



T.C. MARMARA ÜNİVERSİTESİ

TEKNİK EĞİTİM FAKÜLTESİ

ELECTRIC EDUCATION DEPARTMENT COURSE CONTENT (CREDIT SYSTEM)

1. SEMESTER

ELK101 INTRODUCTION TO ELECTRICAL TECHNOLOGY

(2+0)2

Fundamental and derived units used in electrical technology , Atomic structures of materials, interatomic bonding forces, crystal and amorphous structures, General equations between atomic bonds and electrical properties of materials, Electrical conductivity, super conductivity, Energy bands, Fundamental semiconductors, n-type semiconductors, p-type semiconductors, numerical examples related to semiconductors, Dielectric properties of materials, capacitor materials, piezoelectric materials, insulating materials , Magnetic properties of materials, Optic properties of materials, optic properties of metals and covalent bonded materials, Oils, gases and contact materials used in electrotechnics

MAT141 MATHEMATICS I

(4+0)4

Numbers (Natural, Real, Complex), Functions, Continuity and Limit in One Variable Functions, Definition of Derivative and Rules, Applications of Derivative, Studying Variation of Functions and Graph, Trigonometric and Inverse Trigonometric Functions, Exponential and Logarithmic Functions, Hyperbolic and Inverse Hyperbolic Functions, Rolle and Mean-Value Theorems, Calculations of Indeterminate Forms by Using Derivative on Limit, Parametric Equations, Polar Coordinates, Differential, Undefined Integral.

FZK131 PHYSICS I

(3+0)3

Physics and Measurement, Vectors, Motion in One Dimension, Motion in Two Dimensions, Newton's Laws of Motion, Circular Motion and Other Application of Newton's Laws, Work and Kinetic Energy, Potential Energy and Conservation of Energy, Linear Momentum and Collisions, Rotation of a Rigid Object About Fixed Axis, Simple Harmonic Motion, Newton's Law of Gravity, Static Equilibrium and Elasticity.

TEF172 OCCUPATIONAL SAFETY AND HEALTH

(2+0)2

Defining occupational safety and health and its importance and aim , Occupational accidents and their reasons, occupational accident losses and their cost, Electrical shock, shock conditions, labeling switches , Fuses, grounding and its importance, illumination Fuses, grounding and its importance, illumination Common security precautions related to the device used in laboratories and work places. Working on a energized circuits Electrical fires, precautions for working with low, medium and high voltages, Burns, classifications of burns and first aid, First aid in electrical shock, fainting, being poisoned, broken bones and bleeding, Legal procedures for occupational accidents.

MAK105 TECHNICAL DRAWING

(1+2) 2

Explain of Technical Drawing, Place and Importance of Technical Drawing in Industry, Standart Level Technical Drawing, Draw Set and Supplies, Draw Papers, Scales, Writing and Digits, Lines, Geometric Drawings, Perspectives, Cross sectioning, Dimensions.

TRD121 TURKISH LANGUAGE 1

(2+0) 2

ATA121 PRINCIPLES OF ATATURK AND REVOLUTION HISTORY

(2+0) 2

YDZx121 ENGLISH LANGUAGE 1

(2+0) 2

Introduction and introducing of the English language comparatively , Tense and sentence system, comparative grammar, word orders, noun groups, adjectives, 'verb to be' in simple tense, Adjectives with nouns, their orders comparatively, simple present tense verb system, numbers (ordinal-cardinal), Basic active-nonactive verbs, countable nouns; practising them using simple present sentences, Simple present- third person singular irregular verbs (do – have – go etc.), Adverbs of place and time - dates – months – days – years, negative and positive sentences; yes/no questions, There is - There are, Has – Have, Have got - Has got, Countables – Uncountables, How many – How much questions, More adverbs and adjectives, studies on simple present , More verbs; like - would like - want – need, modals: can – must, 'Why' – 'How' questions, Present continuous tense: positive – negative – question forms, time expressions of present continuous tense, Active verbs with present continuous tense, More studies with simple present and present continuous tenses, Comparative studies with simple present and present continuous tenses





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**ELECTRIC EDUCATION DEPARTMENT COURSE CONTENT
(CREDIT SYSTEM)**

2. SEMESTER

ELK102 CIRCUIT COMPONENTS AND MEASUREMENT LABORATORY

(2+2) 3

Introduction to circuit components, unit systems, description and importance of measurement, accuracy and precision in measurement ,types of errors, active and passive circuit components , measurement devices and classification of its and related laboratories, Types of measurement devices, measurement techniques of electric circuit components, electrodynamic and induction coiled devices, Wheatstone bridge, Kelvin bridge, measurement transformers, digital instruments, oscilloscopes and related laboratories.

MAT142 MATHEMATICS 2

(4+0)4

Defined Integral, The Fundamental Theorem of Integral, Calculations of Area by Using Defined Integral, Areas of Surfaces of Revolution, Volume of a Solid of Revolution, Improper Integrals, Series, Fourier Series, Limit, Continuity, Partial Derivatives, Total Differential of Functions of Several Variables, Derivatives of Compound, Closed and Inverse Functions, Change of Variable, Problems of Maxima and Minima, Double Integrals (Change of Variables, Volume Calculus, Areas of Surface).

FZK132 PHYSICS 2

(3+0)3

Electric Fields, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Current and Resistance, Direct Current Circuits, Magnetic Field, Sources of the Magnetic Field, Faraday's Law / Inductance, Alternating Current Circuits, Electromagnetic Waves.

KMY125 CHEMISTRY

(2+0)2

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.

BKB101 USING FUNDAMENTAL INFORMATION TECHNOLOGIES

(2+2) 3

Course information, Computers, Information Technology, Software, systems and applications, systems and applications, Operating systems, Application software, word processors, spreadsheets, presanataion, database,, multimedia, Computer Hardware, Processores, Main Memory devices, Main Boards , Ports, Parallel CPU, new structures, Storage devices hard disk, optical disk, flash disk, Input/Output Devices , Computer Networks Internet and E - commerce, databases, Information System Techologies and ergonomy

TRD122 TURKISH LANGUAGE 2

(2+0)2

ATA122 PRINCIPLES OF ATATURK AND REVOLUTION HISTORY 2

(2+0)2

YDZx122 YABANCI DİL 2

(2+0)2

Grammatical order system; nouns,pronouns,prepositions, object of prepositions,verbs,adverbs , Simple past tense verb to be and active verbs (regulars) , Studies on simple past tense and the time expressions, frequency adverbs with simple past, Comperative study with simple present and simple past, Simple past tense irregular verbs, Why and 'How' questions with simple past, Futures: will- to be going to, Some past modals: would-could-might, Past Continuous Tense, The time expressions of past continuous tense; using 'when' and 'while' sentences as subordinates, Expressing ideas and giving advice with 'should', Exercises with simple past and past continuous, Studies on simple present-simple past-present continuous-past continuous , Picture telling activity.





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ELECTRIC EDUCATION DEPARTMENT COURSE CONTENT (CREDIT SYSTEM)

3. SEMESTER

ELK203 ELECTRIC CIRCUITS I

(2+2)3

Principles of electric circuits, laws and basic theorems, circuit analysis methods, series and shunt circuits, network theorems, practical and ideal sources, capacitance and transients in RC circuits, introduction to magnetism, Faraday's law, inductance and transients in RL circuits and related laboratories.

ELK201 ELECTRICAL MACHINES I

(2+2)3

Introduction to D.C machines, excitation methods, characteristics of shunt, series and compound machines, D.C. motor moment and mechanical power calculation, D.C. motors control techniques, D.C. motor characteristics.

ELK205 WINDING TECHNOLOGY

(2+2)3

Kinds of DC machines, kind of armature and excitation coil winding, calculating, drawing and applications, Kinds of armature and excitation coil breakdown, determination and repair, Wire radius of armature and excitation and calculating of winding number, Kinds of transformers winding, structures, winding calculation and samples, Transformers breakdown, determination and repair, Kinds of three phase induction machines winding, structures, breakdown determine and repair, Preparing card file, dismounting induction machine and its turns, insulating stator and preparing for winding, soldering, bandaging, varnishing, Handle type winding, calculations, drawing scheme and sample applications, Half American winding, calculations, drawing scheme and sample applications, Full American winding, calculations, drawing scheme and sample applications, Balanced fractional winding, calculations, drawing scheme and sample applications, Parallel connection of windings, methods to obtain variable speed, Kinds of the windings of one phase induction machines and their breakdowns and repair process, Calculation of stator winding of the motor with starting winding and drawing of the scheme of it.

ELK207 ELECTROMAGNETIC FIELD 1

(2+0)2

Vectors in the Cartesian Coordinate System, Cylindrical Coordinate System, Differential vector calculation, Differential vector calculation, introductory electromagnetic, Coulomb's Law, Electric and magnetic fields, Dipole electric field and moment, Gauss's Law, Electric potential, Equal potential, Capacitance

ELK209 GROUNDING IN ELECTRICAL POWER SYSTEMS

(2+0)2

Introduction grounding, Electrical accidents and cautious, Importance of grounding, Biological effect of current, Protection grounding, Grounding of transformer wye point, Potential regulation, TN Systems, TT Systems, IT Systems, Measurement of earth resistance, Grid grounding

BKB201 COMPUTER PROGRAMING

(1+2)2

Introduction to programming, Flowcharts and algorithm concept, Examples about flowcharts, data and object types, General input output functions, Program control commands and structures, Program control commands and examples, Loops, Loops and examples, Nested loops and examples, Arrays, Searching and ordering in arrays, Multidimensional arrays, Examples about arrays, Strings and input output functions

MAT245 DIFFERENTIAL EQUATIONS

(3+0)3

Solutions of a Differential Equation, Determination of Constants, Equations Containing Integrals, Equation of Continuity, First-order differential equations, Variables are separable differential equations, Homogeneous differential equations, Exact differential equations, Linear first-order differential equations with and without initial conditions, A given first-order differential equation will have a unique solution, Reducible to first order differential equations, Linear differential equations of higher-order, Linearly dependent or independent definition, Homogenous linear equation systems with constant coefficients, Non-homogenous linear equation systems with constant coefficients.





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ELECTRIC EDUCATION DEPARTMENT COURSE CONTENT (CREDIT SYSTEM)

4. SEMESTER

ELK204 ELECTRIC CIRCUITS 2

(2+2)3

Introduction to A.C. circuits, RL, RC, RLC series and shunt circuits, phase relations, complex sources, current and voltage sources, star-delta transformation, A.C circuit theorems, power, power triangle, active and reactive power, correction of power factor, series and shunt resonance circuits and related laboratories.

ELK202 ELECTRICAL MACHINES 2

(2+2)3

Introduction to the induction machine, Basic principles and related important Laws, Construction of induction machine, induction machine slip, The revolving magnetic field, The equivalent Circuit, Power-flow, Torques, Starting torque and current, No-load and Short Circuit tests, Speed Control, Controllers for induction machine, Testing and efficiency, Induction machine Generators.

ELK206 INSTALLATION TECHNIQUE

(2+2)3

Electrical installation equipment and systems(fuse system,miniature circuit-breakers,residual-current protective devices, switching with timers), Electrical installation equipment and systems(monitored with current relays), Operator communication, switching, control, and signaling system, information and monitoring system, Information and monitoring system, Power supply and distribution (Power cables for voltages 500 V) , Power supply and distribution (material for installing and fixing cables), Application examples of electrical installation(Functional buildings,main power supply,cable installation methods for power supply,planning).

ELK208 ELECTROMAGNETIC FIELD 2

(2+0)2

Magnetic Field and Magnetic Induction, Determination of the potential differences moving conductor in magnetic field, Determination of the Torque carrying the current in magnetic field, Magnetic flux , Hall effect, magnetic field Ampere Law, Biot - Savart Law, Two parallel conductors , selenoid and toroid, Magnetic circuits, Ferromagnetic properties (Magnetization in Materials), Hysteresis , series and parallel magnetic circuits, magnetic leakages, Faraday Law , Lenz Law, inductances and examples, Mutual inductance , fault currents, Skin Effect Phenomena , industrial application of Inductance, Gauss Law for magnetism , Maxwell Equations

ELK212 ILLUMINATION TECHNIQUE AND PROJECT

(2+2)3

Introduction to illumination and aims and kinds, Basic photometric laws of illumination, Light sources and armature in illumination, Kind of illumination, Basic characteristic of illumination, Calculation methods of interior illumination, Applying to computer programming of interior illumination calculation.

ELK214 MEASURING TECHNIQUE

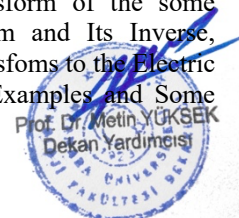
(2+2)3

Introduction to lesson and to information about lesson content, Classify of measuring systems and methods, Measurement transformers, Effects of measurement transformers on measurement faults and numerical examples, Balancing circuit method and technics. Voltage measuring with DC balancers, Balancing circuit method and technics. Voltage measuring with AC balancers, Resistance measuring with balancing circuit method, Utilised physical electrical instruments on AC bridge circuit, AC bridge circuit methods, capacitor bridges, Joint inductance bridges, Schering bridge, Numerical examples on AC bridge circuit, Scaling of measurement transformers, T- bridge circuits and T-parallel circuits.

ELK216 PROFESSIONAL MATHEMATICS

(3+0)3

Differential equations and First-Order Diff. Equation Systems and those Characteristics, Applications of First-Order Diff. Equations and Transients of the Electric Circuits, Homogenous Second-Order Equations with Constant Coefficients, Mechanical Applications of the Homogenous Linear equations of the second –order, Electrical Applications of the Homogenous Linear equations of the second –order, Differential Equations,Phase Plane, Stability, State Variables Method, Laplace Transformation and Laplace Transform of the some Functions, The Inverse Laplace Transform some Properties of the Laplace Transform and Its Inverse, Application of Laplace Transforms to the Differential equations, Application of Laplace Transforms to the Electric Circuits, Fourier Series, Even and Odd Functions ve Harmonic Spectrum, Illustrative Examples and Some Important Vocational Applications,





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**ELECTRIC EDUCATION DEPARTMENT COURSE CONTENT
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5. SEMESTER

ELK301 ELECTRICAL MACHINES 3

(2+2)3

Introduction to the Transformer, Basic principles and related important Laws, Construction of Transformer, Flux Distribution, Induced Voltage, Theory of operation to the transformer, The equivalent Circuit, Development of Phasor Diagrams, Basic tests of transformers, Short Circuit parameters, Voltage variations under Load. Terminal Connections of Three Phase Transformers, Parallel operation of transformers, Power balance and efficiency of transformers, Measurement Transformers, Auto Transformers

ELK 303 PRINCIPLES OF CIRCUIT ANALYSES

(2+0)2

Basic Notions About Electrical Circuit, Basic Enormities in Circuit Theory, Electrical Circuit Elements (two-pointed/two-gate circuit elements), Electrical Circuit Elements (many-pointed circuit elements), Circuit Analysing Methode, Circuit Analysing Methode, Graf Theory, To reveal Equation Situation with Graf Theory, To Resume Equation Situation, Analysing Methods of Equation Situations, Equation Situations Analysing, Application of Equation Situation to Electrical Circuits.

ELK305 ELECTRIC CONTROL TECHNICS

(2+4)4

The components of electrical control circuit, Buttons, Switches, Drum switches, Position-contact diagram and basic application circuits, Contactors, Time relays, Proximity and Limit switches, The design procedure of drawing of control and motor circuit, Basic command circuits for electrical motors, Reversing, Continuous and Peace-wise run, Control of two speed one-winding (Dahlander) induction motor, Automation of a garage gate, Barrier type gate, Starting methods, Primary resistor type and Reactance type starters, Calculation of starting resistor, Autotransformer starters, Star-Delta starters, Current, power and torque during star-delta, Braking, Mechanical braking, Dynamic and Regenerative braking, Dynamic braking of DC motors, Dynamic braking of induction motors, Calculations of braking voltage, Protection devices, Overload relays, Thermic overload relays, circuit layout and an example circuit, Protection relay with thermistor, Phase sequence relay.

ELK307 COMPUTER AIDED DESIGN OF ELECTRICAL SYSTEMS

(1+2)2

General structure of computer aided programmmes, Indtroduction to general structureof AutoCAD designing programme, Understanding using AutoCAD screen, Drawing commands, Modifying commands, Output commands, Electrical installation applications, Creating private AutoCAD menü, Drawing electrical illimination installation scheme by using PC, electrical illimination installation application, High current installations, Drawing a sample high current installation scheme, 3D applications.

ELK309 MECHANICAL CALCULATION OF TRANSMISSION LINES

(2+0)2

Conductors and their structure, strength calculation, forces, thermal limits, To determine Transmission line route, Extra loads, Wind loads, Ice and wind loads, Calculations sag on symmetrical sapn, Calculations sag on asymmetrical sapn, Span and their types, Critical temperature, Detailed information about poles and pole types

EHE311 ELECTRONICS

(2+2)3

Semi-conductor basics: concepts and semi-conductor components. Semiconductor diode; physical structure, terminal characteristics, analysis of diode circuits. Bipolar junction transistor (BJT); physical structure and operating modes, BJT as a switch; DC biasing, BJT as an amplifier, small-signal model, basic amplifier circuits. MOSFET; structure and operating modes, MOSFET as a switch, MOSFET amplifiers. Operational amplifiers; concepts and application examples.





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TECHNICAL ELECTIVE COURSES 1 (TS1)

ELK 321 DIGITAL MEASUREMENTS

(2+0)2

Digital measurement, The kinds of digital instruments, Classification of digital equipments, A/D converters, D/A converters, Feedback converters, Digital measurements of period, frequency and time interval, Digital measurements of circuit parameters, Digital voltmeters, Digital ammeters, Digital wattmeter, digital frequency meters, Digital multimeters

ELK325 ENERGY CONVERSION PRINCIPLES

(2+0)2

Electromechanical conversion general Introduction, Introduction to magnetic circuit, flux linkage, inductance and energy, Force and Torque in magnetic field systems, Energy Balance, Energy and Force in singly excited magnetic field systems, Determinations of magnetic force; coenergy, One, two, three airgap structure systems energy balance equations, Reluctans Motor energy balance Equations, Multiply

ELK327 RENEWABLE ENERGY RESOURCES FOR ELECTRICITY GENERATION

(2+0)2

Renewable energy resources and their potentials, Renewable energy Technologies, Structure of electrical components used in generation, Structure of generators used in electricity generation and cost of generation, Wind turbines, Electrical structure of the system and generator types, Solar panels and their structure , Solar energy farms, Biomass energy conversion systems, Generating electricity from waves and water flow , Pumped storage systems, Hydrogen energy production and conversion systems, Technology and systems of geothermal energy conversion, Hybrid systems used in electricity generation

NON-TECHNICAL ELECTIVE COURSES (TOS)

MAT 331 NUMERICAL METHODS

(2+0)2

Relative and absolute approximation, Finding roots of equations, Solution of sets of linear equations, Solution of sets of nonlinear equations, Tables of finite difference, Interpolation, Numerical derivative, Numerical integral, Curve fitting, Curve fitting techniques, Numerical solution of ordinary differential equations , Numerical solution of partial differential equations

IST333 STATISTICS AND PROBABILITY

(2+0)2

Basic Probability, Descriptive Statistic, Mean, median and mode concepts, Variance and standart deviation, Rondon variables, Binominal and Poisson distrubition, Normal distribution, Sampling theory, Estimation theory, Test of hypothesis and significanc, Curve fitting, Regression and correlation, Chi-Square distribution, t and f distribution.





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**ELECTRIC EDUCATION DEPARTMENT COURSE CONTENT
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6. SEMESTER

ELK302 ELECTRICAL MACHINES 4

(2+2)3

Classification of synchronous machines and synchronous speed concept, Construction of alternator, armature and pole (field) windings, pitch, distribution and form factor, Shape of mag.flux in airgap of a s.m. and the effects of harmonics to e.m.f., the induced e.m.f. in alt., Induction of three-phase voltages in synchronous machines, alternating and rotating field, Star and delta connection of alternators and the effect of connection type on the harmonics, Various load positions of alternators, voltage drops and armature reaction, Calculation of voltage regulation according to various methods, Excitation of alternators and voltage regulators, Parallel operation of alternators and dividing load of parallel alternators, Losses and efficiency of alternators, Synchronous motors, methods of starting and their characteristics, effect of load, Calculation of counter e.m.f. in synchronous motor, Power, torque and max. torque in synchronous motors and torque angle, Power factor correction and synchronous condenser, single-phase synchronous motors.

ELK304 POWER CONVERTERS AND APPLICATIONS

(2+2)3

Power Electronic Systems, Overview of Power Semiconductor Switches, Design of gate drive Circuits, Series and Parallel Operation of Semiconductor Switches, Cooling and Heat Sinking, Protection Circuits of Semiconductor Switches, Thyristor Commutation Techniques, Line-Frequency Single-Phase Uncontrolled, Half and Full Controlled Rectifiers, Line-Frequency Three-Phase Uncontrolled, Half and Full Controlled Rectifiers, Single-Phase Half and Full Wave AC Voltage Controllers, Three-Phase Half and Full Wave AC Voltage Controllers, Switch-Mode Single Phase Inverters (dc-ac), Switch-Mode Three Phase Inverters (dc-ac) , Switch-Mode dc-dc Converters.

ELK306 PROTECTION IN ELECTRICAL NETWORKS

(2+2)3

Introduction to protection, Requirements of protection systems, Selectivity in protection systems, Speed in protection systems, Types of protective relays, Instantaneous over current relay, Inverse time relay, Buchholz relay, Directional relays, Differential relay, Distance relay, Generator, transformer and line protection, Alert systems in power systems.

EHE308 LOGIC CIRCUITS

(2+2)3

Number systems, Conversion of number systems and codes, Logic gates, Properties of integrated circuit families, Boolean algebra, Reduction of boolean algebraic equations and implementation of circuits, Reduction of boolean algebraic equations and implementation of circuits, Quine-Mc Cluskey yöntemi ile indirgeme ve devre gerçeklemeleri, Multiplexer-demultiplexer, Encoder-Decoder, Flip-Flop, Design of counter circuits , Circuit examples, Programmable logic circuits





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TECHNICAL ELECTIVE COURSES 2 (TS2)

ELK322 QUALITY CONTROL AND VOCATIONAL STANDARTS (2+0)2

Standards and its aim, Important standards on electric industry, Quality concept, Basis factors on quality, Quality management, Education on quality management, Quality management on KOBİ's, Control loops, Quality improvement equipment and tools, Performance of quality management, Benchmarking methods, Quality guaranty systems, Quality guaranty documentation, ISO 9000 Standards.

ELK324 MEDIUM VOLTAGE NETWORKS (2+0)2

Introduction to Medium Voltage Distribution systems, Classification distribution systems and their specifications, Calculation cross sectional area for cables in the MV Distribution systems, Computation cross sectional area depending on power losses, Computation cross sectional area depending on mechanical criteria and voltage drop, Phasor diagrams, Circuit Breakers and their selection, Disconnectors and their types, Insulators, Transmission line arrester TLA, Conductors, Cables, Bus bar systems, Protection devices

ELK326 SPECIAL WINDING TECHNIQUES (1+2)2

Voltage balancing windings in direct current machineries, Compensation and commutation windings, Windings of direct current spark welding generator, Rotor windings of induction motors and dahlender winding , Dahlander windings with fixed momentum, Dahlander windings with fixed power, Dahlander windings with variable momentum and power, Parallel connection of windings, Connections to operate induction machineries under different voltages, Winding structure of step motors, Winding structure of reluctance motors, Motor windings of alternative current motors with commutator, Windings of synchronous generators, Windings of alternative current linear motors

TECHNICAL ELECTIVE COURSES 3 (TS3)

ELK332 INSTRUMENTATION (2+0)2

Instrumentation systems, General measurement system configuration, analog and digital systems, Quality of measurement, Performance characteristics of instruments, Signal conditioning, Instrumentation amplifier , Analog multiplier, Analog divider, Active filter, Electronic analog instruments, True RMS measurement , Digital instruments

ELK334 DISCHARGE PHENOMENA IN HIGH VOLTAGE TECHNIQUE (2+0)2

Introduction to high voltage breakdown phenomenas, Fundamentals of the kinetic gas theory, Various type of Ionization, Ionization and decay processes : mobility, diffusion, recombination, Townsend breakdown theory in uniform fields, The streamer or Channel Theory, The lighting mechanism, Corona discharges, Partial discharges, Discharge phenomena in liquids

ELK336 ELECTRICAL DRIVES (2+0)2

Industrial Application importance of the electrical drive systems, Uniform linear, uniform rotating movements and analytical examples, Inertia effect and Drive force, Heavy construction equipments characteristics, Reappraising of the electric machines, Series motor characteristics inspection, Shunt motor characteristics inspection, Various Motor operational system Effects on the electric drive system.





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7. SEMESTER

ELK401 GRADUATION PROJECT 1

(0+2)1

Literature survey, Planning the study, Making analyses, Thesis writing, Thesis presentation.

ELK403 POWER SYSTEMS 1

(2+2)3

Introduction to power systems, Requirements and dimensions of energy, Basic principles of thermodynamic, General knowledge about energy economic, Load duration curve, daily load curves, Power Plant Construction, Compare to Power Plants on the costs and cost for multiple power plants, Unit KWh Cost, Classification of thermal plants, Thermal plants, Basic of economic loading for thermal plants, Hydroelectric power stations, Power Plant Electrical Installation and Generator Operation

ELK405 POWER TRANSMISSION 1

(3+0)3

Description of power systems, Classification of power systems according to voltage, current systems, topology and their function, D.C and A.C transmission comparison, principles of AC power transmission and classification of transmission lines according to their length and specifications of them, Short power transmission lines and their specifications, intermediate-length power transmission lines and their specifications, Long power transmission lines and their specifications, Power lines with cumulative parameters, Defining operation conditions in power transmission lines, Maximum power transmission in power transmission lines, Characteristic impedance and natural power, Analysis of equivalent circuits, Per-unit values.

ELK411 AUTOMATIC CONTROL 1

(2+2)3

Introduction, Basic definitions, Open-Loop and Closed Loop control systems, Examples, The components of a closed loop control system, History of control systems, Flyball regülatör, Laplace transform review, Basic input functions, s-t transformations table, Poles, Zeros, s plane, Initial value and Final value theorems, Transfer functions, Block diagrams, Rules and block diagram reduction methods, Transfer functions and block diagrams of electrical components, Transfer functions and block diagrams of a DC motor, Transfer functions of systems constituted with Opams, Signal-flow graphs, Mason's gain formula, Converting a block diagram to signal-flow graph, Transfer functions and block diagrams of liquid-level systems, Transfer functions and block diagrams of mechanical systems, Transient response of first order systems, Transient response of second order systems.

ELK407 PROGRAMMABLE LOGIC CONTROLLERS AND INDUSTRIAL APPLICATIONS

(2+2)3

Industrial automation, Structure of PLC and peripheral equipments, Addressing and data structure, Bit logic, instructions, Timers, Counters, Comparators, Move, jump, for-next and sub programming, SHRB, Real time clock, SCR, Mathematics and logic instructions, Interrupts, Analog I/O.

ELK435 MODERN CONTROL METHODS OF ELECTRIC MACHINERIES

(2+0)2

Mathematical Model of Induction machine, Space vector theory basics/ Coordinate Transformations, Induction machine model in the stationary d-q frame, Induction machine model in the rotating rotor speed frame, Vector control on induction machines, Field -oriented control method, Stator -Flux -oriented control method, Flux -oriented control method, Flux models, Direct vector control, Indirect vector control, Space vector modulation, vector controlled current-fed inverter drive, vector controlled Voltage-fed inverter drive.





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TECHNICAL ELECTIVE COURSES 4 (TS4)

ELK421 INDUSTRIAL MEASUREMENT AND CALIBRATION TECHNICS (2+0)2

Introduction to lesson and general informing about the content of the lesson, Terms and definitions, linear and nonlinear devices, Dynamic effects, primary systems, secondary systems, Temperature sensors, expansion termometers, termometer with resistance, Thermocouples, thermoelectric effect, thermocouple laws, various kinds of thermocouple, Thermocouples, cold junctions, thermocouple temperature indicators, linear variable differential transformer, transducers with variable inductance or capacitance, Strain gages, foil strain gages, semiconductor strain gages, Strain gage with wheatstone bridge, balancing the temperature, Balancing the bridge, Pressure transducers, various sensing devices, electrical depletion transducers, Piezoelectrical items, load balancing systems, electrical systems, pneumatic systems, Optoelectronics technic, sensors, photoresistances, photodiodes, phototransistors, Modulation technics, telemetry, length measurements

ELK423 MV-HV PROJECT AND THEIR APPLICATIONS (2+0)2

MV distribution line route study, HV transmission line route study, Reason reports and preparation of project files, Voltage drop calculations, Conductor and cable selection, Tower selection, Preparation of energy transmission line plan profile, Circuit breaker selection, Disconnecter selection, selection of measurement, Insulator selection, Selection of surge arrested (TLA), Protection relay selection

ELK425 CONTROL OF ELECTRICAL MACHINERY WITH POWER ELECTRONICS (2+0)2

Basic Characteristics of the DC Motors, Breaking Types of the DC Motors, Types of speed Control of the DC Motors, DC Drivers, Basic Principles and Control Methods of DC Choppers, DC Chopper Types, Thyristor Commutations of the DC Chopper Circuits, Mono-phase Voltage Source Inverters, Three-phase Inverters, Pulse Width Modulation Inverters, Current Source Inverters, Induction Motor Speed Control Methods, Scaler Control Methods, Vector Control Methods.

TECHNICAL ELECTIVE COURSES 5 (TS5)

ELK431 INTELLIGENT BUILDING SYSTEMS (2+0)2

Logic and technologies used in intelligent buildings, Intelligent building automation system and the use of, Electrical wiring systems used in intelligent buildings, Security system used in intelligent buildings, Intelligent building energy efficiency effect.

ELK433 HIGH VOLTAGE TECHNIQUE (2+0)2

Introduction to High Voltage Technique, Static Electric Field and examples, High Voltage System Elements and Basic Concepts, Internal overvoltages: Sudden load rejection, Capacitive circuit switching operations, Ferranti Effects, Unsymmetrical faults, Ferroresonance conditions, External Overvoltages- Lighting current and occurred overvoltages, Properties of the - Travelling waves problems Speeds, Energy and attenuation, Travelling waves problems: Reflection and transmission of travelling waves, Protection devices, arresters, Volt-Ampere Characteristic of arrester, Protection for overvoltage, Protectors.

ELK436 SPECIAL ELECTRIC MACHINERIES MODERN CONTROL TECHNIQUES (2+0)2

Mono-phase Motors, Repulsion motors, Hysteresis motors, Step motors, Universal Motors, Speed Control of Universal Motors, Brushless DC Motors, Permanent Magnet Synchronous motors, Properties and Application Fields of Permanent Magnet Synchronous Motors, Reluctance Motors, Switched Reluctance Motors, Servo Motors, Servo Motor Structures And Application Fields.





T.C. MARMARA ÜNİVERSİTESİ

TEKNİK EĞİTİM FAKÜLTESİ

**ELECTRIC EDUCATION DEPARTMENT COURSE CONTENT
(CREDIT SYSTEM)**

8. SEMESTER

ELK402 GRADUATION PROJECT 2

(0+2)1

Literature survey, Planning the study, Making analyses, Thesis writing, Thesis presentation.

ELK404 POWER SYSTEMS 2

(2+2)3

Introduction to energy distribution systems, Determination of the voltage levels, Line constants, Calculations of cable cross-section, Basic Radial system, Radial primary feeder system, Primary network system, Ring system, Satellite network, Meshed systems, Electric shock and basic concepts on preventive, Fault current circuit and contact voltage, Protection against contact voltage

ELK406 POWER TRANSMISSION 2

(3+0)3

Introduction to stability and transient analysis of the power systems, Extremely fast, medium fast and slow transient regimes, Symmetrical short circuits, Examining faults by using classical circuit, Examining faults by bus matrix method, Solving sample problems, Symmetrical components methods, Transformation to symmetrical components from operation equations of asymmetrically loaded synchronous machine, Single phase-ground short circuit faults, Phase to phase short circuit faults, Three phase-ground short circuit faults, Impedance values of synchronous machines and transformers, Comparison of the short circuits, Solving Solving sample problems

ELK412 AUTOMATIC CONTROL 2

(2+2)3

Second-order systems, R-L-C series circuit, Steady-state and transient response of second order order system in respect to damping ratio, Definitions of transient response specifications of second order systems, Stability of linear control systems, Routh-Hurwitz stability criterion, Special cases in Routh Criteria, Steady-state errors, Open-loop transfer function, Position, Velocity and Acceleration errors, Steady-state errors for disturbance inputs, Analog controllers, ON-OFF controller and its transfer curve, Designing ON-OFF controller with OPAMPs, P type controllers, transfer curve and designing P controller with OPAMPs, I type controllers, transfer function and designing I controller with OPAMPs, D type controllers, transfer function and designing D controller with OPAMPs, PID type controllers, transfer functions and designing PID controller with OPAMPs, Ziegler-Nichols methods and find the PID coefficients.

BKB491 MICROPROCESSORS

(2+0)2

Basic operations of a microprocessor, Data representation in microprocessor based systems, Basic internal architecture of the microprocessor, General microcomputer architecture, data bus, address bus, Registers, types of memory, memory hierarchy, pipeline structure, Fundamentals of microprocessor instructions, Execution an instruction, A microprocessor programming model, register functions, Instruction set, Addressing modes, Arithmetic-Logic instructions, Program control instructions, Subroutine handling and return, Interrupt processing, expanding the interrupt structure, Microprocessor hardware specifications, bus timing, buffering and latching, Memory map, memory interface, Input/Output Interface, Port structures.





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ELECTRIC EDUCATION DEPARTMENT COURSE CONTENT (CREDIT SYSTEM)

TECHNICAL ELECTIVE COURSES 6 (TS6)

ELK422 INDUSTRIAL AUTOMATION SYSTEMS (2+0)2

PLC memory system and input-output programs, PLC input and output connections in the sensor and transducer, Sensor information processing in the industry over the PLC, Lighting and auxiliary elements through PLC automation systems, Through PLC and ancillary staff and power plant automation systems.

ELK424 HIGH VOLTAGE MEASUREMENT TECHNIQUE (2+0)2

Testing high voltages, Generation of high alternating voltages, Generation of high d.c. Voltages, Generation of high impulse voltages, Electrostatic voltmeters, Sphere gaps, Voltage dividers, Voltage transformers, Capacitor voltage transformers, Measurement of peak, direct, alternating and impulse voltages, Measurement of impulse current, Measurement of dielectric constant and loss factor, Partial-discharge, Corona discharge and measurement.

ELK426 INDUSTRIAL POWER ELECTRONICS (2+0)2

DC-DC Converter conception/ DC-DC Converter classification and Comparison, DC-DC Converters Control Technics, Switching Technics Those are used on DC-DC Converters, Direct DC-DC Converters, Buck(Step down) converter, Boost(Step-up)Converter, Buck-Boost Converters, Cuk converter, Sepic Converter, Zeta Converter, Isolated DC-DC Converters, Forward converter/ Fly-back converter/ Push-Pull converter, Half Bridge converter/ Full Bridge converters, PWM with bipolar voltage switching- PWM with unipolar voltage switching.

TECHNICAL ELECTIVE COURSES 7 (TS7)

ELK432 SCADA APPLICATION AND AUTOMATION IN LIGHTING SYSTEMS (2+0)2

PLC-controlled lighting systems, Scada documentation system, Scada and PLC cooperation, SCADA and PLC systems in cooperation with interior, Lighting facilities SCADA systems, SCADA systems, plant lighting applications in the investigation.

ELK434 SCADA APPLICATION IN POWER SYSTEMS AND FEEDER AUTOMATION (2+0)2

Introduction to SCADA systems, Microprocessor based control systems, planning software development, projecting cost analysis, DCS and PLC based SCADA, determination of system conditions, Control and Collecting Data, evaluating alarm signal, reporting, trains, modulation, CBS systems, communication protocols, tests and software standards, principles of application, operational structure and general functions of automation systems in power systems, determination of monitored and controlled systems, input- output info, control priorities, economic evaluation, benefits of feeder optimization, principles of application.

ELK436 SPECIAL ELECTRIC MACHINERIES (2+0)2

Mono-phase Motors, Repulsion motors, Hysteresis motors, Step motors, Universal Motors, Speed Control of Universal Motors, Brushless DC Motors, Permanent Magnet Synchronous motors, Properties and Application Fields of Permanent Magnet Synchronous Motors, Reluctance Motors, Switched Reluctance Motors, Servo Motors, Servo Motor Structures And Application Fields, Problem solutions for related subjects.

