Nashelsky, John Wrala, 6<sup>th</sup> Edition
- Digital Computer Electronic, Glencoe, McGraw Hill International Edition, 5<sup>th</sup> Editions
- Digital Fundamentals, Thomas L, Floyd, Prentice-Hall International inc, 6<sup>th</sup> Edition.
- Fuzzy Sets Theory Foundations and Applications, George . J. Klir & Bo. Yuan

Approval:

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: MICROPROCESSOR SYSTEMS	
Discipline	: B.E. Electrical Engineering	
Term	: 7 <sup>th</sup> 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

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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 & MOTOROLLA 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).

Note : Practical work is based on the above theoretical course

- 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. _____	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	: POWER SYSTEM ANALYSIS	
Discipline	: B.E. Electrical Engineering	
Term	: 7 <sup>th</sup> 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

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- 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.

**SYMMETRICAL 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 Systems, A.E guile & W Paterson, Vol. 1 & 2 (Paragon on press)
- Modern Power System Analysis, J. Nagrath & D.P. Kothari, (McGraw Hill)
- Elements of Power System Analysis, W.D .Stevenson, Jr, (McGraw Hill)
- Electrical Power System & Analysis, Mohammad E.El-Harwary,(Reston), Turan GOENIN

Approval:

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Dated : 23-12-2009

**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: POWER ECONOMICS AND MANAGEMENT	
Discipline	: B.E. Electrical Engineering	
Term	: 7 <sup>th</sup> 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:**

Types of loads, Estimation of load. Load growth and load forecasting. Load duration curve. Maximum demand, diversity and diversity factor, Demand Factor, Capacity and Utilization Factors load management, Economics of Power losses, Power Losses Reduction.

**FINANCIAL MANAGEMENT AND COST ANALYSIS:**

Cost of power plant, financial mathematics. Depreciation and Amortization. Maintenance and operating costs. Economic selection of number of units in the power station. Relative costs of various power plants. Financial Management.

**TARIFFS:**

Energy Tariff objectives, General Tariff forms. Different types of tariffs, their origin and justification. Optimum tariff design. WAPDA tariff system. Private power policy.

**FEASIBILITY STUDIES:**

Feasibility study of power generation, transmission and distribution, electrification of houses, multi-story buildings and industries, project documentation.

**MANAGEMENT OF POWER SYSTEM:**

Reliability and optimization. Theory of management. Project management. Management of large power plants. Management information systems.

**PROCUREMENT, TENDERING AND CONTRACTS:**

Procurement procedures, tendering documents, Electricity Act 1910 & rules 1937 & contracts. **Preparation of Essentials** . 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

**Reference Books.**

- Economics Operation of power systems, Kirchmayer ; John Wiley and sons
- Modern Economics theory , Dewe K.K. , Delhi great and Ireson Principles of Engg. Economy.

**Approval:**

: Board of Studies, EL. Engg  
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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: ELECTRICAL POWER DISTRIBUTION & UTILIZATION	
Discipline	: B.E. Electrical Engineering	
Term	: 7 <sup>th</sup> 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

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**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:**

Introduction to distribution system. Urban. Suburban and Rural distribution systems. Primary, secondary and Tertiary voltages. Radial and Ring Main systems. Estimation of load. Load characteristics. Substation-Switch gear and busbar arrangements. Calculation of voltage drop and regulation in distribution feeders. Power distribution voltages in Pakistan, causes, arcing on power distribution lines.

**GROUNDING AND EARTHING:**

Distribution transformers neutral earthing. Earthing resistance. Earthing practice in L.V. network.

**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 heating:** Resistance, Induction and Dielectric heating. Electric furnaces, Microwave heating.

**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

- Books Recommended** :
- (Latest available editions)
- Electric Power Distribution System Engineering ,Turan Gonen.
  - Utilization of Electric Energy , Ram Kumar Garg-Dhir-Bhatnagar.
  - Electrical Technology, B. L. Theraja.

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: POWER SYSTEM CONTROL	
Discipline	: B.E. Electrical Engineering	
Term	: 8 <sup>th</sup> Term	
Effective	: 01EL-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

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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
- Power Generation , Operation and Control, Allen J. Wood ,Bruce f. Woolenbarg.

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	: POWER SYSTEM PROTECTION	
Discipline	: B.E. Electrical Engineering	
Term	: 8 <sup>th</sup> Term	
Effective	: 01EL-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

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- 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** (Latest available editions)
- Power System Protection Vol. 1,2,3 , 2<sup>nd</sup> ed. 1990. The Electricity Council
  - Switch gear and protection, Sunil, S. Rao, Khanna Book Publishing House
  - Electric Power System Vol. I and II, Guile and Paterson, John Wiley
  - Power System Protection with Microprocessor Application, T.S. Mathava Rao
  - Power System Protection, Patria, Basti, and S Chouthuria.

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	:	POWER ELECTRONICS	
Discipline	:	B.E. Electrical Engineering	
Term	:	8 <sup>th</sup> Term	
Effective	:	01EL-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

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- 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:**

Recent advancement in Power Electronics & its Application, Power semiconductor devices, Power diodes, Power transistors, Power MOSFET, IGBT and their characteristics. Free wheeling diodes, Diodes with RC & RL , LC & RLC loads.

**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** (Latest available editions)
- Power Electronics Circuits, Devices & Applications, M.H. Rashid
  - Power Electronics Thyristor Controlled ,R.S. Ramshah ,Power for Electric motors.

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**MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO**  
**DEPARTMENT OF ELECTRICAL ENGINEERING**

Title of Subject	:	HIGH VOLTAGE ENGINEERING	
Discipline	:	B.E. Electrical Engineering	
Term	:	8 <sup>th</sup> 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

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**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:**

Ionization, Townsend Theory, Cathode Processes, Decay Process, Effect of space charge on Breakdown voltage, Steamer Mechanism, Breakdown in compressed gases, Paschen Law, Penning effect, partial breakdown, Mechanism of partial discharge. Applications of corona. Design consideration for Rod – gaps, Flashover mechanism.

**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:**

**Need for high Voltage, Voltage levels, Problems of Erection & maintenance of High Voltage Systems.** Method of generation of alternating high voltage, Transient voltage and direct voltage. Transformers in cascade, Series Resonant circuit, single stage and multistage impulse generators, Half wave rectifiers circuits, Full wave rectifier circuits. Voltage Doubler circuit, cascade circuits.

**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 Protecue circuit.), potential dividers.

**NON DESTRUCTIVE INSULATION TEST TECHNIQUES:**

Dielectric loss measurements and partial discharge detection. Measurement of resistivity & dielectric strength.

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
- High Voltage Measurement, Testing and Design T.J. GAGllagher & A.J. Pearmain

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