Erciyes University, Faculty of Engineering

Department of Electrical and Electronics Engineering

Course Contents

7. Semester

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 407	Electronic Design and Application	0	3	3	3
Course Description:					
The purpose of this course is to provide the developing students' abilities. Students have to be realizing a practical or theoretical project to choose final projects.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 413	Communication Laboratory	0	2	2	2
Course Description:					
Signal source presentation. Tune circuits. Amplifier. Filters. Balanced modulators. Simple amplitude modulators. Separation and demodulation. Superheterodyne radio. Frequency modulation. FM detection.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 403	Power Electonics I	2	0	3	3
Course Description:					
Power electronic devices such as power diode, power BJT, power MOSFET, SCR, Triac, Diac, IGBT, GTO etc and their characteristics.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 405	Wireless and Mobile Communications	2	0	3	3
Course Description:					
Principles of wireless and mobile communications. Propagation characteristics of mobile radio channels. Multipath propagation sources, multipath fading, small and large scale fading. Types of small scale fading. Methods for alleviating the effects of fading channels, multicarrier transmission. Spread spectrum communications. Principles of cellular communications. Handoff. Cell types used in mobile communications. Development of mobile communication systems. Description of the current mobile communication technologies (GSM 900, GSM 1800, HSCSD, GPRS, EDGE). 3rd generation mobile communication systems (UMTS and CDMA 2000 versions).					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 409	Communication Systems	2	0	3	3
Course Description:					
Stationary and nonstationary random processes. Bandpass random processes. Behaviours of amplitude, frequency, phase and pulse modulated systems in noise environment. Behaviours of digital modulated systems (ASK, FSK, PSK, DPSK and M-ary systems) in noise environment. Signal space. Optimum receiver structures. Detection procedures used in the detection of optimum signals.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 411	System Design Based on Microcontroller	2	0	3	3
Course Description:					
Microprocessor / mikrocontroller difference. Basic mikrocontroller architectures. The structure of the program memory. The structure of the data memory. Basic I / O port structures. Counter/timer modules. Cutting mechanism. Variety of applications and sample designs.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 417	Medical Electronics	2	0	3	3
Course Description:					
Basic concepts of instrumentation. Measurement of the signals of the human nervous system. Measurement of the signals of the electromyogram. Measurement of the signals of electrocardiographs. Measurement of the signals of Electroencephalograph and Evoked potentials. Measurement of the signals of Electroretinogram and Electrooculogram. Measurement of the blood pressure. Measurement of flow and volume of blood.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM421	Switching Systems in Communications	2	0	3	3
Course Description:					
Switching in communication systems. Classification of circuit and packet switching systems. Requirements for switching technique. Telephone exchanges. Hierarchical arrangement of telephone network. Major components of a telephone Exchange. Selection in switching and the selective types. Link systems. Signaling systems. Classification of signaling systems. Subscriber line signaling. Signaling between telephone exchanges.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EEM 433	Analog Integrated Circuit Design	2	0	3	3
Course Description:					
Current mirrors and current sources; basic, Widlar, Wilson, cascode and others. Voltage source. DC shifting circuits. Emitter coupled differential amplifiers. Active loads in integrated circuits. Gain stages and output stages in integrated circuits. Noise in integrated circuits.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EEM 435	Opto Electronics	2	0	3	3
Course Description:					
Wave propagation in planar and cylindrical optical wave guides. Optical fibres. Laser theory: Lineshape function, lineshape broadening. Einstein coefficients, optical amplification, oscillation conditions, 3- and 4-level lasers, mode locking, Q-switching, Gas lasers, solid state lasers, homo- and heterojunction diode lasers. Light emitting diodes. Optical fibre amplifiers. Detection of optical radiation: Photomultipliers, photodiodes, avalanche photodiodes. Noise in optical detection systems. Video- and heterodyne detection. Optical communication systems.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 437	Fiber Optics	2	0	3	3
Course Description:					
The purpose of this course is to provide the student with a clear presentation of the theory and application of the principles of fiber optics and to develop students' ability to analyze problems based on the understanding of its basic concepts, such as basic information transmission. Advantages and disadvantages of optical fibers. Optical fiber wave-guides. Transmission characteristics of the optical fibers. Fiber materials and their properties and optical fiber coupling.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 439	Instrumentation Electronics	2	0	3	3
Course Description:					
Data acquisition and conversation. Terminologies of converter. Resistance transducers for angular or linear position applications. The Wheatstone bridge circuit and Null balance measurement. Transducer for temperature measurement applications. Transducer for light measurements. Transducer linear position or force application. Transducer for environmental measurement applications. Transducer for rotational speed or position measurements applications. Transducer for sound measurements. Transducer for sound output. Output transducers for linear or angular motion.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 445	Computer Aided Circuit Design	2	0	3	3
Course Description:					
Introduction to simulation tools for analyzing, modeling and designing electrical&electronic systems: PSPICE, MATLAB/SIMULINK, and other CAD programmes. Analog and digital simulation Essentials. Programmable devices in simulation. Design issues for a general circuit implementation. Layout of analog circuits. Introduction to PCB Design Techniques. Sample design applications.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 447	Electromagnetic Compatibility	2	0	3	3
Course Description:					
Introduction to Electromagnetic Compatibility (EMC) and Electromagnetic Interference (EMI). EMI requirements for electronic systems. Signals and spectrum. Emissions and susceptibility. Non ideal behavior of passive components. EMI from active devices and equipments. Preventing of EMI: Shielding, filtering, grounding. EMI considerations for PCB design. Arcing and ESD.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 451	Illumination Technique	2	0	3	3
Course Description:					
Theory of light generation. Reflection. Illumination terms and definitions. Types of Ilumination. Interior illumination. Compensation and its importance.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 455	Image Processing	2	0	3	3
Course Description:					
Review of DSP fundamentals. Review of linear algebra. Image acquisition and representation. Geometric operations. Neighborhood and block operations. Spatial domain filtering. Edge/Line detection. Frequency domain filtering. Image enhancement. Image transforms. Image compression. Feature extraction. Image Fusion. Advanced topics.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 473	Circuit Synthesis	2	0	3	3
Course Description:					
Circuit synthesis problem. Circuit functions; Positive real functions. Filter approximation. Freguency transformations. Passive network synthesis. Active network synthesis.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 481	Digital Signal Processing Applications	2	0	3	3
Course Description:					
Linearity and time invariance. Difference equations. Transfer funtions, stability, frequency responce. Discrete time signals, discrete time frequency analysis. Digital signal processing and applications. Analog and digital filters correlations. Discrete time systems. Ideal digital filters. Linear phase FIR filters. Windoving method. Design by frequency sampling. Design of digital differentiators. Digital IIR filters. Impulse invariance method. Bilinear transformation. Comparison with FIR filters.					

Term	Autumn				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 425	Modern Control Techniques	2	0	2	
Course Description:					
Analysis of time domain responses of control systems. Effects of zeros and poles on system responses, steady state errors. Frequency domain analysis of systems, stability criterions. Design constraints of control systems, design methods. Design of control systems, types and designs of the controllers. State feedback control. State feedback control with integral action. Observer design. Robust control systems.					

8. Semester

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 452	Graduation Project	0	4	6	6
Course Description:					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 408	Antennas	2	0	3	3
Course Description:					
Antenlerin temel parametreleri. Işıma integralleri ve potansiyel fonksiyonlar. Lineer ince antenler. Halka antenler. Diziler. Antenlerin ortak ve öz empedansları. Uyumlama teknikleri. Yürüyen dalga ve geniş band antenler. Açıklık antenleri. Huni, mercek ve yansıtıcı antenler. Anten sentezi. Propagasyon.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 410	Information and Coding	2	0	3	3
Course Description:					
The measure of information, entropy, properties of entropy. Uniquely decipherable codes, instantaneous codes. The noiseless coding theorem. Huffman method. Models of communication channels. Channel kinds, channel capacity and calculation methods. The noisy coding theorem. Linear block codes. Cyclic codes. BCH codes. Convolutional codes ARQ schemes.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 416	Fundamentals of Biomedical Engineering	2	0	3	3
Ders İçeriği:					
Biotelemetry. Physiological pressure. Computed Tomography. X-ray. Ultrasound. Magnetic resonance imaging. Electrical Safety. Thermography. Respiratory systems. Use of computer in medical devices.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 428	Microwave Circuits	2	0	3	3
Course Description:					
Microwave components. Impedance elements. H-plane, T, E-plane T and the Magic-T junctions. Directional couplers. Attenuators. Multi-layer impedance converters. Microwave filters.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 430	Engineering System Analysis	2	0	3	3
Course Description:					
Mathematical modeling of dynamic systems. State-variable analysis of linear dynamic systems. Time-domain analysis of systems. MIMO (multi-input, multi-output) systems. Solution of state equations. Discrete systems. Stability of systems and asymptotic stability.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 432	Optical Communication	2	0	3	3
Course Description:					
Introduction to optical communications. Basic elements of an optical communication system. Advantages of optical communications. Optical transmitter circuits. Optical fiber transmission cables. Optical receiver circuits. Design of optical communication systems. Selection of system components for using in design. Optical modulation methods. Modulation types for analog systems. Current applications and disscussing the future applications on optical communications.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 434	Power Electronics II	2	0	3	3
Course Description:					
Applications of power electronics. Application circuits of power devices such as AC-AC, DC-AC and DC-DC convertors.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 436	Noise Analysis in Communication Systems	2	0	3	3
Course Description:					
Mathematical definition of random processes, correlation functions and spectral density functions of random processes. Ergodic process. Gaussian process. Properties of Gaussian process, noise samples in communication systems, narrowband noise. Represantation of narrowband noise in terms of in-phase and quadrature components. Represantation of narrowband noise in terms of envelope and phase components.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 476	Web Technologies and Applications	1	1	3	3
Course Description:					
.NET ve applications, Socket programming, TCP/IP, OSI, Router, Firewall, ASP PHP, XML ve applications, Windows'ta Handle control in Windows.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 484	Electronic Circuit Hardware and Test Techniques	2	0	3	3
Course Description:					
Prototype techniques and evaluation boards. Grounding in circuits. Cabling. PCB Essentials and techniques. Layout of analog and digital circuits. Electromagnetic Interference and Compability issues in electronic systems. Implementation and general production issues of circuits. Computer hardware. Fault analysis and test techniques in electronic systems.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 488	Digital Filters	2	0	3	3
Course Description:					
Basic principle of digital filter design. FIR filter design methods. IIR filter design methods. Realizations of digital filters. Quantization effects in Digital filters					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 424	Acoustics	2	0	3	3
Course Description:					
Sizes of sound field, abundance, level of abundance, sound spectrum, noise measurement, sound levelmeter, noise spectrum analyzer, noise criterion, noise insulation, reverberation, saloon acoustics, building acoustics, electroacoustics transducers, microphones and kinds, loudspeakers and kinds, design of sound recording systems, digital sound recording.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
MM 472	Introduction to Robotics	2	0	3	3
Course Description:					
Robot definition, history, classification, industrial applications and variations. Fundamental issues of robotics. Mechanical structure, mechanical, electrical, pneumatic and hydraulic drives. Robot control systems. Independent joint control. Force control. Trajectory planning and control. Robot sensors. Dynamic properties. Robot hand and clutch mechanisms. Artificial intelligence in robotic applications. Programming of robots, robot languages, examples. Robot computer hardware, interfaces, and advanced hardware structures.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 456	Antennas and Microwave Laboratory	1	1	3	3
Course Description:					
Frequency and wavelength measurement. Microwave power measurements. Detector characteristics. Impedance measurement. Microwave tuner. Serial and parallel T (H-plane and E-Plane) junctions. Microwave antennas. The use of coaxial cable.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 460	Power Electonics Laboratory	1	1	3	3
Course Description:					
Basic application circuits of SCR, triac, diac, power BJT ve power MOSFETs. Converter circuits, motor driver circuits.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 462	Instrumentation Laboratory	1	1	3	3
Course Description:					
Open and closed-loop basic measurement applications. Inductive, capacitive, resistive, optical, magnetic, mechanical, thermal and electromagnetic detector based instrument applications.Integral, derivative and proportional control of the DC motor.					

Term	Spring				
Code	**Course Title**	**T**	**P**	**K**	**ECTS-Cr**
EM 466	Electrical Machines Laboratory	1	1	3	3
Course Description:					
Transformers and their connections. Open-circuit and short-circuit tests. Separately and self excited generators, their efficiencies. DC series motor applications their efficiencies. DC shunt motor applications their efficiencies. Induction motors and their speed control. Synchronous motor applications. Speed control techniques and applications of synchronous motors. Controlling of stepper motors.					