



T.C
ALANYA ALAADDIN KEYKUBAT UNIVERSITY
RAFET KAYIS FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL-ELECTRONICS ENGINEERING
COURSE CONTENTS

First Semester

**ELK 101E Introduction to Electrical and Electronics Engineering (2-0-0) Local Credits: 2,0
ECTS: 2**

Introduction to Electrical and Electronics Engineering, basic electrical concepts, circuit elements and analysis methods of simple circuits formed with them, analysis of basic electronic circuit elements and basic circuits, designing and printing PCB.

**BIL 101E Introduction to Computer and Information Systems (1-1-0) Local Credits: 1,5
ECTS: 2**

Computers, the usage of the computers in daily life, computer hardware and software, Operating systems, Input/Output and Storage, Web and the Internet, wired and wireless communication, Application softwares such as text editors, visualizations, spreadsheets, and databases, Error in computation, Introduction to scientific problem solving through algorithms.

MAT 101E Mathematics I (3-2-0) Local Credits: 4,0 ECTS: 5

Functions of a Single Variable, Limits and Continuity, Derivatives, Applications of Derivatives, Sketching Graphs of Functions, Asymptotes, Integration, Fundamental Theorem of Calculus, Applications of Integrals, Polar Coordinates, Transcendental Functions, Techniques of Integration, Indeterminate Forms, L'Hopital's Rule.

FIZ 101E Physics I (3-0-0) Local Credits: 3,0 ECTS: 4

Vectors. Motion in one and two dimensions. Newton's laws and its applications. Work and energy. Conservation of mechanical energy. Momentum and motion of systems. Static equilibrium of rigid bodies. Rotation and angular momentum. Newton's law universal gravitation.

FIZ 101EL Physics I Lab. (0-0-2) Local Credits: 1,0 ECTS: 1

Basic measurement. Motion with constant acceleration. Conservation of linear momentum. The equilibrium experiment. The friction experiment. Rotational dynamics. Simple harmonic motion. Projectile motion. Elastic and inelastic collisions. Moment of inertia. Centripetal acceleration. Physical pendulum.

KIM 101E Chemistry (3-0-0) Local Credits: 3,0 ECTS: 4

The scope of chemistry and stoichiometry, atoms and the atomic theories, the periodic table and some atomic properties, chemical bonding, molecular geometry, gases and gas laws, liquids, solids, solutions and their physical properties, thermochemistry, principles of chemical equilibrium, acids and bases, thermodynamic.

KIM 101EL Chemistry Lab. (0-0-2) Local Credits: 1,0 ECTS: 1

It covers basic chemical concepts given in Chemistry. In this course, Chemistry students are exposed to the traditional emphasis on chemical compounds, solutions, stoichiometry, separation techniques, hardness of water, synthesis of soap and electrolytes. Individual experiment times range from 30 mins to 2 hrs.

RES 103E Technical Drawing (2-2-0) Local Credits: 3,0 ECTS: 5

Terminology of technical drawing, types of technical drawings, drawing tools, standard line types and thicknesses, basic geometric drawings, types of perspective projections, principal views and auxiliary views, dimensioning elements and rules, types of section views (full section, half section, broken-out section, offset section, rotated section and auxiliary sections), freehand sketching techniques, introduction to computer aided design, technical drawings of electrical-electronics circuit components and circuits, introduction to drawing of electrical installation projects

TDB 101 Türk Dili I (2-0-0) Local Credits: 2,0 ECTS: 2

Definition of Language, Language and Thought, Language and Culture, World Languages (In Point of Origin and Structure), The Significance of Turkish Language among World Languages, The Historical Development of Turkish Language, The Structure of Turkish Language, Turkish Phonetics, Today's Turkish Language, The Act of Writing and the Rules of Writing (Orthography), Spelling Rules, The Right Expression of Thought, Scientific Language and Turkish as a Scientific Language, Turkish Poetry and Poetry Language.

YDE 170E Academic Language Skills (3-0-0) Local Credits: 3,0 ECTS: 4

Learning the terminology of Electrical-Electronics Engineering, reading and understanding the research articles, learning how to write a project report.

Second Semester

MAT 102E Mathematics II (3-2-0) Local Credits: 4,0 ECTS: 5

Improper Integrals, Infinite sequences and series, Vectors in Space, Vector-Valued Functions, Multivariable Functions and Partial Derivatives, Multiple Integrals, Integration on vector fields.

Prerequisite: MAT 101E Mathematics I

FIZ 102E Physics II (3-0-0) Local Credits: 3,0 ECTS: 4

Coulomb laws and electrical field. Gauss law. Electrical potential. Capacitance. Electrostatic energy and properties of insulators. Current and resistance. DC circuits. The magnetic field. Sources of magnetic field. Faradays law. Inductance. Magnetic field in the matter. Electro Magnetic oscillations and AC circuits. Maxwells equations and electromagnetic waves.

FIZ 102EL Physics II Lab. (0-0-2) Local Credits: 1,0 ECTS: 1

Fundamental measurements and Ohm's law. Oscilloscope and signal generator. Electric field and lines. Kirchoff's law and Wheatstone bridge. Transient currents. Charging and discharging of capacitors. RC circuits. Determination of electron e/m ratio. Transformers.

BIL 106E Introduction to Programming C (2-0-2) Local Credits: 3,0 ECTS: 5

C Programming; constants, variables, expressions, statements; selective structures; repetitive structures and arrays; functions and recursive programming; pointers.

MAT 108E Linear Algebra (3-0-0) Local Credits: 3,0 ECTS: 4

Matrices and System of Equations, Systems of Linear Equations, Row Echelon Form, Matrix Algebra, Elementary Matrices, Determinants, Vector Spaces, Subspaces, Linear Independence, Basis and Dimension, Change of Basis, Row Space and Column Space, Orthogonality, Orthogonal Subspaces, Orthonormal Sets, The Gram-Schmidt Orthogonalization Process, Eigenvalues and Eigen vectors, Diagonalization.

ELK 102E Fundamentals of Electrical and Electronics Engineering (3-0-0) Local Credits: 3,0 ECTS: 5

Kirchhoff voltage and current law, Thevenin and Norton theorems, Maximum Power Theorem, Three phase systems, RC, RL, RLC circuits, resonant circuits.

TDB 102 Türk Dili II (2-0-0) Local Credits: 2,0 ECTS: 2

Written Expression, Method and Planning of Written Expression, Writing Exercise, Scientific Texts (Article-Report-Critic), Official Texts (Petition-Resume), Genres of Literature, Essay, Column, Travel Writing, Biography, Story, Novel, Verbal Literature, Verbal Expression and Communication.

2nd Semester Elective English Course (3-0-0) Local Credits: 3,0 ECTS: 4

2nd Semester Elective English Courses (ITB)

YDE 229 Effective Communication Skills (3-0-0) Local Credits: 3,0 ECTS: 4

This course aims to further students' oral communication skills in English that they have acquired in the previous courses.

YDE 123E Listening and Speaking (3-0-0) Local Credits: 3,0 ECTS: 4

Analyzing and interpreting original listening materials and speech phrases taken from different contexts; advanced listening skills; basic listening and speaking skills such as vowels, silent letters, word stress and intonation; pronunciation development.

YDE 227 Language Acquisition (3-0-0) Local Credits: 3,0 ECTS: 4

This course is a general introduction to scientific research geared to how children acquire their first language (L1) and how both children and adults acquire a second/foreign language (L2). Students are familiarized with the main methods, theories, and substantive findings in the fields of first language acquisition and second language acquisition (SLA).

Third Semester

ELK 201E Circuit Analysis I (4-0-0) Local Credits: 4,0 ECTS: 7

Lumped circuits: Kirchoff's laws, basic lumped elements, circuit graphs, circuit equations, linear and nonlinear resistive circuits, first and second order dynamic circuits. Introduction to operational amplifier circuits.

Prerequisite: ELK 102E Fundamentals of Electrical and Electronics Engineering

ELK 201EL Circuit Analysis I Lab. (0-0-2) Local Credits: 1,0 ECTS: 2

Application of Kirchhoff current and voltage laws, Thevenin and Norton equivalent circuits, Transient analysis. Operational amplifier applications.

Prerequisite: ELK 102E Fundamentals of Electrical and Electronics Engineering

MAT 202E Differential Equations (4-0-0) Local Credits: 4,0 ECTS: 5

First order equations and various applications. Higher order linear differential equations. Power series solutions: The Laplace transform: solution of initial value problems. Systems of linear differential equations: Introduction Partial Differential Equations.

Prerequisite: MAT 102E Mathematics II

ELK 203E Digital Logic Design (3-0-0) Local Credits: 3,0 ECTS: 4

Initial course in Boolean algebra, binary numbers, combinational logic design, synchronous sequential circuit analysis and synthesis.

ELK 203EL Digital Logic Design Lab. (0-0-2) Local Credits: 1,0 ECTS: 2

Number Systems-Codes, Boolean Algebra and Logic Doors, Logical Functions and Simplification Techniques, Combinational Logic Circuits, Arithmetic Operations-Circuits, Multifunctional Circuits, Code Converters-Encoders, MUX and DEMUX Circuits, FlipFlops / Data Loggers, Synchronous Counter Circuits, Asynchronous Counter Circuits, Special Counter Circuits, Counter Circuits Applications.

MAT 203E Probability and Statistics (3-0-0) Local Credits: 3,0 ECTS: 4

Product rule, permutation, combination, concept of Probability (Kolmogorov axioms), conditional probability and independency, random variables, Probability density function, distribution function, discrete distributions: Bernoulli, Binomial, Poisson, continuous distributions: Normal, Gamma, Exponential, Expectation, Moment generating function, mean, variance, standart deviation, covariance, correlation, Chebchev's inequality, Estimator and its properties, maximum likelihood estimators, Confidence intervals, Hypothesis testing, One and two sample test for means, Regression.

ATA101 Atatürk İlkeleri ve İnkilap Tarihi I (2-0-0) Local Credits: 2,0 ECTS: 2

A definition of Revolution/Renovation. The aim and the importance of the Turkish history of renovation. General state of the Ottoman Empire, the reason for the decline. Efforts to save the Ottoman Empire. The current ideals. The First World War. Societies. Mustafa Kemal in Anatolia and the Congresses. The opening of the Great Turkish National Assembly. Reactions to the National Government. National and International policy. The Mudanya treaty. Lousanne conference.

3rd Semester Elective (ITB)-SGS (2-0-0) Local Credits: 2,0 ECTS: 2

3rd Semester Elective (ITB)-SGS (2-0-0) Local Credits: 2,0 ECTS: 2

3rd Semester Elective Courses (ITB)-SGS

SGS 101E History of Art (2-0-0) Local Credits: 2,0 ECTS: 2

Basic concepts used in the field of Art History, Central Asian Turkish Art, the birth and development of Turkish Islamic Art will be given.

SGS 103E History and Philosophy of Science (2-0-0) Local Credits: 2,0 ECTS: 2

Historical development of science, approaches to science philosophy.

SGS 105E Disaster Awareness (2-0-0) Local Credits: 2,0 ECTS: 2

General information about disaster awareness, earthquake, flood, drought, landslide hazard and risk management.

SGS 109E Basic First Aid and EMAKEmergency (2-0-0) Local Credits: 2,0 ECTS: 2

General first aid information, Patient-wounded and crime scene evidence and symptoms used in evaluating teaching, Basic life support, Bleeding first aid, Burns, freezing and heat prostration in the first aid, Consciousness disorders aid, Injuries first aid, In an animal bite first aid. Ear and nose foreign bodies in many first aid, Drowning first aid, Fracture, dislocation and sprain first aid, Poisonings, Patient/injured carrying techniques, Organization of emergency care services.

SGS 125E Folk Dance (2-0-0) Local Credits: 2,0 ECTS: 2

Local, national and international folk dance cultures and their basic dance steps are handled.

SGS 131E Theatre and Cinema (2-0-0) Local Credits: 2,0 ECTS: 2

Practical exercises that encourage and develop collaborative work on stage. Discussions over these workshops and plays watched during the week. Short design tasks and working on these pieces.

SGS 133E Healthy Living (2-0-0) Local Credits: 2,0 ECTS: 2

Students who successfully complete this course; Knows the dynamics necessary for a healthy life., Adopts the concept that a healthy life is one of the fundamental rights and freedoms of every citizen, Knows what are the duties of individuals and society to create and protect healthy life.

SGS 135E Nutrition (2-0-0) Local Credits: 2,0 ECTS: 2

General principles of human nutrition, Food chemistry; Nutritional value of foods; Balanced diet; Possible alternative solutions to nutritional problems, Food technologies, Cooking technologies, Nutrients in collective nutrition organizations, Hygiene and environmental health, Dry nutrition health. Types of nutrients which are essential in nutrition; Physical and chemical properties of nutrients; Common feeding problems and solutions; Nutrition in diseases. Distinction of food according to

nutritional value.

SGS 137E Media Literacy (2-0-0) Local Credits: 2,0 ECTS: 2

Media Literacy course in Turkey has entered into all over the world as well as elective courses in the curriculum. In this context, the importance of this course to the students of our university, to explain the method, methodology, and to provide information about Media Writing constitutes the content of the course.

SGS 141E Industrial Design (2-0-0) Local Credits: 2,0 ECTS: 2

The students who succeeded in this course; Student will be able to apply basic design methods and creativity techniques to given design problems. Student will be able to identify, find and interpret information that is relevant to the given design problems. Student will be able to develop skills in physical model making and CAD modelling and manual rendering techniques in the resolution of design problems. Student will be able to experience design problems introducing to problems of the context of a product, and its utility, usability, visual appearance, and manufacturability. Student will be able to use techniques and gain experience in sharing ideas and working in groups.

SGS 167E Japonca I (2-0-0) Local Credits: 2,0 ECTS: 2

Reading and writing of the text books which include the structures and expressions that have to be learned at the lower intermediate level, and meaning of Kanji characters.

SGS 169E Japonca II (2-0-0) Local Credits: 2,0 ECTS: 2

Japanese history, culture and civilization.

Fourth Semester

ELK 202E Circuit Analysis II (4-0-0) Local Credits: 4,0 ECTS: 7

Definition of the phasor, Application on RLC circuits, Reactive and complex power and maximum power transfer, Three phase circuits, Laplace transform and applications in circuit solution, Filters, Two gate circuits, Frequency response.

Prerequisite: ELK 201E Circuit Analysis I

ELK 202EL Circuit Analysis II Lab. (0-0-2) Local Credits: 1,0 ECTS: 2

Sinusoidal source and phasor applications, Thevenin-Norton Equivalent applications, Three phase circuit applications, Frequency Response Curves, Bode Drawing applications.

Prerequisite: ELK 201E Circuit Analysis I

MAL 102E Materials Science (3-0-0) Local Credits: 3,0 ECTS: 4

Introduction to materials science and classification of atomic structures of the materials. Crystal structures and imperfections. Mechanical and physical properties of the engineering materials. Solid-state diffusion. Phase diagrams and solidification. Ferrous / non-ferrous alloys and heat treatment. Electrical, optical, thermal and magnetic properties associated with electron band structures of the materials. Metallic corrosion and prevention from corrosion. Principle geomaterials, their properties and application areas. Deterioration of geomaterials.

Prerequisite: KIM 101E Chemistry

ELK 206E Electromagnetic Theory (4-0-0) Local Credits: 4,0 ECTS: 5

Vector Analysis, Coordinate Systems and Transformations, Electric Charge and Electric Field Concept, Electrical Flux and Gauss Law, Physical Meaning and Applications of Divergence, Industrial Applications of Static Electric Field, Electrical Potential and Energy, Current and Current Density, Conductors and Boundary Conditions, Dielectrics and Boundary Conditions, Capacitor and Applications, Solution Estimates of Laplace and Poisson Equations, Display Method.

Prerequisite: FIZ 102E Physics II

MAT 201E Numerical Methods (3-0-0) Local Credits: 3,0 ECTS: 4

Description of Numerical Methods and application of them particularly in engineering. Error analyses in numerical methods, analytical solutions, numerical methods for the solution of systems (linear and non-linear), approximation methods, interpolation, linear regression, numerical integration.

Prerequisite: MAT 102E Mathematics II

ATA 102 Atatürk İlkeleri ve İnkılap Tarihi II (2-0-0) Local Credits: 2,0 ECTS: 2

The declaration of the Republic, The importance of the leader and the staff in the revolution Constitutional solutions to the problems related to the Lausanne Conference, The participation of Turkey in pacts and in international organizations, Reactions to the new governmental structure, Trials in the multi party system, The Home and foreign policy of the Republic of Turkey, Atatürk's foreign policy to inspire confidence in the future of Turkey, Kemalism the Principles of Atatürk.

ETK 101E Engineering Ethics (2-0-0) Local Credits: 2,0 ECTS: 2

Ethics word origin, meaning and historical development. Ethical theories and types of ethic. Ethics, in terms of individual freedom and universal. Discussion of rights and freedom, crime and punishment and professional ethics. Ethical decision-making processes. Engineering concept and discussion of the principles of engineering ethics. Professional liability and assessment of occupational risks. Discussion of engineering ethics principles in practical applications.

4th Semester Elective Course (TB) (3-0-0) Local Credits: 3,0 ECTS: 4

4th Semester Technical Elective Courses (TB)

MAT 401E Theory of Complex Functions (3-0-0) Local Credits: 3,0 ECTS: 5

The axiomatic construction of the complex numbers, Complex powers and roots, The complex numbers and analytical geometry, The definition of a complex function, The basic complex functions, The geometry of the simple basic complex functions, Analytic functions, Complex power series and Taylor series, Linear fractional transformations, Fixed points and the cross-ratio, Classification of linear fractional transformations.

MAT 403E Fuzzy Mathematics (3-0-0) Local Credits: 3,0 ECTS: 5

This lesson covers; crisp sets. introduction to fuzzy logic, fuzzy sets, foundation of fuzzy logic. fuzzification, inference and defuzzification processes, fuzzy numbers, fuzzy rules. fuzzy control, fuzzy identification, fuzzy optimization, training of fuzzy systems and some practical applications.

MAT 405E Linear Algebra II (3-0-0) Local Credits: 3,0 ECTS: 5

Canonical forms, minimal polynomial. Dual spaces and adjoints. Inner product spaces. Orthonormal bases and Gram-Schmidt orthogonalization. Bilinear forms, quadratic forms and Sylvester's Law of Inertia. Symmetric, hermitian, orthogonal and unitary operators and their spectral theorems.

Fifth Semester

ELK 300E Internship I (0-0-0) Local Credits: 0,0 ECTS: 0

Internship covers field experience at any work place (public or private) for four weeks (twenty work days). Students should follow the instructions stated in ALKU Internship Guide in order to successfully complete their internships.

ELK 303E Analog Electronics (4-0-0) Local Credits: 4,0 ECTS: 5

Conduction. Semiconductors, carriers, p-type and -type doping, drift and diffusion mechanisms, physical structure and behavior of the pn junction. Ideal diode, practical diode, electrical behavior and current-voltage curve. Diode model. DC analysis methods for diode circuits (constant voltage drop model, fixed point iteration with the exponential model).

Small signal approximation, diode small signal equivalent and AC analysis of the diode circuits, DC power supply design (rectifiers, analysis of the topology with filter capacitor). Zener diode and regulation. Body resistance and parasitic capacitors. Other diode types. Physical structure and

behavior of the bipolar-junction transistor (BJT), the Early phenomenon, BJT operation regions, electrical model (Ebers-Moll) and characteristics. DC biasing and thermal stability of BJT circuits. Physical structure and behavior of MOSFET, operation regions, characteristics, important secondary effects (channel length modulation, body effect). DC biasing and thermal stability of MOSFET circuits. Switching applications of BJT and MOSFET, the conceptual usage in digital circuits.

Prerequisite: ELK 202E Circuit Analysis II

ELK 303EL Analog Electronics Lab. (0-0-2) Local Credits: 1,0 ECTS: 2

Transformer circuits (Theoretical and practical studies on the subject), Supply voltage arrangements (Theoretical and practical studies on the subject), Transistor amplifiers (Theoretical and practical studies on the subject), Nonlinear applications of the operational amplifier (Theoretical and practical studies on the subject)

Prerequisite: ELK 202E Circuit Analysis II

ELK 305E Electrical Machines I (4-0-0) Local Credits: 4,0 ECTS: 5

Construction of single and three phase transformers, equivalent circuits, operation at no-load and at load, phasor diagrams, short-circuit quantities, voltage regulation, parallel operation, connection group of three phase transformers, magnetization currents, transient phenomena, construction of single and three phase induction machines, introduction to single and three phase windings, winding coefficients, expression of induced e.m.f., rotating field, phasor diagrams, power flow diagrams, efficiency, torque-speed characteristics, starting, breaking, and speed control methods.

Prerequisite: ELK 202E Circuit Analysis II

ELK 305EL Electrical Machines I Lab. (0-0-2) Local Credits: 1,0 ECTS: 2

Determining equivalent circuit parameters of single phase transformer. Determining equivalent circuit parameters of three phase induction motors and speed control. Computer aided speed control of three-phase induction machines fed from a cycloconverter. Heating in a loaded, singlephase induction machine. Determining synchronous generator characteristics. starting of synchronous motors. Four-quadrant speed control of DC motors. Determining equivalent circuit parameters of a salient-pole synchronous machine.

Prerequisite: ELK 202E Circuit Analysis II

ELK 307E Electromagnetic Waves (4-0-0) Local Credits: 4,0 ECTS: 5

Maxwell's equations, Wave concept and time dependent wave equation, Time harmonic waves, Phasor (complex) representation, Helmholtz equation and its solutions. Monochromatic plane waves. Polarization. Reflection and refraction of plane waves from planar boundaries. Waveguides, Mode and cut-off frequency concepts.

Prerequisite: ELK 206E Electromagnetic Theory

ELK 309E Signals and Systems I (4-0-0) Local Credits: 4,0 ECTS: 6

Memory, causality, stability, invertibility, linearity and time-invariance Linear time-invariant systems: impulse response, convolution. Functions of a complex variable, complex series and integrals. Transform methods: Continuous time Fourier series and transform, discrete-time Fourier series and transform, Frequency response. Sampling theory. Laplace and z-transforms, system functions.

Prerequisite: MAT 202E Differential Equations

5th Semester Elective Course (TM) (3-0-0) Local Credits: 3,0 ECTS: 5

5th Semester Elective Courses (TM)

ISM 303E Operational Research (3-0-0) Local Credits: 3,0 ECTS: 5

History and development of operations research science, deterministic and probabilistic models, model building and problem solving art, the place of linear programming in mathematics programming, linear decision models, studies for the installation of linear decision models, solution of linear programming models, graphics, algebraic, simplex methods, revised simplex methods, computer software for the solution of linear programming models, duality and simple simplex method, sensitivity analysis, models of assignment models, network models.

ELK 311E Measurement & Instrumentation (3-0-0) Local Credits: 3,0 ECTS: 5

Static (accuracy, sensitivity, linearity etc.) and dynamic characteristics (effect, response time, etc.) of measurement systems. Error types and their analysis. Measurable values of electrical signals (Effective value, mean value, etc.). Analogue and digital measuring instruments: Operating principles, accuracy Power and energy measurement. Circuits in industrial instrumentation: Instrumentation amplifiers and related notions (CMRR, SMRR, offset, drift, noise). AC bridges: Measurement of inductance (L), capacitance (C), loss factor (D). Analogue/Digital and Digital/Analogue Converters.

ELK 313E Fundamentals of Super Conductivity (3-0-0) Local Credits: 3,0 ECTS: 5

Superconductivity and superconductor materials. Superconductor material characteristics. Elementary Phenomenological Theory and London model. GinzburgLandau Theory. Type I and Type II superconductors. Results from the microscopic theory. BCS (Bardeen-cooper-Schrieffer) theory. Josephson effects. High-Temperature superconducting Oxides. Superconductivity technology and related applications. Selected papers on special topics.

Sixth Semester

ELK 302E Automatic Control Systems (3-0-0) Local Credits: 3,0 ECTS: 4

Signals and Systems, Feedback, Modeling and transfer function of systems, Modeling of mechanical and electromechanical systems, Modeling of electrical systems, Modeling of Thermal systems, Time domain criteria, Stability analysis, Root-locus method, Controller structures and PID controller, Frequency domain analysis, Nyquist diagram and stability criterion.

Prerequisite: ELK 309E Signals and Systems I

ELK 304E Digital Electronics (4-0-0) Local Credits: 4,0 ECTS: 5

Understanding the basic concepts of multivibrators and flip-flops to understand their usage in Synchronous Sequential / Sequential Circuits. Describing counters and counter types and counter designs. Recipients and Recorder types to teach, To improve memory capacity by grouping / detailing the memory, to explain the programmable logic elements.

Prerequisite: ELK 203E Digital Logic Design

ELK 304EL Digital Electronics Lab. (0-0-2) Local Credits: 1,0 ECTS: 2

Examination of electronic components and circuits in experimental environment, reading of circuit diagrams and experimental implementation of logic circuits.

Prerequisite: ELK 203E Digital Logic Design

ELK 306E Electrical Machines II (4-0-0) Local Credits: 4,0 ECTS: 5

Working principles of rotating alternating current machines; Structure of asynchronous machines, equivalent circuit, equations and characteristics; Three-phase and single-phase asynchronous machine; Structure of synchronous machines, armature reaction, equivalent circuit, equations, characteristics, operating characteristics.

Prerequisite: ELK 305E Electrical Machines I

ELK 106EL Electrical Machines II Lab. (0-0-2) Local Credits: 1,0 ECTS: 2

It is a laboratory carried out in a laboratory where a total of ten separate experiments are carried out, one phase transformer, three phase synchronous and cascaded asynchronous motors, one phase asynchronous motors, synchronous motor and generators, DC motor and generator tests and warming test.

Prerequisite: ELK 305E Electrical Machines 1

6th Semester Elective Course-I (ITB) (3-0-0) Local Credits: 3,0 ECTS: 4

6th Semester Elective Course-II (ITB) (3-0-0) Local Credits: 3,0 ECTS: 4

6th Semester Elective Course-III (ITB) (3-0-0) Local Credits: 3,0 ECTS: 4

Seventh Semester

ELK 400E Internship II (0-0-0) Local Credits: 0,0 ECTS: 0

Internship covers field experience at any work place (public or private) for four weeks (twenty work days). Students should follow the instructions stated in ALKU Internship Guide in order to successfully complete their internships.

END 401E Occupational Health and Safety I (2-0-0) Local Credits: 2,0 ECTS: 2

The course is designed to assist the student with the implementation of safe and healthy practices at laboratories and university campus. This course enables students to learn safe work practices as well as how to identify and prevent or correct problems associated with safety and health in these locations.

7th Semester Elective Course-I (MT) (3-0-0) Local Credits: 3,0 ECTS: 5

7th Semester Elective Course-II (MT) (3-0-0) Local Credits: 3,0 ECTS: 5

7th Semester Elective Course-III (MT) (3-0-0) Local Credits: 3,0 ECTS: 5

7th Semester Elective Course-IV (MT) (3-0-0) Local Credits: 3,0 ECTS: 5

7th Semester Elective Course-I (ITB) (3-0-0) Local Credits: 3,0 ECTS: 4

7th Semester Elective Course-II (ITB) (3-0-0) Local Credits: 3,0 ECTS: 5

6th and 7th Semesters Elective Courses (ITB)

ISL 426E Sociology (3-0-0) Local Credits: 3,0 ECTS: 5

Introduction to sociological thinking; the foundations of society; social divisions and inequalities; social structures, social practices and social institutions; social change.

END 106E Economics (3-0-0) Local Credits: 3,0 ECTS: 5

Introduction to the principles of micro and macroeconomics; the fundamental problems of economies; the modeling of household and firm behaviors; market structures; the principles of public finance; the modeling of macroeconomics in an international context.

END 425E Entrepreneurship (3-0-0) Local Credits: 3,0 ECTS: 4

Core Managerial Concepts and Entrepreneurship; Finding a new idea; From business model to business plan; Marketing plan in Business Plan; Production Planning; Management Plan; Financial Plan; Business Planning workshops: Legal and regulatory issues; Current Issues in Entrepreneurship; Communicating with Business People; Communicating Business Plans; Investor Presentations.

END 412E Innovation Management (3-0-0) Local Credits: 3,0 ECTS: 5

Despite the increasing importance of innovation to competitive advantage of organizations in today's world, few companies master the ability to identify, create and exploit opportunities for innovation on a systematic basis. In this course, all aspects of managing innovation; from recognizing the need and desire to be creative and innovative, using imagination to add value, developing structures, systems and incentives that encourage and implement innovation, will be discussed. The course will center on three themes: ideation/creativity generation techniques, innovation (models, dimensions, degrees and sources of innovation) and strategic management of innovation. In line with these topics, real company cases will be presented and discussed so that students will better understand the significance of leadership and corporate entrepreneurship in managing innovation.

BIL 401E Technology and Ethics (3-0-0) Local Credits: 3,0 ECTS: 4

Concepts of ethics and morality, Change in society and interaction channels, The place of information technologies in the process of change, The place of information technologies in the transfer of global values, The effects of information technologies on social life, The effects of information technologies on working life, Social institutions in IT society, Information technologies in national and local organizations, Ethical analysis, Responsibility, accountability, obligation, Ethical issues arising from the effects of science technologies, Information related problems, Intellectual property questions, Health problems, New crime tools, new crimes, Home office crimes, Family social relations and time dedicated to special interests, virtual media and virtual communities, artificial intelligence and human, social interest relations and technology, informatics principles of professional ethics in the world and Turkey.

IKY 415E Social Psychology (3-0-0) Local Credits: 3,0 ECTS: 5

Science of psychology, fields of psychology, the place of social psychology in psychology, the field and methods of social psychology, the nature of human, socialization, social perception, attitudes and change, social impact, individual behavior within the group, interpersonal appeal and love.

ISM 406E Organizational Behaviour (3-0-0) Local Credits: 3,0 ECTS: 4

Scientific fundamentals of organizational behavior, historical improvement of organizational behavior, research techniques, personality in a group, attitude and job satisfaction, fundamentals of personality differences; biographical characteristics, abilities, and learning, organizational culture, groups and processes in organizations, attending groups, motivation, leadership in organizations, conflicts in organizations, stress management, organizational environment and technology, organizational changes, politics, ethic, management and control.

ISM 402E Labour Law (3-0-0) Local Credits: 3,0 ECTS: 4

Introduction to law, definition, main features, development and sources of labor law, concepts of employee, employer, employer's representative, workplace, foundation of labor relation, labor contract, types of labor contract, duties arising from labor contract, employee's duties of doing work, obedience, loyalty, employer's duties of paying wages, protecting employees and behaving equally, termination of labor contract, work stability, severance pay.

END 308E Project Management (3-0-0) Local Credits: 3,0 ECTS: 0

Main Stages of Project Management, Project Management Techniques, Computer Aided Project Management.

Eighth Semester

ELK 402E Senior Design Project (0-6-0) Local Credits: 3,0 ECTS: 8

Depending on the selected topic: Scientific research by conducting experiments; system and component in Electrical-Electronics Engineering; interpret and analyze data. Preparing and writing a report.

Prerequisite: To be 4th class students.

END 402E Occupational Health and Safety II (1-0-0) Local Credits: 1,0 ECTS: 1

Establishing workplace, regulations of workplace and its attachments, fire, Electricity, First aid and rescue, Personal protective equipment, Safety and health symbols, Emergency plan, Work safety and health at design, manufacturing and usage of working equipment, Education work safety and health in workplace, standards and communication, Heavy and high risk industries, Regulations dealing with occupational work safety,

8th Semester Elective Course-I (MT) (3-0-0) Local Credits: 3,0 ECTS: 5

8th Semester Elective Course-II (MT) (3-0-0) Local Credits: 3,0 ECTS: 5

8th Semester Elective Course-III (MT) (3-0-0) Local Credits: 3,0 ECTS: 5

8th Semester Elective Course-IV (MT) (3-0-0) Local Credits: 3,0 ECTS: 5

7th and 8th Semester Elective Courses (MT)

ELK 402E Discrete Time Systems (3-0-0) Local Credits: 3,0 ECTS: 5

Importance and advantages of discrete time system models in control. Time domain analysis of discrete-time systems. Sampled data systems. Stability; translation of analog design. State space design methods: observer theory, introduction to optimal design methods. Quantization effects.

ELK 403E Nonlinear Control Systems (3-0-0) Local Credits: 3,0 ECTS: 5

State-space analysis methods. Isocline Lienard's methods, classification of singularities. Analytic techniques of periodic phenomena: Perturbation method. Stability definitions. Lyapunov's second method; Popov stability criterion. The method of harmonic realization: Describing functions. Dual-input describing functions. Equivalent linearization and oscillations in nonlinear feedback systems.

ELK 405E Signals And Systems II (3-0-0) Local Credits: 3,0 ECTS: 5

Correlation of signals. Energy and power spectral densities. Hilbert transform. Principles of modulation. Stochastic processes: Characterization, correlation functions, stationarity, ergodicity, power spectral density, transmission of random signals through linear systems. Special stochastic processes. Noise.

ELK 406E Laboratory of Feedback Control Syst. (3-0-0) Local Credits: 3,0 ECTS: 5

Digital control of linear and nonlinear electromechanical systems; components of a digital control system; simulation models; Proportional-Derivative (PD) position control; lead-compensator speed control; pole-placement based state-space control of nonlinear cart-pendulum system; Optimal Linear Quadratic Regulator (LQR) based state-space control of flexible-joint and inverted pendulum systems; sampling rate selection and discrete-time controller design; more advanced advanced electromechanical control examples.

ELK 407E Process Control (3-0-0) Local Credits: 3,0 ECTS: 5

Structure of Industrial Control and Automation Problems, Modelling of Processes, Sensing and Actuation Technology, Electronic Instrumentation Technology, Automation via PLC Technology, Control System Architecture and Design.

ELK 408E Process Instrumentation and Control (3-0-0) Local Credits: 3,0 ECTS: 5

Process Characteristics and Process Control Types, Electrical Signal Processing Conditions, Sensors and Flowmeters.

ELK 409E Nonlinear Electronics for Communication (3-0-0) Local Credits: 3,0 ECTS: 5

System level RF transceivers, temperature noise, noise sources in RF systems, introduction to nonlinear circuits, frequency converters, oscillators, and filters.

ELK 410E Introduction to VLSI Design (3-0-0) Local Credits: 3,0 ECTS: 5

Design techniques for rapid implementations of very large-scale integrated (VLSI) circuits, Metal-Oxide-Semiconductor (MOS) technology and logic. Structured design. Design rules, layout procedures. Design aids: layout, design rule checking, logic, and circuit simulation. Timing. Testability. Projects to design and lay out circuits.

ELK 411E Introduction to Analog Integrated Circuits (3-0-0) Local Credits: 3,0 ECTS: 5

Integrated building blocks, integrated circuit design.

ELK 412E Introduction to Medical Imaging (3-0-0) Local Credits: 3,0 ECTS: 5

Fundamentals of X-ray, generation and detection of X-rays, X-ray diagnostic methods, X-ray image characteristics, biological effects of ionizing radiation. Fundamentals of acoustic propagation, generation and detection of ultrasound, ultrasonic diagnostic methods, biological effects of ultrasound. Fundamentals of radionuclide imaging, generation and detection of nuclear emission, radionuclide imaging methods, radiation dosimetry and biological effects. Fundamentals of magnetic resonance imaging, generation and detection of NMR signal, imaging methods, biological effects of magnetic fields.

ELK 413,0E Biomedical Signals, Instrumentation and Measurement (3-0-0) Local Credits: 3,0 ECTS: 5

Biomedical signals, Spectral analysis methods, Time-frequency analysis.

ELK 414E Solid State Devices (3-0-0) Local Credits: 3,0 ECTS: 5

Applications of energy band models for semiconductors. Carrier statistics and transport. Diodes, bipolar and field-effect transistors. Integrated circuits. Heterojunction devices.

ELK 415E Antennas and Propagation (3-0-0) Local Credits: 3,0 ECTS: 5

Wave-guides and cavities; Radiation and antennas; Antenna parameters; Basic propagation modes; Introduction to propagation models in mobile radio systems.

ELK 416E Microwaves I (3-0-0) Local Credits: 3,0 ECTS: 5

Main Properties of RF and Microwave Technology: Electrical Circuits with the Lumped / distributed parameters; Propagation Delay; Standing Waves; Analysis of the Distributed parameter Circuits: S-parameters; Analytical and Graphical (Smith Chart) Methods; Impedance Transformation property of the transmission line; Using Transmission lines as Circuit Elements; Power flow along a transmission line; Maximum power delivery from a source into a load through a transmission line: Fundamental Impedance Matching Circuits: Matching with a single Lumped reactive element/ stub; Double – stub matching with its forbidden region; Matching with no forbidden region; Broad-band Matching.

ELK 417E Microwaves II (3-0-0) Local Credits: 3,0 ECTS: 5

Introduction to Microwave Engineering, Transmission Lines and Waveguides, Microwave Network Analysis, Power Dividers and Directional Couplers, Microwave Filters, Microwave Resonators, Introduction to Microwave Systems.

ELK 418E Digital Signal Processing (3-0-0) Local Credits: 3,0 ECTS: 5

Analysis of discrete time signals and systems, examination of sampling and quantization, investigation of z transform and analysis of system properties (such as stability, causality) in the z domain, discrete time and discrete Fourier transform (DTFT, DFT and FFT), Design and implementation of finite and infinite impulse response filters (FIR, IIR).

ELK 419E Communications I (3-0-0) Local Credits: 3,0 ECTS: 5

Transmission of Signals, Spectral Analysis, Modulation Concept, Amplitude and Angle modulation and demodulation, Sampling Theory.

ELK 420E Telecommunications II (3-0-0) Local Credits: 3,0 ECTS: 5

Digital communication systems, Baseband transmission, shift-keying modulation methods, Additive noise in communication systems, optimal receivers, intersymbol interference, Practical applications.

ELK 421E Optical Communication Systems (3-0-0) Local Credits: 3,0 ECTS: 5

Introduction to geometric optics; ray theory and electromagnetic wave theory of optical propagation in fibers. Optical fibers and their transmission characteristics. Cables, connectors and couplers. Introduction to optical sources and detectors. Principles of optical communication systems, performance analysis and design.

ELK 422E Data Structures (3-0-0) Local Credits: 3,0 ECTS: 5

The course involves the study of basic data structures (e.g., stack, queue, list, tree, binary search tree) and associated algorithms.

ELK 423E Operating Systems (3-0-0) Local Credits: 3,0 ECTS: 5

Introduction to operating systems, concurrent processes, process scheduling, memory management, virtual memory, deadlocks, distributed systems, introduction to Unix, the file system, using the shell, filters, shell programming.

ELK 424E Computational Methods in Electrical Eng. (3-0-0) Local Credits: 3,0 ECTS: 5

Numerical errors and their estimation. Approximation and interpolation. Roots of equations. Solutions of linear and nonlinear simultaneous equations. Numerical differentiation and integration. Solution of ordinary and partial differential equations. Introduction to statistical methods.

ELK 425E Introduction to Computer Networks (3-0-0) Local Credits: 3,0 ECTS: 5

Seven layered ISO-OSI model, the medium access sublayer, ALOHA and local area network protocols, IEEE 802.2 and ethernet, the data link layer, error detection and correction, data link protocols, the network layer, routing, congestion control, internetworking, the transport layer, Internet and Internet tools.

ELK 426E Computer Architecture I (3-0-0) Local Credits: 3,0 ECTS: 5

Asynchronous logic system. Algorithmic state machines. CPU organization. Construction of arithmetic logic unit. Process control architectures. Instruction modalities. Microprogramming. Bit slicing.

ELK 427E Computer Architecture II (3-0-0) Local Credits: 3,0 ECTS: 5

Arithmetic processor design, arithmetic algorithms. Memory organization, parallel processing, multiprocessors systems. Peripheral organization. I/O processing. I/O controllers.

ELK 428E Introduction to Microprocessors (3-0-0) Local Credits: 3,0 ECTS: 5

Lectures will focus on microprocessor organization, assembly language, I/O techniques, real-time interfaces, applications, hardware and software. Lab sections will focus on the STM32F0 32 bit Flash microcontrollers based on the ARM Cortex M0 processor, in order to learn how to design, build, and program embedded systems. STM32F0 Cortex-M0 offers a 32 bit product range that combines very high performance, real-time capabilities, digital signal processing, and low power, low voltage operation, while maintaining full integration and ease of development. Labs during the first half of the course will focus on essential topics. The second half of the course will focus on the design and implementation of non-trivial, open-ended project involving both hardware and software.

ELK 429E Utilization of Electrical Energy (3-0-0) Local Credits: 3,0 ECTS: 5

Introduction to Electrical Energy Generation, Transmission and Distribution Analysis of Three Phase Circuits and Three Phase Power Calculation Reactive Power Compensation Systems Electrical Energy Generation and Generation Sources and Energy Calculations Transmission Lines and Its Parameters Distribution Systems and Their Calculations.

ELK 430E Static Power Conversion I (3-0-0) Local Credits: 3,0 ECTS: 5

Power switches and their characteristics. Power converter definitions, classification. VTA method. Midpoint and bridge rectifiers: non-ideal commutation, harmonics, input power factor, utility-factor, winding utilization and unbalances in rectifier transformers. Applications.

ELK 431E Static Power Conversion II (3-0-0) Local Credits: 3,0 ECTS: 5

Introduction to forced commutated circuits, analysis, classification of techniques. Centretap inverter. Voltage-fed inverters; waveshaping; PWM, stepped and square-waveforms, voltage regulation, harmonics. Current-fed inverters; analysis, effect of SCR turn-off time on voltage waveform, overlap. DC-DC switching converters; time-ratio control, effect of loading, parameter optimization. Device failure mechanisms. Thermal considerations, maximum ratings, protection of switching elements. Series and parallel operation of switching elements.

ELK 432E Power System Analysis I (3-0-0) Local Credits: 3,0 ECTS: 5

Basic structure of electrical power systems. Electrical characteristics of transmission lines, transformers and generators. Representation of power systems. Per Unit System. Symmetrical three-phase faults. Symmetrical components. Unsymmetrical faults.

ELK 433E Power System Analysis II (3-0-0) Local Credits: 3,0 ECTS: 5

Matrix analysis of power systems networks and methods of solution. Load flow and short circuit analysis. Economic operation of power systems. Transient stability analysis.

ELK 434E Distribution Systems (3-0-0) Local Credits: 3,0 ECTS: 5

Basic considerations. Load characteristics and forecasting methods. Distribution substations. Subtransmission, primary and secondary distribution. Choice of voltage levels. Operational characteristics of cables, aerial lines and transformers. System voltage regulation. Power factor correction. Fusegear, switchgear, current and voltage transformers. Overcurrent and thermal protection. Earthing methods. Economics of distribution systems.

ELK 435E High Voltage Techniques I (3-0-0) Local Credits: 3,0 ECTS: 5

Field analysis: experimental and numerical (finite difference, finite element and charge simulation) methods and applications. Electrical breakdown in gases: ionization processes. Townsend s

breakdown criterion, Paschens Law, breakdown in electronegative gases, time lags. Streamer-Kanal mechanism, breakdown in non-uniform field and corona. Electrical break-down of liquids: breakdown mechanism of pure and commercial liquids. Electrical breakdown of solids: Intrinsic, electromechanical, thermal and erosion mechanism. Insulating materials: dielectric gases; insulating oils and solid dielectrics.

ELK 436E High Voltage Techniques II (3-0-0) Local Credits: 3,0 ECTS: 5

Basic definitions, internal and external overvoltages. Reflection, transmission and attenuation of traveling waves, protection systems for overvoltages, High voltage insulators, generation of high voltages, measurement of high voltages, testing of materials and electrical apparatus (cable, insulator, etc.) used in high voltage systems.

ELK 437E Power System Protection (3-0-0) Local Credits: 3,0 ECTS: 5

Protective Devices and Controls; Protection Measurements and Controls; Protective Device Characteristics; Relay Logic; System Characteristics; Fault Protection of Radial Lines; Introduction to Transmission Protection; Complex Loci in the Z and Y Planes; Impedance at the Relay; Admittance at the Relay; Transmission Protection; Analysis of Distance Protection; Transmission Line Mutual Inductance; Pilot Protection Systems.

ELK 438E Power Electronics (3-0-0) Local Credits: 3,0 ECTS: 5

Teaching solid-state devices Understanding of AC-DC converter circuits operation Calculating of DC output voltage of rectifier Controlling of DC output voltage of rectifier Understanding operation of AC-AC converter Calculating of AC-AC converter output voltage Controlling of output voltage of AC-AC converter Designing the single phase rectifier and AC-AC converter Designing three-phase AC-AC and AC-DC converter Teaching the general structure of DC-DC choppers Teaching the general structure of DC-AC converter.

ELK 439E Illumination Techniques (3-0-0) Local Credits: 3,0 ECTS: 5

Light, Light Sources / Indoor Lighting Design / Design and Drawing of Weak Current and Strong Current Systems.

ELK 440E Fundamentals of Photonics (3-0-0) Local Credits: 3,0 ECTS: 5

Ray optics, ray transfer matrix, wave optics, interference and diffraction; beam optics; electromagnetic optics; electromagnetic waves in nonlinear, inhomogeneous, and dispersive media;

Lorentz and Drude models; polarization optics; Jones matrix representation of polarization; interaction of photons with atoms; Einstein coefficients; light amplification and lasers; laser types.

ELK 441E Special Topics: Introduction to Computational Intelligence (3-0-0) Local Credits: 3,0 ECTS: 5

Introduction to various aspects of modeling and transformation of information and knowledge in computers, computational intelligence paradigms: neural networks, evolutionary algorithms, fuzzy systems, Bayesian networks, machine learning, intelligent algorithms, biologically inspired computation.

ELK 442E Special Topics: Real-Time Applications of Digital Signal (3-0-0) Local Credits: 3,0 ECTS: 5

Introduction to real-time processing hardware and software, Signal types, Fast Fourier Transform, Correlation, Detection of signals in noise, Decimation, Interpolation, Filtering, Phase locked loop, System identification and adaptive filtering, Least Mean Square algorithm, Optimum filtering, Finite-impulse response Wiener filter, Two-dimensional signals, Transforms, and Filtering.

ELK 443E Electrical Equipment And Applications (3-0-0) Local Credits: 3,0 ECTS: 5

Introduction to power supplies and systems. Short circuit phenomena and analysis in low voltage systems. Protection concept, devices and applications in electrical systems. Characteristics and applications of circuit breakers, relays and fuses. Power and installation cables and applications. Power and energy measurement techniques and devices. Reactive power compensation. Battery plants and UPS systems. Lighting sources and installations. Electrical safety and earthing systems.

ELK 444E Programmable Logic Controllers (PLC) (3-0-0) Local Credits: 3,0 ECTS: 5

Programmable logic controllers (PLC) forming hardware structures, Discrete inputs / outputs, PLC scanning, PLC programming languages, Ladder diagram language, basic PLC functions, Logic operations, Comparison and conversion operations, Counters, Timers, Interrupt and subroutine operations, Arithmetic operations, Scroll and rotation operations, Table operations, Application examples.