**Concise courses description**

**Courses of level 3**:

**Courses of level 4**:

**101EE-3- Engineering Mechanics** 3 ( 3 , 0 , 1 ) Credit Hours (theory, Lab/practical, tutorial)

**Objectives:**

(1) Solve problems related to forces and moments for planar systems.
(2) Analyze basic equilibrium conditions.
(3) Analyze the kinematics of a particle
(4) Analyze the dynamics of particles and rigid body.

**Course Description:**

Statistics:

Forces and moments for planar systems; Basic equilibrium conditions; Centroids; Friction; Area and mass moments of inertia; Kinematics of a particle: rectilinear and curvilinear motion;

Dynamics:

Kinetics and Kinematics of particles and rigid body: Newton's law, work and energy; Relative velocity and acceleration; translation, fixed axis rotation, general motion, work and energy.

**Text Book:**

1. Engineering Mechanics: Statics, Meriam, JL, and Kraige, LG, 7th Ed., Wiley, 2011.
Engineering Mechanics: Dyamics, Meriam, JL, and Kraige, LG, 7th Ed., Wiley, 2012.

**203GE-3 Engineering Drawing** 3 ( 1 , 0 , 4 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

The main purpose of this course is to make the student understand the language of drawing and regenerate it for various use.

**Course Description:**

Introduction to engineering drawing & its course specification. - Engineering drawing instruments & their properties. - Applied geometry. - Orthographic projections (Basic views, applied dimensions & lettering, vertical sections) - Mid-Term Exam - Orthographic projections (missing views) – Pictorial drawings (Isometric and Oblique) - Introduction to Engineering Drawing using AutoCAD (Draw and Modify Commands) - Engineering Drawing using AutoCAD (Layers, Dimensioning, Zooming and Printing Commands) - Pre-Final Exam - Answer the Pre-Final Exam, Individual and Oral test for AutoCAD

**Text Book:**

1. Cecil H. Jensen; Jay D. Helsel; Dennis R. Short, Engineering Drawing & Design (2007), 7th Edition, McGraw Hill, Science Engineering.

K. Venugopal, Engineering Drawing & Graphics, New Age International, 2007

## Courses of level 5:

**202EE-3 Engineering Mathematics 3 ( 3 , 0 , 1 )** Credit Hours (theory, Lab/practical, tutorial)

**Objective:**

1. Understand the definitions of Vector Space and its linear Independence
2. Solve Eigen value problems and apply Cayley Hamilton Theorem..
3. Study Curl and divergence with their applications.
4. Derive mathematical models of physical systems.

**Desciption:**

Vector analysis including vector fields, gradient, divergence, curl, line and surface integrals, Gauss' and Stokes' theorems. Introduction to complex variables, eigenvalues and eigenvectors. Commonly used engineering functions, series and sequences.

**Text Book:**

Advanced Engineering Mathematics by P. O'Neil, International Student Edition.

**204GE-3 Computer Programming for Engineers 3 ( 2 , 2 , 0 )** Credit Hours (theory, Lab/practical, tutorial)

**Objectives:**

1. Understand the basic computer programming concepts.
2. Programming some examples with C language

**Course Description :**

Overview of computer hardware and software; Computer Algorithms; Programming Preliminaries; Numeric constants and variables in C language; Arithmetic expressions; Inputs and outputs in C programs; Logical expressions and control statements; Conditional statements; Looping; Functions; Pointers; Recursion; Defining and manipulating arrays; Files in C; Solving simple engineering and scientific problems in C.

**Text Book:**

Computer Programming in C" by V. RAJARAMAN Eastern Economy Edition.

**204 Maths-3 Differential Equations 3 ( 3 , 0 , 1 )** Credit Hours (theory, Lab/practical, tutorial)

**Objective:**

- Inform the students of certain type of Differential equations.
- Illustrate the need of differential equations in our practical life.
- Training the students on some methods and strategies of solutions DE

**Course Description:**

The course introduces basic concepts, theorems and knowledge of the linear algebra of matrices, special functions, Fourier analysis and partial differential equations with application to engineering problems. Matrices and Vectors, linear system of equations (Gauss Eliminations) - Determinates, Crammer rule, inverse of matrix Gauss, Jordan elimination - Introduction to vector differential calculus, Dot product and Cross product - Vector differential calculus, Gradient, Divergence and Curl of a vector field) - Special function, Gamma function, Beta function - Introduction to Fourier analysis, Fourier series, Fourier sine series, Fourier cosine series - Partial differential equations, Classifications and methods of solution, heat equation, wave and potential equation.

**Text Book:**

Differential Equations (Part I) dr. Hassan Alowyhdi

Differential equations - theories and problems - (Shum series) Frank Ayers

Differential Equations theories – dr. Rahmah Abdul Karim...

W.E.Boyce and R.C. Diprima.( Elmentary DifferentialEquations ) Jon wily New York

S . Ross ( Ordinary Differential Equations ) Jon Wiley and Sons N . Y

**211EE-3 Electrical Circuits I** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical, tutorial )

**Objectives:**

The course objective is to introduce fundamental concepts of electric circuits, and provide students with basic electric circuits analysis techniques.

**Course Description:**

Basic circuit elements and concepts; Basic laws of circuit theory: Ohm's law, Kirchoff's law; Circuit theorems: superposition principle, Thevenin and Norton theorems; maximum power transfer theorem. Techniques of circuit analysis: Nodal and mesh analysis. Sinusoidal AC circuit: waveform, response of basic R, L and C elements, phasor, impedance and admittance. Introduction to concept of active, reactive, complex power and power factor.

**Text Book:**

Introductory Circuit Analysis, Robert L. Boylestad, 13th Edition, 2015, Pearson.

**324 STAT**-3 **Statistics and Probability** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical, tutorial )

**Objectives:**

1. Find out the basic concepts related to the collection and tabulation of statistical data and calculate statistical measures its own.
2. Know the basic concepts related in possibilities.
3. Transfer student from the stage descriptionto the stage of decision-making on the basis of the results available to him.
4. Recruitment of statistical skills acquired by the student in solving problems.

**Course Description:**

This course introduce: Importance of statistics, Presentation and description of statistical data, Measures of central tendency, Measures of dispersion, Variation coefficient, Measures of skewness, Kurtosis Measure, Correlation and regression, Introduction of probability , Random Variables and Probability functions.

**Text Book:**

R.E Walpole, R.H. Myers, probability and statistics for engineers and scientists ,Macmillan publishing 1998.

## Courses of level 6:

**212EE-3 Electrical Circuits II** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

- Find the circuit transient response.
- Find the circuit frequency response.
- Understand the condition of resonance.
- Design a simple passive filter.
- Deal with two port circuits.
- Understand the mutual inductance and transformers.
- Analyse a balanced three-phase circuit.

**Course Description:**

Time domain transient responses for first and second order circuits, Resonance in Series and parallel AC circuits, Frequency domain analysis: bode plots and passive filters, Magnetically coupled circuits, Two port networks, Analysis of three-phase circuits with balanced conditions.

**Text Book:**

James W. Nilsson and Susan A. Riedel , “Electric Circuits“ , Tenth edition, 2014, Pearson Prentice Hall .

Electric Fundamentals of Electric Circuits by C. D. Alexander and M. N. O. Sadiku, 5th Edition, Mc Graw-Hill Education, 2012.

**213EE-1 Electric Circuits Lab** 1 ( 0 , 2 , 0 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

The course objective is to apply fundamental concepts of electric circuits in laboratory, and provide students with basic electric circuits analysis techniques.

**Course Description:**

In this course students will perform experiments to verify practically the theories and concepts learned in 211EE3 and 214EE3. This lab course introduces circuit using Ohm's law, KVL, KCL, Superposition, Thevenin's and Maximum power transfer theorems in DC circuits. Topics include also AC circuits, resonant circuits, transient response of 1st order circuits, magnetically coupled circuits and three phase circuits.

**Text Book:**

Lab Manual.

- Introductory Circuit Analysis, Robert L. Boylestad, 13th Edition, 2015, Pearson.
- * Fundamentals of Electric Circuits, Charles Alexander and Matthew Sadiku , 5th Edition, 2012, McGraw-Hill.
- * Electric Circuits, James W. Nilsson and Susan A. Riedel , 10th Edition, 2014, Pearson Prentice Hall.

**231EE-3 Electronics I** 3(3,0,1) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

After learning this course the students will be able to understand the discrete semiconductor devices. It covers essential topics from basic semiconductor theory through to the application of diodes and transistors. It focuses the P-N junction and the Diode as a circuit element, the Bipolar Junction Transistor (BJT) as a circuit device, the Single stage BJT amplifier circuits, the Junction Field-Effect-Transistor (JFET) and the Metal Oxide Semiconductor Field Effect Transistor (MOSFET) as circuit element.

**Course Description:**

This course introduces students to discrete semiconductor devices. It covers essential topics from basic semiconductor theory through to the application of diodes and transistors. It focuses the P-N junction and the Diode as a circuit element, the Bipolar Junction Transistor (BJT) as a circuit device, the Single

stage BJT amplifier circuits, the Junction Field-Effect-Transistor (JFET) and the Metal Oxide Semiconductor Field Effect Transistor (MOSFET) as circuit element.

**Text Book:**

Electronic Devices and Circuit Theory, Robert L. Boylestad, 11th Edition, 2013, Pearson Education.

**240EE-4 Electromagnetism I** 2 (2,0,1) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Calculate electric field, force, potential, energy from various charges and charge distributions.
2. Calculate electric flux, flux density and total charge from Gaussian surfaces.
3. Calculate electric current density, electric current and resistance of conductors.
4. Calculate capacitance and polarization of dielectric materials.
5. Solve Laplace's equation and find capacitance and resistance of coaxial cables.
6. Use of different laws and equations to analyze electrostatic and magnetostatic fields.
7. Study Maxwell's equations and analyze magnetostatic fields.

**Course Description:**

Electrostatics: Coulomb's law, Electric flux density, Gauss's law and applications, Electric potential, Electric dipole, Current density and conductors, Polarization in Dielectrics, Boundary conditions, Poisson's and Laplace's equations, Resistance, Dielectrics and Capacitance, Image method.

Magnetostatics: Biot-Savart law, Ampere's circuit law and applications, Magnetic flux density, Maxwell's equations for static fields, Magnetic scalar and vector potentials.

**Text Book:**

*Matthew N. O. Sadiku, "Elements of Electromagnetics", Oxford Edition, 7th Edition, Saunders College, 2018.*

**251EE-3 Digital Logic Design** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

The main purpose of this course is to identify how to analyze and design the digital systems.

**Course Description:**

Number systems & codes. Logic gates. Boolean algebra. Karnaugh maps. Analysis and synthesis of combinational systems, decoders, multiplexers, adders and subtractors. Types of flip-flops. Sequential circuit analysis and design.

**Text Book:**

Morris , ”Digital Design”, Prentice Hall, 2007**.**

**252EE-1 Digital Logic Design lab** 1(0,2,0) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

- The main purpose of this course is to identify how to us the lab for analyzing
- Designing digital systems.

**Course Description:**

Familiarization with logic circuits laboratory -Introduction to logic gates -Implementation of Boolean functions using AND and OR gates; NAND and NOR implementation; XOR and adders; Design of combinational circuits; Flip-flops; Design of sequential circuits. Practicing experiment of the above topics on equipment's of prototyping circuit boards ETS-8000A, and PCs with logic circuit design software.

**Text Book:**

Nilsson, “Electric Circuits“, Addision Wesley, 1996.

Morris , ”Digital Design”, Prentice Hall, 2007**.**

## Courses of level 7:

**314EE-2: Instrumentation and Measurements** 2 ( 2 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

- To learn fundamentals of the instrumentation and measurements.
- To be familiar with basic terms used in electrical measurements.

**Course Description:**

Measurement fundamentals: units and errors, statistical analysis: DC and AC analog digital meters constructions :DC and AC bridge : Oscilloscope: CRT, trigger sweep circuits: Oscilloscopes, Analog and Digital Multi meters to measure electrical parameters: Transducers and sensors; passive and active : specifications of Spectrum analyzer, Liquid crystal displays (LCDs) and optical fiber sensor

**Text Book:**

Electrical Measurements and measuring instruments by A. K. Sawhney, 2010.

**315EE-1: Instrumentation and Measurements Lab** 1 ( 0 , 1 , 0 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

- To learn fundamentals of the instrumentation and measurements.
- To be familiar with basic terms used in electrical measurements

**Course Description:**

Measurement fundamentals: units and errors, statistical analysis: DC current and voltage measurement, Use of Oscilloscope, Use of bridge circuit

**Text Book:**

Electrical Measurements and measuring instruments by A. K. Sawhney, 2010

**321EE-3 Electrical Machines 1** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Analyze Single-phase transformers, auto – transformers and three-phase transformers

2.Analyze three-phase induction machines

3.Study the performance and speed control of the three-phase induction machines

**Course Description:**

Transformers (construction, operation of single-phase transformers, equivalent circuit, voltage regulation and efficiency, auto – transformers, three-phase transformers), AC machinery fundamentals, three-phase induction machines (construction, operation, equivalent circuit, performance calculations, starting of induction motors), small AC motors (single-phase induction motors)

**Text Book:**

Stephen J Chapman, Electrical Machinery Fundamentals, McGraw-Hill Higher Education, 2005, Fourth Edition.

**332EE-3 Electronics II** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

This course is a continuation of 231EE-3 course. After learning this course the students will be able to understand the analysis of amplifier frequency response, the operational amplifiers design and applications, the power Amplifiers and the feedback concept and oscillator circuits.

**Course Description:**

This course is a continuation of 231EE-3 course. It focuses the analysis of amplifier frequency response, the operational amplifiers design and applications, the power Amplifiers and the feedback concept and oscillator circuits.

**Text Book:**

Electronic Devices and Circuit Theory, Robert L. Boylestad, 11th Edition, 2013, Pearson Education.

**333EE-1 Electronics** Lab 1 ( 0 , 2 , 0 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

The course objective is to apply fundamental concepts of electronic circuits in laboratory, and provide students with basic electronic circuit analysis techniques.

**Course Description:**

This lab performs experimentation in basic electronic circuits and devices. Diodes, transistors (BJT, FET), DC and small signal AC Analysis, Amplifier configurations. It is equipped with basic electronics equipment package such as digital oscilloscopes, DMM, DC power supply units and function generators.

**Text Book:**

Lab Manual.

Electronic Devices and Circuit Theory, Robert L. Boylestad, 11th Edition, 2013, Pearson Education

**342EE-3 Signals and Systems Analysis** 3(3,0,1) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

*Use the different theories to analyze:*

*i. Analog Signals*

*ii. Digital Signals*

*2) Simulate the signal in both time and frequency domains*

**Course Description:**

Motivation, Signal Classifications, Signal Operations, Eigen Functions; Theories of Fourier series for continuous and discrete time signals, Linear circuits and system concepts, impulse response, convolution and transfer function; Frequency response of systems, Fourier Transform, Laplace transform and z-transform with applications; Nyquist theorem for sampling of analog signals.

**Text Book:**

*Oppenheim, Willsky and Nawab,"Signals and Systems", Prentice-Hall, 1997.*

**353EE 3 Computer Programming for Electrical Engineering** 3(2,2,0) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Use different Matlab systems and its applications.
2. Solve Problem solution techniques and algorithm design
3. Understand LabVIEW front panels and block diagrams.
4. Use built in Vis

**Course Description:**

Introduction to MATLAB; create arrays; plot data; annotate graphs; create m-file scripts and functions; construct and manipulate data structures; set up a basic data analysis. How Simulink software interacts with MATLAB; creating a Simulink model; modeling a dynamic control system.

Introduction to LabVIEW; virtual instruments; LabVIEW environment; creating, editing and debugging a VI; creating a sub VI; loops and charts; arrays; graphs; clusters; case and sequence structures; formula node.

**Text Book:**

- Holly Moore, MATLAB for Engineers, 4th Ed., Prentice Hall, 2015.
- Matlab 2010 with Simulink Software. www.mathworks.com

LabVIEW 2011 , Course manual, Course software version 2011, www.ni.com/LabVIEW

**240EE-4 Electromagnetism II** 2 (2,0,1) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Analyze forces due to magnetic fields, magnetic torque and moment .
2. Study magnetic dipole, magnetic boundary conditions.
3. Calculate inductances and magnetic energy.
4. Apply Faraday's law to analyze the transformer and motional EMFs.
5. Apply Maxwell's equations in analyzing time-varying and time-harmonic electric and magnetic fields .
6. Analyze plane wave propagation in several types of materials.
7. Characterize the reflection and transmission behavior of plane wave incident upon plane boundaries, for both normal and oblique incidence .
8. Calculate the rate of power carried by an electromagnetic wave in both lossy and lossless media.

**Course Description:**

This course covers forces due to magnetic fields, magnetic torque and moment, Magnetic dipole, magnetic boundary conditions, Inductors and inductances, magnetic energy and circuits. Time varying

fields: Faraday's law, Transformer and motional emfs, Displacement current, Maxwell's equations and time harmonic fields, Wave equation, Power transfer and Poynting vector, Plane wave propagation in free space, in lossy dielectrics and in good conductors, Reflection of plane wave at normal and oblique incidences.

**Text Book:**

*Matthew N. O. Sadiku, "Elements of Electromagnetics", Oxford Edition, 7th Edition, Saunders College, 2018.*

## Courses of level 8:

**322EE-3 Electrical Machines II** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. To understand the basic principles of DC and Synchronous machines.
2. To know the operation and testing of DC and Synchronous machines

**Course Description:**

Synchronous machines (construction, internal voltage, equivalent circuit, phasor diagram, performance of turbo-alternator, generator operating alone, parallel operation of AC generators, synchronous motor: steady-state operation, starting), DC machines (construction, classification, performance, motor characteristics, starting of DC motors.

**Text Book:**

Chapman;" Fundamentals of Electric Machinery", McGraw Hill, 2005.

**323EE-1 Electrical Machines Lab** 1 (0 , 2 , 0) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Gain an engineering appreciation of electrical machines' operation and their applications

2. Develop practical skills for measuring electrical and mechanical quantities (Current, voltage, power, efficiency, regulation, torque, speed)

**Course Description:**

Hands-on exercises to set up circuits along with measurement and observation capabilities to explore the operating principles and characteristics of transformers, DC and AC Motors and Generators.

**Text Book:**

Stephen J Chapman, Electrical Machinery Fundamentals, McGraw-Hill Higher Education, 2005, Fourth Edition.

**343EE-3 Communication Engineering** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Categorize components of communication system.
2. Make use of signal analysis techniques in communication systems.
3. Analyze linear systems in time and frequency domains.
4. Categorize modulations techniques.
5. Analyze simple modulation systems.
6. Categorize multiplexing techniques.
7. Identify and analyze pulse code modulation systems.
8. Describe and analyze delta modulation systems.
9. Explain digital modulation techniques.

**Course Description:**

Introduction to communication systems, brief review of signals and systems, Hilbert transform, basic concepts of modulation techniques including amplitude modulation (AM) and detection, phase modulation (FM and PM) and demodulation, SNR in AM/FM reception, basic concepts of a digital communication system, sampling theorem and quantization, pulse amplitude modulation (PAM), pulse code modulation (PCM), delta modulation (DM) and demodulation, advantages of digital communication systems.

**Text Book:**

Simon Haykin. Communications Systems. John Wiley and Sons. 5th Edition. 2013.

**354EE-3 Introduction to microprocessor** 3 (3,0,1) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

- Describe the major components of a computer system and state their function and purpose.
- Recognize the hardware and software model of microprocessors.
- Identify addressing modes, instruction set of microprocessors.
- Demonstrate the ability to program a microprocessor in assembly language.
- Identify interrupt, memory and input/output interfaces.

**Course Description:**

Microprocessors architecture; Addressing modes and techniques; Instruction set; Assembly language programming; Interrupt systems; Input/output devices and timing; Memory devices; Future trends in microprocessors

**Text Book:**

Triebel and Singh “The 8088 and 8086 Microprocessors”, Prentice Hall, 2000

**355EE-1 Microprocessor Lab** 1(0,1,0) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Identify the 8086 training kit and demonstrate the basic operations and assembly commands.
2. Develop microprocessors arithmetic and logic instructions.
3. Implement hardware interfaces to practical systems.
4. Recognize the microprocessor interrupts.

**Course Description:**

Microprocessors architecture; Addressing modes and techniques; Instruction set; Assembly language programming; Interrupt systems; Input/output devices and timing; Memory devices; Future trends in microprocessors

**Text Book:**

Triebel and Singh "The 8088 and 8086 Microprocessors", Prentice Hall, 2000

**361EE-3 Automatic Control** 3 (3 , 0 , 1) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

By the completion of this course, the student should be able to:

1. Represent a system using (block diagram, transfer functions, signal flow graph)
2. Analyze a system both Time domain and Frequency domain.

**Course Description:**

Review of mathematical background (complex variables, Laplace, Diff. Equations); System representation (block diagram, transfer functions, signal flow graph) Modeling of electric and mechanical systems; State variable analysis; Stability; Time domain analysis; Root locus; Frequency domain analysis; Introduction to PID control.

**Text Book:**

Modern Control Systems, by Richard C. Dorf and Robert H. Bishop, Pearson Education, 2008.

**362EE-1 Automatic Control Lab** 1 (0 , 2,0)Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

By the completion of this course, the student should be able to:

1. Learn modern control techniques.
2. Student learns how to run Experiments include system identification, dynamic analysis of control systems with application to level, temperature, flow and pressure controls, PID tuning, and typical process control systems.

**Course Description:**

Experiments to support control theory using physical processes (e.g. water level, temperature control, light intensity control, etc); Control system simulation using Matlab; Modeling of physical (experimental) equipment; Static performance; Transient analysis; Measuring devices; Two-position control; Proportional control; PID control.

**Text Book:**

Modern Control Systems, by Richard C. Dorf and Robert H. Bishop, Pearson Education, 2008.

## Courses of level 9:

**GE 306 Engineering economy** Credit hours: **2**

**Objectives:**

Students should learn basic science and procedures in the field of engineering economics and evaluation of projects merits.

**Course Description:**

Introduction to Engineering economy. Interest formulas and equivalence. Bases for comparison of alternatives. Decision making among alternatives. Evaluating replacement alternatives. Break even and minimum cost analysis. Cost accounting. Depreciation. Economic analysis of operations. Economic analysis of public projects. Basic management process approach, strategies and planning methods, project planning and scheduling, Bar chart, critical path methods, PERT method, resource leveling and allocation, time cost trade off. Construction and organizational approaches, leadership elements and decision making, computer applications.

**Text Book:**

**"**Engineering economy by W.G.Sullivan, E.M. wicks, and J.T.Luxhoj

**424EE 3 : Power System Analysis I** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. To understand basic concepts in power system.
2. To conduct power transmission and distribution calculations.

**Course Description:**

Power system components and representation; Transmission line and cable parameters; Analysis of transmission and distribution lines; Power factor correction, Electric insulators; Grounding systems.

**Text Book:**

Power System Analysis, John J. Grainger and William D. Stevenson, Jr.-McGraw-Hill, 1994.

**425EE-1 : Power Systems lab** 1 (0 , 2 , 0) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. To understand basic concepts in power system.
2. To conduct experimental work.
3. To measure electrical quantities and analyze data.

**Course Description:**

This lab course includes ten experiments to study various aspects of power systems: measurement of the characteristics data of a transmission line and an assessment of its voltage drop and losses; synchronization and steady state operation of a generator connected to an infinite bus system; load characteristics of a synchronous motor and effect of field excitation on reactive power load; effect of voltage levels on power transmission and effects of various load types on power plants; load flow data preparation and system study; analysis of symmetrical and unsymmetrical faults; power factor correction; performance and connections of power transformers.

**Text Book:**

Power System Analysis, John J.Grainger and William D. Stevenson, Jr.-McGraw-Hill, 1994.

**444EE-3 Digital Communications** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Categorize the basic elements of modern communication systems.
2. Classify of the advanced techniques for digital communication
3. Categorize digital modulations techniques.
4. Analyze digital modulation and demodulation systems.
5. Categorize wireless channel.
6. Analyze channel coding and error correction.
7. Explain modern communication systems.

**Course Description:**

This course provides student with basics and advanced techniques for digital communication, which are the basic elements of modern communication systems. It presents the basic elements to implement any communication system and different digital technique such as source coding, channel coding, digital modulation and detection, noise and wireless channel. Examples of modern Communication Systems.

**Text Book:**

Bernard Sklar, (2005), Digital Communications Fundamentals and Applications, Second Edition, Hall P T R, United States.

**445EE-1 Communications Lab** 1 ( 0 , 2 , 0 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

- Know the primary communication resources, namely, transmission power and bandwidth
- Know the communication channel for signals transmission
- Define the modulation process
- Know the continuous modulation techniques, amplitude and angle modulation
- Define sampling, which is basic to all forms of pulse modulation
- Define quantization, which when combined with sampling represents analog signals in the form of amplitude and time
- Know different methods of digital modulation

**Course Description:**

AM and FM modulation and detection: PCM and delta modulation; TDM; shift- keyin, basics of modem technology; ASK; FSK; PSK; Line coding and decoding.

**Text Book:**

Communications Systems, Simon Haykin, John Wiley, 2010.

491EE-2 Senior Design Project I 2 ( 2 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

Ability to formulate design project and manage it.

•Ability to review related data and knowledge from credible sources.

•Ability to communicate orally and to report technically.

**Course Description:**

The graduation project is a culminating handy course work for which the students are expected to integrate and apply what they have learned through previous academic work and field experiences, with faculty supervision. These projects may be "new," continuation of work done in previous courses; or may be projects started in a previous course that become significantly expanded and enhanced for the thesis. It has two phases- to be taken in consecutive two semesters at senior level.

At the beginning of the semester, the students propose a topic on which they are supposed to work as a group. Project students meet in class weekly, discuss their research, and screen their progresses for peer and faculty critique and suggestions. At the end of the semester, students present their thesis projects to the supervising committee.

**Text Book:**

Any available books in the library related to project work.

## Courses of level 10:

**GE407-2 : Management of Engineering Projects** 2 ( 2 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

The main purpose of this course is to introduce students to the field of projects management, with the main areas in this field such as time planning and quality control.

**Course Description:**

The course focuses on the characteristics of construction industry; project delivery systems; the design and construction process; construction contracting; construction planning; project control, conceptual cost estimation; and Quality and Safety Management.

**Text Book:**

Daniel W. Halpin ,"Construction Management", John Wiley & Sons, New York (2006).

**492EE-3 Senior Design Project II** 3 ( 1 , 4 , 0 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

- Identify and formulate engineering problems in the area of electrical engineering
- Work effectively as a member of the team
- Conduct enough literature review in the project domain
- Design a system, component or process with defined constraints
- Solve engineering problems and implement designed solution
- Collect and analyze data, and draw conclusions though experiments while testing a project
- Communicate orally and in writing the project design details in a technical report.

**Course Description:**

The graduation project is a culminating handy course work for which the students are expected to integrate and apply what they have learned through previous academic work and field experiences, with faculty supervision. This is the continuation of graduation project-I, and consequently graduation project-II is supposed to be taken in the consecutive semester.

Throughout the semester, the students try to implement what they proposed in graduation project-I as a group. Project students meet in class or lab weekly, segregate the work into sub-projects, and integrate the individual works in order to reach their target and faculty critique and suggestions. At the conclusion

of the semester, students present their design projects along with the thesis to the supervising committee.

**Text Book:**

Any available books in the library related to field of work.

**490EE-0 Field training** 0

**Objectives:**

1.enable the students to gain valuable practical experience,

2. test the students' career interests.

3. provide the students with in depth knowledge about career fields.

**Course Description:**

A continuous period of 60 days of summer training spent in industry working in any of the fields of electrical engineering. The training should be carried out in an organization with an interest in one or more of these fields. On completion of the program, the student is required to submit a formal written report of his work.

## Elective Courses:

**418EE-3 Renewable Energy System** 3(2,2,1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

how the renewable energy resources can help the economy and environment.

-the principles of the most common renewable energy systems.

**Course Description:**

Introduction, Energy and Civilization, Distributed Generation Technologies & Economics, Fundamentals of Solar Power Systems, Concentrated Solar Power, Fundamentals of Wind Power Systems, Energy Storage, Integration of Distributed Generation into the Grid, Impact of Distributed Generation on Power System Operation, Applications.

**Text Book:**

Design of Smart Power Grid Renewable Energy Systems, Ali Keyhani , John Wiley 2011, ISBN 978-0470-62761-7

**419EE-3 : Energy Efficiency** 3 ( 3 , 1 , 0 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

Identify and describe the energy conservation opportunities in industrial and commercial systems.

**Course Description:**

This course will provide the student with a practical understanding of the energy efficiency measures which can be implemented by large and medium industrial and commercial energy users, and domestic users. It will cover energy technologies including energy auditing, rate structures, economic evaluation techniques, lighting efficiency improvement, HVAC optimization, combustion and use of industrial waste, steam generation and distribution system performance, process energy management, and maintenance considerations.

**Text Book:**

Kennedy, William J., Turner, Wayne C., and Capehart, Barney L. Guide to Energy Management, The Fairmount Press, 1994.

**426EE-3 Electrical Drives** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Principles of electric drive and different mechanical loads
2. DC & AC solid state drives.

**Course Description:**

Principles of electric drive; Definitions; Electrical considerations: running, starting, braking; Mechanical considerations: type of enclosure, noise, drive transmission, motor selection; Electric traction; DC & AC solid state drives.

**Text Book:**

Krishnan, "Electric Motor Drives", Prentice Hall, 2001.

**427EE-3 : Power Systems Protection** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. To understand basic concepts in power system protection.
2. To conduct relay selection and setting calculations.

**Course Description:**

The course provides comprehensive concepts of power system protection including an understanding of the principles of the operation of protection system components, e.g. fuses, relays, circuit breakers, instrument transformers and their applications for the design of protection systems for transmission lines, busbars, motors, generators and transformers.

**Text Book:**

Power system relaying. Horowitz & Phadke. (2nd Ed.) J. Wiley, 1995.

**428EE 3 : Power System Analysis II** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. To understand basic concepts in power system operation.
2. To conduct power flow and short circuit studies.

**Course Description:**

This course is a continuation of 424EE-3, and provides students with a working knowledge of power system problems and computer techniques used to solve some of these problems. Topics covered include: power system components and modeling, optimal dispatch of generation, symmetrical three-phase faults, symmetrical components, unsymmetrical faults, power flow, power system stability.

**Text Book:**

Power System Analysis, John J. Grainger and William D. Stevenson, Jr.-McGraw-Hill, 1994.

**434EE-3 VLSI Design** 3(3 , 0 , 1) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

After learning this course the students will be able to understand Lambda Design Rules, NMOS and CMOS Inverters, NMOS and PMOS transistors, P -Well process, N -Well process, CMOS logic, CMOS Technologies, CMOS fabrication and Layout, Integrated Circuit Design using Verilog/VHDL.

**Course Description:**

Introduction to Integrated Circuit, Lambda Design Rules, NMOS and CMOS Inverters, NMOS and PMOS transistors, P -Well process, N -Well process, CMOS logic, CMOS Technologies, CMOS fabrication and Layout, Integrated Circuit Design using Verilog/VHDL.

**Text Book:**

Carver Mead, Lynn Conway, "Introduction VLSI Systems", 1st Edition, Addison-Wesley Pub (Sd) 1979.

Pucknell, "Basic VLSI Design", Prentice Hall Publication, 1995.

**441EE-3 Microwave Engineering** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical ,

tutorial )

**Objectives:**

1. Describe, impacts and applications of microwave circuits
2. Analysis and design of transmission lines.
3. Explain transmission line propagation.
4. Analyze impedance matching techniques using smith chart.
5. Study and analyze waveguides.
6. Study and investigate microwave network analysis using S-Parameters.
7. Analysis and design of passive and active components.
8. Explain and perform the measurement techniques.

9. Describe the applications of microwave systems.
10. Utilize computer simulation tool in solving problems.

**Course Description:**

Theory, analysis and design of transmission lines, transmission line propagation, impedance matching techniques using smith chart, waveguides, microwave network analysis using S-Parameters, analysis and design of passive and active components, measurement techniques and application of microwave systems.

**Text Book:**

Pozar, D. M. (2011). Microwave Engineering. 4th Edition. New York: John Wiley & Sons.

**442EE-3 Antenna and Wave Propagation** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Explain various types of antennas and applications.
2. Understand the fundamental parameters of antenna.
3. Realize radar range equation, half-wave dipole antenna, antenna arrays, planar antennas, broadband antennas.
4. Explain methods of antenna measurements.
5. Understand matching techniques.
6. Describe the principles of designing different types of antenna, design of antenna arrays. Explain and understand the theory of wave propagation.
7. Construct an antenna system to satisfy the requirements of a wireless system.
8. Utilize computer simulation tool in solving problems.

**Course Description:**

Introduction to antennas, fundamental parameters of antenna, radar range equation, half-wave dipole antenna, antenna arrays, planar antennas, broadband antennas, methods of antenna measurements, matching techniques, principle of designing different types of antenna, design of antenna arrays, theory of wave propagation.

**Text Book:**

Das, S.K., and Das, A. (2013). Antenna and Wave Propagation, Last Edition. New Delhi: Tata McGraw Hill Education Private Limited.

446 EE-3 EMBEDDED SYSTEMS DESIGN 3(2,2,1) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

The main purpose of this course is to identify how to analyze and design embedded systems.

**Course Description:**

This course covers the main elements of embedded systems design. Emphasis given includes hardware and firmware design, hardware selection, hardware testing, development tools and software, firmware development and firmware debugging.

**Text Book:**

Embedded System Design: A unified Hardware/Software Introduction, Frank Vahid and Tony Givargis. Wiley. ISBN: 9780471386780

Designing Embedded Systems with Arduino, Tianhong Pan and Yi Zhu, Springer, ISBN 978-981-10-4417-5

**447EE-3 Data Communications and Networks** 3 ( 2 , 2 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Build an understanding of the fundamental concepts of computer networking.
2. Introduce students to the evolution of computer networks and the concepts data communication;
3. Introduce students the general principles of network design and compare the different network topologies
4. Introduce students to the wireless Local Area Networks;
5. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
6. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.

**Course Description:**

**Network Architectures. Network Layers: OSI Model and TCP/IP Model. Physical Layer** Protocols and Digital Transmission Fundamentals. Data Link Layer Protocols. Network Layer Protocols: IP Protocols. Medium Access Control systems. Packet Switching and Circuit Switching. Routing in Packet Switching Network Architectures. Network Layers: OSI Model and TCP/IP Model. Physical Layer Protocols and Digital Transmission Fundamentals. Data Link Layer Protocols. Network Layer Protocols: IP Protocols. Medium Access Control systems. Packet Switching and Circuit Switching. Routing in Packet Switching. Network security.

**Text Book:**

B. A. Forouzan, S. C. Fegan, Data Communications and Networking, McGraw-Hill, 5th Edition,2013.

**448EE-3 Wireless Communications** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Explain the basic concepts of wireless communications.
2. Describe channel models.
3. Understand large and small scale fading.
4. Explain and understand diversity.
5. Understand cellular system analysis (frequency planning, capacity, sectorization, etc.).
6. Recognize link budget analysis.
7. Explain multiple access techniques (TDMA, FDMA, CDMA).
8. Describe the technology and applications of satellite communications.
9. Understand the standards of wireless communications.
10. Evaluate problem related to mobile radio and satellite communication.
11. Explain the mobility management of mobile radio communication system.

**Course Description:**

Introduction to wireless communications, Channel models, Large and small scale fading, Diversity, cellular system analysis (frequency planning, capacity, sectorization, etc.), Link budget analysis, Multiple access techniques (TDMA, FDMA, CDMA), technology and applications of satellite communications, Standards of wireless communications.

**Text Book:**

Theodore S. Rappaport (2001). Wireless Communications Principles and Practice. 2nd Edition, Prentice Hall.

**451EE-3 Digital Image Processing** 3 ( 2 , 2 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Study the fundamentals of digital image processing.
2. Apply image transform.
3. Categorize and apply the image enhancement techniques.
4. Analyze image restoration techniques and methods.
5. Classify and apply Image compression and Segmentation.

**Course Description:**

Discussion on digital image processing fundamentals; review of DSP algorithms such as DFT; intensity transforms, frequency domain filtering; image restoration and reconstruction; color image processing; multiresolution processing; image compression; morphological image processing.

**Text Book:**

R. Gonzalez and R. Woods, Digital Image Processing, Prentice-Hall, 2008.

**456EE-3 Digital Signal Processing** 3 ( 3 , 0 , 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. *Understand and use different theories and tools for digital signal processing*
2. ***2.*** *Design digital filters*

**Course Description:**

Review of discrete-time signals and systems; The Discrete-Time Fourier transform, Fast Fourier Transform, Z Transform, Recursive and no recursive digital filters design and realization; Decimation and interpolation; Applications of digital signal processing in communications.

**Text Book:**

*Mitra, "Digital Signal Processing: A Computer Based Approach", Mc Graw Hill, 2001*

**463EE-3 Applied Control** 3 ( 3 , 0, 1 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

1. Use the different approaches for advanced system control
2. Design controller ,Transducers and actuators

**Course Description:**

Basics of system modeling and analysis; PID controller design; Transducers and actuators; Real time control; Control applications (power systems, robotics, etc.), Understanding a Programming Logic Controller (PLC).; Control design project**.**

**Text Book:**

Kuo, "Automatic Control Systems", Prentice-Hall, 1995.

**464EE-3 Introduction to Robotics** 3 ( 3 , 1 , 0 ) Credit Hours ( theory , Lab/practical , tutorial )

**Objectives:**

- To learn fundamentals and design of the robots.
- To be familiar with applications of robotics in the industry

**Course Description:**

This course provides an overview of the robotics, basic elements of the robot, basics of the robot design, programming and vision in robotics and applications of robots in biomedical, deep water and manufacturing.

**Text Book:**

Introduction to Robotics, mechanics and control by John J. Graig, 2003 F. Bucher