

# **BSEE Course Descriptions and Textbook Details**

**Updated Jan 2015**

## **1. CS141 Programming Fundamentals (2+1)**

This is an introductory course in programming that is a pre-requisite for almost subsequent courses related to programming. The course will introduce the students to problem solving using at first pseudo code and then C language. We shall be using plenty of problems from arithmetic for programming. We shall get to know the concepts of variables, data types and program flow in the C language. These shall be used to construct working solutions to the problems posed. Later on the use of functions will be introduced to break up the solutions into manageable chunks. The use of Arrays will be introduced. The concept and use of pointer-variables will be dealt with as well as their relation to the arrays in C. The use of null-terminated character arrays as string will be taught. The course directly contributes to objectives a, d, e and f of the HEC Electrical Engineering Curriculum

### **Text Book:**

- H. M. Dietel and P.J. Deitel, "C How to Program ",7<sup>th</sup> edition 2012

### **Reference Book:**

- Kernighan and Ritchie, "The C Programming Language", 2nd Edition, Prentice Hall, 2009

## **2. CS150 Object Oriented Programming (3+0)**

The goal of this course is to teach object oriented programming using pre-built libraries and OOP concepts. Java will be used as the example object-oriented language in this course. Java is currently among the most widely used languages for the programming of large scale software applications. From web to GUI based applications, from micro devices to large enterprise applications Java is found everywhere. A good by-product of this course is that students will learn Java. Topics covered in the course include algorithm design, basic language elements, control structures, functions, strings, arrays, file i/o, classes and objects, composition, inheritance, polymorphism and other key concepts. The course directly contributes to **objectives** d, e, f, and g of the HEC Electrical Engineering Curriculum.

### **Recommended Text:**

- Bruce Eckel, 'Thinking in Java', Prentice Hall; 4 edition (February 20, 2006)

**Reference Books:**

- Java: The Complete Reference by Patric. Naughton & H. Schildt, McGraw-Hill Osborne Media; 9 edition (March 11, 2014)
- Java: How to Program By Dietel ,Prentice Hall; 10 edition (March 6, 2014) and Ivor Horton's Beginning Java,Wrox; Java 7 Edition edition (September 27, 2011)

**3. EE102 Engineering Drawing (0+1)**

This is an undergraduate level course to introduce the students to the basic concepts of Engineering drawing using Computer-Aided Design. Students will be introduced to software packages, such as AUTOCAD.

**Text Book:**

- A First Year Engineering Drawing by A.C. Parkinson, Isaac Pitman
- Introduction to AutoCAD 2009 2D and 3D design by Alf Yarwood Routledge; 1 edition (September 12, 2008)

**4. EE111 Circuit Analysis(3+1)**

This course is the foundation on which most other courses in electrical engineering curriculum rest. It is designed as an introductory course in linear circuit analysis. Subject areas included are, basic circuit quantities, voltage and currents, resistive circuits, Kirchhoff's Laws, nodal and mesh analysis, linearity, source transformation, Thevenin's and Norton's theorems, maximum power transfer, Capacitance, Inductance, RC, RL, RLC circuits, Sinusoidal response, Phasors .. Introduction to Op Amp is also included.

**Recommended Books:**

**Text book:**

- Fundamentals of Electric Circuits, 3rd Ed., By Alexander and Sadiku, McGraw-Hill – 2007
- Principles of Electric Circuits: Conventional Current Version (9th Edition) by Thomas L. Floyd Prentice Hall International 5<sup>th</sup> edition, Prentice Hall; 9 edition (March 15, 2009)

**Reference Book:**

- Basic Engineering Circuit Analysis, 8th Ed., By J. David Irwin, John Wiley & Sons, Wiley; 10 edition (October 26, 2010)
- Electric Circuits (10th Edition), by James W. Nilsson Susan Riedel ,Prentice Hall; 10 edition (January 19, 2014)

## 5. EE112 Workshop Practice (0+2)

According to objectives listed in HEC guidelines as a, d, e, & f, this Lab includes the basic techniques such as: Series and parallel connections of electric wiring, Use of different types of switches, 3-phase circuits, PCB design. Hands on experience of sawing, filing, grinding and drilling operation, which make up the mechanical portion of the lab.

### Text Book:

Reading Package/Lab Manual

## 6. EE209 Electronic Devices and Circuit (3+1)

Electronic devices: construction and operation of discrete devices, p-n junction diodes, special diodes. Diode circuit applications. Bipolar junction transistors: dc models, modes of operation, amplifier configurations. Amplifier circuits: Bias and stabilisation, graphical analysis, small signal ac models, coupled amplifiers. Construction and characteristics of field effect transistors (FET). Operational amplifiers basics. The course directly contributes to **objectives** a, d, e and f of the HEC Electrical Engineering Curriculum.

### Recommended Text:

- Electronic Devices and Circuit Theory (11th Edition) by Robert L. Boylestad, Louis Nashelsky, 2012
- Electronic Devices by Prentice Hall; 9 edition (February 18, 2011)

### Reference:

- Microelectronics Circuits by Sedra/Smith. Fifth edition
- Electronics Devices and Circuit Prentice Hall, by Guillermo Rico, Jeffrey , Bogart) Sixth edition

## 7. EE210 Data Structures and Algorithms (3+0)

Data structures are the building blocks of computer software. This course is designed to teach students some of the basic data structures, abstract data types (ADTs), and algorithms. Students will learn the fundamental techniques of data representation, organization, storage, searching, sorting, retrieval, and manipulation. Students will also be introduced to the notions of time and space complexities and practical performance evaluation of algorithms and data structures. So that the students can appreciate the time and space tradeoffs, the basic concepts, implementations, performance, and applications of the various data structures and algorithms will be integrated throughout the course. Students shall gain hands-on experience through several programming exercises. Programming language: C and C++

**Recommended Text:**

- M. A. Weiss. Data Structures and Algorithm Analysis in C. Pearson Education, second edition, 2008.

**Reference:**

- Any good C programming book such as Kernighan and Ritchie's The C Programming Language, Deitel and Deitel's C How to Program or Herbert Schildt's C The Complete Reference will be helpful for the programming assignments.

**8. EE219 Digital Logic Design (3+1)**

The course will cover basic concepts and tools to design digital hardware consisting of both combinational and sequential logic circuits, number systems, Boolean algebra, logic gates, combinational logic design, sequential circuits and logic design, memory and simple programmable logic devices (SPLDs), introduction to field programmable logic devices (FPLDs)/field programmable gate arrays (FPGAs), introduction to HDLs (Verilog and VHDL), gate-level and dataflow modeling, use of simulation software such as Veriwell Verilog Simulator. The course directly contributes to objectives a, d, e and f of the HEC Electrical Engineering Curriculum.

**Recommended Text:**

- Digital Design: With an Introduction to the Verilog HDL, 5<sup>th</sup> Edition, M. Morris Mano and Michael D. Ciletti, 2012
- "Digital Design, Principles & Practices", by John F. Wakerly, 4<sup>th</sup> Edition, 2005

**9. EE223 Electrical Network Analysis (3+1)**

This course is a continuation of Circuits I. It covers following topics. Steady-State analysis of AC circuits; AC Power analysis and concept of complex power; Single phase and three phase systems; Magnetically coupled circuits and ideal transformer; Transient response of second order circuits and frequency response of circuits; The Laplace Transform and Circuit Analysis using Laplace Transform. Fourier analysis and Two port networks.

**Recommended Text:**

- Fundamentals of Electric Circuits, 5<sup>th</sup> ed by Alexander and Sadiku, McGraw-Hill Science/Engineering/Math; (January 12, 2012)

**Reference:**

- Network Analysis, 3<sup>rd</sup> ed., by M.E. Van Valkenburg

#### **10. EE224 Computer Organization and Architecture (3+1)**

This course is intended to teach the Hardware-Software interface in a microprocessor as the fundamentals of computing. The course begins with the Instruction Set Architecture (ISA) design and the use of assembly language instructions along with the various addressing modes for MIPS microprocessor. CPU performance is then evaluated both qualitatively and quantitatively. Number formats such as fixed and floating point representations are discussed in context of hardware implementations of arithmetic, logic and control instructions. The MIPS data path is thoroughly discussed in connection with single and multiple cycle approach ultimately leading to the development of pipelined processor. Pipeline data flow is studied in the light of the associated hazards along with the pipelined performance. Virtual memory system is introduced at the end along with the disk storage, buses and interfacing. These topics are in line with the HEC curriculum objectives a, d & e.

##### **Recommended Text:**

- Computer Organization and Design (The Hardware / Software Interface), D.A. Patterson and J.L. Hennessy (5th Edition), 2013

#### **11. EE306 Probability and Statistics for Engineers (3+0)**

The course is a basic core course in Electrical Engineering which shall build necessary background for courses in the area of communication. Course will include in-depth knowledge of Basic Probability Theory, Discrete and Continuous Random Variables, Functions of Random Variables, Expectations, Joint Distributions, Moment generating functions. The course directly contributes to **objectives** a, d, e and f of the HEC Electrical Engineering Curriculum.

##### **Recommended Text:**

- Intuitive Probability and Random Processes using Matlab, Steven M. Kay, 2005

##### **Reference:**

- A First course in Probability By Sheldon Ross
- Probability, Statistics, and Random Processes for Electrical Engineering By Alberto Leon Garcia

#### **12. EE310 Electromagnetics (3+0)**

This course deals with the fundamental concepts of electromagnetic theory. The emphasis is made on physical understanding and practical applications in Electrical systems. It covers the study of Electric field concepts, Gauss's Law, Divergence, energy and potential, current in

conductors, dielectrics, capacitance, Laplace and Poisson's equations, steady magnetic field and study of laws like Bio-Savart Law, ampere's circuital law, magnetic forces, materials and inductance, time varying fields and Maxwell's equations.

**Recommended Text:**

- Engineering Electromagnetics, 8<sup>th</sup> edition, by William H. Hayt and John A. Buck, McGraw Hill.2011
- Fundamentals of Applied Electromagnetics (6th Edition)Mar 7, 2010by Fawwaz T. Ulaby and Eric Michielssen

**Reference:**

- Field and wave Electromagnetics by David K. Cheng, 2nd ed

**13. EE312 Signals and Systems (3+1)**

The concepts and theory of signals and systems are needed in almost all electrical engineering fields and in many other engineering and scientific disciplines as well. They form the foundation for further studies in areas such as communication, signal processing, and control systems. This course is concerned with the methods of characterizing systems and signals and with the determination of the interaction of systems and signals. Much light is shed on the subject of mathematical models as a direct result of attempting to use them in system analysis. The course directly contributes to **objectives** a, d, e and f of the HEC Electrical Engineering Curriculum.

**Required Textbook:**

Signals & Systems by Alan V. Oppenheim and Alan S Willisky. 1996

**Reference:**

- Linear Systems and Signals 2nd Edition, by B. P. Lathi
- Continuous and Discrete Signal & System Analysis 3rd Edition, by McGILLEM & COOPER.

**14. EE317 Power System Fundamentals (3+0)**

This introductory course will deal with the basic concepts involved in power systems, structure of modern power system, study of the conventional and nonconventional sources of electrical energy, calculation of transmission line parameters: inductance of single conductor, inductance of single and three phase lines, capacitance of single and three phase lines, basic considerations and distribution system layout, distribution substations and protection of the power system

**Textbook:**

- Power System Analysis, By Hadi Saadat 3rd Edition, 2011

**Reference Books:**

- Power System Analysis by John J. Grainger, William D. Stevenson
- Electrical Power Distribution & Transmission by L.M. Faulkenberry & W. Coffey
- Principles of Power Systems by V.K. Mehta, Rohit Mehta

**15. EE318 Electrical Machines (3+1)**

This is an undergraduate level course. The course will cover; Magnetic field and reluctance of magnetic materials and air. Voltage-current characteristics and voltage regulation of generator. Torque speed characteristics and speed regulation of DC motors. Various techniques for starting, speed control, reversing and braking. Remedial measures of main problems occurring in DC machines. Generalized concepts of electromechanical energy conversion. To introduce the fundamentals of ac machine. Detailed operating principles of ac machines including induction motor, synchronous motors, alternators and Transformers have been included to develop thorough understanding of construction characteristics, operation and proper application of ac machines being used in industries.

**Textbook:**

- Electrical Machines, Drives and Power Systems by Theodore Wildi, 6th Edition, 2005

**Reference Books:**

- Electric Machinery Fundamentals by Stephen J. Chapman, Latest Edition
- Electric Machinery by Fitzgerald, Kingsley and Umans, Latest Edition

**16. EE324 Control Systems (3+1)**

This course introduces the students to the theory and practice of control system engineering, emphasizing on classical control theory and covering fundamentals of modern control theory. The teaching approach will be both qualitative and quantitative. Various control systems will be discussed – emphasizing how the different system variables interact and how they affect system performance, qualitatively. The concepts of transient and steady-state response analysis for control systems, assess the stability of control systems through the root-locus method and the frequency-response method, and teach methods for designing controllers that correspond

to desired system behaviors. Students will develop the capability of analyzing the stability of a system and of designing simple controllers to regulate systems behavior.

**Text Books:**

- Modern Control Engineering (5th Edition), Katsuhiko Ogata ,2009
- Control Systems Engineering, Norman S. Nise, 6<sup>th</sup> edition, Wiley Dec 2010

**Reference Book:** Feedback Control Of Dynamic Systems, Gene F. Franklin, 5/E, Pearson Education

**17. EE326 Modern Microprocessor Systems (3+1)**

The objectives of this course are to introduce students to development of microprocessor based programmable digital systems. Specifically architecture, interfacing and programming of Intel family of microprocessors are the main focus. Emphasis is put on evolution of IA-86 architecture as seen through 8008 to dual core processors. Topics related to memory & I/O interfacing, addressing modes, instruction set, microprocessor programming techniques, bus structure, DMA and interrupts are discussed. Recent research trends in modern multi-core microprocessors are also examined. These objectives conform to the ones listed in HEC guidelines as a, d & e.

**Text Book:**

- 80X86 IBM PC and Compatible Computers: Assembly Language, Design, and Interfacing”, Volumes I & II (5th Edition) 2010, Pearson by Muhammad Ali Mazidi

**Reference Book:**

- Latest research papers from IEEE Micro

**18. EE414 Communication Systems (3+1)**

To provide a comprehensive survey of communication system techniques and technologies with emphasis on analog communication. To provide a context for undertaking advanced subjects in this area, especially digital communications. To provide exposure to relevant computing techniques in this area. The course contributes to HEC Electrical Engineering Curriculum objectives a, d, e and f.

**Text Book:**

- Communication Systems 5<sup>th</sup> edition , Mar 16, 2009, by Simon Haykin and Michael Moher

**Reference Book:**



- Modern Digital and Analog Communication Systems by B. P. Lathi, Zhi Ding , 2009 4th Edition. Oxford University Press
- Communication Systems Engineering by John G. Proakis & Masoud Salehi, 2<sup>nd</sup> Edition, Pearson Education.

### **19. EE416 Instrumentation and Measurements (3+1)**

The course will cover; Precision measurements terminologies including resolution, sensitivity, accuracy, and uncertainty; engineering units and standards; principles of different measurement techniques; instruments for measurement of electrical properties, pressure, temperature, position, velocity, flow rates (mass and volume) and concentration; systems for signal processing and signal transmission; modern instrumentation techniques; static and dynamic responses of instrumentation and signal conditioning; basic data manipulation skills using personal computers and graphs; data acquisition systems; principles of operation, construction and working of different analog and digital meters, oscilloscope, recording instruments, signal generators, transducers, and other electrical and non-electrical instruments; types of bridges for measurement of resistance, inductance, and capacitance; power and energy meters; high-voltage measurements. The course directly contributes to **objectives** a, d, e and f of the HEC Electrical Engineering Curriculum.

#### **Recommended Text Book:**

- Electronic Instrumentation and Measurement Techniques, W.D. Cooper & A.D. Helfrich, 1985
- Process Control Instrumentation Technology Eighth Edition by Curtis Johnson.2007
- Instrumentation and Measurement in Electrical Engineering, Apr 20, 2011 by Roman Malaric

#### **Reference Book:**

- Measurements and Instrumentation Principles by Alan S Morris
- A course in Electrical Measurements and Instrumentation by J.B Gupta

### **20. ME322 Applied Thermodynamics (3+0)**

This course introduces students to the basic concepts of thermodynamics, properties of pure substances, energy transfer and general energy analysis, energy analysis of closed systems, zeroth first, second and third law of thermodynamics, entropy, heat engine, heat pump and refrigerator, gas power cycles (Otto, Diesel, Stirling, Ericsson, and Brayton engines), vapor and combined power cycles (Rankine engines). The course directly contributes to **objectives** a, d, e and f of the HEC Electrical Engineering Curriculum.

**Text Book:**

Thermodynamics - An Engineering Approach", by Yunus A. Cengel and Michael A. Boles, 6th Edition, Tata McGraw Hill, 2006

**Reference Book:**

- Applied thermodynamics for engineers and Technologists, T. D. Eastop and Mckonkey, Longman, 5<sup>th</sup> Edition.
- Applied thermodynamics, by Onkar Singh, 3<sup>rd</sup> Edition, New Age International Publishers.
- Fundamentals of Engineering Thermodynamics, by Moran & Shapiro, 6<sup>th</sup> edition.

**21. EN110 English – I (2+0)**

This course is the first in a series of three required English language courses designed to promote English language proficiency at undergraduate level for students belonging to all academic disciplines. We will focus on core language skills (reading, listening, writing, and speaking) using variety of texts (traditional textbook lessons, online material, contemporary newspaper and magazine articles, films, and documentaries) with particular emphasis on grammar, vocabulary, and spoken fluency. Starting with thesis statement and paragraph development we will progressively move on to activities and exercises illustrating the concepts of (a) narration, (b) description, (c) comparison and contrast, and (d) cause and effect. By the end of course you should be able to demonstrate the improvement of your English usage within appropriate contexts (academic, social, personal, work related).

**Text Book:**

- Brandon, Lee. (2004). Paragraphs and Essays
- Murphy. R. (1994). Intermediate English Grammar

**22. EN112 English – II (2+0)**

English II (Composition & Communication) is a continuation of English I (Grammar and Comprehension). This course is designed to improve and polish the communication skills through **listening, speaking, reading and writing**. Documentaries, Movie clips, Motion pictures, online and book resources for grammar exercises, articles from major national and international newspapers (Express Herald Tribune, Dawn etc.) are included to emphasize **personal and reflective, expository, analytical, argumentative and proposal** writing that forms the basis for academic and professional communication. It fosters the development of writing faculty in any context. In addition, this course incorporates the proper utilization of critical observation and analytical thinking through **formal and informal presentations** also. Students

are motivated to place a high emphasis on content, purpose, audience and overall coherence patterns.

**Text Book:**

- Hughes, Langston. (2007). Salvation. The New York Times.
- Ali, Ahmad. (1974). Twilight in Delhi. New York : Directions publishing co-operations

**23. EN223 Communication Skills (2+0)**

Introduction to research concepts and research methodology, development of students' problem solving skills by using the appropriate research approaches for the topics or issues according to the students' interests by emphasizing the processes of problem recognition and identification, investigation of the related information for problem interpretation, information analysis and synthesis for problem solving, and the knowledge sharing and research findings communication

**Learning materials**

This syllabus may be accomplished on the basis of training materials and original special supplementary materials provided by the lecturer. The usage of up to date authentic materials will help students obtain the necessary skills in problem solving and research methodology.

**24. HM150 Islamic Studies (2+0)**

Acquired traits in a personality exert a powerful influence on human destiny-collective and individual. While a constructive attitude can propel mankind to progress and prosperity in life here and life-hereafter, a destructive personality can destroy the very foundations of society. Personality development being so crucial to the health of a society, it is sad that most of us are letting our personality take shape up by itself. This course is a conscious effort for personality development. The Muslim as Islâm meant him to be is a unique and remarkable person in his attitude and conducts and in his relationships and dealings with others at all levels. Throughout his long history, man has never been given the components of a virtuous and integrated personality such as Islâm has bestowed upon the Muslim through the divine guidance contained in the Qur'ân and Sunnah

**Text Book:**

Vision of Islam (Visions of Reality) Jun 1, 1998 by Sachiko Murata and William C. Chittick

**Reference Books:**

- Ahmad Von Denffer, Ulum al- Qur'an, An Introduction to the Sciences of the Qur'an
- The Meaning of the Qur'an, S. Abul A'la Maududi

## 25. MA111 Applied Calculus (4+0)

MA111 is a one-semester, four-credit course for introducing the methods of differential and integral calculus. It is assumed that the student is familiar with classical algebra and trigonometry, and has some familiarity with elements of the calculus at the intermediate (higher secondary school) level. After discussing the calculus of a single variable, the student is introduced to the calculus of two and more variables. The expansion from two to three (or more) dimensions requires a corresponding increase of the student's knowledge of symbolic representation. Partial derivatives and extreme values for functions of two variables are discussed. Then we pass on to vectors differentiation and integration with applications.

### Text Book:

Weir & F.R., J. Hess, Giordano. Thomas' Calculus, Addison-Wesley, 12th edition, September 12, 2009.

### Reference Books:

- Calculus by James Stewart, 5th Edition, December 24, 2002
- Calculus and Analytical Geometry, Dr. S. M. Yusuf (Latest Edition)

## 26. MA210 Linear Algebra (3+0)

An introduction to the algebra and geometry of vector spaces and matrices, this course stresses important mathematical concepts and tools used in advanced mathematics, Computer Science, Physics and Economics. A systematic method of solving systems of linear equations is the underlying theme and applications of the theory will be emphasized. Topics of exploration include Gaussian elimination, determinants, and linear transformations, equations of line and plane and Cylindrical and Spherical co-ordinate system. Conference time will be allocated to clarifying course ideas and exploring additional applications of Linear Algebra. This course directly contributes to **objectives** a, d, e, f and g of the HEC Electrical Engineering Curriculum.

### Text Book:

- Anton, Howard, Elementary Linear Algebra, 10<sup>th</sup> Edition. Wiley Publishing, 2005.
- Calculus and Analytic Geometry (9th Edition) Aug 14, 1995

### Reference Books:

- Mathematical Methods, Dr. S. M. Yusuf (Latest Edition)
- Calculus and Analytic Geometry, Dr. S. M. Yusuf (Latest Edition)

## 27. MA222 Numerical Analysis (3+0)

The purpose of numerical analysis is two-fold: First, to find acceptable approximate solutions when exact solutions are either impossible or so tough and time-consuming as to be impractical, and second to devise alternate methods of solution better suited to the capabilities of computers. While this course will involve the student in considerable computation in order to apply techniques and obtain acceptable answers, the main emphasis will be on the underlying theory. It will be necessary to draw upon a good bit of calculus, linear algebra, computer science and other branches of mathematics during the course. Goal is to understand the basic techniques of numerical analysis for solving nonlinear algebraic equations, interpolation, for numerical differentiation and integration and be able to set up computational algorithms for the solution of above problems. Students will use MATLAB software package where needed. The course directly contributes to **objectives** a, d, e and f of the HEC Electrical Engineering Curriculum

### Text Book:

- Numerical Analysis, 5th ed. Burden, R.L. and Faires, D.F., PWS-Kent, Boston, MA, 2010
- Saeed Bhatti and Naeem Bhatti :A First Course in Numerical Analysis , Fourth edition, 2003, Shahryar Publishers, Urdu Bazar Lahore.)

## 28. MA233 Complex Variables and Transforms (3+0)

This course has been designed for undergraduate students of mathematics, physics and engineering. We shall try to make a balance between the pure and applied aspects of complex analysis and try to present concepts in a clear writing style that is understandable to students at the junior or senior undergraduate level. Starting with algebra of complex numbers, we will go through topics on complex functions, limit, continuity, differentiation and integrals of complex functions and ending with series, singularities, zeros, poles, residues, Laplace transforms, inverse Laplace transforms, convolution and use of these in solving differential equations.

### Text Book:

- Advanced Engineering Mathematics –by Erwin Kreyszig (10th Edition), John Wiley;2011

### Reference Books:

- Complex Analysis for Mathematics and Engineering— by John H. Mathews and Russell W. Howell;

### **29. ME105 Applied Mechanics (3+1)**

Measurement and vectors. Motion in one, two and three dimensions. Newton's laws of motions. Work and energy principles. Laws of conservation of momentum and energy. One- and two-dimensional collisions. Rotational kinematics and dynamics. Conservation of angular momentum. Gravitation. Fluid mechanics. The learning in this course is strengthened by related lab work.

#### **Text Book:**

- Physics for Scientist and Engineers, Raymond A. Serway, John W. Jewett, Jr., 6<sup>th</sup> Edition, Thomson Brooks/Cole, US, 2004.

#### **Reference Books:**

- Fundamentals of Physics, 8<sup>th</sup> Edition by Halliday, Resnick, and Walker

### **30. MS215 Engineering Ethics (3+0)**

This course is designed to develop engineering ethics in the students. Topics that will be covered are: Introduction to ethical concepts, Ethics and professionalism, Moral reasoning and codes of ethics, Moral frame works, Engineering as social experimentation, Commitment to safety, risk and liability in engineering, Workplace responsibilities and rights, Honesty, Integrity and Reliability, Engineers as employees, Environmental ethics, Global issues, Engineers and technological progress, Responsibility for research integrity, Fair credit in research and publication, Credit and intellectual property in engineering practice, Making a life in engineering and science, Case studies on professional behavior. The course directly contributes to **objectives** b, c, d, and g of the HEC Electrical Engineering Curriculum.

#### **Text Book:**

- Ethics in Engineering, Martin M. W., Martin M. and R. Schinzinger, McGraw-Hill, February 6, 2004

#### **Reference Books:**

- Ethics in Engineering Practice and Research, Whitbeck C., Cambridge University Press, March 13, 1998
- Engineering Ethics: Concepts and Cases, Harris Jr. C. E., Pritchard M. S. and M. J. Rabins, Wadsworth Publishing, January 9, 2013

### **31. MS224 Engineering Economics (2+0)**

This is a stand-alone under graduate course in economics which deals with introductory level of economics. Brief introduction to Accounting and Finance are touched so that students get to know that how engineering projects are initiated, planned, executed, controlled and completed. The course directly contributes to objectives b, c, g and k of the HEC Electrical Engineering Curriculum.

#### **Text Book:**

- By Donald Newnan, Ted Eschenbach, Jerome Lavelle. Oxford University Press, Engineering Economic Analysis 9th Edition, February 26, 2004

### **32. MS323 Engineering Management (2+0)**

This course deals with management techniques of the Engineering systems and Engineering Processes, management of new products, linkage between products and their manufacturing processes. It also deals with Engineering Project Management like project planning, Forecasting, Scheduling, Resource allocation etc.

#### **Text Book:**

- Engineering Management by Fraidon Mazda, Printice Hall Publisher, October 22, 1997
- Project Management by Clifford F Gray Erik W Larson, McGraw-Hill/Irwin; 4th edition August 15, 2007
- MS Project 2010 by Courter Marquis

#### **Reference Books:**

- Managing Engineering and Technology by Morse Babcock
- Management by Stephen P. Robbins 10<sup>th</sup> Edition
- Entrepreneurship theory and practices by Donald F. Kuratko.

### **33. NS113 Chemistry for Engineers (3+1)**

In today's society chemistry is greatly involved in the world of engineering. Whether it is aerospace, electrical, mechanical, environmental, energy or other engineering fields, the makeup of substances is always a key factor which must be known. The more chemistry an engineer understands, the more beneficial it is. The curriculum is designed to prepare the undergraduate for work in the highly diverse engineering profession. All engineering fields have

unique bonds with the chemistry. So this course provides an introduction to basic undergraduate chemistry and covers the concepts such as the periodic table, mole, stoichiometry, properties of matter & solutions, acid and bases, chemical equilibrium, chemical kinetics, transition elements, thermodynamics, electrochemistry, battery technology, fuel cell types and organic chemistry. In addition to that applied concepts are given on corrosion, polymers, metals, semiconductors, environmental pollutants and pollution control. The course is taught using a problem-solving approach.

**Text Book:**

- Chemistry ,5th edition ,Prentice Hall; John E. McMurry ,Robert C. Fay (April 23, 2007)

**34. NS125 Applied Physics (3+1)**

Coulomb's law, electric field due to a single charge and distribution of charges, electric flux and Gauss's law, electric potential due to a single charge and distribution of charges, capacitance and dielectrics, current and resistances, direct current circuits, Kirchhoff's rules, RC circuits, magnetic field and forces, Biot-Savart law, Ampere's law, Faraday's law of induction, inductance, alternating current circuits, RL circuits, LC circuits and RLC circuits, Maxwell's equations, and electromagnetic waves. The learning in this course is strengthened by related lab work.

**Text Book:**

- Physics for Scientist and Engineers, Raymond A. Serway, John W. Jewett, Jr., 9<sup>th</sup> Edition, Thomson Brooks/Cole, US, Jan 1, 2013.

**35. SS171 Pakistan Studies (2+0)**

The course will focus attention upon the creation of Pakistan examining its several essential and other elements to understand its foundation and later on its function as a state system. The course directly contributes to **objectives** b, c and g of the HEC Electrical Engineering Curriculum.

**Required Text:** M.R.Kazimi, **Pakistan Studies** New Edition Oxford University Press Karachi , Oct 25 , 2007.



## **Elective Courses**

### **36. EE323 Electronic System Design (3+0)**

This is a wide-ranging course in electrical engineering curriculum. It is designed as an advance course in electronic systems design and their integrations. It will develop student's ability to design modern analog and mixed-mode electronic systems. Subject areas included are, design methods of analog and digital electronic systems. Developing the students' understanding of the principles and operation of advanced electronic circuits and devices (bipolar junction transistor, operational amplifier circuits, Op-amp based Active Filters: Op-amp characteristics, Transfer functions, Bode Plots, First order active filters (low-pass and high pass), Oscillators and Timers, Basic Communication circuits, Voltage regulators, Various types of Analog to Digital Converters (ADC), Digital to Analog Converters (DAC),, 555 Timer and Instrumentation amplifiers). It also emphasizes the importance of modeling the behavior of complex electronic circuits and devices using systematic mathematical techniques. LTSPICE/PSPICE is used extensively in the design, analysis and simulation.

#### **Textbook:**

- Analog Fundamentals: A Systems Approach Jul 13, 2012 by Thomas L. Floyd and David M. Buchla
- Fundamentals of Analog Circuits Second Edition By Tom Floyd And David Buchla ,2001 ( Both are Highly recommended books for this course)

#### **Reference**

Microelectronic Circuits, by Adel S. Sedra, K.C Smith, 7<sup>th</sup> edition ,Oxford University Press, Nov14 , 2014.

### **37. EE327 Digital System Design (3+1)**

This course explains how to go about designing complex, high-speed digital systems. A hardware description language such as Verilog will be taught to model digital systems at Behavior and RTL level. Field programmable gate arrays (FPGA) will be used in the laboratory exercises as a vehicle to understand complete design-flow. Advanced methods of logic minimization and state-machine design will be studied. The working of complex logic and memory building blocks such as memory chips, arithmetic circuits, digital processors etc. is included. Memory technologies will also be discussed. A seminar is also included to introduce the students about latest trends in design technologies. The course contributes to objectives a, d, e and f of the HEC Electrical Engineering Curriculum

**Recommended Text:**

- Advanced Digital Design with the Verilog HDL by Michael D. Ciletti, 2nd Edition, Prentice Hall, Feb 15, 2014 .

**Reference:**

- “Digital Design”, by M. Morris Mano, Michael D. Ciletti , 4th Edition (PEARSON, Prentice Hall)
- “Verilog HDL” by Samir Palnitkar, Pearson Education, Second edition, 2004

**38. EE330 Computer Networks (3+1)**

To enable the students to gain understanding of the terminology and standards in modern day computer networks. To make the students understand communication basics, networking and network technologies; with emphasis on data and computer communication within the framework of the OSI and TCP/IP protocol architectures, Internet and internetworking and how to apply these in the design and analysis of networks. The course directly contributes to **objectives** of the HEC Electrical Engineering Curriculum.

**Text Book:**

**Recommended Text:** **Computer Networks** by Andrew S. Tanenbaum and [David J. Wetherall](#) (5th Edition) , Oct 7, 2010 .

**Reference:**

**Computer Networking; A Top Down Approach** by Kurose and Ross (4th Edition) Computer Networking; A Top Down Approach by Kurose and Ross 4th Edition

**39. EE375 Telecom Switching and Transmission (3+0)**

This is an undergraduate level course.. The course will cover; all types of telecommunication systems including the OSP, PSTN, Data Communications, traditional transmission media, Different Networks, IP services, next generation networks, Optical Networks, Broadband access Network, Wireless Networks, Emerging Wireless Applications. Transmission Transport, ATM. Network Management Systems which is applicable on all the modern telecom Networks. Project Management will also be introduced in addition to Telecom Standards, National and International.

**Recommended Text:**

- Telecommunication Essentials(The complete global source) second Edition by Lilian Goeniewski and [Kitty Wilson Jarrett](#) (Editor) , Oct 20 , 2006.
- Fundamentals of Telecommunications second Edition by Forger Freeman, IEEE Press Wiley Interscience , 2005.
- Data communications and Networking by Behrouz A Frozouzan 4<sup>th</sup> edition ,Feb 17 , 2012.

**Reference:**

- Telecommunication Network Management by Salah Aidarous Thomas Plevyak.
- Telecom Management Crash Course by P.J Louis
- Telecommunication Expense Manangement by Michael Brosnan
- Telecommunication Convergence by Steven Shepard

**40. EE418 Digital Signal Processing (3+1)**

This course provides an introduction to the theory and application of DSP with a solid foundation in the basics of DSP related to signal analysis, system analysis and design. The contents of the subject include Sampling, Quantization, Discrete time signals and systems, Z-transform, Frequency analysis of signals and systems, Discrete Fourier Transform (DFT), Implementation of Discrete Time Systems and Design of Digital Filters. Course will be supplemented through MATLAB's Digital Signal Processing Toolbox. This course directly contributes to **objectives** a, d, e, and f of the HEC Electrical Engineering Curriculum.

**Required Textbook:**

- Digital Signal Processing-Principles, Algorithms and Applications, 4th Edition, by John G. Proakis and Dimitris G. Manolakis, Prentice Hall; 4 edition (April 7, 2006)

**Reference:**

- Discrete-Time Signal Processing, 2<sup>nd</sup>/3<sup>rd</sup> Edition, by Alan V. Oppenheim, Ronald W. Schaffer, Published by Pearson Press , August 28, 2009 (3rd Edition).

**41. EE430 Opto Electronics (3+0)**

This course is a fundamental course of optical electronics I. It covers following topics. Overview of Optical fiber communication, Optical Structure and wave guiding, Optical Sources, Photo-detectors, Optical Receiving Operations, Optical Modulation, Multiplexing, WDM concept and

components, Optical Amplifiers. The course contributes to HEC Electrical Engineering Curriculum **objectives** a, d, e and f.

**Recommended Text:**

- Optical Fiber Communications by Gerd Keiser, McGraw-Hill Science/Engineering/Math; 4th edition (September 10, 2010)
- Fiber Optics Communications by Harold Kolimberis, Prentice Hall ,2003

**Reference:**

- “Photonics” latest Edition by Yariv , Oxford
- Advanced Optical Communication Systems and Networks (Artech House Applied Photonics)Jan 1, 2013by Milorad Cvijetic and Ivan B. Djordjevic

**42. EE441 Digital Electronics or CMOS VLSI Design (3+1)**

This course provides the electrical engineering student with the analytical and computer skills required for the analysis, computer simulation, design, and computer-aided physical layout of digital integrated circuits. The course is preparatory for study in the field of Very Large Scale Integrated (VLSI) digital circuits and engineering practice.

**Recommended Text:**

Digital Integrated Circuits (2nd Edition)Jan 3, 2003 by Jan M. Rabaey and Anantha Chandrakasan

CMOS VLSI Design: A Circuits and Systems Perspective (4th Edition)Mar 11, 2010by Neil Weste and David Harris

**Reference:**

Digital Systems Engineering by William J. Dally and John W. Poulton,Jun 28, 1998

Digital Electronics: Principles and Applications © 2014 by Roger Tokheim

**EE447 Power Electronics (3+1)**

Principles of power electronics, converters and applications, circuit components and their effects, control aspects. Power Electronic Devices: Power diode, power BJT, power MOSFET, IGBT and SCR, GTO and TRIAC and DIAC. Construction, characteristics, operations, losses, ratings, control and protection of thyristors. Halfwave and full-wave rectifiers with resistive and inductive loads, un-controlled, semi controlled and fully controlled rectifiers, three-phase rectifiers: un-controlled, semi controlled and full controlled, six-pulse, twelve-pulse and 24-pulse rectification, PWM converters, DC to AC converters, three-phase inverter, six-pulse,

twelve-pulse inverters, PWM inverters, switchingmode power supplies, DC to DC conversation, buck converter, boost converter and buck-boost converters, isolated converters, forward converters, flyback converters.

**Textbook:**

- MuhammadH.Rashid,“Power Electronics Circuits,Devices,and Applications”, 4thedition,Pearson Education Limited,Oct 29, 2013.

**Reference:**

- Mohan, Undeland,Robbins“Power Electronics Converters,Applications andDesign”,3rdedition,JohnWiley&Sons Inc,2004.
- C. W. Lander, "Power Electronics", McGraw Hill, Latest Edition

**EE45 Industrial Electronics (3+0)**

Electric heating: Principles and applications; induction and dielectric heating; high-frequency welding. Spot welding control. Industrial control: Speed control of DC, AC, and servo motors. Process control. Measurement of non-electrical quantities: Temperature, displacement, pressure, time, frequency; digital industrial measuring systems. Ultrasonic generation and applications. X-ray applications in industry. Photo-electric devices. Industrial control using PLCs. Data acquisition. Distributed control system in process industries.The course directly contributes to objectives a, d, e and f of the HEC Electrical Engineering Curriculum.

**Recommended Text:**

- “Industrial Electronics, Devices and Systems” by Dale R Patrick and Stephen W Fardo, , The Fairmont Press, Inc.Oct , 2000.
- “Power Electronics” by M D Singh and K B Khanchandani, 2nd Edition, Tata McGraw-Hill , 1998 .

**Reference:**

- “Programmable Logic Controllers,” by Frank D. Petruzella, 3rd Edition, 2005, McGraw-Hill
- “Industrial Electronics,” by Frank D. Petruzella, 1st Edition, 1995, McGraw-Hill
- “Power Electronics: Circuits, Devices And Applications” by M. H. Rashid, 3rd Edition, 2001

**EE480 Wireless Communication (3+0)**

This course deals with the fundamental and practical aspects in the analysis and design of wireless systems. Topics that will be covered are: the wireless communication channel, cellular communication principles, techniques used to enhance channel efficiency, overview of multiple

access techniques and example wireless communication systems. Starting from the transmission fundamentals to case study of systems like GSM and CDMA, there will be discussions on cellular planning, propagation, fading, channel assignments strategies, handoffs etc. The course will also give an overview of Wi-Fi systems and Bluetooth technology. The course directly contributes to the objectives of the HEC Electrical Engineering Curriculum.

**Recommended Text:**

- Wireless communications and networks second edition by William Stallings, Nov 22, 2004 .

**Reference:**

- Introduction to Wireless Systems by P. Mohana Shankar. John Wiley & Sons, 2002

**EE485 Telecom Management (3+0)**

This is an undergraduate level course.. The course will cover; all types of telecommunication systems including the OSP,PSTN,Data Communications, traditional transmission media, Different Networks, IP services, next generation networks, Optical Networks, Broadband access Network, Wireless Networks, Emerging Wireless Applications. Transmission Transport, ATM. Network Management Systems which is applicable on all the modern telecom Networks. Project Management will also be introduced in addition to Telecom Standards, National and International

**Recommended Text:**

- Telecommunication Essentials(The complete global source) second Edition by Lilian Goeniewski and [Kitty Wilson Jarrett](#) (Editor) , Oct 20 , 2006.
- Fundamentals of Telecommunications second Edition by Forger Freeman, IEEE Press Wiley Interscience , 2005.
- Data communications and Networking by Behrouz A Frozouzan 4<sup>th</sup> edition ,Feb 17 , 2012.

**Reference:**

- Telecommunication Network Management by Salah Aidarous Thomas Plevyak.
- Telecom Management Crash Course by P.J Louis
- Telecommunication Expense Manangement by Michael Brosnan
- Telecommunication Convergence by Steven Shepard

### **SS172 International Relations (3+0)**

It is an introductory course aimed at introducing students with the basic concepts, approaches and an appreciation of the environment and problems of International Relations. The Objectives of this course are to enable the students to understand the basic knowledge of the various concepts & theories of International Relations. To make the students aware of the International political environment. And to stimulate the students to keep abreast of the latest developments about the current national and international issues relating to International Relations.

#### **Recommended Books:**

- Coulombis, Theodore A . and Wolfe, James H. , Introduction to International Relations: Power and Justice, Prentice-Hall International, Inc, Dec 1985.
- Palmer, Norman D. and Perkins, Howard C., International Relations: The World Community in Transition, Houghton Mifflin Company, 1969 .
- Pearson, Frederic S. and Rochester, J. Martin, The Study of International Relations or Getting a Handle on the World.
- Morgenthau, Hans J., Politics among Nations: The Struggle for Power and Peace. Alfred A . Knopf, Inc 2001.