Electrical Energy Program Courses Description:

1.1 University Requirements

HU211 – Academic writing and presentation skills
Prerequisites: 25 Cr. Hrs. – Cr. Hrs. 3

Intellectual Skills, Professional Skills, Characteristics and ethics of technical writing: Characteristics of technical writing, General Structure of Technical Reports, Page design, Technical Editing, Common Types of Technical Documents, Progress reports, Inspection reports, and Feasibility reports. Research/laboratory reports, Manuals, Proposals, Correspondence, Memorandum, Purpose of Memo, Memo Structure, Technical Writing Study Guide, Establishing goals, Analyzing the audience, Making Effective Presentations, Structuring the presentation, Designing Technical Presentations, Conclusions.

HU421 - Professional Ethics and Practice Law
Prerequisites: 90 Cr. Hrs. – Cr. Hrs. 2

Introduction to the course Ethics and Professionalism - Moral Reasoning and Codes of Ethics - Moral Frameworks - Engineering as Social Experimentation - Commitment to Safety - Workplace Responsibilities and Rights - Honesty - Environmental Ethics - Global Issues - Engineers and Technological Progress - General Resources on Engineering Ethics - Examples of Codes of Ethics (ABET, IEEE) - Preparation for the Professional Practice Exam (PPE), a requirement for students who want to become professional engineers - Case Studies

HU531 - Introduction to Entrepreneurship
Prerequisites: 112 Cr. Hrs. – Cr. Hrs. 2

Introduction to Entrepreneurship, Feasibility Analysis, Developing an Effective Business Model, writing a Business Plan, Writing a Business Plan, Preparing the Proper Ethical and Legal Foundation, Financial Planning: Getting Financing or Funding, Managing the cash flow, Unique Marketing Issues., Ecommerce and Pricing, Franchising. Building a New-Venture Team.

HU112 Creativity and Innovation
Prerequisites: None – Cr. Hrs. 2

Theoretical elementsm, Different aspects of creativity, Development of cognitive abilities, Influential factors (environmental, social, personal, organizational), Creativity approaches (methods, techniques, activities), Metacognitive processes, Mind-mapping, six hats, SCAMPER, bionics, Engineering examples and projects, Marketing, improvisation and invention, Encoding information, concept map, Vee diagram

HU113 - ICT Skills
Prerequisites: None – Cr. Hrs. 2

Introducing students with Computer Applications, ICT Skills and impact of ICT on various sectors. Digital Transformation and Information Technology at the edge of 4th Industrial Revolution and Ethics of Technology. Data presentation, processing, Big Data Volumes, new technology for data storage handling and principles of Artificial intelligence in various Engineering Sectors. Learn Web-Development, websites building tools and Web-Search Skills. Creating generative forms, GUIs Graphical user interfaces. Creating Database Files and GUIs links with Database handling Tools and application case studies in various Engineering problems. Fundamentals of Mobile Applications, needs, development tools and application case-studies.

HU141 Introduction to Mass Communication
Prerequisites: None – Cr. Hrs. 2

Introduction to the course – Introduction to media (Understanding the media)., Communication Process, types & barriers of communication, Public Speaking Art (skills of writing public speech and skills of performing), Printed Newspapers(history, organizational system, types, and writing characteristics) Magazines (content types & designs) , Online journalism (advantages & disadvantages, effects on traditional journalism), Radio (history, development, types of content, online radio), Television, Introduction to Public relations, Advertising , Advertising appeals, Social marketing (definitions, techniques, case studies)

HU 102 Art Appreciation
Prerequisites: None – Cr. Hrs. 2

Introduction to fine Arts, Art in our lives, The Basic Meaning of Art Explained- Line, Design elements: Shape and ForDesign elements: Space, Design elements: Texture and pattern – Value, Design elements: Color psychology, Color theory, The Principles of Design: Balance- Emphasis- Contrast- Repetition, The Principles of Design: Proximity- Proportion - Harmony- Unity & Variety

HU152 - History of Egyptian Art
Prerequisites: None – Cr. Hrs. 2

This course introduces students to a survey of Egyptian art from the predynastic period to the contemporary period, highlighting various topics including Natural and social contexts. Composition, conventions, materials, patterns, colours, influences. Art in the Amarna Period - Graeco-Roman Egypt: Art in the Ptolemaic period - Ancient Egyptian Art: The rediscovery of Egyptian art in the 19th century. Reception of ancient Egyptian art in the modern world. Egyptomania. Egyptian Revival styles - Coptic (Late Antique) Egypt: The rise of Christianity. Coptic art: conventions, details, and patterns - Islamic Egypt: Principles and meanings of Islamic geometric design. Exercise with patterns - Islamic Egypt: Art in Mamluk Egypt and Ottoman Egypt - Modern Egyptian Art: 19th and 20th century art: Socio-political context - Modern Egyptian Art: Pioneer artists - Trends in Egyptian Contemporary Art (1945-2000).

HU153 - Music and Civilization
Prerequisites: None – Cr. Hrs. 2

This course provides a tour through the world of music. Music & Civilization Definitions: Music, Sound, Pitch, Dynamics, Timbre (Voices and Instruments). Basic Elements Of Music: Melody, Harmony, Rhythm, Texture and Form. Musical Styles: Ancient Music: Egyptian, Mesopotamian Greek And Roman Music., Western Classical Music: Medieval, Renaissance, Baroque, Classical, Romantic, Medieval Period (450-1450), the Renaissance Period (1450-1600), Baroque Period (1600-1750), Classical Period, Romantic Period (1820-1900), Modern Music (20th Century To World War II).

HU171 - History of Engineering and Technology
Prerequisites: None – Cr. Hrs. 2

Definitions of art, science, technology and engineering, The Relation of Art, Science and engineering , History of industrial revolution, History of second industrial revolution, History of information Revolution, Environmental engineering history and advances, Social involvement in technological advances, Branches of engineering Overview, Contrast of the different branches of Engineering , Career opportunities in Engineering branches, Environmental engineering history and advances, Energy situation in Egypt – Energy balance., Energy alternatives in Egypt.

HU132 - Fundamentals of Business
Prerequisites: None – Cr. Hrs. 2

Introduction to the course – overview of business environment, The contemporary business environment – Entrepreneurship, Business Management – the management process, types of managers, contingency planning and crisis management., Organizing the Business – types of organizational structures, Operations Management – services and goods, Quality and productivity, quality improvement, Leadership and Decision Making, Human Resource Management – staffing and developing workforce, Principles of Marketing: marketing plan, marketing strategy, product life cycle., Principles of Marketing: Developing and Pricing Products– pricing strategies, Financial Systems: Understanding Money , Financial Systems: Managing Business Finances, Accounting and Financial Reporting .

HU142 - Arabic Language
Prerequisites: None – Cr. Hrs. 2
An overview of the course content and the importance of Arabic in various fields of specialization - Arabic structures - The uses of simple and compound Arabic sentences - Rules for writing a paragraph in Arabic - Rules for report preparation and writing - Rules for writing applications, resumes and the techniques used for each of them - Principles of summarizing to ensure its correctness and validity - Using Arabic for quick and brief presentations - Rules for writing official correspondences.Training on managing dialogues and discussions in Modern Standard Arabic (MSA) and promoting colloquial Arabic -Correcting spelling mistakes that can lead to misunderstanding/ misconception - Studying errors resulting from rendering foreign books without taking into account the Arabic structures.

HU143 English Language
Prerequisites: None – Cr. Hrs. 2

Orientation , Reading , forming Questions, Procedures and Precautions, Active and Passive Voice, Paragraph Writing and Transition Signals, Topic, Supporting and Concluding Sentences Introduction to presentation skills + Ungraded Two-Paragraph Writing Workshop, Oral Presentations, Essay Writing: essay structure, writing thesis statements and body paragraphs, Unity & Coherence + Writing Concluding Paragraph, (Monitoring and Control) -verb agreement + Graded essay writing workshop , Vocabulary Puzzles , C.V. Writing and Interviewing Skills, Conducting Interviews

HU144 - French Language
Prerequisites: None – Cr. Hrs. 2

Introduction to the course - Initial contact - Introduce yourself – making contact - start a conversation, (telephone) facing complications - Greet someone - write an e-mail - Agenda - Suggest - take - note - postpone - cancel an appointment. Organize your working time - Check information. Travel - Find out about the place of destination - get around - go sightseeing - ask - understand - explain an itinerary. Expression of place - Imperfect - Imperative - Indirect speech. Hotel - find out about a hotel - take - modify - report a reservation - Check a note - write a complaint. Company - identify the company - explain, draw a graph - analyze compare results. Interaction - Application - Adverbs - numbers - expressions of comparison. Find a job: Consult, analyze a job offer, write an ad. Write a motivation letter, a   C.V. Interaction - Job interview: Prepare, analyze, a job interview. Talk about yourself, your motivations. Interaction- Application. Expression of the goal - Taking the floor. Practice active listening. Knowing how to compare, reformulate. Make a presentation.

HU145 - German Language
Prerequisites: None – Cr. Hrs. 2

This course aims at enhancing learners' four language skills: listening, speaking, reading, and writing. In addition, it supports each skills-based lesson with speaking real-life activities designed to give students the opportunity to acquire and practice vocabulary and grammar.

HU146 - Spanish language
Prerequisites: None – Cr. Hrs. 2

Introduction to the course, overview of Spanish language and culture., Alphabets, introduction to pronunciation and multiple activities on pronouncing words. Application using mini conversations. Describing people, introducing adjectives of description and new vocabulary about body parts. Speaking about places, Introducing vocabulary about the house and the class. Describing places (house, class) and describing objects. Introducing definite and indefinite articles, interrogatives, demonstrative adjectives and possessive adjectives, Introduction to Comparison. Talking about famous feasts and parties in Spain. Introducing adverbs of frequency., Do's and don'ts comparing between Egypt and Spain. Application doing debates., Introduction to the imperative, The difference between orders and favors. How to express preferences (like and dislike). Introducing direct and indirect objects., How to express pain. How to express exclamation, obligation and condition., Introducing simple future. Introducing real situations in a restaurant. Description of countries, cities and villages. Speaking about weather conditions.

HU161 - Climate Change and Water Management
Prerequisites: None – Cr. Hrs. 2

Importance of Water for Economic Development, Climate Change, Its Drivers and impacts, Climate Change Mitigation and Adaptation, Climate Change Vulnerabilities and Risk Assessment, Water and

Climate Change - Current Challenges, Introduction to Water resource Management and International Frameworks for IWRM, Water Supply and Distribution, Sources of Water and Minimizing Water Loss, Water Scarcity - Predictions and Preparedness, Safe Wastewater Reuse, Treatment and Recycling, Projections of future climate change impacts on the water cycle, Strategy Development and Planning for Adaptation, Technologies for addressing adaptation challenges, Climate Change Impacts on Agriculture and Drought Risk Management, Conflict issues in water resources management and water rights

HU162 - Sustainable Development
Prerequisites: None – Cr. Hrs. 2
Fundamental concepts of engineering for sustainability and sustainable development. Engineering for sustainability and sustainable development. Green engineering and materials. Resource conservation. Renewable resources. Design for extreme affordability. Problem solving methods. Methods to identify and select sustainable solutions to design problems. Methods of improving existing engineering solutions. Methods of systems thinking. Technical, economic, and social consequences of engineering practices and processes. Complex engineering decisions related to social and environmental issues. Application of science and innovation to meet human needs while indefinitely preserving the life support systems of the planet.

HU233 - Engineering Economy
Prerequisites: 33 Cr. Hrs. – Cr. Hrs. 2
Cost Analysis., Principles of money – time relations, the concept of economic equivalence, Cash flow diagrams: Interest formulas and uniform series, Cash flow diagrams: Uniform gradient series, Nominal and effective interest rates, continuous compounding and continuous cash flows., Applications of engineering economy, Depreciation., Evaluating Projects with Benefit-to Cost ratio Method.

HU254 - Introduction to Photography
Prerequisites: None – Cr. Hrs. 2
This course explores the practical and creative interplay between photographic practice and theory in the field of visual representations of urban space. Technical aspects: camera types - camera parts, Technical aspects : lenses and accessories, Focal lengths , vision angles - aperture – shutter speed and iso, Photographic composition : introduction, Photographic composition : emphasis, Dealing with light : natural and artificial , shades and shadows , Dealing with light : flash, Balance – Contrast: colors, Contrast : texture, Dealing with movable objects, Special photographic effects, Photographic project

HU255 - Introduction to Cinematography
Prerequisites: None – Cr. Hrs. 2
This course introduces students to learn the basics of filmmaking techniques with a focus on Cinematography. Basic Camera Operation, Lenses, Composition, Camera Angles ,Types of Shots, Photo Sequence that Achieves visual storytelling,Camera Movement, Storyboarding, Script Writing, Video Editing – Learn to apply the different types of cuts and the basics of video editing software using Adobe Premiere Pro, Color Correction & Color Grading , Text & Animation

HU263 - Environmental Sciences and Technology
Prerequisites: None – Cr. Hrs. 2
Environmental sciences and engineering and definitions of physical, chemical, biological, and social environments and environmental studies.   - Ecology and ecological systems, formations, functions and limiting factors, energy transfer and materials cycling in ecosystem. - Terrestrial and marine

environments, food chains and food webs. - Main environmental problems extinction and biodiversity of organisms, resources depletion and environmental pollutions. - Environmental ethics principals of eco-centrism and anthropocentrism. - Sustainability of natural system and sustainable development in energy and water utilizations. - Changing the role of technology, preventive technology, waste treatment, pollution control, recycling of wastes, green technology, cleaner production, life cycle assessment. -Population growth, environmental problems, environmental modelling and applications. - Air pollution sources, types and control, smoke, fogs and smog phenomena. - Greenhouse gases and impacts on the environment. - Climate change and sea level rise and its management. - Acid rains and its effects on soil, water and biological systems. - Tropospheric and stratospheric ozone sources, roles and effects. - Water pollution types, sources and treatments. - Radiation and radioactivity and health effects and environmental impacts   and radiation protection. - Municipal and hazardous wastes, sources, types and management. - Environmental auditing and impacts assessment.- Risk assessment, characterization and management.

HU264- Safety and Risk Assessment
Prerequisites: None – Cr. Hrs. 2
Introduction to Safety Risk Assessment - The type of risk assessment in workplace - Identifying and Defining Varying Levels and Types of Risk - Hazardous Activities Can Include Issues (Specific Hazards) - Complexity of Work - Age of Equipment and Preventative Maintenance Programs - Specific Federal, State, and Local Regulations for Business Activities - Determine Potential Risk in a Work Environment - Risk Analysis - Risk Matrix Template - Risk Evaluation - Risk Communication - Risk Plan off The Ground - Risk Management - Documentation for Risk Assessment and Management.

HU272 - Introduction to Artificial Intelligence
Prerequisites: None – Cr. Hrs. 2
General Introduction to Artificial Intelligence (AI) – Machine Learning (ML) – Deep Learning (DL) - What is AI? - Data – The Fuel of AI- What is Machine Learning?- The process of ML- Supervised and unsupervised ML- Clustering- Regression- Deep Learning- Neural Networks - Applications of DL- Case Studies (1) and (2) customizes for the departments- The Future of AI.

3.2 College Requirements

BA113 – Physics (1)
Cr.3. Prerequisite: None
Electrostatics + Coulomb's law- Electric field – Motion of charged particles in a uniform electric field– Electric flux and Gauss law –Electric Potential energy and electric potential – Capacitors (parallel plate capacitors, energy stored) – Capacitors in series and parallel–Electric current –Ohm's law – resistivity – Power in the circuits –Resistors in series and parallel – Kirchhoff's rules –R.C circuit –Magnetism (Force on a charge in magnetic field) Force on a current –carrying conductor in magnetic field. Biotsavart law and its application – Amper's law and its applications – Electromagnetic Induction – Magnetic flux –Faraday's law- Mutual Induction – Self Induction – Introduction to electromagnetic waves- electromagnetic spectrum – Interference of light – Young's double slit experiment.

BA114 – Physics (2)
Cr.3. Prerequisite: BA113

Temperature, the Zeroth Law of Thermodynamics and Thermal expansion in solids and liquids – Specific Heat and Calorimetry – Latent Heat – Heat, work and the system- Reversibility-Reversible work- the state of working fluid – Conservation of energy and the First law of thermodynamics – Ideal Gas (as a working fluid) – Applications of the First Law of Thermodynamics – Reversible non-flow processes – Heat Engines and the Second Law of Thermodynamics – Heat Pumps and Refrigerators: The Carnot Cycle – Entropy; Changes in Entropy for Thermodynamic Systems – T-s diagram, Reversible processes on T-s diagram for a perfect gas – Heat Transfer (Fourier's law of conduction – Newton's law of cooling) – The composite wall and the electrical analogy – Oscillatory Motion (Analysis model: Particle in simple harmonic motion – Energy of the simple harmonic oscillator) – Wave Motion (Analysis Model: Traveling Wave – The Speed of Waves on Strings – The Doppler Effect).

BA118 – Chemistry
Cr.3. Prerequisite: None

Chemical bonding and The Formation of Materials - Chemical Equation and Mass Balance - Gases and Gas Properties-Basics of Electrochemistry-Basics of Corrosion-Forms of Corrosion - Basics of Corrosion Protection - Chemistry of Fuel - Physical and Chemical Properties of Fuel - Water Chemistry - Basics of Water Treatment - Chemical and Physical Properties of Building – Materials - Review.

BA123 – Calculus (1)
Cr.3. Prerequisite: None

Functions – New Functions from Old – Composition of Functions – Families of Functions – Trigonometric Functions - Inverse Functions – Inverse Trigonometric Functions – Exponential and Logarithmic Functions - Limits at Infinity; End Behavior of a Function – Tangent Lines and rate of change, The Derivative Function, Techniques of Differentiation, The product and quotient rules – Derivatives of Trigonometric Functions, The Chain Rule, Implicit Differentiation – Derivatives of Logarithmic, Exponential and Inverse trigonometric Functions – Hyperbolic / Inverse Hyperbolic Functions and their Derivatives – Indeterminate Forms and L'Hopital's Rule: Partial Differentiation – Taylor's and Maclaurin's expansions – Curve sketching: Critical, maximum, minimum and inflection points – Conic sections : Parabola.

BA124 – Calculus (2)
Cr.3. Prerequisite: BA123

Area and estimating with finite sums – Sigma notation and Limits of finite sums – Definition of indefinite integrals & Table of famous integrals – Simple rules of integration & The fundamental theorem of calculus – Integration by parts – Integration by parts & integration of rational functions – Integration of rational functions using Partial Fractions – Integration of Trigonometric powers – Trigonometric substitution – Integration of quadratic forms and the Reduction formulas – Definite integration, Areas between curves, Volume of Revolution using Disk and Washer methods – Improper Integrals – Length of the curve, Average of a function & numerical integration.

BA141 – Statics
Cr.3. Prerequisite: None

Force system - Rectangular components of forces - Parallelogram law - Equilibrium of a particle: springs and cables - Moment of forces - Force system resultant - Free body diagram - Transability of a force - Equilibrium of a rigid body - Equations of equilibrium - Trusses (joint method – zero force members) - Trusses (method of sections) - Frames - Friction - Mass moment of inertia - Virtual work.

BA142 – Dynamics
Cr.3. Prerequisite: BA141

Kinematics of a particle - Rectilinear Kinematics - Curvilinear motion: Rectangular components, projectile motion - Force and acceleration (Kinetics), Newton's laws - Work and energy of a particle (kinetics) - Rotation of a rigid body about a fixed axis - General plane motion - Relative motion: velocity - Relative motion: acceleration - Planar Kinetics of a rigid body: Equation of translational motion - Equation of rotational motion - Equation of General plane motion - Work and Energy.

CC111 – Programming Fundamentals and Problem Solving
Cr.3. Prerequisite: None

An introduction to computer programming and problem-solving methodologies - Data type operators and simple functions - Input/output statements and expressions - Arithmetic operations - Selection structures and switch statements - Selection structures and switch statements continued-Iterations and Multi-disciplinary Engineering Case-studies - Iterations and Multi-disciplinary Engineering Case studies continued - Arrays and Application Case-Studies - Multi-dimensional Arrays and Application Case studies in Engineering Problems - String structures and applied applications in Engineering Problems - Functions and modular programming.

IM111 – Manufacturing Technology
Cr.2. Prerequisite: None

Introduction and course review – Introduction to engineering materials (Steels, cast irons ceramics, polymers, composite materials) – Mechanical properties of materials – Heat treatment operations (Hardening-Annealing-Tempering-Normalizing) – Sand casting (Pattern design & mould preparations), Centrifugal casting, die casting and aspects of the casting process – Forming operations (Rolling – Forging, Extrusion – Wire drawing – Deep drawing) – Gas and Electric arc welding – Electric resistance and solid state welding and aspects of the welding process – Metal cutting principles: Tool geometry, cutting and feed motions, different cutting operations, turning, drilling, Milling, shaping, planning and grinding operations – Advanced Manufacturing Systems – Industry 4.0 and smart manufacturing – Measurements and Engineering metrology – Measuring Instruments: Dial gauge, Block gauges.

IM424 – Operations Research
Cr.3. Prerequisite: 80 Cr. Hr.

Introduction to Operations Research – Formulation of Linear Programming Models – Formulation of Advanced Linear Programming Models – Linear Programming: The Graphical Solution – Linear Programming: The Simplex Method – Linear Programming: Variations of the Simplex Method – Sensitivity Analysis of Optimization Problems – The Duality Theory – Transportation Model and Algorithms: Formulation and Initial Solution – Transportation Model and Algorithms: Finding the

Optimal Solution – The Assignment Model and Hungarian Algorithm – Network Analysis: The Minimal Spanning Tree Algorithm and The Shortest Route Algorithms: The Dijkestra Algorithm and Floyd's Algorithm – Network Analysis: Maximal Flow Problem- Ford-Fulkerson algorithm and the Max-Flow-Min-Cut Theorem.

EG400+ EG500 – Practical Training

Cr.1. Prerequisite: 64 Cr. Hr., 80 Cr. Hr

This course is a college graduation requirement. Students are asked to undertake a minimum of four weeks of practical training in off-campus sites recommended by the college and the department in order to pass this course. Students are required to submit a recognition letter from the site where they received their training; in addition, a report and a presentation are submitted. Course is a Pass/Fail course.

ME151 - Engineering Drawings & Projection
CR: 3. Prerequisite: None
Introduction to Engineering drawing / Computer aided drafting (CAD) Basics(I) - Methods of object - projection (Exercises on geometrical construction using hand sketching) / Basic Drawing commands using CAD applications(II) - Geometrical Constructions (II) / Exercises on geometrical construction using hand sketching and CAD(I) - Orthographic projection (I) (Exercises on orthogonal projection using hand sketching)/ Exercises on geometrical construction using CAD(II) - Orthographic projection (II) / Exercises on orthographic projection using hand sketching and AutoCAD(I) - Third View Projection (I) (Exercises on third view projection using hand sketching) / Exercises on orthographic projection using CAD(II) - Third View Projection (II) / Exercises on missing view using hand sketching and CAD(I) - Sectional View (I) (Exercises on sectional views using hand sketching)/ Exercises on Third view using CAD(II) - Sectional View (II) / (Exercises on sectional views using hand sketching and CAD) - Pictorial Drawing (I) (Exercises on pictorial drawing using hand sketching)/ Exercises on sectional view using CAD(II) - Pictorial Drawing (II) / Exercises on pictorial drawing using hand sketching and CAD(I) - Standard Metal Sections (Exercises on metal sections) / Exercises on pictorial drawing using CAD(II) - Course Review / (Exercises on Standard Metal Sections using CAD.

3.3 General Specialization Requirements

BA223 – Differential Equations
Cr.3. Prerequisite: BA124
First order ordinary differential equations: Separable equations – Initial value problems- Homogeneous equations - Total differential and exact equations. Linear equations - Bernoulli's equation - Revision on first order ordinary differential equations - Second order ordinary differential equations with constant coefficients: Fundamental set of solutions - Linear independence of solutions: Wronskian- General solution of homogeneous equations - Second order ordinary differential equations with constant coefficients: Non-homogeneous equations (Method of undetermined coefficients) - Second order ordinary differential equations with constant coefficients: Non-homogenous equations - Method of undetermined coefficients (Case of duplication). The method of variation of parameters - Second order ordinary differential

equations with variable coefficients: [Cauchy - Euler Equation] - Laplace transforms: Basic definition- First shifting theorem (s-shifting) - Laplace transforms: Transform Differentiation - Transform Integration - Laplace transforms: Unit step function - Second shifting theorem (t-shifting) - Convolution theorem - Inverse Laplace transforms - Applications: Solution of ODEs using Laplace transforms – Solution of R-L circuit using the Laplace transforms - Fourier series: Fourier series for functions of period 2P - Fourier series: Fourier series for even and odd functions - Fourier series for harmonic functions.

BA224 – Vector and Complex Analysis
Cr.3. Prerequisite: BA223

Vector Algebra / Dot and cross product and Applications - Lines and Curves in Plane and Space – Vector valued function – Plane - Partial Differentiation / Derivatives of vector functions - Gradient / Divergence/ curl/ Laplacian - Line Integrals/ Line Integrals of a scalar and a vector function - Line Integrals Independent of the path / Double Integrals in Cartesian - Double Integrals in polar coordinates - Green's Theorem/ Triple Integrals - Triple Integrals in Cylindrical and Spherical coordinates - Surface Integrals – Surface area – Flux of a Vector Field - Divergence Theorem (Gauss' Theorem) / Stokes' Theorem - Complex numbers and functions – forms of representation Roots of complex number - Complex power /Elementary functions - Analytic functions /Harmonic functions/ Zeros and poles of Analytic functions - Residue Theorem / Application to Real Integral.

BA321 – Probability and Discrete Analysis
Cr.3. Prerequisite: BA224

An introduction to statistics and statistical analysis on data observation – Statistical measurements – Elementary Probability – Probability theorems – Conditional probability – Independent and dependent events –Total probability rule – Baye's Theorem and applications – Discrete probability distribution – probability mass function – Continuous probability distribution – probability density function. Mathematical expectation, mean and variance – Special discrete distribution: Bernoulli, Binomial, Hypergeometric and Poisson distributions – Special continuous distribution: Uniform and exponential distribution – Special continuous distribution: normal distribution – The z-transform: definition– properties – The z-transform : convolution – Inverse z-transform and difference equation– Numerical integration and differentiation.

CC217 – Programming Techniques and Algorithms
Cr.3. Prerequisite: CC 111

This course builds on the introductory programming course given in C/C++. The course will introduce new user-define data types and their usage in more advanced engineering applications. Students will study searching and sorting algorithms and their applications and finally introducing the files and their handling.

CC215 – Applied Programming
Cr.3. Prerequisite: CC111

Introduction to structured programming and problem - solving methodologies - Introduction to Arrays - Applications and case studies on arrays - Functions by value - Functions by reference -

Searching algorithms - Sorting algorithms – Strings - Struct definition - Typedef of Structs - Text Files - Binary Files - Advanced Applications.

CC221 – Digital Logic Design
Cr.3. Prerequisite: CC111

Introduction to digital concepts - Number systems, operations, and codes - Logic gates - Boolean algebra and logic simplification - (SOP) and (POS) Expressions - Simplification using Karnaugh maps - Functions of combinational logic, adders and sub-tractor design - Decoders, encoders and combinational design - MUX, DEMUX and Comparator design - Flip-Flops and related devices - Asynchronous counter design - Synchronous counter design - Shift registers.

ME422 – Power Plant Technology
CR: 2. Prerequisite: ME439

Introduction (Revision on first law of thermodynamics, Process and second law of thermodynamics) - Introduction to Exergy - Heat engine cycles (Basics - Carnot Cycle)- Heat engine cycles (Joule Cycle – Otto Cycle) - Heat engine cycles (Diesel Cycle – Dual Cycle) - Steam Cycles (Rankine cycle – using steam tables)-Steam Cycles (Rankine cycle with super heat) - Steam Cycles (enthalpy / entropy chart)-Steam Cycles (Reheat Cycle) - Introduction to Fluid Mechanics, and fluid properties - Measurements of Pressure &Pascal law.-Bernoulli, Energy, & Momentum Equations - Bernoulli, Energy, & Momentum Equations - Flow in Pipe - Flow in Pipe.

ME439 – Thermo-Fluids
Cr.3. Prerequisite: BA114

Introduction (Revision on first law of thermodynamics, Process and second law of thermodynamics) - Introduction to Exergy - Heat engine cycles (Basics - Carnot Cycle) - Heat engine cycles (Joule Cycle – Otto Cycle) - Heat engine cycles (Diesel Cycle – Dual Cycle) - Steam Cycles (Rankine cycle – using steam tables) - Steam Cycles (Rankine cycle with super heat) - Steam Cycles (enthalpy / entropy chart) - Steam Cycles (Reheat Cycle) - Introduction to Fluid Mechanics, and fluid properties - Measurements of Pressure & Pascal law - Bernoulli, Energy, & Momentum Equations - Flow in Pipe.

EE211 – Electrical Measurements
Cr.2. Prerequisite: EE231

Introduction to Instrumentation & Measurement Analysis - DC Multimeters: Voltage and Current Measurements - DC Multimeters: Resistance Measurements and Loading Effect - Introduction to AC Multimeters - Dynamometer type instruments - Induction type Instruments – Power and Energy Meters - Measuring of Active and Reactive Power - Measuring of Power Factor - DC Bridges - AC Bridges - Process Instrumentation: Pressure Sensors - Flow Sensors - Temperature Sensors - Level Sensors - Gyroscope. Displacement, Velocity and Acceleration Sensors - Discrete Sensors - Encoders - Introduction to signal processing - Op-amp theory and circuits - Op-amp circuit applications 2 - D/A converters - A/D converters - Data Acquisitions Cards and Systems - Electric-to-pneumatic and pneumatic-to-electric transmitters - Actuators 1 (Electrical & Solenoids) - Actuators 2 (Valves) - Advanced Sensors (Hall-effect transducers,…) - Analog and Digital Signal Connection - Case Study on Idustrial Measuremet System.

EG341 – Electric Machines
Cr.2. Prerequisite: EE232

Concept of enegy converion in electric machines - DC Generator (construction, theory of operation and equivalaent circuirs) - DC Generator power flow diagrms, external charcteristics and applications - DC motor theory of operation, different connections types and equivalent circuits - DC motors power flow diagrams, charcteristics and applicatoions - DC motor armature reaction, commutation problems and compensating methodes - DC motor starting and speed control techniques - Simulation of DC machines and case study (Electric vehicles) - Single phase transformer constructionm theory of operation and application examples - Single phase transformer equivalent circuit and power flow diagram - Single phase transformer parameter testing and performance analysis - Three phase transformer costructuion and theory of operation - Three phase transformer grouping connection and parallel operation - Special connection of transformers (open delata, scot connection , etc) - Appications and case studies (auto transform and tap changer). Three-phase winding configurations and revolving field theory - Construction of 3ph induction motor, theory of operation and fields of applications - Induction motor equivalent circuit, parameters testing and torque calculations - Power flow diagram and efficiency calculations - Induction motor characteristics, statring, reversing and speed control - Application case studies (Electric Lifts and Water pumping station) - Synchronous generator construction and theory of operation - Synchronous generator equivalent circuit, parameters testing and EMF calculations - Methods of voltage regulation in synchronous generators - Synchronization, parallel operation and load sharing of SGs - SGs drooping characteristics and conecting to infint grid - Synchronous motor theory of operation and starting methods - V- curves and synchronous condencer - Synchronus machines power circle diagram - Application case studies (SM for steel industries and electric propulsion).

EE323 – Power Electronics I
Cr.3. Prerequisite: EC213

Introduction to Power Electronics - Power Diodes types and characteristics - Single phase half wave uncontrolled rectifiers - Single phase full wave uncontrolled rectifiers - Three phase uncontrolled rectifiers - Application examples and filtering systems in rectifier circuits - Thyristor characteristics and Gate Drive Circuits - Line commutated single phase half wave controlled rectifiers - Line commutated single phase full wave controlled rectifier - Line commutated three phase controlled rectifier - Dual Converter and application examples - Recommended Case Studies: Battery Charger, HVDC - AC switches and single phase AC Voltage controllers principles - Three phase half wave AC voltage controllers - Cyclo-converters principle and application examples.

EE423 – Power Electronics II
Cr.3. Prerequisite: EE323

The Power Transistor types and charactersistics - Principles of DC/DC converters and classification - The buck and boost regulators - The Buck-Boost and the Cuk regulators - Discontinuous Current Mode (DCM) operation of DC/DC converters - Design and application examples of DC/DC converters - Principles and performance of Single Phase Inverters - Three phase inverters - Voltage and frequncy control techniques - Pulse Width Modulation (PWM) techniques for inverters - Harmonic reduction

techniques - Other kinds of inverters such as current source inverter (CSI) - Application Case study 1: Uninterupptible Power Supply (UPS) - Application Case study 2: Stand-alone PV system - Application Case study 3: Electric vehicle.

EE231 – Electrical Circuits I
Cr.2. Prerequisite: BA113 & BA124

Introduction to Basic Circuit: Resistance, Voltage, Current - Ohm's Law - 1st & 2nd Kirchhoff's laws, Dependent Sources - Series Parallel Circuits - Nodal analysis - Mesh analysis - Source Transformation – Superposition - Thevenin Equivalent Circuit - Norton Equivalent Circuit, Maximum Power Transfer - Alternating current fundamentals and AC generation - Root Mean Square and Average Value Calculations - Relation between current and voltage in resistors, inductors and capacitors - Introduction of Magnetic Circuits - Analysis of Magnetic Circuits.

EE232 – Electrical Circuits II
Cr.3. Prerequisite: EE231

Sinusoidal response of series RLC circuits - Sinusoidal Steady State Analysis for Series and Parallel Circuits , Resonance - Star delta transformation - Source Transformation for AC circuits - Thevenin and Norton Equivalent Circuit for AC circuits - Node Voltage Analysis, Mesh Current Analysis for AC circuits - Complex Power Calculations - Maximum Power Transfer - Three Phase Systems and Balanced Y-Y Circuit - Y- Δ, Δ -Y, Δ - Δ Three Phase systems - Power Calculation in three Phase System - Unbalanced Three Phase Circuits - The natural response of RL and RC Circuits - Step response of RL and RC Circuits - General Solution for RL and RC Circuits.

EE233 – Magnetic and Electrical Fields
Cr.3. Prerequisite: BA223 & EE231

Vector Analysis and coordinate systems - Review on Electric field and Coulomb's law and Applications - Electric flux density & Gauss's law and Divergence theorem - Energy, Potential, Potential Difference and Potential gradient and capacitance - Laplace's & Poisson's equations and boundary condition (electric) - Review on Magnetic field and Gauss law of Magnetic field vs Electric field - Biot-Savart Law vs. Ampere's law - Curl's theory, Magnetic flux density & Magnetic potential vector & Stoke's theorem - Maxwell's Equations & Boundary conditions (magnetic) - Force between two parallel conductors and torque on a loop and magnetic moment - Solenoid and the definition of inductor and its inductance - Application for thin and thick co-axial cables and parallel wire transmission line - Energy and Co-energy in magnetic devices and Magnetic circuits - Electromechanical energy conversion (Translational motion) in linear and nonlinear regions.

EG331 – Power Systems Analysis I
Cr.3. Prerequisite: EE232

Single line diagram of power system - The per unit system - Bus admittance matrix - Bus impedance matrix - Power flow equations - Gauss-Seidel power flow solution - Newton Raphson power flow solution - Synchronous generator for power control - Tap changing transformers - Introduction to economic dispatch problem - Economic dispatch neglecting losses and no generator limits - Economic dispatch neglecting losses and including generator limits - Economic dispatch including losses.

EG212 - Electrical Materials Science
CR:2. Prerequisite: BA114

Classification of Engineering Materials – General Introduction-Atomic Bonding in Solids-The Crystalline Structure of Materials-Thermal Equilibrium Diagrams-Properties, Testing, & Inspection of Engineering Materials-Semi Conductors Material Structure-Theory of superconductivity- 7th exam-Dielectrics Macroscopic & Microscopic approaches-Types of polarization –frequency response – complex permittivity-Conduction and Breakdown in Gas Dielectrics -Conduction and Breakdown in liquid Dielectrics-Conduction and Breakdown in Solid Dielectrics-Photovoltaic and the role of materials-Magnetic properties-Insulating materials

EG418 – Energy Storage and E-mobility
Cr.3. Prerequisite: EG341

The aim of this course is to learn more about latest batteries technologies and the importance of energy storage and how to solve this problem

EG211 – Renewable Resources & Energy Conversion
Cr.3. Prerequisite: EE231

Conventional methods of energy conversion: Introduction to energy conversion, different types of renewable energy from solar energy, wind energy, hydro energy, bio mass, and geothermal. Also the renewable transportation, and the technologies of batteries and energy storage .

EC213– Electronics Fundamentals
Cr.2. Prerequisite: EE231

Semiconductors - p-n junction - diode current components - junction capacitance - junction diode as a circuit element - special p-n junctions - bipolar junction transistor and field effect transistor: structure- operation – I-V characteristics - large and small analysis.

EE418 – Automatic Control Systems
Cr.3. Prerequisite: BA223

Introduction to open loop and closed loop control systems– Control system classification– Block diagram– System transfer function and signal flow graph– Standard input signal– Time domain specifications– Modeling of some physical systems– Time response of first and second order systems– Importance of feedback, sensitivity to parameter variations– System stability and effect of disturbance– Error analysis and error constants– Root locus techniques– Frequency domain analysis (Nyquist- Bode) Analog controllers– Controller tuning.

EG332 – Power Systems Analysis II
Cr.3. Prerequisite: EG331

Transient in R-L series circuits - Internal voltage of laoaded machines under fault conditions - Fault calculation using Z bus - The selection of circuit breakers - The symmetrical components of unsymmetrical phasors - Power in terms of symmetrical components - Sequence circuit of ΔY impedance synchronous - machine and 3 phase transformers - Unsymmetrical faults on power system single line to ground faults - Line to line faults and double line to ground faults - Power system stability - Further consideration of the swing equation - The power angle equation - Equal area criterions of stability - Further applications of equal-area criterion - Numerical solution of swing equation.

EE442 – Power Systems Protection
Cr.3. Prerequisite: EG332

General principles of protection– Types of relays and construction of over current relays– Instrument transformers – Fuses and Circuit breakers – Over-current relay settings – Directional relays– Protection

of lines and distance protection Differential protection– Protection of transformers– Protection of motors– Protection of generators.

EG433 – Economics of Energy Generation
Cr.3. Prerequisite: EG211

Load curves, Variation in demand, Load diversity. Power plant layout, Main equipment, Auxiliaries, Bus ‹bar arrangements. Power plant economics: Capital cost, Operating cost, Fixed charge rate, Selection of plant and size and unit size, Operation and economics of spinning reserve, economic analysis of a transmission system, tariffs, power factor, all ‹thermal generation allocation problem, hydro ‹thermal coordination, new energy resources. Transmission access fees assessment and calculations.

EG342 – Advanced Electrical Machines for Renewable Energy Applications
Cr.2. Prerequisite: EG341

Synchronous generator construction - EMF & Equivalent circuit Power equation and efficiency calculation for the synchronous generators - Load angle definition and operation stability limits - Voltage regulation in synchronous generators - Synchronization, parallel operation and load sharing of synchronous generators - Automatic voltage regulation and excitation techniques - Synchronous Motor V-curves - Starting methods of the synchronous motors - Saliency effect in synchronous machines -Synchronous reluctance motor - Permanent magnet synchronous generator construction, theory of operation, equivalent circuit and governing equations Permanent magnet synchronous generators applications - Field testing of electrical machines

EG351 – Micro Pro Based Control & Smart Meters.
Cr.3. Prerequisite: CC221

Introduction to Microcontrollers and Architectures with a review of various types available in the market - C-language programming overview - Microcontroller basic structure - Microcontroller basic programming principles (Basic IO design) - Timers and Counters, PWM - Analog interfacing of Microcontrollers - Serial interfacing standards using RS-232 principles of the PC - Serial Interfacing of the Microcontroller - Serial Interfacing of the Microcontroller - Applications - Embedded system Applications

3.4 Specific Specialization Requirements

EG501 + EG502 – Project (1) + Project (2)
Cr.3+Cr.6.
Prerequisite of EG 501: Completion of 111 Credit Hours, EG 400, and a GPA of at least 2.00.
Prerequisite of EG 502: EG 501 & EG 500.

The final year project extends over two semesters – Topics will depend on student's and supervisor's interest – They include data acquisition and interpretation – Computer models and simulation or design and experimentation – Students are required to give a seminar to discuss the project results and submit a final report.

EG415 – Solar Thermal Energy
Cr.3. Prerequisite: ME439

Study of solar thermal energy, its intensity in outer space and the calculation of the solar intensity on earth with different models. Availability and usability of solar energy. Study of solar angles, Shades and the equation of time. Theory of the flat plate collector, transmission through glass, heat loss calculations and definitions of all parameters involved in collector performance.

EG413 – Photo-voltaic Energy Systems 1
Cr.3. Prerequisite: EC213

Introduction - Photo-voltaic (PV) cells description, equivalent circuit and characteristics equation - PV panel structure, parameters and variables determination - PV panel efficiency and voltage regulation calculations - Array design and energy conversion (Field study) - PV grid connection - PV power electronics (Interface Topology) - PV maximum power tracking (Mechanical & sensor-less) .

EG414 – Photo-voltaic Energy Systems 2
Cr.3. Prerequisite: EG413

The main objective of this course is to move from the basics of PV to the advanced level, knowing the difference between different types of systems and when to use each of them.
Difference between on grid and off grid systems and also the hybrid system and how to implement a real system with the accurate sizing of each component.

EG416 – Wind Energy (1)
CR: 3. Prerequisite: EG211 & ME439

The course covers the fundamentals of wind energy from mechanical engineering point of view. This includes an introduction to wind energy, types of wind turbines, fundamentals of wind turbines aerodynamic and wind turbines design standards.

EG417– Wind Energy (2)
Cr.3. Prerequisite: EG416

Energy in the Wind Stream (Basic calculations- Wind turbines power characteristics) - Squirrel-Cage Induction Generators- Wound-Rotor Induction Generators- Doubly-Fed Induction Generators- Permanent-Magnet Synchronous Generators- Wind Power in Power Systems: Current Status of Wind Power in Power Systems- Characteristics of Wind Power Generation- Generators and Power Electronics for Wind Turbines: Overview of wind turbine topologies- Overview of power control concepts- State-of-the-art power electronics (Soft-starter- Capacitor bank- Rectifiers and inverters- Frequency converters)

EG443 – Applications of Power Electronics and Drives in Renewable Energy
Cr.3. Prerequisite: EG342

Elements of Electric Drive System - Two- and Four-Quadrant Converter Drives - Single phase converter DC motor drives - Semi/Full- converter DC drives - DC chopper drives for DC motors -

Breaking of DC motors - Closed-Loop Control of Converter based DC Drives - Closed-Loop Control of chopper based DC Drives (Micrprocessor Control) - Applications Case Study: CNC Motor Drive - Induction Motor Stator Voltage Control and Rotor Voltage Control - Induction Motor Frequency Control and V/F Control - Induction Motor Current Control technique and application examples - Closed-Loop Control of Induction Motors - Closed-Loop Control of Synchronous Motors and application examples - Application case study: (Design of Speed Controller for PMSM Electric Vehicle drive).

EG525: Bioenergy Systems
CR: 3. Prerequisite: EG211

Overview of bioenergy systems from resource, conversion technologies to final product. Bioenergy conversion technologies and systems for heat, power, and bio-fuels. Cogeneration and poly generation. Innovative cycles (such as biomass integrated gasification combined cycles, biomass air turbines, humid air turbines etc) for biomass resources. Evaluation of the bioenergy system performance. Economic and environmental assessments of bioenergy systems.

EG 524 – Green building
CR: 2. Prerequisite: EG471

Introduction to the green building movement, the scope of green building, Energy conservation and efficiency, Renewable energy, Building durability, Water efficiency

EG526– Selected Topics in Renewable Energy
CR: 2. Prerequisite: EG211

Specialized topics in renewable energy systems will be selected and presented

EG552 – Control Applications of Energy Systems
Cr.3. Prerequisite: EE418

Control problems in energy system – Excitation control problem : definition and control configuration of classical and modern systems– Transfer function model excitation system Excitation system compensation (power system stabilizer) Effect excitation system on generator steady – state stability limit and dynamic stabilization– Generation control problem: definition and element modelling– Power factor-control of isolated system using PID controller– Power factor-control of two area system – SCADA for electric grid monitoring – SCADA for electric grid control.

EG522 – Grid Integration of Renewable Energy Resources
Cr.3. Prerequisite: EG331

Concept of Distributed Generation, Interconnection standards, Type of interface, static synchronous generators, Power quality issues, control of active power and voltage regulation, current control mode

vs. voltage control mode, Wind power interface: direct connection, back-to-back converters, matrix converters, Fuel cell and photo voltaic interface topologies.

EG573 – Energy Efficiency

Cr.2. Prerequisite: EG211

Energy efficiency and electricity :(Energy saving regulations- Active and passive energy efficiency-energy monitoring and information systems) - Diagnosis through electrical measurement: (Electrical measurements- Voltage and current -Collecting relevant electrical data for specific objectives) - Energy saving opportunities (Motor-related savings opportunities- Lighting- Power factor correction)- Distributed Generation Issues.

EG534 – Electrical and RE based Installations

Cr.3. Prerequisite: EE442

Illumination; properties of light, quantities and units, inverse sq. Law and cosine law– Types of lamps and their characteristics– Road lighting– Elec. Heating and welding methods– Dielectric heating, induction heating, arc induction & resistance furnaces– Direct Energy Conversion – Traction, lifts– UPS Standby power systems– Batteries– fuel cells– solar cells– Elec. safety engineering.

EG521- Smart Grids

Cr.3. Prerequisite: EG332

Loads and Generation– Distribution Systems– Transmission Lines– Basic Principles of Feedback Systems – Linear and Non-Linear Programming – Energy Pricing Theory– Demand Side Management and Response – Pricing and Energy Consumption Scheduling – Advanced Metering Infrastructures – Electric Vehicles and Vehicle-to-Grid Systems– Frequency Control– Voltage Control– Reactive Power Control Microgrid Architecture – Distributed Storage and Reserves

EG561 – Introduction to Nuclear Engineering

Cr.3. Prerequisite: ME439

Introduction to nuclear engineering – Types of nuclear power reactors(part1) - Types of nuclear power reactors(part2) – Nuclear Energy Planning(part1) - Nuclear Energy Planning(part2) – Nuclear safety(part1) - Nuclear safety(part2) – Reactors dynamics(part1) - Reactors dynamics(part2) – Legal and regulatory framework(part1) - Legal and regulatory framework(part2) – Economics and environmental aspects.

EG535 – Electrical Distribution For Renewable Energy Systems

Cr.3. Prerequisite: EG332

Introduction to electrical distribution system and Distribution system elements - Electrical load characteristics - Voltage Regulation, profile and Voltage Drop Calculations - Branching Circuit Design - Power factor correction - Methods of improving power factor - Locating and sizing kVARs - Distribution transformers Distributors Operation and control of distribution system - Power quality in distribution system – SCADA centers.

EG553 – Industrial Automation Systems

Cr.3. Prerequisite: EE418

Introduction to Automation - Building Blocks and Components of Automated systems - Motor Control Center (MCC) Relay Logic - Programmable Logic Controller (PLC) Hardware - PLC Programming

language - Programming with Logic Functions - Timers operation - Counters operation - Advanced Programming Techniques - Control Application Examples - Industrial Applications Examples - Practical Case Studies - Application Project - Advanced PLC and Automated Systems - Trouble Shooting using PLC - Data Interchange and serial communications - Communication networks protocol and topology - Industrial protocol - Human Machine interface (HMI) and SCADA - Case study and applications.

EG537 – Advanced Power System Protection for Renewable Energy Systems
Cr.3. Prerequisite: EE442

Static/ digital versus electromechanical relays– Relaying practices– Components, detectors and applications– Hardware of digital relay– Mathematical background for digital protection– Digital O.C. relay– Digital distance relay– Digital protection of rotating machines– Digital protection of transformers– Digital bus bar protection– Integration of protection and control in substations– Traveling wave based protection– Recent topics in digital protection, SCADA and substation automation - Protection schemes of renewable energy stations.

ME465- Computational fluid dynamics (CFD)
CR: 3. Prerequisite: ME431

Introduction – The finite difference method (FDM) – Solution of fluid flow problems using FDM with MATLAB – The finite element method (FEM) - Solution of fluid flow problems using FEM with MATLAB (PDE Tool) – The finite volume method (FVM) - Solution of fluid flow problems using FVM with MATLAB – Thermo-fluid problems using the FVM with FLUENT software.

ME455 - Computer Aided Design
CR: 3. Prerequisite: ME422

Introduction to computer aided drafting and analysis – 2D and 3D Drafting (parametric solid modeling) –Introduction to the software "Solid Edge" – 2D and 3D parametric modeling – Introduction to finite element analysis – The finite element software "FEMAP" – Application to different machine element problems – Simulation of dynamic systems – MATLAB analysis and graphics – Application to different Mechanical, Hydraulic and Thermal systems (MATLAB 'Simulink') – Introduction to optimization – System and element optimum design problems.

ME464- Hydraulic and pneumatic systems
CR: 3. Prerequisite: ME439

Introduction to Fluid Power System - Hydraulic Fluids and Transmission Lines -Hydraulic Pumps - Fluid Power Actuators (Cylinders, Rotary Actuators, Motors) - Control Components of Hydraulic Systems - Accumulators and Pressure Intensifiers - Hydraulic Circuit Design and Analysis

EG562 – Nuclear Fuel Cycle
CR: 2. Prerequisite: EG561

This course will introduce different elements relating to nuclear fuel cycle, fuel storage and radioactive waste and spent fuel management.

EG523 – Sea Water Desalination
CR: 3. Prerequisite: ME422

Introduction on the water resources and the need for water desalination, Treatment of water plants, An overview of desalination techniques, Single effect evaporation with vapor compression techniques,

Forward feed and parallel feed multiple effect evaporation, Economic analysis of desalination processes.

EG572 Energy System Laws and regulations

Cr.2. Prerequisite: none.

This course aims to acquaint students with an understanding of the relationship between the law and the energy sector. The course designed to provide students with insight into the policies, players, and stakes involved in this highly complex area. The merging interests in this area of law touch upon social, political and environmental issues. Students will focus on energy regulation and public utility concepts, competition theory, resource efficiency efforts, social responsibility and environmental issues, integrated infrastructure planning, and public and private partnerships.