Gazi University Institute of Science and Technology
Electrical & Electronics Engineering

[Click on course name to see the content.]

COURSE	Credit	ECTS Credit
EE 502 Dynamics and Control Of AC Drives	(3+0) 3	7,5
EE 503 Special Topics in Power Electronics	(3+0) 3	7,5
EE 504 Analytical Methods In Electromagnetic Wave Theory	(3+0) 3	7,5
EE 505 Control System Design	(3+0) 3	7,5
EE 506 Nonlinear Control Systems	(3+0) 3	7,5
EE 507 Computer Aided Numerical Analysis In Engineering	(3+0) 3	7,5
EE 508 Medical Imaging Systems	(3+0) 3	7,5
EE 510 Numerical Methods in Electromagnetics	(3+0) 3	7,5
EE 513 Theory and Design Of Electronic Power Supplies	(3+0) 3	7,5
EE 515 Optical Communications	(3+0) 3	7,5
EE 517 Mathematical Methods In Electrical Engineering	(3+0) 3	7,5
EE 519 High Frequency Methods In Electromagnetic Theory	(3+0) 3	7,5
EE 520 Optical Wave Propagation	(3+0) 3	7,5
EE 525 Design of Digital Control Systems	(3+0) 3	7,5
EE 526 Antenna Engineering	(3+0) 3	7,5
EE 527 Radio Propagation For Wireless Communication Systems	(3+0) 3	7,5
EE 528 Microwave Engineering I	(3+0) 3	7,5
EE 529 Photovoltaic Materials and Devices	(3+0) 3	7,5
EE 530 Digital Image Processing	(3+0) 3	7,5
EE 531 Object- Oriented Programming with C++	(3+0) 3	7,5
EE 532 Semiconductor Power Converters	(3+0) 3	7,5
EE 533 Optimization	(3+0) 3	7,5
EE 534 Microwave Engineering II	(3+0) 3	7,5
EE 535 Introduction to Cryptography	(3+0) 3	7,5
EE 542 Advanced Power Electronics	(3+0) 3	7,5
EE 544 Control of Electrical Machines	(3+0) 3	7,5
EE 546 Process Control Instrumentation Technology	(3+0) 3	7,5
EE 548 Radar Systems I	(3+0) 3	7,5
EE 549 Wavelet Transform	(3+0) 3	7,5
EE 572 Power System Insulation Coordination	(3+0) 3	7,5
EE 576 Power System Operation and Control	(3+0) 3	7,5
EE 577 Power System Planning	(3+0) 3	7,5
EE 578 High Voltage Gas Discharges	(3+0) 3	7,5
EE 579 Artifical Hearing Systems and Speech Processing	(3+0) 3	7,5
EE 580 Communication Theory	(3+0) 3	7,5
EE 581 Digital Communications	(3+0) 3	7,5
EE 584 Wireless Communications	(3+0) 3	7,5
EE 585 Pattern Recognition By Artificial Neural Networks	(3+0) 3	7,5
EE 586 Models of High Efficiency Solar Cells	(3+0) 3	7,5
EE 583 Spectral Estimation	(3+0) 3	7,5
EE 587 Information Theory anf Coding	(3+0) 3	7,5
EE 588 Machine Learning and Genetic Algorithms	(3+0) 3	7,5
EE 589 Linear System Theory in Engineering	(3+0) 3	7,5
EE 593 Electromagnetic Compatibility	(3+0) 3	7,5
EE 594 Applications of Functional Analysis and Operator Theory	(3+0) 3	7,5

5001006 MS Thesis	0	10
5980006 SEMINAR	0	7,5
6001006 PhD Thesis	0	10
7001006 TERM PROJECT	0	17,5
8000006 DOCTORAL QUALIFYING EXAMINATION	0	17,5
80*06DD SPECIAL TOPICS in MS	0	10
8500006 PROGRESS IN THESIS	0	7,5
90*06DD SPECIAL TOPICS in PhD	0	10

EM502 DYNAMICS AND CONTROL OF AC DRIVES	DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Semester	Teaching Methods							Credits	
	Lecture	Recite	Lab.	Field Study		Other	Total	Credit	ECTS Credit
1-2	42	-	-	40		106	188	3	7,5

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	d-q models of induction machines and synchronous machines. d-q models for solid state power converters. Complex vector analysis of induction machines. Introduction to AC drives. Principles of vector control and field orientation. Dynamics of vector control and field orientation. Current regulation in power converters. Small signal analysis of AC machines.
Course Objectives	Teaching the dynamic behaviour and control techniques of ac motors, especially induction motors; teaching the required tools and analysis techniques to analyze transients.
Learning Outcomes and Competences	Definition, Formulation and Solution of Engineering Problems; Use of Techniques and Modern Tools Necessary for Engineering Applications
Textbook and /or References	1. Novotny, D.W., Lipo, T.A.; Vector Control and Dynamics of AC Drives, OXFORD Science Publications, 1998 2. Krause, P.C., Analysis of Electric Machinery, McGraw Hill, 1986 3. Leonhard, W.; Control of Electrical Drives, Springer-Verlag, 1990

Assessment Criteria		If any,mark as (X)	Percent (%)
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	X	15
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. M. Timur AYDEMIR**
Week	**Subject**
1	Derivation of winding functions
2	Calculation of winding inductances
3	Expression of induction motor equations in stationary a,b,c reference frame; complex vector definition
4	Expression of induction motor equations in d-q axises
5	d-q equivalent circuits

6	Investigation of dynamic behaviour of IM via coputer simulation
7	d-q models of synchronous machines
8	Types of AC drives
9	d-q models of inverters
10	Complex vector analysis of IM
11	Complex vector analysis of IM
12	Complex vector analysis of IM
13	Principles of vector control technique
14	Principles of vector control technique

EM 503 SPECIAL TOPICS IN POWER ELECTRONICS								DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING	
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**		**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**40**	**-**	**106**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Resonance Pulse Inverters, Series Resonance Inverter, Parallel Resonance Inverters, Voltage Control, Zero-Current Switching, Zero-Voltage Switching, DC- link Resonance, Multi level Inverters, Introduction, Different types of Inverters, Applications, Harmonic Filter Design for Power Converters, Static Power Compensation, Uninterruptible Power Supply, Different Configuration of Uninterruptible Power Supplies, Principles of High DC Voltage (HVDC)
Course Objectives	Teaching current research topics, developments in the area of power electronics, and the background of these developments.
Learning Outcomes and Competences	Modelling and simulation experience; Transient analysis techniques. Competence in reading and critisizing papers.
Textbook and /or References	1. Power Electronics: circuits, devices, and applications; M. Rashid, Prentice-Hall 2. Power Electronics: Converters, Applications, and Design; N. Mohan, Tore Undeland, William P. Robbins 3. Elements of Power Electronics, Philip T. Krein, Oxford university press

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	40
	Quizzes	-	-
	Homeworks	-	-
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. İres İSKENDER**
Week	**Subject**
1	Resonance Pulse Inverters, Series Resonance Inverter
2	Parallel Resonance Inverters, Voltage Control
3	Zero-Current Switching, Zero-Voltage Switching
4	DC- link Resonance

5	Multi level Inverters, Introduction
6	Different types of Inverters, Applications
7	Midterm Exam 1
8	Harmonic Filter Design for Power Converters
9	Static Power Compensation
10	Uninterruptible Power Supply
11	Different Configuration of Uninterruptible Power Supplies
12	Different Configuration of Uninterruptible Power Supplies
13	Midterm Exam 2
14	Principles of High DC Voltage (HVDC)

EM 504 ANALYTICAL METHODS IN ELECTROMAGNETİC WAVE THEORY					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**60**	**40**	**46**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Fundamental theorems and concepts. Plane wave functions. Modal expansion. Cylindrical wave functions. Spherical wave functions. Wave transformations. Green's functions in rectangular, cylindrical and spherical coordinates.
Course Objectives	To teach the behaviors of electromagnetic waves in several media.
Learning Outcomes and Competences	To learn the behaviors of electromagnetic waves in several media and to learn how to apply this knowledge in propagation problems.
Textbook and /or References	1. C. A. Balanis, Advanced Engineering Electromagnetics, John Wiley & Sons, New York, 1989

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	40
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	10
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. Erkan AFACAN**
Week	**Subject**
1	Maxwell's equations; Boundary conditions; Constitutive relationships
2	Kramers-Kronig relationship; ac characteristics of matters
3	Wave equation
4	Waves in a perfect dielectric
5	Polarization; Intrinsic wave constants
6	Waves in lossy medium
7	Reflection and transmission of waves

8	Radiation; Antennas
9	Duality; Uniqueness theorem
10	Field equivalence theorem
11	Construction of wave solutions
12	Plane wave functions
13	Cylindrical wave functions
14	Rectangular waveguide

EM 505 CONTROL SYSTEMS DESIGN					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**				**70**	**76**	**188**	**3**	**7.5**
Language	Turkish								
Compulsory / Elective	Elective								
Prerequisites	-								
Course Contents	Definition of multivariable control systems. Controllability and observabilty. Canonical forms. Eigenvalue assignment by the state and output feedback. Non-interacting control. Introduction to the optimal control								
Course Objectives	. To study and apply some of the modern analysis and design methods available for the multi-variable control systems.								
Learning Outcomes and Competences	To have some knowledge about principles of the modern design techniques and to have the capability to use them successfully.								
Textbook and /or References	1. Ogata, K (1997) Modern Control Engineering. Prentice Hall International 2. Dorf,R.C, Bishop,R.B (2000) Modern Control Systems. Prentice Hall International, 3. Derusso,P.M, Roy Close,C.M ,J.R,. (1967) State Variables for Engineers. John Wiley &Sons,Inc								

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	30
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Prof. Dr. Veysel SİLİNDİR silindir@gazi.edu.tr**
Week	**Subject**
1	Classical control systems
2	State –space modelling
3	State –space models of some systems
4	Relationship between state space and classical approaches
5	Properties of system matrix
6	Midterm exam
7	Controllability
8	Observabiliy

9	Eigenvalue assignment by state feedback
10	Eigenvalue assignment by output feedback
11	Observer design
12	Non-interacting control
13	Introduction to optimal control
14	Typical example systems

EM 506 NONLINEAR CONTROL SYSTEMS	DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Semester	Teaching Methods							Credits	
	Lecture	Recite	Lab.	Field Study	Home work	Other	Total	Credit	ECTS Credit
1-2	42				70	76	188	3	7.5

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Definition and classification of nonlinear systems.Several anlysis techniques (linearisation,describing function, isocline, etc.).Stabity analysis by various methods (Liapunov,Popov,Circle criteria). Ssome nonlinear phenomena.
Course Objectives	To study the several nonlinear elements encountered both in theory and practice, and to investigate their effects on control systems.
Learning Outcomes and Competences	To familiarise the student with the nonlinear systems which exhibit completely different behaviour ,and to enable them to use the various techniques available.
Textbook and /or References	1. Khalil ,H.K , (1996) , Nonlinear Systems, Second Edition, Prentice Hall International Limited. 2. Derusso,P.M, Roy, R.J, Close ,C.M.(1967), State Variables for Engineers , John Wiley & Sons, Inc.

Assessment Criteria		If any,mark as (X)	Percent (%)
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	30
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Prof. Dr. Veysel SİLİNDİR silindir@gazi.edu.tr**
Week	**Subject**
1	Basic concepts and introduction to the nonlinear systems
2	Properties of the nonlinear systems
3	System modelling
4	Linearisatiom
5	Describing function
6	Basic concepts and introduction to the nonlinear systems
7	Midterm exam

8	Isocline method
9	Liapunov method in linear systems
10	Liapunov method in nonlinear systems
11	Popov criterion
12	Circle criterion
13	Jump Resonance
14	Singular perturbation

EM 507 COMPUTER AIDED NUMERICAL ANALYSIS IN ENGINEERING					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**		**-**	**-**	**26**	**120**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Numerical error analysis, roots of equations, linear algebraic equations, curve fittings, numerical differentiation and integration, ordinary differential equations, eigenvalue, and eigenvectors.
Course Objectives	To introduce various methods of the numerical analysis and writing computer programs of these numerical methods.
Learning Outcomes and Competences	Understanding of methods of numerical solutions. To be used these numerical methods to engineering problems.
Textbook and /or References	1. Numerical Methods For Engineers S. C. Chapra and R. P. Canale, McGraw-Hill 2. Applied Numerical Methods for Digital Computation M. L. James and G. M. Smith J. C. Wolford, Harper Collins. 3. Appled Numerical Analysis Using Matlab L.V. Fausett, Prentices Hall

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	40
	Quizzes	-	-
	Homeworks	X	20
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Assoc.Prof. Selma Yüncü e-mail: syuncu@gazi.edu.tr**
Week	**Subject**
1	Introduction, error analysis.
2	Chopping, rounding and truncation errors.
3	The bisection and Regüla-Falsi methods.
4	Simple fixed-points iteration, Newton-Raphson and Secant methods.
5	Multiple roots, Bairstow method, linear algebraic equations.
6	Gauss elimination method, pivoting techniques, scaling ,Gauss-Jordan ,Gauss-Seidel meth.
7	LU and Cholesky decomposition methods.

8	Midterm Exam
9	Curve fitting: Least-squares regression, nonlinear regression.
10	Interpolation: Newton's divided-difference, Lagrange and spline interpolations.
11	Cubic spline, Integration: Trapezoidal rules, Simpson rules.
12	Romberg, gauss-quadrature, numerical differentiation.
13	Ordinary differential equations: Euler, Heun, improved polygon.
14	Runge-Kutta Methods, Eigenvalues and eigenvectors.

EM 508 MEDICAL IMAGING SYSTEMS					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**70**	**25**	**51**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Multi-Dimension Signal Processing, X- Ray Devices, Fundamental Techniques of Digital Radiography, Fundamentals of Computerized Tomography, Nuclear Medicine and Gamma Cameras, Positron-Emission Tomography, Magnetic Resonance Device, Mathematical Fundamentals of Ultrasoundography and Usage in Medicine, PACS
Course Objectives	Learning of the mathematical, operational principles and usage areas of medical imaging systems.
Learning Outcomes and Competences	To obtain necessary information for the new instrumentation designs by studying the image reconstruction techniques and imaging sources of medical imaging systems
Textbook and /or References	1. Karagöz, İ., Eroğul, O.(1998) Tıbbi Görüntüleme Sistemleri Haberal Eğitim Vakfı 2. Macovski A. (1983) Medical Imaging Systems Prentice Hall

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Assoc.Prof.Dr.İrfan KARAGÖZ**
Week	**Subject**
1	Nuclear Medicine and Gamma Cameras,
2	X- Ray Devices,
3	Fundamental Techniques of Digital Radiography,
4	Fundamentals of Computerized Tomography,
5	Image Reconstruction Techniques for Computerized Tomography,,
6	Magnetic Resonance Imaging Device,
7	Image Reconstruction Techniques for Magnetic Resonance Imaging Device,
8	Image Reconstruction Techniques for Magnetic Resonance Imaging Device,

9	Midterm
10	Positron-Emission Tomography,
11	Mathematical Fundamentals of Ultrasoundography and Usage in Medicine,
12	PACS,
13	Project Presentations,
14	Project Presentations

EM 510 NUMERICAL METHODS IN ELECTROMAGNETİCS					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**40**	**40**	**66**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	A review of basic principles of Electromagnetics, Classification of Electromagnetic problems, Analytical methods, Finite difference method, variational methods, Finite-Element's method, Method of moments, Monte Carlo Method.
Course Objectives	Students will learn basic numerical methods and their applications to scattering, radiation and transmision of electromagnetic energy.
Learning Outcomes and Competences	Studennts will gain experience in using numerical methods in solving electromagnetic and practical engineering problems.
Textbook and /or References	M.N.O.Sadiku (2003), Numerical Techniques in Electromagnetics, 2nd Edition, Prentice Hall. A.Taflove (1995), Computational Electrodynamics, Artech House.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. K.Cem NAKİBOĞLU**
Week	**Subject**
1	A review of basic principles of Electromagnetics
2	Classification of Electromagnetic problems
3	Analytical solution of partial differential equations
4	Numerical differentiation and integration
5	Finite difference method
6	Time domain finite difference method
7	Variational methods
8	Application of variational methods in Electromagnetics

9	Finite element method
10	Solution of Poisson's and Laplace's equations by using finite element method
11	Midterm
12	Application of Monte Carlo method in Electric potential problems
13	Moment method
14	Application of moment method in electromagnetic scattering

EM 513 THEORY AND DESIGN OF ELECTRONIC SUPPLIES					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**42**	**20**	**84**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Basic principles of power supplies. Power amplifiers. Design of transformers and inductors for solid-state power supplies. Investigation of power transistors. Voltage regulators. Current limiting and protective circuits. Design of static inverters. Design examples for converters and inverters.
Course Objectives	To teach the fundemental operational principles of linear and switching power supplies and design some commonly used supply circuits.
Learning Outcomes and Competences	In this course essentially people working in electrical and/ or electronics field are targeted. Efficient use of supplies and further research and developement are encoureged.
Textbook and /or References	1. HNATEK Eugene R. *Design of Solid State Power Supplies*, Budapest: Elsevier Book Distribution, 1987. 2. BROWN Marty, *Practical Switching Power Supply Design*, New York: Academic Press . Inc.1993 3. BİLLİNGS Keith, *Switchmode Power Supplies*, New York: McGRAW Hill Co. 1990.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	39
	Quizzes	-	-
	Homeworks	X	13
	Projects	X	8
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr.Fadıl Çelikkol**
Week	**Subject**
1	Presentation of technical references and a general introduction to lineer power supplies,
2	Introduction of block diagrams of lineer power supplies and their analysis
3	Analysis of varlous lineer power supplies,
4	Presentation of internal and external protective arrangements of IC lineer power supplies.
5	A specific lineer power supply design with its rectifying and regulating blocks separated.
6	Comparison of lineer and switching type power supplies,

7	Block description and analysis of switching power supplies,
8	Description and analysis of the internal connection and operational principles of the IC controllers,
9	Analysis of Pulse Width and Pulse Amplitude Modulation and harmonic elimination principles,
10	Design of a switch-mode power supply using TL 494 or SG 3524 controllers,
11	Investigation of internal / external protective circuits used with the switch-mode supplies,
12	A demonstrative presentation of a specific lineer power supply,
13	A demonstrative show of a specific switching power supply,
14	Examination of multi purpose IC components used in switch-mode power supplies.

EM 515 0PTICAL COMMUNICATIONS					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**40**	**40**	**-**	**188**	**3**	**7,5**
Language	Turkish								
Compulsory / Elective	Elective								
Prerequisites	-								
Course Contents	Basic optical laws. Optical Fibber Types. Fiber Types. Fibber Materials and Fabrication. Optical Propagation theory in Fibber. Optical Sources and Photo-detectors. Optical Receiver Operation. Digital Transmission Systems. Analog Systems.								
Course Objectives	Students will learn physics of fiber optics, the propagation of electromagnetic waves in rectangular and circular waveguides and design of fiber optic system design.								
Learning Outcomes and Competences	Learning the application of fiber optics to various engineering systems and gaining experience in solving practical engineering problems by using computers.								
Textbook and /or References	1. G.Keiser (1983), Optical Communications,2nd Edition, McGraw-Hill 2. D.Marcus (1982), Light Transmission Optics, Van Nostrand-Reinhold.								

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. K.Cem NAKİBOĞLU**
Week	**Subject**
1	Historical evolution of fiber optic systems
2	Basic optical laws
3	Fiber types
4	Fiber materials and fabrication
5	Ray optics representation
6	Optical wave guides
7	Power flow in optical waveguides

8	Signal distortion in optical waveguides
9	Optical sources (LED)
10	Midterm
11	Laser diyotes
12	Physical principles of photodiodes
13	Analysis of optical receiver systems
14	Digital transmission systems

EM 517 MATHEMATICAL METHODS IN ELECTRICAL ENGİNEERİNG								DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING	
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**40**	**40**	**66**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Vector Spaces. Linear Transformations. Inner product and Hilbert Spaces. Linear operators. Infinite Series. Elements of Vector Analysis. Complex variables. Sturm-Liouville problems. Eigenfunction expansions and special functions.
Course Objectives	Students will learn application of mathematical methods to physical and non-linear systems.Gaining the ağabeylity of mathematical thinking.
Learning Outcomes and Competences	Gaining the ability of analysing real world problems and solving the equations by using mathematical methods resulting from mathematical modelling.
Textbook and /or References	1. E.Kreyszig (1999). Advanced Engineering Mathematics, 8th Edition, Jhon Wiley. 2. M.D.Greenberg (1998). Advanced Engineering Mathematics, 2nd Edition, Prentice Hall.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. K.Cem NAKİBOĞLU**
Week	**Subject**
1	Vector spaces
2	Linear transformations
3	Inner product and Hilbert spaces
4	Complex functions
5	The complex limit and derivative
6	Mapping of elementary functions
7	Evaluation of real integrals
8	Bessel functions and Hypergeometric functions

9	Midterm
10	Introduction to Green's functions
11	Application of Green's functions
12	Probability and random variables
13	Random processes
14	Application of random processes in communications

EM 519 HIGH FREQUENCY METHODS IN ELECTROMAGNETIC THEORY					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**60**	**40**	**46**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Asymptotic series. Stationary phase method. Method of steepest descent path. Geometrical optics. Geometrical theory of diffraction. Uniform geometrical theory of diffraction. Equivalent current method. Physical optics. Physical theory of diffraction. Application of geometrical theory of diffraction to antenna problems.
Course Objectives	To teach high frequency methods used in electromagnetic theory and to give knowledge about their applications.
Learning Outcomes and Competences	To know high frequency methods and to obtain the necessary skills for their application.
Textbook and /or References	1. C. A. Balanis, Advanced Engineering Electromagnetics, John Wiley & Sons, New York, 1989. 2. D. A. Mcnamara, Introduction to the Uniform Geometrical Theory of Diffraction, Artech House, 1990.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	40
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	10
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. Erkan AFACAN**
Week	**Subject**
1	Asymptotic series; Asymptotic evaluation of integrals
2	Integration by parts; Watson's lemma; Laplace's method
3	The method of statioanry phase
4	Review of complex calculus; Min-max properties
5	The method of steepest descent
6	Saddle point method for a simple pole close to the saddle point
7	Geometrical optics

8	High frequency expansion of electromagnetic fields
9	Dyadics
10	Geometrical theory of diffraction
11	Uniform geometrical theory of diffraction
12	Equivalent current method
13	Physical optics
14	Application of geometrical theory of diffraction to antenna problems

EM 520 OPTICAL WAVE PROPAGATION					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
2	**42**	**-**	**-**	**40**	**40**	**66**	**188**	**3**	**7,5**
Language	Turkish								
Compulsory / Elective	Elective								
Prerequisites	-								
Catalog Description	Optical wave propagation; Fundamentals of VHF and UHF propagation; Fresnel zones; Kirchhoff approximation method; Introduction to random processes; Perturbation method; Wave propagation over regular and irregular terrain; Optical turbulence in the atmosphere; Line-of-sight propagation; Rayleigh scattering; Mie theory; Polarization and Stokes parameters; The effect of rain, fog and snow on wave propagation; Modulation methods; Optical receivers.								
Course Objectives	Understanding of wave propagation in random medium, applying analytical and numerical techniques to remote sensing.								
Course Outcomes	Students will gain experience in applying and understanding the limitations of random medium theory in propagation.								
Textbook and /or References	1. L.C.Andrews,R.L.Philips (1998), Laser Beam Propagation through Random Media, SPIE Optical Engineering Press. 2. J.W.Goodman (1985), Statistical Optics, John Wiley Interscience.								

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. K.Cem NAKİBOĞLU**
Week	**Subject**
1	Fundamentals of VHF and UHF propagation
2	Frensel regions and Kirchoff approximation method
3	Introduction to random processes
4	Perturbation method
5	Wave propagation over regular and irregular terrain
6	Optical turbulence in the atmosphere
7	Propagation of Gaussian-Beam waves

8	Rayleigh scattering
9	Second order statistics
10	Midterm
11	Polarization and Stokes parameters
12	Laser satellite communication systems
13	The effects of rain, fog and snow on wave propagation
14	Fundamentals of VHF and UHF propagation

EM 525 DIGITAL CONTROL SYSTEM DESIGN					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**				**70**	**76**	**188**	**3**	**7.5**
Language	Turkish								
Compulsory / Elective	Elective								
Prerequisites	-								
Course Contents	Z- Transaformation. Transfer function representation of discrete- time systems. Analysis in the discrete time. System design by the conventional methods								
Course Objectives	To teach the theory of the digital kontrol systems and to establish a parallelism with the analogue systems.								
Learning Outcomes and Competences	To enable the students ,who are familiar with the analogue control systems ,to know the basic principles and the several design methods for the digital control systems.								
Textbook and /or References	1. Ogata , K (1987) Discrete – Time Control. Systems,Prentice-Hall Int. Editions 2. Vanlandingham,H.F (1999) Introduction to Digital Control Systems, Macmillan Publishing Company 3. Hostetter,G,H.(1988) Digital Control System Design,Holt Rinehart&Winston . Inc.								

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	30
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Prof. Dr. Veysel SİLİNDİR** **silindir@gazi.edu.tr**
Week	**Subject**
1	Basic Concepts and Z Transformation
2	Z Transformation
3	Impulse Sampling and Data Hold
4	Pulse Transfer Functions
5	Realisation of Discrete time Controllers and Filtres
6	Midterm Exam
7	Design by the Conventional Techniques
8	Mapping Between the Z And S Planes

9	System Stability in the Z Plane
10	Transient Response Analysis
11	Steady State Response Analysis
12	Design by the Root Locus Method
13	Design by the Frequency Response Methods
14	Analytical Design Methods

EM 526 ANTENNA ENGINEERING					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**60**	**40**	**46**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Fundamentals of electromagnetic radiation. Fundamental parameters of antennas. Dipoles, arrays and long-wire antennas. Loop antennas. Aperture antennas. Radar antennas. Antennas in mobile systems. Antenna synthesis.
Course Objectives	To teach methods used in antenna analysis and design.
Learning Outcomes and Competences	To know several antenna types and to obtain necessary skills for the analysis and design of them.
Textbook and /or References	1. C. A. Balanis, Antenna theory : analysis and design, Harper and Row, 1982. 2. J. D. Kraus, Antennas, McGraw-Hill, 1988.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	40
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	10
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. Erkan AFACAN**
Week	**Subject**
1	Fundamental parameters of antennas
2	Friis transmission equation
3	Radar equation
4	Polarization
5	Vector potentials
6	Reciprocity theorem
7	Hertz dipole
8	Finite length dipole

9	Half-wavelength dipole
10	Vertical electric dipole
11	Small circular loop
12	Circular loop of constant current
13	Antenna arrays
14	Antenna synthesis

EM 527 RADİO PROPAGATION FOR WIRELESS SYSTEMS					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**40**	**40**	**66**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	The cellular concept and system design fundamentals. Mobile radio principals, basic concepts. Channel characteristics, signal loss probability, Interference environments and its control. Wave propagation, Reflection and refraction. Diffraction and scattering techniques. Antennas used in wireless communication systems and radiation principles. Ray tracing techniques. Propagation models. Modulation techniques for mobile radio. -
Course Objectives	Gaining experience in analytical and experimental methods for predicting the propagation of electromagnetic waves over a wide range of frequencies.
Learning Outcomes and Competences	The ability of applying computers to solve simple propagation problems.
Textbook and /or References -	1. T.S.Rappaport (2002), Wireless Communications:Principles and Practice, 2nd Edition, Prentice Hall. 2. H.L.Bertoni (2000), Radio Propagation for Modern Wireless Systems, Prentice Hall.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. K.Cem NAKİBOĞLU**
- **Week** -	**Subject**
1	The cellular concept and system design Fundamentals
2	Mobile radio principles
3	Signal loss probability, interference environments
4	Plane wave propagation
5	Reflection and refraction of plane waves
6	Diffraction and scattering techniques

7	Geometrical theory of diffraction
8	Antennas used in wireless communication systems
9	Antenna parameters and radiation principles
10	Midterm
11	Modelling wave propagation in the presence of buildings
12	Modeling terrain effects
13	Ray tracing techniques
14	Modulation techniques for mobile radio

EM 528 MİCROWAVE ENGINEERING I					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Homework**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**-**	**70**	**76**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Passive microwave devices; attenuators, directional couplers, power dividers, and other ferrite devices. Electromagnetic resonators; resonant circuits, transmission-line resonant circuits, microwave cavities, equivalent circuits for cavities, Fabry-Perot resonators. Periodic structures and filters; wave analysis of periodic structures, matching of periodic structures, group velocity and energy flow, some low-pass filter design techniques and other types of filters. Microwave oscillators and mixers; oscillator circuits and design, linear and nonlinear mixer operation, mixer noise figure, balanced mixers and other types of mixers.
Course Objectives	To teach the basic concepts and phenomenon of passive microwave devices, and related topics, theorem and analysis of these devices as applied to modern microwave engineering.
Learning Outcomes and Competences	Designing of passive microwave components, due to their motivational and practical value. Learning methods used for analysis and logic behind these designs. Understanding the process s of applying fundamental principles to arrive at useful results.
Textbook and /or References	1. R. E. Collin, Foundations for Microwave Engineering, McGraw-Hill. 2. David M. Pozar, Microwave Engineering, Addision-Wesley Publishing Company. 3. P. A. Rizzi, Microwave Engineering- Passive Circuits, Prentice-Hill.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	35
	Quizzes		
	Homeworks	X	10
	Projects		
	Term Paper		
	Laboratory Work		
	Other	X	15
	Final Exam	X	40

Instructors	**Instructor Dr. Nursel AKÇAM**
Week	**Subject**
1	Microwave Resonators
2	Waveguide Cavities
3	Excitation of Resonators
4	Microwave Power Dividers

5	Microwave Directional Couplers
6	Microwave Filters
7	Filters Design
8	Design of Different Types Filters
9	Filter Transformations
10	Theory and Design of Ferrimagnetic Components: Introduction
11	Plane Wave Propagation in a Ferrite Medium
12	Ferrite Isolators
13	Ferrite Phase Shifters
14	Ferrite Circulators

EM 529 PHOTOVOLTAIC MATERIALS AND DEVICES					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**-**	**70**	**76**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Sun and sunligth. Introduction to solar material science. History of photovoltaic cells. Description of phovoltaic effect. Solar cell equivalent circuit. Electrical characteristics of silicon solar cells. Low cost silicon solar cells. Other solar cell materials. Heterojunctions for thin film solar cells. The optimization of solar energy conversion devices. Solar mirror materials. Module Technologies. Grid connected/off-grid photovoltaic systems. Market investigation of photovoltaic modules.
Course Objectives	Present solar cells have a lower cost, higher efficiency and longer lifetime than those produced 10 years ago. The purpose of this course is to analyze and discuss recent advances in solar cell research and applications.
Learning Outcomes and Competences	Ability to identify and analyze of cell technologies, module technologies, system technologies of solar cells..
Textbook and /or References	1. Larry D. Partain, Solar Cells and Their Applications. 1995. 2. Kenneth Zweibel, Basic Photovoltaic Principles and Methods, 1984. 3. Lawrence E. Murr, Solar Material Science, Academic Pres, 1980.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	30
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Prof. Dr. Muzeyyen SARITAS**
Week	**Subject**
1	Sun and sunligth
2	Introduction to solar material science
3	History of photovoltaic cells
4	Description of phovoltaic effect

5	Solar cell equivalent circuit
6	Electrical characteristics of silicon solar cells
7	Low cost silicon solar cells
8	Other solar cell materials.
9	Heterojunctions for thin film solar cells
10	The optimization of solar energy conversion devices
11	Solar mirror materials. Module technologies
12	Grid connected/off-grid photovoltaic systems
13	Market investigation of photovoltaic modules
14	Solar cell equivalent circuit

EM 530 MEDICAL IMAGING SYSTEMS					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**70**	**25**	**51**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	2-D discrete signals. Frequency response of a 2-D linear system. Image transform techniques. 2-D discrete Fourier transform. Digitization, sampling, degradation, resolution and acutance. Gray level histogram. Relationship between histogram and image. Image enhancement methods. Spatial filtering. Color image processing. Image restoration. Image compression methods.
Course Objectives	Teaching and applying the techniques of digital image processing,
Learning Outcomes and Competences	Learning to many image processing methods and applying to the many related algorithms to the different projects, Designing ability of a system, a component or a process for providing necessities, Ability of applying practically mathematical, scientific and engineering knowledge practically, Ability of defining , formulasing, and solving of engineering problems, Ability of usage of necessary techniques and modern devices for engineering applications.
Textbook and /or References	1. Gonzalez, R.C., Woods R.E.(2002) Digital Image Processing 2nd.Edition Prentice Hall.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Assoc. Prof. Dr. İrfan KARAGÖZ**
Week	**Subject**
1	2-D discrete signals.
2	Frequency response of a 2-D linear system.
3	Image transform techniques
4	2-D discrete Fourier transform.

5	Digitization, sampling, degradation, resolution and acutance.
6	Gray level histogram. Relationship between histogram and image.
7	Image enhancement methods.
8	Spatial filtering.
9	Midterm
10	Image restoration.
11	Color image processing.
12	Image compression methods.
13	Project presentations.
14	Project presentations.

EM 531 OBJECT- ORIENTED PROGRAMMING WITH C++								DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING	
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**-**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**26**	**-**	**120**	**188**	**3**	**7.5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	C Programming Language
Course Contents	Dynamic memory allocation. Classes and objects. Defining dynamic objects. Constructors. Destructors. Passing objects to functions as arguments. Operator overloading.
Course Objectives	To understand the concepts of Object oriented Programming and C++ languages
Learning Outcomes and Competences	To be able to write Object Oriented Programming using C++ languages
Textbook and /or References	1. The C++ Programming Language Bjorne Stroustrup Adission-Wesley. 2. C++ How to Program H.M.Deitel, P.J. Deitel Prentice Hall. 3. Herkes İçin Temel Öğrenim Klavuzu Herbert SchildTürkçe Basın editörü Dr. Cahit AKIN Mc-Graw-Hill

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	40
	Quizzes	-	-
	Homeworks	-	-
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors **Assoc.Prof. Selma Yüncü e-mail: syuncu@gazi.edu.tr**

Week	**Subject**
1	Introduction
2	C++
3	Inline functions,dynamic memory allocation
4	Functions overloading
5	Classes
6	Constructor, destructures, copy constructures
7	Passing objects to functions as arguments
8	Friend functions

9	Midterm exam
10	Operator overloading
11	İnheritance
12	Projects presentation
13	Projects presentation
14	Projects presentation

EM532 SEMICONDUCTOR POWER CONVERTERS	DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Semester	Teaching Methods							Credits	
	Lecture	Recite	Lab.	Field Study		Other	Total	Credit	ECTS Credit
1-2	42	-	-	40		106	188	3	7,5

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Full and Half Bridge DC-DC Converters, Resonant Link Converters, Active Power Filters, Multilevel Inverters, FACT Systems.
Course Objectives	Teaching the high-power converters, their principles of operation, and design criteria. Providing introductory knowledge in the power quality subject.
Learning Outcomes and Competences	Definition, Formulation and Solution of Engineering Problems; Use of Techniques and Modern Tools Necessary for Engineering Applications
Textbook and /or References	1. Power Electronics, M.H. Rashid, Pearson Pub. 2. Power Electronics Handbook, Editor: M.H. Rashid, Academic Press 3. Reactive Power Control in Electric Systems, T.J. Miller, J. Wiley Pub. 4. Power Electronics, N. Mohan et.al., J. Wiley Pub.

Assessment Criteria		If any,mark as (X)	Percent (%)
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	X	15
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. M. Timur AYDEMIR**
Week	**Subject**
1	Full and Half Bridge DC-DC Converters
2	Full and Half Bridge DC-DC Converters
3	Resonant Link Converters
4	Resonant Link Converters
5	Active Power Filters
6	Active Power Filters
7	Multilevel Inverters
8	Multilevel Inverters

9	Multilevel Inverters
10	FACT Systems
11	FACT Systems
12	FACT Systems
13	Project Presentations
14	Project Presentations

EM 533 OPTIMIZATION								DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING	
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**		**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**41**	**-**	**105**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Mathematical preliminaries on functions of several variables. Derivative approximations. Convexity and convex functions. Unconstrained minimization problems. Computational algorithms such as steepest decent and Newton methods. Constrained minimization problems: equality constraints, inequality constraints. Fundamental theorems of linear optimization and the simplex algorithm.
Course Objectives	Teaching how to find the most suitable solutions to different engineering problems by deriving their mathematical models and converting to a standard optimization problem
Learning Outcomes and Competences	Learning how to find an optimal solutions to different engineering problems
Textbook and /or References	1. Introduction to Linear and Nonlinear Programming, David G. Luenberger 2. Linear and Nonlinear Programming, Stephen G. Nash, Ariela Sofer 3. Nonlinear Programming: Theory and Algorithms , Mokhtar S. Bazarea

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	60
	Quizzes	-	-
	Homeworks	-	-
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. İres İSKENDER**
Week	**Subject**
1	Mathematical preliminaries on functions of several variables
2	Classification of Optimization Problems
3	Examples about Optimization Problems
4	Unconstrained Optimization Problems
5	Derivative approximations, Convexity and convex functions
6	Computational algorithms such as steepest decent and Newton methods

7	Midterm 1
8	Constrained minimization problems:
9	equality constraints, inequality constraints.
10	One Dimensional Search Techniques
11	Single-Direction Search Technique, Fibonacci Method
12	Fundamental theorems of linear optimization
13	Midterm 2
14	simplex algorithm.

EM 534 MİCROWAVE ENGINEERING II					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Homework**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**-**	**70**	**76**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Active microwave circuits. Noise in microwave circuits. Detectors and mixers. Transistor amplifier design. Oscillator design. PIN diyote control circuits. Microwave integrated circuits. Introduction to microwave systems; definition of important antenna parameters, basic types of antennas, antenna pattern characteristics, antenna efficiency, gain and temperture. Radar systems: Pulse radar, Doppler radar, radar cross-section. Micrawave propagation: atmospheric effects, ground effects, plasma effects.
Course Objectives	To teach the basic concepts and phenomenon of active microwave devices, and related topics, theorem and analysis of these devices as applied to modern microwave engineering.
Learning Outcomes and Competences	Designing of active microwave components, due to their motivational and practical value. Learning methods used for analysis and logic behind these designs. Understanding the process s of applying fundamental principles to arrive at useful results.
Textbook and /or References	1. R. E. Collin, Foundations for Microwave Engineering, McGraw-Hill. 2. David M. Pozar, Microwave Engineering, Addision-Wesley Publishing Company. 3. P. A. Rizzi, Microwave Engineering- Passive Circuits, Prentice-Hill.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	35
	Quizzes	-	-
	Homeworks	X	10
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	X	15
	Final Exam	X	40

Instructors	**Instructor Dr. Nursel AKÇAM**
Week	**Subject**
1	Active Microwave Circuits: Introduction
2	Noise in Microwave Circuits
3	Detectors and Mixers
4	Transistor Amplifier Design
5	Oscillator Design

6	PIN Diode Control Circuits
7	Microwave Integrated Circuits
8	Introduction to Microwave Systems
9	Definition of Important Antenna Parameters
10	Microwave Communications Systems
11	Radar Systems
12	Radiometry
13	Microwave Propagation: Atmospheric Effects
14	Microwave Propagation: Ground Effects, Plasma Effects.

EM 535 INTRODUCTION TO CRYPTOGRAPHY	DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Semester	Teaching Methods							Credits	
	Lecture	Recite	Lab.	Field Study	Home work	Other	Total	Credit	ECTS Credit
1-2	42	-	-	60	40	46	188	3	7,5

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Elementary number theory. Finite fields and quadratic residues. Classical cryptosystems. Block ciphers. Stream ciphers. Shannon's theory. Public key cryptography. Primality and factoring. Primality tests and prime number generation. Quantum cryptography.
Course Objectives	To teach the basics of cryptography and to give knowledge about the commonly used methods in cryptography.
Learning Outcomes and Competences	To know the basics of cryptography and to obtain the necessary skills to use common cryptographic methods.
Textbook and /or References	1. D. R. Stinson, Cryptography: theory and practice, CRC, 1995. 2. B. Schneier, Applied cryptography : protocols, algorithms, and source code in C, Wiley, 1996.

Assessment Criteria		If any,mark as (X)	Percent (%)
	Midterm Exams	X	40
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	10
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. Erkan AFACAN**
Week	**Subject**
1	Fundamental definitions; Binary operation
2	Groups; Rings and fields
3	Integers and integer mathematics
4	Modular mathematics
5	Shift cipher; Substitution cipher; Affine cipher
6	Vigenere cipher; Hill cipher; Permutation cipher
7	Stream ciphers
8	Digraph transformations

9	RSA cipher
10	Cryptoanalysis
11	Shannon theory
12	Primality and factoring
13	Primality tests and prime number generation
14	Quantum cryptography

EM 542 ADVANCED POWER ELECTRONICS				DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING					
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**		**Other**	**Total**	**Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**41**		**105**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Thyristor commutation techniques; natural and force commutations. AC to DC converters; overloaded modes of operation, characteristics. Unity power factor converters. DC choppers; principles of step-up and step-down operations, switching-mode regulators. Inverters; configurations, principle of operation, single-phase bridge inverters, three-phase inverters, voltage fed and current fed inverters, soft switching, resonant types. Protection of devices and circuits; cooling and heat sinks, snubber circuits. Pulse-Width-Modulation techniques. AC voltage controllers.
Course Objectives	Teaching the application of semiconductor switches in electrical energy conversion, teaching the characteristics of the power elements, analysis of different types of power converters, and the control methods used in power converters.
Learning Outcomes and Competences	Learning the characteristics of power elements, learning the design of rectifiers, dc-dc choppers and inverters for different loads, and learning the control methods used in power converters
Textbook and /or References	1. Power Electronics: circuits, devices, and applications; M. Rashid, Prentice-Hall 2. Power Electronics: Converters, Applications, and Design; N. Mohan, Tore Undeland, William P. Robbins 3. Elements of Power Electronics, Philip T. Krein, Oxford university press

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	40
	Quizzes	-	-
	Homeworks	-	-
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. M. Ires ISKENDER**
Week	**Subject**
1	Commutation Techniques
2	Natural and Forced Commutations
3	Rectifiers

4	Over Loading Analysis in Rectifiers
5	DC Choppers, Step-down and Step-up Choppers Operating Principles
6	Buck-Boost and Cuk Converters
7	Midterm Exam 1
8	Operation Principles of AC Voltage Controllers
9	Single-Phase and Three-Phase AC Voltage Controllers
10	Inverters; Operation Principles of Inverters, Single-Phase Inverters
11	Phase-Shift Control technique in Single-Phase Inverters
12	Three-Phase Inverters
13	Midterm Exam 2
14	PWM Techniques and Harmonic Elimination

EM544 CONTROL OF ELECTRICAL MACHINES						DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING			
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**		**Other**	**Total**	**Credit**	**ECTS Credit**
2	**42**	**-**	**-**	**40**	**-**	**106**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Principles of DC Motor Speed Control and Closed Loop Control. Principles of Induction Motor Speed Control. Principles of Synchronous Motor Speed Control. Adjustable Speed Drives. Adjustable Torque Drives.
Course Objectives	Teaching speed control in electrical machines through steady-state equivalent circuits.
Learning Outcomes and Competences	Definition, Formulation and Solution of Engineering Problems; Use of Techniques and Modern Tools Necessary for Engineering Applications
Textbook and /or References	1. Novotny, D.W., Lipo, T.A.; Vector Control and Dynamics of AC Drives, OXFORD Science Publications, 1998 2. Fitzgerald, A.E., et.al., Electric Machinery, Mc Graw Hill 3. Leonhard, W.; Control of Electrical Drives, Springer-Verlag, 1990

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	X	15
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Asst. Prof. Dr. M. Timur AYDEMIR**
Week	**Subject**
1	DC Motors: Speed Control Principles
2	DC Motors: Dynamic Modeland Closed Loop Control
3	DC Motors: Dynamic Modeland Closed Loop Control
4	Induction Motors: Principles; Per-Unit Equivalent Circuit; Speed Control Principles
5	Non-sinusoidal Excitation of Induction Motors
6	Unbalanced Operation of IM
7	Principles of Synchronous Motor Operation and Speed Control
8	Adjustable Speed DC Drives.

9	Adjustable Speed DC Drives
10	Adjustable Speed DC Drives
11	Adjustable Speed AC Drives
12	Adjustable Speed AC Drives
13	Adjustable Speed AC Drives
14	Adjustable Torque Drives

EM 546 PROCESS CONTROL INSTRUMENTATION TECHNOLOGY					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**-**	**70**	**76**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Introduction to process control. Process characteristics. Types of process control. Basic control modes. Control loop characteristics. Analog signal conditioning. Digital signal conditioning. Transducers: Temperature, humidity, light, displacement, stress, strain, magnetism, pressure, fluid flow, liquid level sensors.
Course Objectives	To learn, process-control loop, its function, and its description. To understand the operation of sensors and systems used in analog and digital process control.
Learning Outcomes and Competences	Provides to analyze the operation of sensors and control systems used in process control.
Textbook and /or References	1. Curtis D. Johnson, Process Control and Instrumentation Technology, 1997. 2. James T. Humphries, Leslie P. Sheets, Industrial Electronics, 1989.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	30
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Prof. Dr. Muzeyyen SARITAS**
Week	**Subject**
1	Process characteristics
2	Types of process control
3	Basic control modes
4	Control loop characteristics
5	Analog signal conditioning
6	Digital signal conditioning

7	Transducers
8	Temperature
9	Humidity
10	Light
11	Displacement, stress, strain
12	Magnetism, pressure
13	Fluid flow, liquid level sensors
14	Seminar

EM 548 RADAR SYSTEMS I					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Homework**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**-**	**70**	**76**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	General design principles and performance evaluation of pulsed radars. Statistical detection theory and radar cross-section of targets. CW, FM, and Doppler radars. Target tracking radars. Propagation of radar wave and radar clutter.
Course Objectives	To teach the basic concepts and phenomenon of general design principles and performance evaluation of radars. To teach the theorem and analysis of propagation of radar wave and radar clutter as applied to modern radar systems.
Learning Outcomes and Competences	Understand basic concepts of general design principles and performance evaluation of radars and understanding the processes of applying fundamental principles to arrive at useful results.
Textbook and /or References	1. Merrill I. Skolnik, Introduction to Radar Systems, Second Edition, McGraw-Hill International Edition. 2. David M. Pozar, Microwave Engineering, Addision-Wesley Publishing Company.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	35
	Quizzes	-	-
	Homeworks	X	10
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	X	15
	Final Exam	X	40

Instructors	**Instructor Dr. Nursel AKÇAM**
Week	**Subject**
1	An Introducion to Radar
2	The Radar Equation
3	Probability Density Functions
4	Radar Cross-Section of Targets
5	Pulse Repetition Frequency
6	Transmitter Power
7	Antenna Parameters
8	

	MTI and Pulse Doppler Radar
9	Tracking Radar
10	Detection of Signals in Noise
11	Information From Radar Signals
12	Detection Criteria, Detectors, Integrators
13	Radar Clutter
14	Sources of Atmosferic Echoes

EM 549 WAVELET TRANSFORM					DEPT. ELECTRICAL-ELECTRONICS ENGINEERİNG				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	42	-	-	60	40	46	188	3	7.5

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	None
Course Contents	Inner product spaces, function spaces and Hilbert spaces. Windowed Fourier transforms. Continuous wavelet transforms. Generalized frames. Discrete time-frequency analysis and sampling. Discrete time-scale analysis. Multiresolution analysis. Daubechies orthonormal wavelet bases. Electromagnetic wavelets. Applications to radar and scattering.
Course Objectives	To teach the basics of wavelet transform and to give knowledge about their applications in signal processing and electromagnetics. -
Learning Outcomes and Competences	To know the basics of wavelet transform and to obtain the necessary skills for their applications in signal processing and electromagnetics.
Textbook and /or References	1. I. Daubechies, *Ten lectures on wavelets*, SIAM, 1992. 2. G. Kaiser, *A friendly guide to wavelets*, Birkhauser, 1994. 3. T. K. Sarkar, M. Salazar-Palma, M. C. Wicks, *Wavelet applications in engineering electromagnetics*, Artech House, 2002.

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams	X	40
	Quizzes		
	Homeworks	X	10
	Projects	X	10
	Term Paper		
	Laboratory Work		
	Other		
	Final Exam	X	40

Instructors	Asst.Prof. Dr. Erkan AFACAN e.afacan@gazi.edu.tr
Week	**Subject**
1	Review of linear algebra
2	Inner product spaces
3	Function spaces and Hilbert spaces
4	Windowed Fourier transform
5	Continuous wavelet transform

6	Generalized frames
7	Discrete frames
8	Sampling in the time-frequency domain
9	Sampling in the time-scale domain
10	Multiresolution analysis
11	Daubechies' orthonormal wavelet bases
12	Electromagnetic wavelets
13	Ambiguity functions for time signals
14	The scattering of electromagnetic wavelets

EM 572 INSULATION COORDINATION OF POWER SYSTEMS					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**50**	**40**	**56**	**188**	**3**	**7.5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Over-voltages. Disruptive discharges and with stand voltages. Lightning over-voltages on transmission lines. Lightning performance of transmission lines. Switching surge design of transmission lines. Insulation co-ordination of high voltage substations.
Course Objectives	To provide basic information on Insulation Coordination of Power Systems.
Learning Outcomes and Competences	Protection of Power Lines against Lightning Discharges, Insulation Coordination for Switch ing over voltages, Insulation design of Transformer Substations
Textbook and /or References	1. Rakosh Das Begamudre (1990), Extra High Voltage AC Transnmission Engineering (Second Edition), Wiley Eastern Limited 2. Stevenson, W.D., Jr. (1982), Elements of Power System Analysis (2nd and 4th Edition), McGraw-Hill International Book Co.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	35
	Quizzes	-	-
	Homeworks	-	-
	Projects	-	-
	Term Paper	X	25
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Prof. Dr. M. Sezai DİNÇER**
Week	**Subject**
1	Introduction to Insulation Coordination
2	Nominal and Maximum System Voltages, Insulation Level and Protection Level
3	Basic Requirements and Reduced Insulation Levels
4	Over Voltages Caused by Lightning Discharges
5	The Mechanism and Characteristics of Lighting
6	Over Voltages caused by direct strokes and strokes to a tower
7	Shielding of Transmission Lines

8	Midterm
9	Switcing Surges
10	Travelling Over-Voltage Waves on Transmission Lines
11	Bewley-Lattice analysis of travelling over-voltage Waves
12	Protective Devices
13	Protective Devices and Insulation Coordination
14	Insulation Coordination Of Transformer Substations

EM 576 POWER SYSTEM OPERATION AND CONTROL					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**-**	**46**	**100**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	The need and importance of power system control. Problems of power system control. Control Systems and review of frequency and voltage control. Real time system monitoring. Control system software. Man-machine interface devices, control strategies. State estimation, steady state and transient states. State transitions, operation constraints. System security analysis and security control strategies. Configuration analysis, power system state estimation and problem formulation. Detection, identification and correction of gross measurement errors due to any failure in SCADA (Supervisory Control and Data Acquisition System). Observability analysis and functions of modern control systems.
Course Objectives	To analyze and to investigate the system control and operation concepts and apply them to the electrical power systems. Learning the steps of computer aided power system control and operation with the examples and applications.
Learning Outcomes and Competences	To learn basic concepts of the system operation and control. To apply these concepts to electrical power systems. To enhance the effectiveness of the power system operation and control by using advanced technologies and computer usage. To understand the integration and interconnection of a power system with the other neighboring power systems.
Textbook and /or References	1. Stevenson W.D. (1996). Elements of Power System. New York: McGraw-Hill Int. Book Company Press. 2. Dugan R.C. et al. (2002) Electrical Power System Quality. New York: McGraw Hill Int. Book Company Press. 3. Wood A. (1998). Power Generation, Operation Control. John Wiley & Sons Inc.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	25
	Quizzes	-	-
	Homeworks	X	10
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	X	25
	Final Exam	X	40

Instructors	**Prof. Dr. M. Cengiz TAPLAMACIOĞLU**
Week	**Subject**
1	Introduction to the power systems
2	The need for power system real time monitoring and control.
3	Classical control systems

4	Modern control systems and SCADA
5	Power system control strategies
6	System security concept
7	Security control strategies
8	Real-time configuration analysis
9	State estimation
10	Decoupled state estimation
11	Detection , identification of measurement errors in power system monitoring
12	Correction of gross measurement errors.
13	Real time observability analysis
14	Power quality in power system monitoring

EM 577 POWER SYSTEM PLANNING					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**-**	**46**	**100**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Power system planning concepts. The need and basic aim for planning. Load forecasting and forecasting methods. Demands and characteristic. Load patterns of Turkey. Generation system planning. Representation of power system units. Transmission system planning. The future of transmission systems and stability of power systems. Principles of engineering economy and applications to power systems.
Course Objectives	To teach the basic concepts of planning and to apply them generation, transmission and distribution systems which constitute the power systems. Application of these planning concepts to the system related to the power and preparation and presentation of these subjects in front of the other students
Learning Outcomes and Competences	Estimation of the future of the power system planning by taking into account of the previous and recent situation of the system. To get knowledge on the planning of a power system using by statistical and mathematical methods.
Textbook and /or References	1. Xifan Wang et. al. (1994). Modern Power System Planning. Mc.Graw Hill. 2. Steven Stoft (2002). Power System Economics. John Wiley & Sons, Inc., Publication. 3. Timoty S. Yau (1997). Power System Planning and Operations: Future Problems and Research Needs. Electric Power Research Institute, USA. 4. Orhan Tarkan (1981) Power System Planning Lecture Notes, Middle East Technical University, Ankara, Turkey.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	25
	Quizzes	-	-
	Homeworks	X	10
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	X	25
	Final Exam	X	40

Instructors	**Prof. Dr. M. Cengiz TAPLAMACIOĞLU**
Week	**Subject**
1	The need for power system planning
2	Data development and models for power systems
3	Time horizon for load forecasting

4	Application of forecasting methods
5	Generation planning for power systems
6	Linear programming model for power systems
7	Transmission planning for power systems
8	Loading of transmission lines
9	Power system compensation methods
10	Stability of power systems
11	Basic principles of engineering economy
12	Economic calculation of energy purchase
13	Fuel calculations for power plants
14	Transmission line and substation costs

EM 578 HIGH VOLTAGE GAS DISCHARGES						DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING			
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**		**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**50**	**40**	**56**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Gaseous discharges. Townsend and streamer mechanisms. Breakdown in uniform and non-uniform fields. Corona discharges.
Course Objectives	Gas insulation behaviour under electric fields and investigation of insulation design at graduate level.
Learning Outcomes and Competences	Gaz İzoleli Sistemlerde Yalıtkan Tasarımı, Elektronegatif Gaz Yalıtkanlar için Uygulamalar Insulation design of Gas Insulated Systemsand applications of electronegative gas insulators.
Textbook and /or References	1. Essam Nasser (1971), Fundamentals of Gaseous Ionization and Plasma Electronics, Wıley-Intersience 2. MKuffel, E. and Abdullah, M. (1970), High Voltage Engineering, Oxford Pergamon Pres 3. Kuffel, E., Zaengel, W.S., Kuffel, J. (2000), High Voltage Engineering Fundamentals, Newnes

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	35
	Quizzes	-	-
	Homeworks	-	-
	Projects	-	-
	Term Paper	X	25
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Prof. Dr. M. Sezai DİNÇER**
Week	**Subject**
1	Introduction to Gaseous Dielectrics
2	Low E/P and Charged Particle Behaviour Under Low Pressure Reduced Fields
3	Charged Particle Behavour Under Low Pressure Reduced Fields
4	High E/P and charged Particle Behaviour Under High Pressure Reduced Fields.
5	Charged Particle Behaviour Under High E/P
6	Breakdown Mechanisms

7	Midterm
8	Introduction to Electronegative Gases
9	Breakdown Mechanisms in Electronegative Gases.
10	Insulation Design for Practical Systems
11	Insulation Design Applications.
12	A.C Breakdown Mechanisms
13	Frequency Dependence and breakdown
14	Corona Discharges

EM 579 ARTIFICIAL HEARING SYSTEMS AND SPEECH PROCESSING					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**70**	**25**	**51**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Fundamentals of Digital Speech Processing, Digitals Models for the Speech Signal, Time-Domain Models for Speech Processing, Digital Representation of the Speech Waveforms, Introduction to the Hearing Physiology, ABR and Cochlear Implant Design, Multichannel Cochlear Implants, Speech Processing Algorithms for Multichannel Cochlear Implants.
Course Objectives	Learning of the mathematical, operational principles and usage areas of artificial hearing devices.
Learning Outcomes and Competences	To obtain necessary information for the new instrumentation design by studying the artificial hearing devices and speech processing techniques, Learning ability of basic information about speech processing, Designing ability of a system, a component or a process for providing necessities, Ability of applying practically mathematical, scientific and engineering knowledge practically, Ability of defining , formulasing, and solving of engineering problems, Ability of usage of necessary techniques and modern devices for engineering applications.
Textbook and /or References	Textbooks: 1. Cochlear Implants: A Practical Guide, 2nd Edition Huw Cooper & Louise Craddock 2. Speech and Audio Signal Processing: Processing and Perception of Speech and Music Ben Gold & Nelson Morgan

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Assoc. Prof. Dr. İrfan KARAGÖZ**
Week	**Subject**
1	Fundamentals of Digital Speech Processing,
2	Digitals Models for the Speech Signal,
3	Time-Domain Models for Speech Processing,

4	Digital Representation of the Speech Waveforms,
5	Introduction to the Hearing Physiology,
6	Cochlear Implant Design,
7	Multichannel Cochlear Implants,
8	Midterm
9	Speech Processing Algorithms for Multichannel Cochlear Implants.
10	Speech Processing Algorithms for Multichannel Cochlear Implants.
11	ABR
12	Project Presentation
13	Project Presentation
14	Project Presentation

EM580 COMMUNICATION THEORY					DEPT. OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Homework**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	42	-	-	-	73	73	188	3	7,5

Language	English
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Probability theory and stochastic processes. Classical detection and estimation theory. Detection of signals and estimation of signal parameters. Optimum receiver principles. Efficient signaling for message sequences. Coded system implementations. Important channel models.
Course Objectives	Learning the basic functions in modern communications engineering, gaining design and analysis expertise in these areas
Learning Outcomes and Competences	Learning basic functions in modern communications engineeering. The design and analysis of various communication systems for different scenarios using these functions.
Textbook and /or References -	1. J. M. Wozencraft and I. M. Jacobs. Principles of Communication Engineeering. John Wiley and Sons Inc. 2. H.L. Van Trees. Detection, Estimation and Modulation Theory. John Wiley and Sons Inc. 3. R. G. Gallager. Information Theory and Reliable Communications. Prentice Hall.

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams	X	40
	Quizzes		
	Homeworks	X	10
	Projects		
	Term Paper		
	Laboratory Work		
	Other	X	10
	Final Exam	X	40

Instructors	Assist. Prof. Dr. Özgür Ertuğ
Week	**Subject**
1	Basics of probability, random variables, expected value, limit theorems
2	Stochastic processes and their representations, filtered noise, multivariable central limit theorem, Gaussian processes, correlation functions and power spectrum
3	Basic binary detection, M-ary detection
4	Bayes estimation random parameters, estimation of nonrandom parameters
5	Detection and estimation in white noise, linear and nonlinear estimation

6	Detection and estimation in colored noise, whitening approach
7	Optimum receiver desgin approaches, vector channels, waveform channels
8	Receiver implementations, error rate
9	Midterm
10	Sequential sources, bit-by-bit and block-orthogonal signalling, time-bandwidth-dimensionality, efficient signalling choices
11	Channel capacity, reliability functions
12	Transmitter implementations, receiver quantization
13	Binary convolutional codes, sequential decoding
14	Filtering effects, bandpass channels, random amplitude and phase channels, fading channels and coding

EM DIGITAL COMMUNICATIONS					DEPT. OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Homework**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**-**	**73**	**73**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Characterization of communication signals and systems. Optimum receivers for additive white Gaussian noise channel. Carrier and symbol synchronization. Signal design for bandlimited channels. Communication through bandlimited linear filter channels. Adaptive equalization.
Course Objectives	To learn the required digital modulation, synchronization, signal design and equalization techniques in digital communication systems.
Learning Outcomes and Competences	To learn the representation and characterization of digital communication signals and systems. To understand the optimum receiver structures for AWGN channels and to do performance analysis of different modulation techniques with these receivers. To learn the carrier and symbol synchronization techniques in digital communications. To understand and apply the signal design and equalization techiques over bandlimited linear filter channels.
Textbook and /or References -	John. G. Proakis. Digital Communications. McGraw-Hill Inc

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams	X	40
	Quizzes		
	Homeworks	X	10
	Projects		
	Term Paper		
	Laboratory Work		
	Other	X	10
	Final Exam	X	40

Instructors	Assist. Prof. Dr. Özgür Ertuğ
Week	**Subject**
1	Representation of bandpass signals and systems, signal space representation
2	Representation of digitally modulated signals, spectral characteristics of digitally modulated signals
3	Optimum receiver for AWGN channels
4	Performance analysis of memoryless digital modulation techniques with optimum receiver for AWGN channels
5	Performance analysis of memoryless digital modulation techniques with optimum receiver for

	AWGN channels, Optimum receiver for CPM signals
6	Midterm I
7	Optimum receiver for random phase signals over AWGN channels, repeaters and link budget analysis
8	Carrier phase estimation, symbol synchronization
9	Symbol synchronization, signal design and characterization for bandlimited channels
10	Error rate in PAM symbol detection, modulation codes for spectrum shaping
11	Optimum receiver for AWGN channels with ISI
12	Midterm II
13	Lineer equalization, decision-feedback equalization. Adaptive lineer equalization, adaptive decision-feedback equalization
14	Adaptive channel estimation for ML sequnce estimation, RLS algorithm for adaptive equalization.

EM 582 MEDICAL IMAGING SYSTEMS					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**70**	**25**	**51**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Multi-Dimension Signal Processing, X- Ray Devices, Fundamental Techniques of Digital Radiography, Fundamentals of Computerized Tomography, Nuclear Medicine and Gamma Cameras, Positron-Emission Tomography, Magnetic Resonance Device, Mathematical Fundamentals of Ultrasoundography and Usage in Medicine, PACS
Course Objectives	Learning of the mathematical, operational principles and usage areas of medical imaging systems.
Learning Outcomes and Competences	To obtain necessary information for the new instrumentation designs by studying the image reconstruction techniques and imaging sources of medical imaging systems
Textbook and /or References	1. Karagöz, İ., Eroğul, O.(1998) Tıbbi Görüntüleme Sistemleri Haberal Eğitim Vakfı 2. Macovski A. (1983) Medical Imaging Systems Prentice Hall

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	20
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	**Assoc.Prof.Dr.İrfan KARAGÖZ**
Week	**Subject**
1	Nuclear Medicine and Gamma Cameras,
2	X- Ray Devices,
3	Fundamental Techniques of Digital Radiography,
4	Fundamentals of Computerized Tomography,
5	Image Reconstruction Techniques for Computerized Tomography,,
6	Magnetic Resonance Imaging Device,
7	Image Reconstruction Techniques for Magnetic Resonance Imaging Device,
8	Image Reconstruction Techniques for Magnetic Resonance Imaging Device,

9	Midterm
10	Positron-Emission Tomography,
11	Mathematical Fundamentals of Ultrasoundography and Usage in Medicine,
12	PACS,
13	Project Presentations,
14	Project Presentations

EM 583 SPECTRAL ESTIMATION					**DEPT. ELECTRICAL-ELECTRONICS ENGINEERİNG**				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**60**	**40**	**46**	**188**	**3**	**7.5**
Language	Turkish								
Compulsory / Elective	Elective								
Prerequisites	None								
Course Contents	Review of linear algebra. Probability and random processes. Periodogram and Blackman-Tukey spectral estimation. Parametric modeling. Autoregressive (AR), moving average (MA) and autoregressive moving average (ARMA) spectral estimation. Mininum variance spectral estimation. Prony's method. Beamforming and direction finding.								
Course Objectives	To teach the basics and applications of spectral estimation methods used for the analysis of stochastic processes.								
Learning Outcomes and Competences	To know the fundamental spectral estimation methods and to obtain the necessary skills for their applications.								
Textbook and /or References	1. P. M.T. Broersen, *Automatic autocorrelation and spectral analysis*, Springer, 2006. 2. S. L. Marple, *Digital spectral analysis with applications*, Prentice-Hall, 1987. 3. S. M. Kay, *Modern spectral estimation:Theory and applicaiton*, Prentice-Hall, 1988.								

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams	X	40
	Quizzes		
	Homeworks	X	10
	Projects	X	10
	Term Paper		
	Laboratory Work		
	Other		
	Final Exam	X	40

Instructors	Assoc.Prof. Dr. Erkan AFACAN e.afacan@gazi.edu.tr

Week	Subject
1	Matrix algebra basics
2	Probability and random processes
3	Periodogram
4	Blackman-Tukey spectral estimation
5	Rational transfer function models
6	Autoregressive processes and spectrum properties
7	Autoregressive (AR) spectral estimation methods
8	Moving average (MA) spectral estimation
9	Autoregressive-moving average (ARMA) spectral estimation
10	Mininum variance spectral estimation.
11	Prony's method
12	Beamforming and direction finding
13	MUSIC algorithm
14	ESPRIT algorithm

EM584 WIRELESS COMMUNICATIONS					DEPT. ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	Teaching Methods							Credits	
	Lecture	Recite	Lab.	Field Study	Homework	Other	Total	Credit	ECTS Credit
1-2	45	-	-	-	71	72	188	3	7,5
Language	Turkish								
Compulsory / Elective	Elective								
Prerequisites	-								
Course Contents	Overview of concurrent wireless communication systems. Path loss, shadowing and statistical multipath fading channel models. Channel capacity of wireless communication channels. Performance analysis of digital modulation techniques over wireless channels. Diversity schemes. Channel equalization and coding for wireless communiciations MIMO wireless communications. Multicarrier modulation and OFDM systems. Spread-spectrum communications. Multiple-access systems and random medium access protocols. Cellular wireless communication systems and their analysis.								
Course Objectives	To acquaint with concurrent wireless communication systems, learn the relavant channel models, understand the techniques used for high-speed high reliability wireless communication systems, learn the fundamentals of multiuser and cellular wireless communication systems								
Learning Outcomes and Competences	To learn the concurrent wireless communication systems, understand the wireless channel models, perform capacity and quality analysis over wireless channels, learn the techniques used for high speed and high reliability in wireless communications, understand the fundamentals of MIMO, OFDM, spread-spectrum, multiple-access and cellular wireless communication systems.								
Textbook and /or References -	1. Andrea Goldsmith. Wireless Communications. Cambridge University Press.								

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams	X	35
	Quizzes		
	Homeworks	x	10
	Projects	x	10
	Term Paper		
	Laboratory Work		
	Other	X	5
	Final Exam	X	40

Instructors	Assist. Prof. Dr. Özgür Ertuğ
Week	**Subject**
1	An overview of concurrent wireless commuication systems and technical issues, wireless spectrum and standards

2	Path loss and shadowing models used
3	Statistical multipath fading channel models
4	Statistical multipath fading channel models (cont'd), capacity of wireless communication channels
5	Capacity of wireless communication channels (cont'd), performance analysis of digital modulations over wireless channels
6	Performance analysis of digital modulations over wireless channels (cont'd), diversity techniques
7	Diversity technques (cont'd), channel equalization schemes
8	Channel equalization schemes (cont'd), channel coding for wireless communications
9	Channel coding for wireless communications (cont'd)
10	Channel coding for wireless communications (cont'd), MIMO communications
11	MIMO communications (cont'd), OFDM systems
12	OFDM systems (cont'd), spread-spectrum systems
13	Spread-spectrum systems (cont'd), multiuser systems
14	Multiuser systems (cont'd), Random medium access protocols
15	Cellular wireless communication systems and performance analysis

EM 585 PATTERN RECOGNITION BY ARTIFICIAL NEURAL NETWORKS					DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	Teaching Methods							Credits	
	Lecture	Recite	Lab.	Field Study	Home work	Other	Total	Credit	ECTS Credit
1-2	42	-	-	-	46	100	188	3	7,5
Language	Turkish								
Compulsory / Elective	Elective								
Prerequisites	-								
Course Contents	Biological Nerve systems, What is Artificial Neural Networks, Trained and nontrained learning, Adaptive linear neron, Adaptive linear neron, Linear accessing memory design, Multi layer perceptron, Back propagation Algortihm, Radial based function, Hopfield network, Kohonen network.								
Course Objectives	Teaching to students for Artificial Neural Networks techniques								
Learning Outcomes and Competences	Students ability to practise with Artificial Neural Networks techniques Telling, Data projection with computer Books, Computer								
Textbook and /or References	1. Omid Omidvar, Judith Dayhoff, " Neural Networks & Pattern Recognition", Academic Press, September 1997. 2. Carl G. Looney," Pattern Recognition Using Neural Networks : Theory & Algorithms for Engineers & Scientists ",Oxford University Press, January 1997. 3. Shigeo Abe, Pattern Classification: Neuro -Fuzzy Methods and Their Comparision, Springer Verlag, 2001. 4. Richard O. Duda, Pattern Classification, Wiley-Interscience, 2000. 5. Sankar K. Pal, Pattern Recognition: From Classical to Modern Approaches, World Scientific Pub. Co., 2001.								
Assessment Criteria							If any,mark as (X)		Percent (%)
	Midterm Exams						X		30
	Quizzes						-		-
	Homeworks						-		-
	Projects						X		30
	Term Paper						-		-
	Laboratory Work						-		-
	Other						-		-
	Final Exam						X		40
Instructors	Asst.Prof.Dr. Fırat HARDALAÇ								
Week	Subject								
1	Biological Nerve systems								

2	What is Artificial Neural Networks
3	Trained and nontrained learning
4	Adaptive linear neron
5	Least min sequare leraning
6	Linear accessing memory design
7	Multi layer perceptron
8	Back propagation Algortihm
9	VISA
10	Radial based function
11	Hopfield network
12	Kohonen network
13	Various Applications
14	Various Applications
15	Various Applications

EM586 MODELS OF HIGH EFFICIENCY SOLAR CELLS								DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING	
Semester	Teaching Methods							Credits	
	Lecture	Recite	Lab.	Field Study	Home work	Other	Total	Credit	ECTS Credit
1-2	42	-	-	-	70	76	188	3	7,5
Language	Turkish								
Compulsory / Elective	Elective								
Prerequisites	-								
Course Contents	Fundementals of solar cells. Photon absorption, radiative and nonradiative recombination phenomena in solar cells. Effects of Auger generation and recombination. Thermodynamic efficiency limit of solar cells, analysis of solar cells using detailed balance model. New photovoltaic technologies. High efficiency solar cells absorbing larger part of solar spectrum; thermophotovoltaic cells, tandem cells, intermediate band solar cells, up and down conversion cells. Analysis of high energy solar cells using detailed balance and quasi-drift diffusion models. High sun light concentration in solar cells.								
Course Objectives	One of the most important factor that limits the solar cell conversion efficiency arises from the fact that only a small part of the solar spectrum can be absorbed by solar cells. The objective of this course is learning the structures and the operational principles of high efficiency solar cells, investigating the new photovoltaic technologies and creating new ideas about improving the solar cell efficiency.								
Learning Outcomes and Competences	Having information about the conditions for providing high efficiency in solar cells, be able to analyze the structures and the operational principles of high efficiency solar cells, be able to create new ideas on this subject.								
Textbook and /or References	A. Marti and A. Luque, Next Generation Photovoltaics: High Efficiency through Full Spectrum Utilization, 2003 M.A. Green, Third Generation Photovoltaics: Advanced Solar Energy Conversion, 2007								
Assessment Criteria								**If any mark as (X)**	**Percent (%)**
	Midterms							X	30
	Quizes							-	-
	Homework							-	-
	Project							-	-
	Term Paper							X	30
	Laboratory Work							-	-
	Other							-	-
	Final Exam							X	40
Instructors	**Asist. Prof. Dr. Tuğba Selcen NAVRUZ**								

Week	Subject
1	The importance and the goals of solar energy
2	Fundamentals of solar cells
3	Absorption and recombination phenomena in solar cells and their mathematical expressions
4	Effects of Auger mechanism
5	Detailed balance equations and efficiency limit in solar cells
6	The effects of high sun light concentration
7	Introduction to high efficiency solar cells
8	Analysis of Tandem solar cells using detailed balance model
9	Mathematical modeling of multi-absorption solar cells
10	Midterm
11	Operational principles of Thermo photovoltaic cells
12	Analysis of intermediate band solar cells using detailed balance and quasi-drift diffusion models
13	Comparison of detailed balance and quasi-drift diffusion models for all types of the cells
14	Comparison of high efficiency solar cell models from the perspective of efficiency, current, voltage and production cost parameters.

EM587 INFORMATION THEORY AND CODING					DEPT. OF ELECTRICAL AND ELECTRONICS ENGINEERING				
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Homework**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**-**	**73**	**73**	**188**	**3**	**7,5**
Language	Turkish								
Compulsory / Elective	Elective								
Prerequisites	-								
Course Contents	Entropy and mutual information. Discrete memoryless channels, channel coding theorem and their capacity. Discrete memoyless sources, source coding theorem and their rate-distortion function. Gaussian channels and sources. Source-channel coding theorem. Linear codes. Cyclic codes. BCH, RS and related codes. Convolutional codes. Variable-length source coding.								
Course Objectives	To understand the basic principles of information theory and coding theory and to develop necessary skills in order to apply these knowledge to the analysis and design of communication systems.								
Learning Outcomes and Competences	To apply the information theory and coding theory knowledge obtained during the course to the design and analysis communication systems								
Textbook and /or References -	1. R. J. McEliece. The Theory of Information and Coding. Cambridge University Press, 2002.								

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams	X	40
	Quizzes		
	Homeworks	X	10
	Projects		
	Term Paper		
	Laboratory Work		
	Other	X	10
	Final Exam	X	50

Instructors	Assist. Prof. Dr. Özgür Ertuğ
Week	**Subject**
1	Introduction to information and coding theory
2	Entropy and mutual information for discrete and continous random variables
3	Discrete memoryless channels, channel coding theorem and capacity-cost functions

4	Discrete memoryless sources, source coding theorem and rate-distortion functions
5	Gaussian channel and sources
6	Source-channel coding theorem
7	Summary of topics in information theory, channel and source coding theorems
8	Midterm I
9	Linear codes
10	Cyclic codes
11	BCH, RS and related codes
12	Convolutional codes
13	Variable-length source coding and Huffman algorithm
14	Midterm II
15	Summary of topics in coding theory, comparison of block and convolutional codes, source codes

EM 588 MACHİNE LEARNİNG AND GENETİC ALGORİTHMS								DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING	
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**-**	**46**	**100**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Introduction, Mathematical Preliminaries; Instance-Based Learning; Artificial Neural Networks; Decision Tree Learning; Bayesian Learning; Learning Theory; Support Vector Machines; Regularization Methods; Reinforcement Learning; Assesing, Comparing and Combining Learning Algorithms; Evolutionary Algorithms; Analytical Learning, Combining Inductive and Analytical Learning; Recent Applications: e.g. Face Recognition, Music Genre and Composer Classification.
Course Objectives	To analyze and to investigate the Basic concepts of machine learning. Learning the steps of Machine Learning and Genetic Algorithms with the examples and applications.
Learning Outcomes and Competences	They will learn Basic concepts of machine learning and Genetic Algorithms.
Textbook and /or References	[1] Tom M. Mitchell, “Machine Learning”, McGraw Hill, 1997. [2] Pierre Baldi, Søren Brunak, “Bioinformatics: The Machine Learning Approach”, The MIT Press, 2001. [3] H. Adeli and S. Hung, "Machine Learning: Neural Networks, Genetic Algorithms and Fuzzy Systems", John Wiley & Sons, Inc., 1995. [4] Vera Kurkova, “Artificial Neural Networks and Genetic Algorithms”, Springer Verlag, 2001. [5] Ivan Bratko, “Prolog Programming for Artificial Intelligance”, Addison-Wesley, 2001. [6] Ethem Alpaydın, “Introduction to Machine Learning”, The MIT Press, 2004. [7] Ethem Alpaydın, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press, 2004. [8] Tom M. Mitchell, "Machine Learning", McGraw Hill, 1997.

Assessment Criteria		**If any,mark as (X)**	**Percent (%)**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	-	-
	Projects	X	30
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	Asst.Prof.Dr. Fırat HARDALAÇ

Week	Subject
1	The basic concepts of machine learning
2	Basics of Artificial Neural Networks
3	Learning with Decision Trees
4	Bayesian Learning
5	Learning Theory
6	Support Vector Systems
7	Methods of Regularization
8	Learning Support-Repeat
9	Evaluation of learning algorithms, and Comparison using together
10	Evolutionary Algorithms; Analytical Learning
11	Using analytical and inductive learning together
12	Genetic algorithms: copy, crossover, mutation, fitness function, the schema theorem, structured-block hypothesis
13	Genetic learning
14	Update Applications; Face Recognition, Music and Composers Recognition Type, etc.

EM589 LINEAR SYSTEM THEORY IN ENGINEERING	DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Semester	Teaching Methods							Credits	
	Lecture	Recite	Lab.	Field Study	Home work	Other	Total	Credit	ECTS Credit
1-2	42	-	-	60	40	46	188	3	7,5

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	-
Course Contents	Linear spaces: fields, linear independence, basis, direct sum decomposition, normed linear spaces, convergence concepts, Banach spaces. Linear transformations. Differential equations: existence and uniqueness, linear differential equations, stability of solutions, variational equation, periodically time-varying differential equations. Difference equations. Dynamical system representations: equivalence, linearity, time -invariance. Differential system representations: impulse response, system function, stability, algebraic equivalence, duality, controllability, observability, realizations. Transform techniques.
Course Objectives	Teaching the characteristics and the analysis methods of linear systems
Learning Outcomes and Competences	Learning the characteristics and analysis methods of the linear systems and gaining the ability to designing and realizing linear systems
Textbook and /or References	1. Linear System Theory and Design (Oxford Series in Electrical and Computer Engineering), Chi-Tsong Chen, 1998. 2. Linear System Theory: The State Space Approach, L.A. Zadeh, C.A. Desoer, 2008. 3. Linear Systems Theory, F. Szidarovsky, A.T. Bahill, 1998.

Assessment Criteria		If any,mark as (X)	Percent (%)
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	20
	Projects	X	10
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	

	Dr. Özgül SALOR
Week	**Subject**
1	Linear spaces: Fields, linear independence, basis.
2	Linear spaces:Direct sum decomposition, normed linear spaces, convergence concepts, Banach spaces.
3	Linear transformations
4	Differential equations: Existence and uniqueness, linear differential equations.
5	Differential equations: Stability of solutions, variational equation, periodically time-varying differential equations.
6	Difference equations.
7	Mid-term exam.
8	Dynamical system representations: Equivalence, linearity
9	Dynamical system representations: Time-invariance
10	Differential system representations: impulse response, system function
11	Differential system representations: stability, algebraic equivalence
12	Differential system representations: duality, controllability.
13	Differential system representations: observability, realizations.
14	Transform techniques.

EM 593 ELECTROMAGNETIC COMPATIBILITY								DEPT. ELECTRICAL-ELECTRONICS ENGINEERİNG	
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**60**	**40**	**46**	**188**	**3**	**7.5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	None
Course Contents	Fundamental concepts of electromagnetic compatibility (EMC). EMC units. Sources and modeling of electromagnetic interference. Electrostatic discharge. Shielding theory. High and low impedance fields. Inductive and capacitive coupling. Applications of shielding, grounding and bonding. Electromagnetic interference filters. Frequency spectrum utilization and planning. EMC regulations and measurements. Effect of electromagnetic waves on human health.
Course Objectives	To teach the fundamental concepts of electromagnetic compatibility and applications.
Learning Outcomes and Competences	To know the fundamental concepts of electromagnetic compatibility and applications.
Textbook and /or References	1) C. R. Paul, *Introduction to Electromagnetic Compatibility*, Wiley-Interscience, 2006. 2) K. L. Kaiser, *Electromagnetic Compatibility Handbook*, CRC Press, 2005. 3) D. A. Weston, *Electromagnetic Compatibility : Principles and Applications*, CRC Press, 2001.

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams	X	40
	Quizzes		
	Homeworks	X	10
	Projects	X	10
	Term Paper		
	Laboratory Work		
	Other		
	Final Exam	X	40

Instructors Assoc. Prof. Dr. Erkan AFACAN
e.afacan@gazi.edu.tr

Week	**Subject**
1	General concepts of electromagnetic theory
2	Fundamentals of electromagnetic compatibility
3	Electromagnetic compatibility units
4	Sources and modeling of electromagnetic interference
5	Electrostatic discharge
6	Shielding theory
7	High and low impedance fields
8	Grounding
9	Bonding
10	Inductive and capacitive coupling

11	Electromagnetic compatibility filters
12	Electromagnetic compatibility regulations and measurements
13	Frequency spectrum utilization and planning
14	Effect of electromagnetic waves on human health

EM 594 APPLICATIONS OF FUNCTIONAL ANALYSIS AND OPERATOR THEORY								DEPT. ELECTRICAL-ELECTRONICS ENGINEERİNG	
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	**Home work**	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	**42**	**-**	**-**	**60**	**40**	**46**	**188**	**3**	**7.5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	None
Course Contents	Finite differences. Interpolation and extrapolation. Solution of nonlinear algebraic equations. Numerical integration and differential. Systems of linear algebraic equations and matrices. Method of least squares. Initial-value problems and boundary-value problems for ordinary differential equations.
Course Objectives	Basic purpose of this course is to teach and gain the ability to use basic numerical methods Functional Analysis and Operator Theory with Applications, used in the solution of engineering problems and to develop the ability of computer usage.
Learning Outcomes and Competences	After taking this course; the students will learn the application of basic numerical methods to engineering problems and to develop algorithms necessary for computer programming. They also will gain the ability to analyze numerical results.
Textbook and /or References	1. Applications of Functional Analysis and Operator Theory, V. Hutson, John Sydney Pym, Michael J. Cloud, Elsevier (2005) 2. Applied Numerical Methods with Software, S. Nakamura, Prentice Hall, First Edition. 3. Numerical Analysis using matlab, Steven T. Karris, Orchard Publications, Third Edition.

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams	X	40
	Quizzes		
	Homeworks	X	10
	Projects	X	10
	Term Paper		
	Laboratory Work		
	Other		
	Final Exam	X	40

Instructors	Yrd Doç Dr. Fırat HARDALAÇ hardalac@gmail.com
Week	**Subject**
1	Root Approximations
2	Sinusoids and Phasors
3	Matrices and Determinants
4	Differential Equations, State Variables, and State Equations
5	Fourier, Taylor, and Maclaurin Series
6	Linear and Parabolic Regression
7	Solution of Differential Equations by Numerical Methods
8	Integration

9	Difference Equations
10	Partial Fraction Expansion
11	The Gamma and Beta Functions and Distributions
12	Orthogonal Functions and Matrix Factorizations
13	Bessel, Legendre, and Chebyshev Functions
14	Optimization Methods

5001006 MS Thesis									
Semester	**Teaching Methods**							**Credits**	
	Meeting	-	**Recitation/ Lab.**	-	-	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	14	-	200	-	-	36	250	0	10

Language	Turkish
Compulsory / Elective	Compulsory
Prerequisites	Assignment of the supervisor
Course Contents	MS thesis work
Course Objectives	To improve the ability of getting the scientific information, its evaluation and interpretation by conductive scientific research
Learning Outcomes and Competences	• To have the ability of getting the scientific and technological information, and engaging in life-long learning • To have the ability of evaluation and interpretation
Textbook and/or References	All the references related to the study.

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects		
	Term Paper		
	Laboratory and Library Work / Applications	X	
	Other (Report, presentation)	X	
	Final Exam		

Instructors	The supervisor

5980006 SEMINAR									
Semester	**Teaching Methods**							**Credits**	
	Seminar	**Library Studies**	**Project Presentation**	-	-	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	28	80	80	-	-	-	188	0	7.5

Language	Turkish
Compulsory / Elective	Compulsory
Prerequisites	Assignment of the supervisor
Course Contents	Presentation of the thesis work
Course Objectives	• To give the ability of the oral presentation and discussion • To decide on the objectives of the thesis work and the strategy
Learning Outcomes and Competences	• To have the ability of the oral presentation and discussion • To have an ability of determining the objectives and the strategy of a scientific work
Textbook and /or References	All the references related to the study.

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Seminar	X	
	Quizzes		
	Homeworks		
	Projects / Presentation	X	
	Term Paper		
	Laboratory/ Library Work	X	
	Other		
	Final Exam		

Instructors	The supervisor

6001006 PhD Thesis								DEPT. OF ELECTRICAL AND ELECTRONICS ENGINEERING	
Semester	**Teaching Methods**							**Credits**	
	Meeting	-	**Recitation/ Lab.**	-	-	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	14	-	200	-	-	36	250	0	10

Language	Turkish		
Compulsory / Elective	Compulsory		
Prerequisites	Assignment of the supervisor		
Course Contents	PhD thesis work		
Course Objectives	To give the ability of carrying out independent research, To give the ability of deducing conclusions scientifically To give the ability of determining progressive steps to reach new synthesis		
Learning Outcomes and Competences	To gain ability for innovations in scientific approach or to develop a new scientific method or to apply obvious method to a new field.		
Textbook and /or References	All the references related to the study.		
Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects		
	Term Paper		
	Laboratory and Library Work / Applications	X	
	Other (Report, presentation)	X	
	Final Exam		
Instructors	The supervisor		

7001006 TERM PROJECT									
Semester	**Teaching Methods**							**Credits**	
	Meeting	**Recitation/ Lab./ Library**	-	-	-	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	70	300	-	-	-	68	438	0	17.5

Language	Turkish
Compulsory / Elective	Compulsory
Prerequisites	Assignment of the supervisor
Course Contents	A theoretical and practical assay in which technical know how gained in professional discipline are applicable
Course Objectives	To acquaint in a certain field and to teach how to apply.
Learning Outcomes and Competences	Getting an ability to apply the knowledge obtained during education
Textbook and /or References	All the references related to the study.

Assessment Criteria		*If any,mark as (X)*	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects / Presentation	X	
	Term Paper		
	Laboratory/ Library Work / Applications	X	
	Other	X	
	Final Exam		

Instructors	The supervisor

8000006 DOCTORAL QUALIFYING EXAMINATION	-

Semester	**Teaching Methods**							**Credits**	
	Individual work	-	-	-	-	**Other**	**Total**	**Credit**	**ECTS Credit**
I-II	400	-	-	-	-	38	438	0	17.5

Language	Turkish
Compulsory / Elective	Compulsory
Prerequisites	To complete the minimum course credit
Course Contents	The written and oral exams on basic subjects and related fields of the PhD thesis work
Course Objectives	To check the qualification on basic subjects and related fields of the PhD thesis work
Learning Outcomes and Competences	To have the qualification on basic subjects and related fields of the PhD thesis work
Textbook and /or References	All the references related to the study.

Assessment Criteria		*If any,mark as (X)*	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects		
	Term Paper		
	Laboratory Work		
	Other		
	Qualıfying Exam		

Instructors	Qualification committee

80*06DD SPECIAL TOPICS in MS									
Semester	**Teaching Methods**							**Credits**	
	Theory	**Library/Lab./ Homework**		**Project / Area studies**		**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	42	150		30		28	250	0	10
Language	Turkish								
Compulsory / Elective	Compulsory								
Prerequisites	Assignment of the supervisor								
Course Contents	Basic concepts and applications related to the thesis work								
Course Objectives	• To give the general knowledge related to the thesis work • To develop the ability of analytical thinking								
Learning Outcomes and Competences	• To have the general knowledge • To have the ability of making plans for the research work								
Textbook and /or References	All the references related to the study.								

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects / presentation	X	
	Term Paper		
	Laboratory / Library Work	X	
	Other		
	Final Exam		
Instructors	The supervisor		

8500006 PROGRESS IN THESIS									
Semester	**Teaching Methods**							**Credits**	
	Report, Presentation	**Measurement and evaluation**				**Other**	**Total**	**Credit**	**ECTS Credit**
I-II	40	100				48	188	0	7.5
Language	Turkish								
Compulsory / Elective	Compulsory								
Prerequisites	Passing the qualification exam								
Course Contents	Developing the research work								
Course Objectives	To analyse the results obtained according to the work plan of PhD studies and make the work plan for the next period and contributing to the direction of the PhD work.								
Learning Outcomes and Competences	To get an ability of making work plans on the basis of research objective and evaluating the results and presentation.								
Textbook and /or References	All the references related to the study.								

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homework		
	Projects		
	Term Paper		
	Laboratory Work		
	Report and presentation	X	
	Final Exam		
Instructors	Thesis committee		

90*06DD SPECIAL TOPICS in PhD	-

Semester	**Teaching Methods**							**Credits**	
	Theory	**Library/Lab./ Homework**	-	**Project / Area studies**	-	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	42	150	-	30	-	28	250	0	10

Language	Turkish
Compulsory / Elective	Compulsory
Prerequisites	Assignment of the supervisor
Course Contents	Basic concepts and applications related to the thesis work
Course Objectives	• To give the general knowledge related to the thesis work • To develop the ability of analytical thinking
Learning Outcomes and Competences	• To develope the ability of analytical thinking • To get the ability of evaluation, data analysis and making written/oral presentation
Textbook and /or References	All the references related to the study.

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects / Presentation	X	
	Term Paper		
	Laboratory / Library Work	X	
	Other		
	Final Exam		

Instructors	The supervisor

EM- STABILITY ANALYSIS OF SYNCHRONOUS MACHINES AND MOTOR DRIVES								DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING	
Semester	**Teaching Methods**							**Credits**	
	Lecture	**Recite**	**Lab.**	**Field Study**	-	**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	42	-	-	40	-	106	188	3	7,5
Language	**Turkish**								
Compulsory / Elective	**Optional**								
Prerequisites	-								
Course Contents	**Developing the models for steady state and transient analysis of three phase synchronous machines. Steady state and transient analysis. Stability of synchronous machines and power systems. Synchronous motor drives.**								
Course Objectives	**Teaching the necessary tools for the steady state and transient analysis of synchronous machines which are very important especially for power systems. Investigation of power system stability issue at the introductory level. Teaching the principles and techniques of synchronous motor drives.**								
Learning Outcomes and Competences	**Depth of knowledge; Analysis and modeling capability, Effective use of computers**								
Textbook and /or References	**1. Lipo, T.A.; Principles of Synchronous Machines (Unpublished corse notes), Univ. of Wisconsin-Madison, 2007** **2. Say, M.G.; Alternating Current Machines, Longman** **3. Fitzgerald, A.E., et.al., Electric Machinery, Mc Graw Hill**								

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams	**X**	**30**
	Quizzes	**-**	**-**
	Homeworks	**X**	**15**
	Projects	**-**	**-**
	Term Paper	**X**	**15**
	Laboratory Work	**-**	**-**
	Other	**-**	**-**
	Final Exam	**X**	**40**

Instructors	**Asst. Prof. Dr. M. Timur AYDEMIR**
Week	**Subject**
1	Winding Distribution in an Ideal Machine
2	Winding Distribution in an Ideal Machine
3	Reference Frame Theory
4	Reference Frame Theory
5	The d-q Equations of a Synchronous Machine
6	The d-q Equations of a Synchronous Machine
7	Steady State Behavior of Synchronous Machines

8	Steady State Behavior of Synchronous Machines
9	Transient Analysis of Synchronous Machines
10	Transient Analysis of Synchronous Machines
11	Computer Simulation of Synchronous Machines
12	Power System Transient Stability
13	Power System Transient Stability
14	Synchronous Motor Drives