

Contents of the Courses Given in Electronics and Communications Engineering Programs

Kod (Code)	ATA101
Ders (Title)	Atatürk İlkeleri ve İnkılap Tarihi I (History of Turkish Revolution I)
Content	

Kod (Code)	ATA102
Ders (Title)	Atatürk İlkeleri ve İnkılap Tarihi II (History of Turkish Revolution II)
Content	

Kod (Code)	BIL101E
Ders (Title)	Introduction to Computer and Information Systems (Introduction to Computer and Information Systems)
Content	

Kod (Code)	BIL104E
Ders (Title)	Int to Scientific and Engineering Computing (C) (Int to Scientific and Engineering Computing (C))
Content	

Kod (Code)	BIL106E
Ders (Title)	Int to Scientific and Engineering Computing (Fortran) (Int to Scientific and Engineering Computing (Fortran))
Content	

Kod (Code)	BIL108E
Ders (Title)	Introduction to Scientific and Engineering Computing (Introduction to Scientific and Engineering Computing)
Content	

Kod (Code)	BIO201E
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Ders (Title)	Enzimleri Anlamak (Understanding Enzymes)
Content	Biology and chemistry of enzymes, laboratory and industrial techniques of enzyme purification, kinetics of enzymatic reactions: rapid equilibrium and steady-state kinetics, reversible and irreversible inactivation kinetics, enzymatic catalysis mechanisms, mechanisms to regulate enzyme activity, allosteric enzymes, industrial use of enzymes and enzyme immobilization methods, enzyme stabilization methods.

Kod (Code)	BIO301E
Ders (Title)	Biyolojinin Temelleri (Fundamentals of Biology)
Content	Classification of organisms, prokaryotes and eukaryotes. The panoramic view of the cell, study of the cell organelles. Membrane structure and functions; Cell division; Laws of Mendelian inheritance, genes and chromosomes, molecular basis of inheritance. Evolution, records of evolution. Higher organisms, plant systems, animal systems. Latest trends in biology, biotechnology, molecular biology and genetic engineering

Kod (Code)	BIO302E
Ders (Title)	Biyoteknolojinin Temelleri (Fundamentals of Biotechnology)
Content	Introduction to Biotechnology; Microbial growth; Metabolism; Measurements & Kinetics in Batch Cultures; Fermentation systems; Reactor design; Scale-up & Instrumentation control; Recombinant DNA Technology; Utilization of genetically modified microorganisms ; Enzyme Technology; Health; Agricultural & Forestry; Food & Beverage; Environmental Technology

Kod (Code)	BLG112
Ders (Title)	Ayrık Matematik (Discrete Mathematics)
Content	Mathematical logic: Induction, quantifiers, predicate calculus. Relations: composition, inverse relation, closure. Functions. Graph theory: connectivity, matrix representation, graph types. Algebraic structures: homomorphism, congruence. Lattices: meet, join, bounded lattice. Boolean algebra.

Kod (Code)	BLG212
Ders (Title)	Mikroişlemci Sistemleri (Microprocessor Systems)
Content	Digital representation and binary arithmetic. Basic microprocessor structure and operating principles. Memory and addressing. Structure of a fictitious microprocessor, its instruction set and addressing methods. Subroutine, interrupt and stack structure. Design of a microcomputer using a selected microprocessor. Busses. Input/Output and direct memory access. Peripheral: parallel and serial communication, samples. Timing. Event counting. Some selected microprocessors.

Kod (Code)	BLG231
Ders (Title)	Sayısal Devreler (Digital Circuits)
Content	Initial course in Boole algebra, combinational logic design, synchronous sequential circuit analysis and synthesis.

BLG 252E	Object Oriented Programming
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Kod (Code)	BLG368
Ders (Title)	Yöneylem Araştırması (Operations Research)
Content	The model concept in operations research. Techniques of model building. Models of linear programming. Simplex, duality and sensitivity analysis. Transportation models. Integer programming, cut plane, branch and bound algorithm, 0-1 linear programming, non-linear programming.

Kod (Code)	BLG441
Ders (Title)	Sayısal İşaret İşlemciler İle Gerçek Zamanda Sistem Tasarım (Real-Time System Design by Digital Signal Processors)
Content	Fundamental concepts of real-time signal processing. Architecture of real-time signal processors. Hardware interface implemented by peripheral units. DSP programming techniques. Software development tools. Analog/digital and digital/analog converter, sampling. Real-time signal processing techniques. Real-

	time signal processing techniques.Real time implementation of signal processing algorithms, and frequency domain processing. Data compressing. Learning process and classifiers in real-time.
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Kod (Code)	DNK201
Ders (Title)	Dinamik (Dynamics)
Content	Particle and rigid body kinematics and dynamics. Translation and rotation. Momentum. Angular momentum. General motion. Absolute and relative motion. Moments and products of inertia. Work and energy.

Kod (Code)	EKO201
Ders (Title)	Ekonomi (Economics)
Content	Economics and the economy; tools of economic analysis; demand, supply and the market; the effect of price and income on demand and supply quantities; government in the mixed economy; developing the theory of demand: consumption; developing the theory of supply: costs and production; perfect competition and pure monopoly; market structure and imperfect competition; introduction to macroeconomics and national income; the determination of national income; aggregate demand and aggregate supply; money and modern banking; central banking and the monetary system; inflation and unemployment; open economy macroeconomics; international monetary system; international trade and commercial policy; EU; economic growth; problems of developing countries

Kod (Code)	ELE111
Ders (Title)	Elektronik Mühendisliğine Giriş (Introduction to Electronics Engineering)
Content	Relevance of Electronics Engineering curriculum to the practice of engineering in manufacturing and R&D environments. Various approaches and methods in problem solving, introduction to electronics and systems; examples of applications.

Kod	ELE211
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(Code)	
Ders (Title)	Elektrik Devre Temelleri (Basics of Electrical Circuits)
Content	Physical electrical circuits. Modelling and measurements of currents and voltages in physical circuits. Definitions of charge, flux, power and energy and modelling their waveforms. Kirchhoff's Laws: current and voltage equations. Circuit graphs. Graph matrices. Ideal 2-terminal and multi-terminal circuit elements. Modelling of physical elements. Small-signal analysis of nonlinear circuits. Analysis of linear and nonlinear resistive circuits: Node-voltage and mesh current methods. Circuit Theorems: Tellegen's theorem, Superposition theorem. Reciprocity theorem. Thevenin and Norton theorems. Solution of dynamic circuits: responses of first- and second-order dynamic circuits.

Kod (Code)	ELE221
Ders (Title)	Elektrik Devre Temelleri Lab. (Basics of Elektrik Circuits Lab.)
Content	Introduction to measurement instruments. Experimental verification of the Kirchoff's Laws. Superposition principle and Thevenin model in resistive circuits. Mathematical modelling of the circuits Analysis of basic RC and RL and RLC circuits in time domain. Operational amplifier and its applications. AC measurement techniques: amplitudes, effective values and phases. Steady-state Anaysis of the Electric Circuits. Thevenin-Norton and Maximum Power Transfer Theorems.

Kod (Code)	ELE222
Ders (Title)	Elektronİęe Giriş (Introduction to Electronics)
Content	Introduction; Components and basic circuits: Operational amplifiers, concepts and application examples. Diodes: ideal diode, terminal characteristics of the junction diode, analysis of diode circuits, semiconductor principles, structure of the junction diode. Bipolar junction transistor (BJT): physical structure and operating modes, DC biasing, BJT as an amplifier, small-signal model, basic amplifier circuits, BJT as a switch. MOSFET: structure and operating modes, MOSFET amplifiers. MESFET.

Kod (Code)	ELE242
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Ders (Title)	Devre ve Sistem Analizi (Circuit and System Analysis)
Content	State equations of higher order circuits and their solutions in t and s domain. State transition matrix and its properties. Zero state, zero input responses. Stability, Routh criteria. Controllability and observability. Analysis of dynamical systems in jw-domain. Sinusoidal steady state. Phasors, phasor network equations. Power and energy. Three phase systems. Network and system equations in s domain. Bode diagrams. Block diagram and signal flow graphs

Kod (Code)	ELE331
Ders (Title)	Analog Elektronik Devreleri (Analog Electronics Circuits)
Content	Multistage amplifiers. Operational amplifier circuits and applications. Circuits derived from op amps. Analog multipliers. Frequency response of amplifiers. Feedback, stability problems in feedback circuits, compensation. Sinusoidal oscillators. Power amplifiers.

Kod (Code)	ELE311
Ders (Title)	Elektronik Giriş Laboratuvarı (Introduction to Electronics Laboratory)
Content	1. Supply voltage circuits 2. DC characteristics of BJTs and MOSFET's 3. Amplifiers 4. Linear applications of operational amplifiers 5. Logic gates and flip-flops 6. Non-linear applications of operational amplifiers

Kod (Code)	ELE312
Ders (Title)	Analog Elektrik Devreleri Laboratuvarı (Analog Electronic Circuits Laboratory)
Content	Experiment 1: Low-frequency power amplifiers Experiment 2: Analog integrated circuits building blocks Experiment 3: Frequency and pulse response of BJT amplifiers Experiment 4: Feedback and stability in transistorized amplifiers Experiment 5: Broad-band amplifiers Experiment 6: Low-frequency oscillators Experiment 7: Active filters Experiment 8: PLL applications

Kod (Code)	ELE322
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Ders (Title)	Sayısal Elektronik Devreleri (Digital Electronic Circuits)
Content	Ideal inverter, various types of (NMOS, resistive-load, etc.) inverters, CMOS inverter, NAND, NOR gates, complex gates, transmission gates, various flip-flop circuits, read-only memories (ROM), static ve dynamic random-access memories (SRAM and DRAM)

Kod (Code)	ELE332
Ders (Title)	Devre Sentezi (Network Synthesis)
Content	Network synthesis problem. Filter approximation: Butterworth and Chebyshev approximations, impedance and frequency normalization, Passive network synthesis: Positive real functions. Synthesis of LC, RC, RL, RLC networks: Cauer's and Foster's realizations. Synthesis of passive 2-ports, Positive real matrices, Synthesis of 2-ports converted to synthesis of 2-terminals. Ladder network synthesis: zero shifting technique. Active network synthesis: decomposition, coefficient matching and signal flow graph methods. Examples of active network synthesis using modern active devices (current conveyor, OTA, opamp)

Kod (Code)	ELE342
Ders (Title)	Sayısal Sistemler Laboratuvarı (Digital Systems Laboratory)
Content	Introduction to the experimental analysis and synthesis of digital networks including a microcomputer as a controller, storage elements, circuit characteristics, combinational networks (adders, multipliers etc.) simple sequential network.

Kod (Code)	ELE414E
Ders (Title)	Mikroelektronik Analog Devre Tasarımı (Microelectronic Analog Circuit Design)
Content	Characteristics and behavioral models of op-amps. OTA, op-amp and operational current amplifier configurations, power stages, amplifier specifications, CMOS and BiCMOS design criteria, electrical and physical design. Miscellaneous microelectronic analog circuits: Comparators, analog multipliers, oscillators.

Kod (Code)	ELE416E
Ders (Title)	Yüksek Frekans Elektronik (High Frequency Electronics)
Content	System noise and inter-modulation distortion. Serial and Parallel Resonant Circuits and impedance matching structures; Single and double tuned transformers, High frequency oscillators; crystal oscillators and VCOs. Tuned amplifiers; Tuned amplifiers using IC blocks, crystal, ceramic and SAW filter performances and the tuned amplifiers constructed with them.

Kod (Code)	ELE417E
Ders (Title)	RF Mikroelektronik Devreleri (RF Microelectronics Circuits)
Content	Introduction to RF and wireless technology. Modulation and detection. Multiple access techniques and wireless standards. Transceiver architecture. Low noise amplifiers and mixers. Oscillators. Power amplifiers.

Kod (Code)	ELE418E
Ders (Title)	RF Laboratuvarı (RF Engineering Laboratory)
Content	1.s-parameters measurement setup 2.Noise figure measurement setup 3.1 dB compression and IP3 intercept point measurement setup 4.Passive matching structures for low noise and power amplifiers 5.Linearization techniques for power amplifiers

Kod (Code)	ELE412
Ders (Title)	Yarıiletken Elemanlar (Semiconductor Devices)
Content	Constituents of semiconductor crystal. Poisson, current and continuity equations. Energy band diagrams. Thermal equilibrium. Injection level. Trapping. BJT in equilibrium. BJT under bias. High-bias effects in BJT. BJT dynamics. MOSFET structure. MOSFET under bias. Strong inversion and subthreshold models. Structural optimization of MOSFET. Secondary effects and MOSFET dynamics.

Kod	ELE413
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(Code)	
Ders (Title)	Çok Geniş Ölçekli Tümdevre Tasarımı I (Very Large Scale Integrated Circuit Design I)
Content	VLSI design techniques and foundations. ASIC design, gate-arrays, standard-cells. Full custom design approaches. Floorplanning in chip-level. Separation of the system building blocks. Standard cell placement & routing algorithms. Verification of design, logic simulation, timing simulation, transistor level simulation. Design techniques for regular building blocks: memory arrays, PLAs. Testable system design techniques. Reliability. Introduction of improving VLSI design techniques and tools.

Kod (Code)	ELE415
Ders (Title)	Analog Tümdevreler (Analog Integrated Circuits)
Content	Basic building blocks: current and voltage sources, supply voltage and temperature independent biasing. Basic amplifier structures. Operational amplifiers: basic structures, basic performance parameters. Integrated oscillator structures. Analog multipliers. Analog MOS building blocks: Current sources, amplifier stages. MOS operational amplifiers, OTAs, current conveyors, analog multipliers, oscillators, D/A and A/D converters.

Kod (Code)	ELE419
Ders (Title)	Sayısal Sistem Tasarımı (Digital System Design)
Content	Adder circuits. The r's and (r-1)'s complement. Subtraction with r's and (r-1)'s complement. Realization of Boolean functions with multiplexers. ROM design with multiplexers. Design with Field Programmable Gate Arrays (FPGA). Register design. Algorithmic State Machine (ASM): ASM chart, control implementation, design with multiplexers and PLA's, some examples. State reduction in completely specified and incompletely specified sequential machines. State assignment in synchronous sequential circuits. Design of asynchronous circuits: Race-free state assignment. Asynchronous circuits design with Programmable Logic Controllers (PLC).

Kod (Code)	ELE420
Ders	Yapay Sinir Ağları (Artificial Neural Networks)

(Title)	
Content	As a motivation, biological neural systems. Definition of Artificial Neural Networks (ANN). Supervised and unsupervised learning. Adaptive linear element. Mean square learning rule. Design of linear associative memory. Multi-layered perceptron design. Back propagation algorithm. Radial based ANN. Dynamic ANN. Hopfield net, cellular ANN. Kohonen Selforganized map. Pattern, image, speech processing and control with hardware and software realization of ANN.

Kod (Code)	ELE421
Ders (Title)	Tıp Elektronikine Giriş (Introduction to Medical Electronics)
Content	The origin of the action potential, bioelectrical sources, and the main properties of bioelectrical signals. Origin and properties of other physiological parameters. Electroneurography, electrocardiography, electroencephalography, electromyography, electroretinography and evoked potentials. Other physiological measurements: blood pressure, blood volume, blood flow, heart sound, respiratory system measurements.

Kod (Code)	ELE422
Ders (Title)	Biyolojik İşaretlerin Oluşumu ve Algılanması Yöntemleri (The Origin and Sensing Methods of Biological Signals)
Content	Introduction to human physiology: The cell and its function, origin of the action potential; bioreceptors; nervous, muscular, cardiovascular, respirator, gastrointestinal, urinary and endocrin systems; the special sense organs; biological signals originated from human systems. Sensing and preprocessing of biological signals: Characteristics of biological signals, the basic amplifiers and basic circuits used for analog processing of biological signals, instrumentation amplifier; electrodes, features and applications; resistive, capacitive, inductive, piezoelectric, electromagnetic and thermic transducers; transducer amplifiers and their calibration.

Kod (Code)	ELE424
Ders (Title)	Ses Ötesi ve Tıp Alanındaki Uygulamaları (Ultrasound and Applications in Medicine)
Content	Basic features of ultrasound propagation; wave equation, characteristic impedance, diffraction, scattering, focusing and Doppler effect, generation and

	detection of ultrasound, velocity and attenuation measurement techniques. Interaction of ultrasonic waves with tissue. Imaging methods: A and M mode imaging, static and dynamic (real time) imaging, three dimensional imaging, tissue characterization with ultrasound, biological effects of ultrasound, application of ultrasound in therapy.
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Kod (Code)	ELE436
Ders (Title)	Sayısal Sistem Tasarımı Laboratuvarı (Dijital System Design Laboratory)
Content	1.Characteristic of TTL and CMOS gate 2.Combinatorial circuit design 3.Flip-flops and triggering methods 4.Synchronous sequential circuit design 5.Using BUS in digital systems 6.Counters 7.Registers 8.Arithmetic operation units 9.Design of combinatorial logic circuits with programmable logic controller 10.Design of asynchronous sequential logic circuits with programmable logic controller

Kod (Code)	ELE443
Ders (Title)	CMOS Yüksek Devre Frekans Tasarımı (CMOS RS Circuit Design)
Content	

Kod (Code)	ELE492
Ders (Title)	Bitirme Çalışması (Graduation Project)
Content	Every student conducts an in-depth study in a selected area of Electronics Engineering under the supervision of an advisor and prepare a technical report of the study.

Kod (Code)	ELE426E
Ders (Title)	Mikroelektronik Analog Sistem Tasarımı (Microelectronic Analog System Design)
Content	Types of analog filters and their frequency-response specifications. Active RC, G/C and SC filter configurations. Electrical and physical design of active filter circuits: Components, parasitics, on-chip tuning, noise and offset. Data converter design:

DAC and ADC. Examples of integrated analog system design.

Kod (Code)	ELE429E
Ders (Title)	Haberleşme Elektronik Devreleri (Communication Electronic Circuits)
Content	Communication System Bloks, Mixers; Diode, Active Mixers, balanced and unbalanced configurations and their applications. High Power RF Amplifiers; Class A, AB and B linear power amplifiers, high efficiency power amplifiers, design of Class D and E type amplifiers. Phase-Locked Loops (PLL) and their applications. Frequency synthesisers, Modulator and de-modulator circuits.

Kod (Code)	ELE432E
Ders (Title)	Mikroişlemcili Sistem Tasarımı (Microprocessor System Design)
Content	Software and hardware design of microprocessor-based systems and system components. Microprocessor peripherals; description and applications of parallel/serial communication interface units, integrated timer/counter circuits, memory elements. A/D and D/A converters, universal logic elements. Single-chip microcontrollers and multiprocessor digital systems. Realization of digital filters.

Kod (Code)	ELE439E
Ders (Title)	Tıbbi Tedavi Sistemleri (Therapeutic Medical Systems)
Content	Design of therapeutic medical equipment-basic concepts, definition and description of medical problems/conditions, physiology underlying the diseases/disabilities that can benefit from therapeutic devices and systems, applicable therapy techniques, design criteria for optimal benefit in a specific application, safety issues, effect of feedback control on system performance, open and closed loop feedback control, applicable transducers, exemplary applications in areas such as sensory problems (partial to total loss of vision, hearing. etc.), mobility problems, internal and external organ deficiencies, cardiovascular problems and cancer.

Kod (Code)	ELE425
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Ders (Title)	Çok Geniş Ölçekli Tümdevre Tasarımı II (Very Large Scale Integrated Circuit Design II)
Content	Introducing of the CADENCE VLSI design environment. Examining the VLSI Design Flow. System level architectural design. Logic design and verification. Usage of VERILOG environment. Automatic synthesis of logic design. SYNOPSIS environment. Introduction of standart-cell libraries and their usage. Standard cell placement & routing. Full custom design strategies. Layout design in CADENCE-ARTIST design environment. Chip-level floorplanning and power distribution. VLSI test methods and design for testability.

Kod (Code)	ELE427
Ders (Title)	Mikroelektronik Teknolojisi (microelectronics Technology)
Content	Brief history of the microelectronics technology. Planar technology. micro-lithography. Thin films; Evaporation, sputtering and CVD techniques. thermal oxidation of silicon. Doping techniques; diffusion, ion implantation and epitaxy. In process measurement and evaluation techniques. Process simulation; SUPREM. Process design: junction isolated bipolar IC and CMOS IC fabrication processes. Packaging. Yield analysis.

Kod (Code)	ELE428
Ders (Title)	Endüstriyel Elektronik (Industrial Electronics)
Content	Linear and nonlinear applications of operational amplifiers: Current sources, AC-DC converters, function generators, comparators, Schmitt trigger, oscillator applications. Analog building blocks: OTA applications, instrumentation amplifiers. PLL applications. Power Supplies: Design with linear regulator ICs, switched mode power supplies. Power MOSFET and its applications: Switching properties, safe-operation area, driver circuits, amplifiers, bridge operation. Sensors; temperature, moisture, pressure, displacement, light intensity sensors.

Kod (Code)	ELE430
Ders (Title)	Radyo ve TV Sistemleri (Radio-Television Systems)
Content	General receiver principles, superheterodyne receivers, selectivity, sensitivity, image frequency, receiver distortions. AM & FM broadcasting principles and

systems, multiple carrier techniques and OFDM; PAL/SECAM/NTSC TV systems, PAL coding and decoding, picture artifacts, sampling and quantization of video signals, digital processing of video, video compression, MPEG, advanced TV systems, video recording, satellite and cable delivery of video signals.

Kod (Code)	ELE431
Ders (Title)	İleri Elektronik Laboratuvarı (Advanced Electronics Laboratory)
Content	IC building blocks: current and voltage sources, current and voltage references, amplifier stages, operational amplifier applications, operational transconductance amplifier (OTA) applications, current-conveyor applications, oscillator circuits, analog multiplier applications, IC characterization.

Kod (Code)	ELE433
Ders (Title)	Sayısal Filtreler ve Sistemler (Digital Filters and Systems)
Content	Filtering by discrete (fast) Fourier transformation. Design aspects of digital filters and realization problem finite impulse filter design methods. Infinite impulse filter design, i)linear phase filters ii>windowing, iii)frequency sampling iv) optimal filter design methods. Infinite impulse response filter design : i)numerical integration methods ii)impulse invariance methods iii) bilateral z-transformation method. Filter design based on least-squares method. i)Pade method ii)FIR Wiener filter. System identification, inverse-filter design, prediction, signal processing applications using software realization State-space representation of discrete time systems. Observable, controllable, canonical representation. Controllability, observability, stability. Methods to design control systems. System design by state feedback (pole implementation) state observer design. Design of optimal control systems.

Kod (Code)	ELE434
Ders (Title)	Lineer Olmayan Devreler ve Sistemler (Nonlinear Circuits and Systems)
Content	Classification of algebraic and dynamic systems. State-space and input-output representation of continuous and discrete time systems. State-space analysis stability of equilibrium points. Oscillators. Small signal analysis. Approximate analysis: Harmonic balance methods, numerical methods. Partitioning into linear dynamical and nonlinear algebraic subsystems. Input-output stability. Synthesis

	of nonlinear resistors and transfer functions. Design of algebraic systems as function approximation problem. Design of continuous and discrete-time dynamical systems: Synthesis of equilibrium points, design based on Lyapunov functions.
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Kod (Code)	ELE435
Ders (Title)	Mühendislik Sistem Analizi (Engineering Systems Analysis)
Content	General overview of engineering systems. Engineering systems other than electrical systems: mechanical, hydraulic, electro-mechanical and thermal systems. Application of the methods developed for the analysis of the electrical circuits to these engineering systems. Controllability and observability of the engineering systems. System components and modelling. Non-energetic multiport components (transducer) and the developed models.

Kod (Code)	ELE437
Ders (Title)	Biyomedikal Düzenler (Biomedical Devices)
Content	Physiological effects of electricity and electrical safety. Microcomputers in medical instrumentation. Clinical measurement devices. Electrosurgical and physical therapy devices. Radiology and nuclear medicine devices. Computers in medicine. Computer axial tomography. Advanced topics in medical electronics.

Kod (Code)	ELE437
Ders (Title)	Biyomedikal Düzenler (Biomedical Devices)
Content	Physiological effects of electricity and electrical safety. Microcomputers in medical instrumentation. Clinical measurement devices. Electrosurgical and physical therapy devices. Radiology and nuclear medicine devices. Computers in medicine. Computer axial tomography. Advanced topics in medical electronics.

Kod (Code)	ELE440
Ders (Title)	Tıp Alanında Kullanılan Bilgisayar Destekli Düzenler (Computer Aided Devices in Medicine)

Content	Origins and properties of biological signals. Transducers for biological signals. Patient isolation methods. Fundamentals of computer units. Computer assisted biological signal acquisition, processing and monitoring. Archiving and transmitting of biological signals and images in and between medical centers. Computer aided telemetric system design. Microprocessor based blood pressure, body temperature, electrocardiogram, and electromyogram measurement devices.
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Kod (Code)	ELE441
Ders (Title)	Tıp Elektroniği Laboratuvarı (Medical Electronics Laboratory)
Content	Some basic devices used for biological signal processing: elektrokardiografik amplifier; transducers and electrodes; right leg driver; hydromechanical and electrical models of human cardiovascular system, digital processing of biological signals, adaptive and digital filters.

Kod (Code)	ELK214
Ders (Title)	Elektromekanik Enerji Dönüşümü (Electromechanical Energy Conversion)
Content	General principles, input-output variables, motor, generator and transformer. Energy conservation and energy balance equation. Relationships between torque-force and magnetic-electric field energies. Self and mutual inductances, torque and force. Generalized and simple machine models, mathematical and circuit models. Conditions for continuous energy conversion, various machine models.

Kod (Code)	ELK234
Ders (Title)	Elektrik Santral Makinaları (Power Plant Machines)
Content	The basics of technical thermodynamics, steam and gas power cycles, thermal energy conversion, boiler, steam and gas turbines. The construction of thermal power plants and environmental pollution issues, nuclear power plants, combined thermal-power generation (cogeneration). The concepts of hydrostatic pressure and force, power losses. The classification of hydraulic machines. Description number. Components of hydroelectric power plants. Hydro turbines.

Kod	FIZ101
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(Code)	
Ders (Title)	Fizik I (Physics I)
Content	Vectors. Motion in one dimension. Motion in two dimensions. Newton's laws and their applications. Newton's universal gravitation law. Work and energy. Conservation of energy. Momentum and motion of systems. Static equilibrium of rigid bodies. Rotation and angular momentum.

Kod (Code)	FIZ101L
Ders (Title)	Fizik I Laboratuvarı (Physics I Laboratory)
Content	Fundamental measurements. Motion with constant acceleration. Conservation of linear momentum. Equilibrium. Friction. Rotation dynamics. Simple harmonic motion. Projectile motion. Elastic and inelastic collisions in two dimensions. Moment of inertia. Centripetal acceleration. Physical pendulum.

Kod (Code)	FIZ106
Ders (Title)	Fizik II (Physics II)
Content	Periodic motions. Free oscillations. Forced oscillations and resonance. Standing and propagating waves. Fluid mechanics. Sound. Temperature and heat conduction. I. Law of thermodynamics. Kinetic theory of gases. II. Law of thermodynamics.

Kod (Code)	FIZ106L
Ders (Title)	Fizik II Laboratuvarı (Physics II Laboratory)
Content	Latent heat of ice melting. Specific heat of solids. Heat capacity. Thermal expansion coefficient of solids. Ideal gas law. Heat conductivity. Joule-calory conversion coefficient. Binomial distribution. Probability and entropy.

Kod (Code)	FIZ201
Ders	Modern Fizik (Modern Physics)

(Title)	
Content	Relativity. Particle characteristics of waves. Wave characteristics of particles. Atomic structure. Quantum mechanics. Quantum theory of the hydrogen atom. Many-electron atoms. Molecules. Statistical mechanics. Solid state physics.

Kod (Code)	ING101
Ders (Title)	English I (English I)
Content	

Kod (Code)	ING201
Ders (Title)	English III (English III)
Ýçerik	
Content	

Ders Kodu	Ders Adı
ING 102	English II
ING 103A	Creative Writing
ING 103AA	Technical English
ING 103AB	History of Drama & Perf. Arts
ING 103AC	Urban Ecology
ING 103AD	Advanced English for Engineers
ING 103B	Business English
ING 103C	Great Moments in Science
ING 103D	Advanced Reading
ING 103E	American Literature
ING 103F	British Literature
ING 103G	Business Communications
ING 103H	Public Presentations
ING 103I	Short Stories
ING 103J	Communication and Mass Media
ING 103K	Urban Socioecology
ING 103L	Mythology
ING 103M	Writing on the Computer
ING 103N	Film Studies

ING 103O	Psychology
ING 103P	Poetry
ING 103R	HTML
ING 103S	Theatre
ING 103T	Social Psychology
ING 103U	Business Matters
ING 103V	Environmental Ethics
ING 103W	History of Bosphorus
ING 103X	English Literature
ING 103Y	Reading in Cont Bus Literature
ING 103Z	Introduction to Business

Kod (Code)	ITB037
Ders (Title)	Bilgi, Dil ve Mantık (Knowledge, Language and Logic)
Content	Wittgenstein and Austin are some of the major philosophers, who contribute the linguistic turn in the twentieth century. This course examines their views on language by appealing to some of the newest interpretations of their texts. "Family resemblance," "form of life," "language games," "performative utterances" are some of the concepts to be analyzed. Lecturing as well as class discussion is the methodology of the course.

Kod (Code)	ITB087
Ders (Title)	Medya ve Toplum (Media and Society)
Content	The aim of the course is to provide students to the study of the photographic and moving image. The course is organized around four themes. In the first part of the course, we examine photography and look at the relation between photographs and the social reality they appear to present. In the second part, we look at the film and television, and analyze the number of specific issues including film and television genre and narrative and realism in film and television. In the third part, we analyze the development of new digital media including the internet. The final part of the course discusses the links between politics and the media.

Kod	ITB151
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(Code)	
Ders (Title)	İnsan Kaynakları Yönetimi (Human Resource Management)
Content	Past, present and future of Human Resource Management CV preparation, interview technics Human resources functions Staffing the organization Training and developing employees.

Code	Title
ITB 020	Modernitenin Oluşumu
ITB 020E	Formations of Modernity
ITB 094	Uluslar. İliş.ve Küreselleşme
ITB 094E	International.Rel.and Globali.
ITB 095	Teknoloji, Politika ve Hukuk
ITB 095E	Technology, Policy and Law
ITB 143	Durrel ve Said:Oryanta.Uyg ve
ITB 143E	Durell&Said: Orient Pra&Theory
ITB 151E	Human Resources and Management
ITB 171	Bilim, Teknoloji ve Toplum
ITB 171E	Science, Techn&Society
ITB 179	İçiçe Ayr.Ede.:Vizyone,Seyf.,A
ITB 179E	Lit.of Int.Sep.:Viz.,Seyfettin
ITB 201	İnsan ve Topl. Bilim. Giriş
ITB 201E	Intr. to Human.& Soc. Sciences
ITB 202	Dünya Tarihi
ITB 202E	World History
ITB 203	Sosyolojiye Giriş
ITB 203E	Introduction to Sociology
ITB 204	Politikaya Giriş
ITB 204E	Introduction to Politics
ITB 205	Felsefeye Giriş
ITB 205E	Introduction to Philosophy
ITB 206	Dünya Politikasında Meseleler
ITB 206E	Issues in World Politics
ITB 207	Osmanlı Tarihi
ITB 207E	Ottoman History

ITB 208	Modern Türkiye'nin Oluşumu
ITB 208E	Formations of Modern Turkey
ITB 209	Türkiye ve Dünya
ITB 209E	Turkey in World Affairs
ITB 211	İstanbul:Tarih,Sanat ve Toplum
ITB 211E	Istanbul:Hist.,Art and Society
ITB 212	Sanat,Kültür ve Toplum
ITB 212E	Art,Culture and Society
ITB 213	Edebiyat ve Toplum
ITB 213E	Topics in Literature&Society
ITB 215	Tarih ve Toplum
ITB 215E	Topics in Hist.and Society
ITB 216	Ekonomi ve Toplum
ITB 216E	Economy and Society
ITB 217	Mühendislik Etiği
ITB 217E	Engineering Ethics
ITB 218	Bilim ve Teknoloji Tarihi
ITB 218E	History of Science&Technology
ITB 219	Etik
ITB 219E	Ethics
ITB 220	Psikolojiye Giriş
ITB 220E	Introduction to Psychology
ITB 222	Kent ve Toplum
ITB 222E	City and Society
ITB 224	Çevre ve Toplum
ITB 224E	Environment and Society
ITB 226	Sanat Felsefesi
ITB 226E	Philosophy of Art

Kod (Code)	KIM101
Ders (Title)	Genel Kimya I (General Chemistry I)
Content	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, solution and their physical properties, thermochemistry, chemical kinetics, principles of chemical equilibrium, acids and bases, solubility.

Kod (Code)	KIM101L
Ders (Title)	Genel Kimya I Laboratuvarı (General Chemistry I Laboratory)
Content	1. The identification reactions of anions. 2. The identification reactions of cations. 3. Determination of reaction rate. 4. Preparation of an inorganic preparat. 5. Determination of the hydrate formula. 6. Iodometry. 7. Determination of dissociation constants of weak acids. 8. Determination and removal of hardness of water. 9. Determination of pH with colorimetric method. 10. Synthesis of soap

Kod (Code)	KIM202
Ders (Title)	Fiziksel Kimya (Physical Chemistry)
Content	Physical chemistry and its branches, basic concepts, gases, ideal gases, real gases, first principle of the thermodynamics, work, heat, energy, Joule-Thomson experiment, application of the first principle in the ideal gas processes, second principle of the thermodynamic, thermodynamic yield, entropy, changes of the entropy in reversible and irreversible processes, third principle and absolute zero, material equilibrium, Gibbs and Helmholtz free energies, Gibbs and Maxwell equations, calculation of the change of state functions (internal energy, enthalpy, entropy, Gibbs and Helmholtz free energies) from the measurable physical properties, chemical potential and material equilibrium, phase equilibriums, phases rules, phase diagrams, Clasius-Clapeyron equation, solutions, ideal solutions and Raoult's law , ideal solutions, colligative properties, vapor pressure, depression of freezing point, increasing of boiling point, osmotic pressure, kinetic theory of the gases, molecular speed, pressure, distribution of the molecular speed, average speed, average free way, collisions, reaction kinetics, rate law, types of reactions, integration of the rate law, determination of the rate law by the experimental methods, reaction mechanism, dependence of the rate constant on the temperature, rate theories, catalysts and catalytic reactions.

Kod (Code)	KIM203
Ders (Title)	Analitik Kimya (Analytical Chemistry)

Content	General informations about analytical chemistry and some fundamental concepts, chemical equation, solubility and solubility product, interpretation analytical data, principles of gravimetric analysis and methods, volumetric analysis, acid base titration and application, precipitation titration, complexometric titration, manganometric titration, general principles and applications of oxidation reduction
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Kod (Code)	KIM204
Ders (Title)	Genel Kimya II (General Chemistry II)
Content	Chemical thermodynamics, electrochemistry, chemistry of elements, nuclear chemistry, organic chemistry, introduction to biochemistry, atmosphere and water chemistry.

Kod (Code)	KIM205
Ders (Title)	Organik Kimya (Organic Chemistry)
Content	Structure and bonding in organic compounds, covalent bonding and chemical reactivity, hybrid orbitals, alifatic hydrocarbons (alkanes and cycloalkanes, alkenes, alkynes. compounds with halogen, alcohols, diols and ethers, aromatic compounds, chemistry of aromatic compounds, carbonyl compounds, aldehydes and ketones, carboxylic acids and their derivatives, carbonhydrates, lipids, amino acids, proteins, polymers, spectroscopic methods for structure identification of organic compounds.

Kod (Code)	KIM207
Ders (Title)	İnorganik Kimya (Inorganic Chemistry)
Content	Electrons in atoms, principles of quantum mechanics, periodic properties of elements, molecular structure, molecular symmetry, covalent bond, valence bond theory, molecular orbital theory; electronegativity, ionic bond, crystal structure of ionic compounds, metallic bond, intermolecular forces, hydrogen bonding, the effects of intermolecular forces, acid- base concepts, hard and soft acids and bases, acid and base strength, transition metals and coordination compounds.

Kod (Code)	KIM208
Ders (Title)	Ýleri Organik Kimya (Advance Organic Chemistry)
Content	Functional aromatic compounds, carbonhydrates, cellulose and derivatives, spectroscopic methods for structure identification of organic compounds, organic compounds as industrial row metaterials, polymers, industrial polymers, dye compounds, surface active compounds, application of organic chemistry

Kod (Code)	KON224
Ders (Title)	Ölçme ve Enstrümantasyon (Measurement and Instrumentation)
Content	

Kod (Code)	KON317
Ders (Title)	Kontrol Sistemleri (Control Systems)
Content	Discrete-time modelling and block-diagram representation of continuous-time systems. Realization of transfer functions in state space. Feedback concept. PID controller and its influence on system response. Time-domain criterion and stability analysis. Frequency domain criterion and stability analysis. Linearization methods for nonlinear control systems. Root-locus diagrams.

Kod (Code)	KON424
Ders (Title)	Biyolojik Sistemlerin Modellenmesi ve Kontrolü (Modelling and Control of Biological Systems)
Content	Derivation of mathematical models of biological systems. Fundamental concepts; biological resistors and memories, models of neurons, signal analysis of biological systems and closed loop concept. Applications: The control loops of eye and sensing organs, the control of body temperature, the control of blood pressure, motion control loops.

Kod (Code)	MAL201
Ders (Title)	Malzeme Bilimi (Materials Science)

Content	Mechanical behavior of materials: tensile test, stress-strain relations, brittle behavior, ductile behavior, shear effect, hardness. Physical properties of materials: specific gravity, water absorption, void ratio, permeability, capillary water absorption. Internal structure of materials: atomic structure, ionic bonding, covalent bonding, metallic bonding. Van der Waals bond, classification of materials. Crystalline structure: directions and planes, metals and ceramics. Crystal defects: point defects, planar defects. Non-crystalline materials: Glass, fluid, gas, phases. Solid solutions. Atomic diffusion. Strengthening mechanisms in metals, cold hardening, hot hardening, alloying, annealing, eutectic alloys, heat treatment, tempering. Creep, relaxation, fracture, and fatigue constitutive equations of materials.
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Kod (Code)	MAT101E
Ders (Title)	Mathematics I (Mathematics I)
Content	Functions of one variable; limits and continuity, derivative and differentiation; chain rule, implicit differentiation. Applications of derivative; maxima and minima, the mean value theorem. Integration; indefinite integrals, integral rules, definite integrals, the fundamental and the mean value theorems of integral calculus. Applications of definite integrals; length of curves, area, volumes of revolution. Transcendental functions. Integration techniques, L'Hospital rule, Improper integrals.

Kod (Code)	MAT102E
Ders (Title)	Mathematics II (Mathematics II)
Content	Sequences; limits, monotone sequences. Series with positive terms, series with arbitrary terms, absolute and conditional convergence, power series, Taylor and Maclaurin series. Vector calculus. Functions of multiple variables; limits, continuity, partial derivatives, chain rule, directional derivatives, maxima and minima, Lagrange multipliers, Taylor's formula. Double and triple integrals, line integrals, Green's theorem in the plane, Surface area and surface integrals, Divergence and Stokes theorem.

Kod (Code)	MAT201
Ders (Title)	Diferansiyel Denklemler (Differential Equations)

Content	First order equations; separable equations, linear equations, change of variable and integrating factor, existence and uniqueness theorems, applications. Higher order linear equations; the method of variation of parameters, reduction of order, Constant coefficient equations, the method of undetermined coefficients. Euler-Cauchy equation. Power series method; solution around ordinary and regular-singular points. Laplace transformation; basic definition and theorems, solution of initial value problems, convolution, delta function, transfer function. Systems of linear differential equations; fundamental theory and solutions, solutions using Laplace transformation. Second order linear partial differential equations and separation of variables.
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Kod (Code)	MAT271
Ders (Title)	Olasılık ve İstatistik (Probability and Statistics)
Content	Combinatorial methods; product rule, permutation, combination. Probability; sigma algebra, probability axioms, conditional probability, Bayes formula. Random variable; distribution function, probability function, Chebyshev inequality. Discrete and continuous distributions; uniform, Bernoulli, Poisson, geometric, hypergeometric, normal, exponential, gamma and beta distributions. Generating functions. Decision theory. The notion of estimation. Hypothesis testing. Non-parametric testing. Correlation and regression.

Kod (Code)	MAT281
Ders (Title)	Lineer Cebir ve Uygulamaları (Linear Algebra and Applications)
Content	

Kod (Code)	MAT106
Ders (Title)	Analitik Geometri (Mathematics II)
Content	Vector calculus. Space and plane analytic geometry; equations of lines and planes, conics, quadratics, spherical and cylindrical coordinates. Vector functions; space curves, unit tangent vector, curvature and torsion, Frenet formulae. Gradient, directional derivative, divergence, curl. Line integrals and applications to geometry and physics; Green theorem. Triple and surface integrals; Divergence and Stokes theorem.

Kod (Code)	MAT202
Ders (Title)	Sayısal Yöntemler (Numerical Methods)
Content	

Kod (Code)	MAT205
Ders (Title)	Kompleks Fonksiyon Teorisi (Theory of Complex Functions)
Content	Complex numbers, analytic and harmonic functions, elementary functions, contour integrals, Cauchy theorem, Cauchy integral formula. Taylor series. Singular and isolated singular points. Laurent series. Residue theorem. Application of Residue theorem to calculation of integrals. Maximum modulus principle. Mapping by elementary functions, conformal mapping. Linear fractional transformations. Applications of conformal mappings. Schwarz-Christoffel transformations, Poisson type integral formulas.

Kod (Code)	MAT206
Ders (Title)	Mühendislikte Bulanık Matematik (Fuzzy Mathematics)
Content	Background, Uncertainty and Imprecision, Statistics and Random Processes, Uncertainty in Information; Fuzzy sets and Membership; Classical sets and Fuzzy sets; Classical Relations and Fuzzy Relations, Membership Functions; Fuzzy to Crisp Conversions, Fuzzy Arithmetic; Numbers, Vectors and the Extension Principle; Classical Logic and Fuzzy Logic, Fuzzy Rule Based Systems, Fuzzy Nonlinear Simulation, Fuzzy Decision Making.

Kod (Code)	MAT208
Ders (Title)	Bilim ve Matematik Tarihi (Science and History of Mathematics)
Content	Knowledge its sources. Reliability and its value. Its kinds and its systematic knowledge and the awakening of the science. Its relation with production. Interaction of science, religion, trade, wars and witchcraft. Civilization in Egypt, Mesopotamia, India, China and South America and plus value in these civilizations and its role in the development of science and mathematics. Number, measuring and comparison of figures. Anatolia, Aegean region, Iran and Rome. Especially science and mathematics in ancient Greece, Hellenistic period and its science and mathematics. Its destruction by barbarians. Development of science

and mathematics in islamic world. Early mathematics in western world: Sicily, South Italy. Moving to north: France, England and Germany and the great scientific revolution and in its aftermath industrial revolution. Descartes, Pascal, Fermat, Newton, Leibniz and Bernoulli. Great mathematicians of 18. and 19. century: Euler, Jacobi, Gauss, Cauchy and others. The crisis in mathematics: Non-Euclidean Geometries, Mathematical Logic and Set Theory and new objects: Hyper complex systems, new algebra and matrices. Contribution of G. Boole, B. Russell and R. Poincaré. Big bang in the 20. century. New mathematics, new objects and healing of crisis. Contributions of D. Hilbert, K.Gödel, Von Neumann and others. Mathematics of today. Changing in mathematics and permanent qualities and objects of mathematics. Mathematics of tomorrow.

Kod (Code)	MAT301
Ders (Title)	Kısmi Türevli Diferansiyel Denklemler (Partial Differential Equations)
Content	The single first order equation; general solutions of linear and quasi-linear equations and Cauchy problem, nonlinear equations. Second order linear equations in two independent variables; Cauchy problem and classification, canonical forms. One dimensional wave equations; Cauchy problem, D'Alembert's solution, Inhomogeneous wave equations. Elliptic equations; Laplace equation, max-min principle, boundary value problems and Green's functions. Parabolic equations; initial and boundary value problems, fundamental solutions and Green's functions. Analytical methods of solution; separation of variables and integral transform techniques.

Kod (Code)	MAT427E
Ders (Title)	Algebra II (Algebra II)
Content	Group theory; isomorphism theorems, fundamental theorem of Abelian groups, Sylow's theorems, solvable groups, nilpotent groups. Field theory; extension fields, simple extension theorem, finite fields, separable extension, normal extension, fundamental theorem of Galois theory, solvability by radicals, construction with straight edge and compass.

Kod (Code)	MAT447
Ders (Title)	İntegral Denklemler (Integral Equations)

Content	Introduction; the classification of integral equations. Fredholm alternative in finite dimensional spaces. Hilbert spaces. Fundamental Existence Theorems; fixed point theorems, contraction maps. The existence theorems. Volterra integral equations. Integral equations with weak kernel. Degenerate kernels and Fredholm's alternative. Integral Equation with L_2 Kernels; compact and self-adjoint compact operators (Hilbert-Schmidt operators) . Positive operators. The upper and lower boundaries for Eigen-values. Fredholm equations with self-adjoint compact operator. Fredholm's alternative. Fredholm's theory. Some singular integral equations; the solutions with Fourier and Laplace transformations. Projection method. Weiner-Hopf method.
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Kod (Code)	MAT495
Ders (Title)	Temel Cebirsel Topoloji (Basic Algebraic Topology)
Content	

Kod (Code)	MUK203
Ders (Title)	Mukavemet I (Strength of Materials I)
Content	Introduction. Concept of modeling and basic principals. Normal axial forces, shear forces and bending and torsional moments in one dimensional structures. Mechanical properties, static and dynamic loadings. Elastic stresses and strains due to axial, shear and bending and torsional moments. Transformations of stress and strain, multidimensional stress-strain relations. Combined loadings. Special topics.

Kod (Code)	STA201
Ders (Title)	Statik (Statics)
Content	

Kod (Code)	STA204
Ders (Title)	Statik ve Mukavemet (Statics and Strength of Materials)
Content	

Kod (Code)	TEL111
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Ders (Title)	Telekomünikasyon Mühendisliğine Giriş (Introduction to Telecommunication Engineering)
Content	Relevance Telecommunication Engineering curriculum to the practice of engineering in manufacturing and R&D environments. Various approaches and methods in problem solving. Introduction to communication and signal processing theory and techniques. Examples of applications.

Kod (Code)	TEL212
Ders (Title)	Elektromagnetik Alanlara Giriş (Introduction to Electromagnetic Fields)
Content	vectors and electromagnetics, elektrostatics, magnetostatic fields components, EM fields in different materials. Elementary electromagnetic field theory as summarized in Maxwell's equations for time varying fields in integral and differential form, energy storage and quasistatic fields, EM field and materials, vector calculus and potential functions, time domain analysis of waves, PC assisted instruction of field calculations.

Kod (Code)	TEL232
Ders (Title)	Analog İşaret İşleme (Analog Signal Processing)
Content	Introduction to analog signal processing, with an emphasis and understanding concepts from circuit and system analysis; linear systems, review of elementary circuit analysis, differential equation models of linear circuits and systems, Laplace transform, convolution, stability, phasors, frequency response, Fourier series, Fourier transform, active filters.

Kod (Code)	TEL252
Ders (Title)	İşaretler ve Sistemler (Signals and Systems)
Content	Classification of signals and systems. Fourier analysis of continuous and discrete signals and systems. Modulation concept and sampling theorem. Sampling in time and frequency domain. Discrete and fast Fourier transform. Transformation of continuous time systems into discrete time systems. Representation of difference equations. State space equations and their solution. z transformation and their properties. Analysis of discrete time systems in z domain. Introduction to filtering.

Kod (Code)	TEL332
Ders (Title)	Sayısal İşaret İşleme Laboratuvarı (Digital Signal Processing Laboratory)
Content	Discrete-time signals in the time domain. Discrete time signals in the frequency domain. LTI discrete-time systems in the frequency domain. Digital processing of continuous*-time signals. Digital filter structures. Digital filter design. Digital filter implementation. Analysis of finite word-length effects. Multirate digital signal processing.

Kod (Code)	TEL341
Ders (Title)	Mikrodalga (Microwaves)
Content	Current and voltage waves in transmission lines, frequency and time domain analysis, power and energy flow, impedance matching, Smith Chart, microstrip lines, pulse transmission on lines, basic principles of circuit analysis by S-parameters, basics of microwave radio propagation and introduction to antennas.

Kod (Code)	TEL342
Ders (Title)	Haberleşmenin Temelleri (Telecommunication Engineering Basics)
Content	Amplitude modulation techniques. Amplitude modulators and demodulators. Frequency and phase modulation. Frequency modulators and demodulators. Frequency division multiplexing. Pulse modulation techniques. Quantization, compressing-expanding, analog-digital converters, delta modulation. Baseband data transmission. Inter symbol interference, Nyquist channel, multilevel baseband transmission, error performance analysis. Digital modulation techniques. Amplitude-shift, phase-shift and frequency-shift keying.

Kod (Code)	TEL242
Ders (Title)	Veri Yapıları ve Yazılım İlkeleri (Data Structures and Software Principles)
Content	Elementary data structures and data types; lists, stacks, queues, trees, searching and sorting techniques. Memory management. Graph algorithms. String

algorithms. Fundamental principles of software engineering, programming project, program design concepts.

Kod (Code)	TEL352
Ders (Title)	Sayısal Haberleşme (Digital Communication)
Content	Sampling theorem, Nyquist criterion, ideal sampling, natural sampling, flat-top sampling. Pulse modulation techniques. Pulse amplitude modulation (PAM), pulse duration (PDM) and pulse position (PPM) modulation, pulse code modulation (PCM), quantization, compressing-expanding, analog-digital converters, delta modulation (DM), differential pulse code modulation (DPCM). Baseband data transmission: intersymbol interference, design of transmit and receive filters, Nyquist channel, bandwidth efficiency, multilevel baseband transmission, error performance analysis. Binary digital modulation techniques: Binary amplitude shift keying (ASK), binary frequency and phase shift keying (FSK, PSK).

Kod (Code)	TEL412
Ders (Title)	Mikrodalga Mühendisliği (Microwave Engineering)
Content	Microwave network analysis using scattering parameters; active and passive subsystems, devices for Transmission media, microwave integrated circuits, receiver, transmitter, modulator, mixer and phase shifter fundamentals, examples of computer simulation.

Kod (Code)	TEL441
Ders (Title)	Temel Haberleşme Laboratuvarı (Basic Communication Laboratory)
Content	Amplitude Modulation/Demodulation, Frequency Modulation/Demodulation, Transmission Lines, Sampling and Pulse Modulation, Pulse Code Modulation, Delta Modulation, Bit Error Probability in Baseband Communication.

Kod (Code)	TEL451E
Ders (Title)	Telekomünikasyon Sistemlerin Yönetimi (Telecommunication System Management)

Content	Examines problems and issues in telecommunications management; the role of management in operation of broadcasting, cable, and telecommunications industries; forces shaping products and services in commercial and non-profit media, i.e., technology, markets, revenues, programming, and regulation; planning, accountability, and social responsibility.
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Kod (Code)	TEL413
Ders (Title)	Mobil İletişime Giriş (Introduction to Mobile Communications)
Content	Mobile cellular radio principles; fundamental features, propagation issues, spectral efficiency. Analog cellular mobile radio systems; cellular layout, fundamental operational concepts, different international analog cellular systems. Digital cellular radio systems; analog cellular vs. digital cellular. The pan-European System: GSM; system description, air interface and network features, radio equipment. Comparison of various digital cellular systems. A view of the future.

Kod (Code)	TEL414
Ders (Title)	Haberleşme Teorisi (Communication Theory)
Content	Random processes, modelling of noise: Gaussian noise, white noise, narrowband noise. Noise analysis in analog modulation: The effect of noise to the signal-to-noise ratio after demodulation in systems with amplitude modulation, threshold effect. Comparisons of signal-to-noise ratio values after demodulation of systems with carrier amplitude, double side-band, single sideband and vestigial sideband modulation. Noise analysis in exponential modulation, threshold effect in frequency modulation. Noise analysis in pulse code modulation, comparisons with amplitude and frequency modulation. Correlated digital transmission techniques, partial response coding techniques, their spectral properties.

Kod (Code)	TEL415
Ders (Title)	Veri Haberleşmesi (Data Communications)
Content	Fundamentals of data communications. Data transmission media. Baseband data transmission. Data transmission with modulated carrier, modems. Data networks and architectures. Internet and Intranet. Interfaces and protocols. ITU-T V and X series recommendations. Data communication quality: security, reliability, availability and maintainability.

Kod (Code)	TEL416
Ders (Title)	Antenler (Antennas)
Content	Antenna parameters, polarization of electromagnetic waves, basic antenna types, antenna arrays, broadband antenna design, antenna measurements.

Kod (Code)	TEL418
Ders (Title)	Mikrodalga Sistem ve Anten Laboratuvarı (Microwave Systems and Antenna Laboratory)
Content	Measurements of frequency, wavelength, power and attenuation. Impedance measurement. Measurement of S-parameters. Measurements for various characteristics of microwave telecommunication circuits and sub-systems. Measurements of VHF, UHF and Microwave Antenna radiation parameters. Measurements of fiber optic characteristics.

Kod (Code)	TEL419
Ders (Title)	Bağlaşma ve Teletrafik Teorisi (Switching and Teletraffic Theory)
Content	Switching in telecommunications. Circuit, message and packet switching. Fundamentals of circuit switching. Telephone exchanges switching networks and control techniques, SPC. Switching software. Signalling systems. Hierarchical network structure. Intelligent networks. Terminals and access to the network. Mobile systems and GSM. Space and time division switching. Digitalisation in telecommunication network. IDN and ISDN. Teletraffic engineering. Quevening systems. Lost and delayed calls. Switching network planning.

Kod (Code)	TEL422
Ders (Title)	Ses ve Konuşma (Sound and Speech)
Content	Physical acoustics, propagation of acoustical waves. Speech and hearing. Speech processing and applications. Electroacoustic transducers and applications. Ultra and infra sound acoustics. Sound recording noise measurements, noise emission and noise reduction. Environmental noise and quality. ISO noise standards.

Kod (Code)	TEL477
Ders (Title)	Elektromanyetik Uyumluluk Temelleri ()
Content	

Kod (Code)	TEL433
Ders (Title)	Mikrodalga ve RF Haberleşmesi (Microwave&RF Communications)
Content	Modelling of the multipath channels. Diversity techniques. Spread spectrum. Frequency hopping spread spectrum. Some applications. Digital radio systems. Link analysis. Antennas and medium parameters. System gain. Interference and noise. Transmitters, receivers and repeaters. Design applications.

Kod (Code)	TEL492
Ders (Title)	Bitirme Çalışması (Graduation Project)
Content	Every student conducts an in-depth study in a selected area of Telecommunication Engineering under the supervision of an advisor and prepare a technical report of the study.

Kod (Code)	TEL424E
Ders (Title)	Uydu Haberleşmesi (Satellite Communications)
Content	Fundamentals of satellite communication system structures. Satellite subsystems, detailed link analysis, antennas and link propagation properties, multiplexing, modulation and multiple access techniques. Earth stations. Design examples for fixed and mobile satellite communication systems.

Kod (Code)	TEL425E
Ders (Title)	Fiber Optik Haberleşme Sistemleri (Fiberoptic Communication Systems)
Content	The importance and application areas of optical laser communication systems.

	Hisktorical survery. The communication channel: Optical film, optical fiber, propagation characteristics, attenuation and dispersion in fibers, fiber cables. Optical sources: Light emission from semiconductor devices,LED principles of Laser's. LD, modulation techniques. Optical receivers: PIN and APD. Quantum limited receiver. Signal/noise ratio and BER. System aspects. Design principles dispersion and attenuation limitations, line codes. Fiber optic networks. T and star couplers. Active repaters. Coherent modulation techniques.
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Kod (Code)	TEL426E
Ders (Title)	Uzaktan Algılama (Remote Sensing)
Content	Properties of earth atmosphere, spektral characteristic of surface objects; space radiation collection systems; detectors; passive radiometer and spectrometers; active lidar; Synthetic aperture radar and tracking systems. Satellite sensing. Digital image processing algorithms: Image characteristics. Image processing instrumentation. Examples for remote sensing applications.

Kod (Code)	TEL428E
Ders (Title)	Kablosuz İletişim Ağları (Wireless Communication Networks)
Content	Overview of cellular systems. Channel characterizaiton Cell layout and cell splitting. Blocking and delay models. Erlang capacity. Network architecture.

Kod (Code)	TEL429E
Ders (Title)	Çoğulortama Giriş (Introduction to Multimedia)
Content	Media and data streams. Audio. Images and graphics. Video and Animation. Data compression. Optical Strage media. Computer technology. Multimadia operation systems. Networking systems. Multimedia communication systems. Database systems. Documents. User interfaces. Synchronization. Multimedia applications.

Kod (Code)	TEL432E
Ders (Title)	Görüntü İşlemenin Temelleri (Image Processing Fundamentals)

Content	What is image processing? Image processing applications and basic problems. Cameras. Preception. Human visuals system and computer vision systems. Reviw of two-dimensional systems. Histogram-based operations. Convolution-based operations. Smoothing operations. Derivative-based operations. Morphology-based operations. Contour representations. Basic enhancement and restoration techniques. Segmentation. Fundamentals of image coding and compression.
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Kod (Code)	TEL435E
Ders (Title)	Sayısal Ses İşleme (Digital Speech Processing)
Content	Applications of digital signal processing to speech signals. Acoustic theories of speech production leading to time and frequency domain models. Speech analysis synthesis technique. Applications to music analysis and synthesis.

Kod (Code)	TEL434E
Ders (Title)	Optimizasyona Giriş (Introduction to Optimization)
Content	Basic Theory and methods for the solution to finite-dimensional optimization problems; iterative and computational algorithms for unconstrained and constrained optimization; linear, nonlinear and large-scale programming with applications.

Kod (Code)	TEL430
Ders (Title)	Sayısal Bağlaşma Sistemleri (Digital Switching Systems)
Content	Digital circuit switching systems, hardware and software organisations. OSI reference model and protocols. Queuing systems. Packet switching systems. X.25 protocol. ISDN and frame relay. SMDS and DQDB-MAN. Asynchronous Transfer Mode (ATM). xDSL access and SDH transport technologies. Local Area Networks (LAN's). Interconnection of LAN's. FDDI backbones.

Kod (Code)	TEL431
Ders (Title)	Sayısal Haberleşme Sistemleri Laboratuvarı (Digital Communication Systems Laboratory)

Content	Line Coding and Partial Response Signaling, Digital Modulation/Demodulation, Modem, Digital Switching and Central Office, Communication Protocols and Networks, Mobile Communication, Spread Spectrum Communication.
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Kod (Code)	TEL468
Ders (Title)	Elektromanyetik Uyumluluk Ölçüm Temelleri ()
Content	

Kod (Code)	TUR102
Ders (Title)	Türkçe II (Turkish II)
Content	