Bilgisayar Mühendisliği Anabilim Dalı %100 İngilizce Yüksek Lisans Programı Dersler ve Ders İçerikleri

DERSİN KODU	**Zorunlu(Z) / Seçmeli(S)**	*DERSİN ADI*	**DERSİN KREDİSİ (Teori / Uygulama / AKTS)**
CME701	S	Complex Network Analysis	3-0-3
CME702	S	Fuzzy Set Theory	3-0-3
CME703	S	Graph Theory and Algorithms	3-0-3
CME704	S	Object Oriented Programming	3-0-3
CME705	S	Machine Learning	3-0-3
CME706	S	3D User Interfaces	3-0-3
CME707	S	Digital System Design	3-0-3
CME708	S	Numerical Analysis	3-0-3
CME709	S	Evolutionary Computation	3-0-3
CME710	S	Selected Topics in Programming Languages	3-0-3
CME711	S	Information and Computer Security	3-0-3
CME712	S	Parallel Processes	3-0-3
CME713	S	Remote Sensing and Applications	3-0-3
CME714	S	Digital Image Processing Applications	3-0-3
CME715	S	Theory of Computation	3-0-3
CME716	S	Geographical Information Systems in Computing Perspective	3-0-3
CME717	S	Advanced Analysis of Algorithms	3-0-3
CME718	S	Computer Networks Design and Simulation	3-0-3
CME719	S	Mobile Application Development	3-0-3
CME720	S	Advanced Database Systems	3-0-3
CME721	S	Industrial Automation and Programming	3-0-3
CME722	S	Data Mining	3-0-3
CME723	S	Linear Programming	3-0-3
CME724	S	Introduction to Natural Language Processing	3-0-3

CME797	Z	M.Sc. Seminar	0-2-0
CME798	Z	M.Sc. Field of Specialization	4-0-0
CME799	Z	M.Sc. Thesis Research	0-1-0

YÜKSEK LİSANS DERS İÇERİKLERİ

CME701 Complex Network Analysis

Course Name	Complex Network Analysis
Course Code	CME701
Course Credits	3
Course ECTS	8
Couse Objectives	Many complex systems, both living and man-made, can be represented as static or dynamic networks of many interacting components. Network science is a new discipline that investigates the topology and dynamics of such complex networks, aiming to better understand the behavior, function and properties of the underlying systems. The applications of network science cover physical, informational, biological, cognitive, and social systems. In this course, we will study algorithmic, computational, and statistical methods of network Science and we will also perform applications about the above mentioned networks.
Method of Delivery	Theoretical background is reviewed, Network analysis tools are discussed, A term project including the analysis of a real network or imitating networks with realistic features is performed.
Course Content	Complex Network definition, history, introduction to Graph Theory, nodes, links, degree distribution, clustering, centrality, small-world networks, scale-free property, random networks, Wattz-Strogatz model, preferential attachment, community detection algorithms, statistical analysis, percolation theory, error-attack tolerance, complsx network examples, time domain evolution of complex network parameters, complex network models.

CME702 Fuzzy Set Theory

Course Name	Fuzzy Set Theory
Course Code	CME702
Course Credits	3
Course ECTS	8
Couse Objectives	Fuzzy set theory introduces fundamental concepts in fuzzy logic. It describes the necessary theoretical background and mathematical models. In addition to this, it makes them familiar with fuzzy control in the engineering field.
Method of Delivery	Lecture, practice, Homework
Course Content	Fuzzy Sets-Basic Definitions, Extensions, Fuzzy Measures and Measures of Fuzziness, The Extension Principle and Applications, Fuzzy Relations and Fuzzy Graphs, Fuzzy Analysis, Uncertainty Modeling, Fuzzy Logic and Approximate Reasoning, Fuzzy Sets and Expert Systems, Fuzzy Control, Fuzzy Data Bases and Queries, Fuzzy Data Analysis, Decision Making in Fuzzy Environments, Applications of Fuzzy Sets in Engineering and Management

CME703 Graph Theory and Algorithms

Course Name	Graph Theory and Algorithms
Course Code	CME703
Course Credits	3
Course ECTS	8
Couse Objectives	The aim of the course is to teach the fundamentals and algorithmic/computational background of the Graph Theory which plays crucial role to solve the problems in network structure.
Method of Delivery	Lecture, Question and Answer, Problem Solving
Course Content	Basic Fundamentals of graphs, Usage areas of the graphs. Properties and types of the graphs. Graph Topology, Graphs and isomorphism. Bipartite Graphs, Euler Circuits, Hamilton Circuits. Matrix presentation of the graphs. Graph visualization and drawing algorithms. Shortest path algorithms; Dijkstra algorithm, Database modelling of shortest path tree of Dijsktra algorithm, Belman-Ford algorithm. Minimum spanning tree, Kruskal algorithm. Graph coloring, duality in graphs, Welch-Powell coloring algorithm. Maximum Matching Algorithms. Independent sets problem. Paull-Unger algorithm.

CME704 Object Oriented Programming

Course Name	Object Oriented Programming
Course Code	CME704
Course Credits	3
Course ECTS	8
Couse Objectives	Teaching basic structures in order to express the solution of the problem related to the object oriented. Finding new flexible solutions by using the feature of multi-type and inheritance. Preparing a detailed report which includes all the processes in the solution of problem. Learning and practicing the basic concepts of design.
Method of Delivery	Lecture, Question and Answer, Problem Solving
Course Content	Introduction to object oriented programming, Java Programming Language Syntax Rules, Introduction to classes and objects, Methods in object oriented programming, Encapsulation, Inheritance, Polymorphism, Exception Handling, Generic & Collections, Multithreading. Applets, GUI programming & Events Handling.

CME705 Machine Learning

Course Name	Machine Learning
Course Code	CME705
Course Credits	3
Course ECTS	8
Couse Objectives	In this lecture it is aimed to make students solve learning problems by examining fundamental theories and applications on machine learning.
Method of Delivery	Verbal Lecture, Application
Course Content	Basic Concepts of Machine Learning, Neural Networks and Artificial Neuron Model, Linear Discriminants and Single Layer Perceptrons, Linear Regression and Multiple Linear Regression, Multi Layer Perceptrons, KNN Algorithm (K-Nearest Neighbor), Support Vector Machines, VC Dimensions and Structural Risk Minimization, Feature Extraction and Selection, Dimension Reduction, Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), Optimization and Search-1 (Gradient Descent, Least Squares), Optimization and Search-2

	(Local Serach Algorithms, Genetic Algorithm), Bayes Theory and Naive Bayes Classification, Decision Tree Learning, Probabilistic Learning (Expactation Maximization Algorithm), Unsupervised Learning (Kmeans Algorithm and Vector Quantization)

CME706 3D User Interfaces

Course Name	3D User Interfaces
Course Code	CME706
Course Credits	3
Course ECTS	8
Couse Objectives	Introducing 3D user interfaces that have been used up to the present in a wide range of interactive display technologies. Providing background regarding existing interfaces to design, implement, and evaluate novel 3D user interfaces.
Method of Delivery	Teaching, presentations, questions-answers, Exercises
Course Content	Introduction to 3d user interfaces, 3d user interfaces: history and roadmap, hardware technologies for 3d user interfaces, 3d interaction techniques, designing and developing 3d user interfaces, evaluation of 3d user interfaces, the future of 3d user interfaces

CME707 Digital System Design

Course Name	Digital System Design
Course Code	CME707
Course Credits	3
Course ECTS	8
Couse Objectives	The objective of this course is to serve as a cornerstone for the learning of logic design, digital system design and computer design.
Method of Delivery	The course will be covered by regular classroom teaching, problem solving, mini projects and homeworks.
Course Content	Revision of combinational and sequential circuits, digital system design methodologies, programmable logic devices, analysis of clocked sequential circuits, sequential circuit design, state machine design, reduction of state tables and state assignment, VHDL for sequential circuit.

CME708 Numerical Analysis

Course Name	Numerical Analysis
Course Code	CME708
Course Credits	3
Course ECTS	8
Couse Objectives	This course aims to provide theoretical knowledge about numerical problem solving methods. The students will be able to apply these numerical methods to problems in the areas of science and engineering.
Method of Delivery	The course will be covered by regular classroom teaching, problem solving and homeworks.
Course Content	Number representation and programming techniques, Loss of significance. Locating roots of equations, Bisection method, Newton-Raphson method, Secant method. Interpolation and numerical differentiation, Polynomial interpolation and errors, Estimating derivatives, Richardson extrapolation. Numerical integration, Trapezoid rule, Romberg algorithm, Simpson and Gauss quadrature formulas. Numerical solution of differential equations.

CME709 Evolutionary Computation

Course Name	Evolutionary Computation
Course Code	CME709
Course Credits	3
Course ECTS	8
Couse Objectives	The purpose of this course is teaching the basic theory and methodology about evolutionary computation and evolutionary computation techniques to be applied various engineering problems.
Method of Delivery	Lecture, Question and Answer, Code Writing
Course Content	genetic algorithms, genetic programming, evolutionary strategies. Introduction to genetic algorithms: the standard genetic algorithm, comparison with other methods. Mathematical foundations: the schema theorem, the building blocks hypothesis, coding, account performance, performance scaling. Genetic operators: to cross, mutation, reproduction, selection methods. Advanced operators: diploid structures, mechanisms of dominance, inversion and re-arranging other approaches, and specific to niches, sharing and descent. Parallel genetic algorithms. Island models. Statistical analysis methods in the implementation of community genetics. Application area. Current research issues.

CME710 Selected Topics in Programming Languages

Course Name	Selected Topics in Programming Languages
Course Code	CME710
Course Credits	3
Course ECTS	8
Couse Objectives	To teach the general structure of the object oriented language and to develop project applications. To teach application development by using tree and garfield algorithms. To teach algorithm analysis with project applications.
Method of Delivery	Lecture, Question and Answer, Code Writing
Course Content	The general structure of an object-oriented language (C ++, Java, etc.), variables, data types, constants, operators, control structures (if else, for, while, switch-case, do-while). Function definitions, functions usage, predefined functions, use of parameters, type and use of return, arrays, character strings, pointers, pointer arithmetic, function pointers, pointer arrays, dynamic memory usage. Class definition, class components, constructors and destructors, references, members variables, member functions, copy constructors, This pointer, singleton and multiple inheritance. Overloading of functions and operators, dominant functions. Defining virtual functions, summarization, templates, hiding function, friend class, exceptions. Stacks, queues, linked lists. Tree structures. B-trees and applications. Graphs, shortest paths, topological sorting. Sorting and searching techniques and performance. Static and dynamic trimming (hash) techniques. Introduction to algorithms, algorithm analysis. Sorting algorithms (sort sort, insertion sort, bubble sort, shell sort, merge sort, quick sort, heap sort), sort sort, radix sort, bucket sort.

CME711 Information and Computer Security

Course Name	Information and Computer Security
Course Code	CME711
Course Credits	3

Course ECTS	8
Couse Objectives	In the areas of information and computer security, students are educated to increase their knowledge and to produce both theoretical and practical solutions to these problems.
Method of Delivery	Lecture, Question and Answer, Code Writing
Course Content	Introduction to information, security and computer security. Security engineering. Security techniques. Cryptography, symmetric and asymmetric algorithms. E-signature. Authentication and authentication approaches. Public key infrastructure. Intrusion detection systems. Computer security models. Software security. Email and www security. Electronic trade. Firewalls. Risk assessment. Information security standards. Research projects.

CME712 Parallel Processes

Course Name	Parallel Processes
Course Code	CME712
Course Credits	3
Course ECTS	8
Couse Objectives	The aim of the course is to teach parallel programming processes on GPU.
Method of Delivery	Theoretic, Application and Project
Course Content	Introduction to parallel programming; Threads, Decomposition methods; Introduction to Heterogeneous Parallel Computing; Introduction to CUDA C; CUDA Parallelism Model; Memory and Data Locality; Thread Execusion Efficiency; Memory Access Performance; Parallel Computation Patterns (Histogram);

CME713 Remote Sensing and Applications

Course Name	Remote Sensing and Applications
Course Code	CME713
Course Credits	3
Course ECTS	8
Couse Objectives	The aim of the course is to teach the fundamentals of the remotes sensing and the processing, interpretation, and analyses operations of satellite images.
Method of Delivery	Lecture, Question and Answer, Code Writing
Course Content	Definition and importance of remote sensing. Remote sensing platforms. Current state of remote sensing in our country. Satellite resolutions. Application areas of remote sensing. Sensors: Passive sensors and Active sensors. Electromagnetic spectrum, wavelengths and atmospheric effects. Toolboxes and software development kits used for remote sensing. Data formats and data types. Geographic coordinates and projection systems. Google Earth Engine (GEE) presentation. Introduction to Google time lapse application and presentation of sample GEE applications. Pre-processing of remote sensing data with Matlab. Image classification techniques: supervised and unsupervised classification. Land classification of remote sensing data with Matlab. Target detection, change detection and path detection on remote sensing data with Matlab. Modern studies I (Recent studies carried out in Turkey). Modern studies II (Recent studies carried out outside Turkey).

CME714 Digital Image Processing Applications

Course Name	Digital Image Processing Applications
Course Code	CME714
Course Credits	3
Course ECTS	8
Couse Objectives	The aim of this course is to teach students the basic principles and algorithms used in image processing. Through this course it aims to enable students perform image analysis processing and discuss obtained results.
Method of Delivery	Lecture, Question and Answer, Code Writing
Course Content	Introduction to the digital image processing and fundamental steps in digital image processing, acquiring and digitalization of image, basic concepts of image processing, intensity transformations and histogram processing, spatial filtering, filtering in the frequency domain, image restoration and reconstruction (image degradation/restoration process model), image restoration and reconstruction (noise models and filtering), color fundamentals and models in color image processing, color transformations, smoothing and sharpening in color image processing, image compression and some basic compression methods, morphological image processing and some basic morphological algorithms, image segmentation (point, line, and edge detection, thresholding), object recognition (patterns and pattern classes).

CME715 Theory of Computation

Course Name	Theory of Computation
Course Code	CME715
Course Credits	3
Course ECTS	8
Couse Objectives	Theory of Computation comprises the fundamental mathematical properties of computer hardware, software, and certain applications and seek to determine what can and cannot be computed, how quickly, with how much memory, and on which type of computational model.
Method of Delivery	Lecture, practice, Homework
Course Content	Regular Languages, Context-Free Languages, The Church–Turing Thesis, Decidability, Reducibility, Advanced Topics in Computability Theory, Time Complexity, Space Complexity, Intractability, Advanced Topics in Complexity Theory

CME716 Geographical Information Systems in Computing Perspective

Course Name	Geographical Information Systems in Computing Perspective
Course Code	CME716
Course Credits	3
Course ECTS	8
Couse Objectives	The aim of the course is to teach the mathematical background and; graphical and computational base of the Geographic Information Systems.
Method of Delivery	Lecture, Question and Answer, Problem Solving
Course Content	Database models in GIS, Basic spatial notions, Spatial data structures, Spatial data models, Representation and algorithms: Representation on Euclid plane. Raster-Vector conversion. Topological correction methods. Overlay analyses algorithms, Graph structures and network analyses

	algorithms. 2D and 3D geometrical objects. 2D and 3D transformations, homogenous coordinates. Shading and filling algorithms. Spatial data conversion, Interoperability. Voronoi diagrams, Delaunay triangulation, Grid analyses algorithms. Spatial indexing. Splines

CME717 Advanced Analysis of Algorithms

Course Name	Advanced Analysis of Algorithms
Course Code	CME717
Course Credits	3
Course ECTS	8
Couse Objectives	To teach skills for the design and analysis of advanced computer algorithms.
Method of Delivery	Lecture, Question and Answer, Code Writing
Course Content	Analyzing Algorithms, Designing algorithms, Growth of function Asymptotic Notation, Probabilistic Analysis and randomized algorithms, Sorting and order statistics, Dynamic Programming, Greedy Algorithms, Amortized Analysis Algorithms, Graph algorithms, Shortest path algorithms, Multi-threaded Algorithms, Matrix Operations, The FFT and Polynomials, String Matching, Computational Geometry, NP-Completeness and Approximation

CME718 Computer Networks Design and Simulation

Course Name	Computer Networks Design and Simulation
Course Code	CME718
Course Credits	3
Course ECTS	8
Couse Objectives	The aim of the course is to evaluate a network situation, to identify the most important network aspects that need to be monitored and analyzed. Modelling and simulation techniques to describe the current network situation are covered.
Method of Delivery	Lecture, Question and Answer, Problem Solving
Course Content	Classification of computer networks, network hardware devices, addressing structures, physical layer, media access protocols, routing protocols, queue management algorithms, network security, network simulators, wired and wireless network simulations, large-scale network analysis.

CME719 Mobile Application Development

Course Name	Mobile Application Development
Course Code	CME719
Course Credits	3
Course ECTS	8
Couse Objectives	The aim of the course is to introduce different mobile platforms, designing effective mobile interface, developing mobile applications, providing connection between mobile application and web platform and services.
Method of Delivery	Lecture, Question and Answer, Code Writing, Project Presentation
Course Content	Introducing to mobile platforms, Layout Desing and XML, Activities, Explicit and implicit intents, Permission concept in mobile programming,

	Fragments, Content Providers, Menus, Lists, Special library and APIs, Geolocation and map implementations in mobile devices, Programming sensors in mobile devices, Data transfer between web and mobile applications, Connecting to web services.

CME720 Advanced Database Systems

Course Name	Advanced Database Systems
Course Code	CME720
Course Credits	3
Course ECTS	8
Couse Objectives	The aim of the course is to teach database management and DBMS data structure. Relational database systems. New mechanisms for storage and retrieval of data.
Method of Delivery	Lecture, Question and Answer, Coding and Testing
Course Content	Advanced concepts in database systems. Data models: hierarchical network and relational data models. Database design and management. Data warehousing systems. Data warehousing staging area. Data mining. Xml related technologies. Xml schemas and validation. Postgresql database. Postgresql database advantages. Postgresql database performance analysis. Graph databases. Nosql database architecture. Nosql types and examples. Nosql performance analysis. Discussion of advanced applications in the area.

CME721 Industrial Automation and Programming

Course Name	Industrial Automation and Programming
Course Code	CME721
Course Credits	3
Course ECTS	8
Couse Objectives	It is aimed to get clear understanding on industial system and to make program related to these systems
Method of Delivery	Lecture, Question and Answer, Problem Solving
Course Content	The data levels on Industrial systems , each level of the programming structure, data communication systems and security structures, Automation hierarcigal presentation. Layers and internal structures. To minimize the physical size. Instruments and standards and actuator structures. Instruments and controllers, and network topology of Networks. control issues. All system security, Industrial automation projects.

CME722 Data Mining

Course Name	Data Mining
Course Code	CME722
Course Credits	3
Course ECTS	8
Couse Objectives	Introducing data mining and improving its use.Getting the abilitiy of analysis in large scale database.
Method of Delivery	Lecture, Question and Answer, Problem Solving

Course Content	Inroduction to data mining, backround of data mining, data mining technics, operations and algorithms, data mining applications, data mining problems, text mining, web mining, sample implementations.

CME723 Linear Programming

Course Name	Linear Programming
Course Code	CME723
Course Credits	3
Course ECTS	8
Couse Objectives	Purpose of this course is to provide an overview of basic linear programming and discuss advanced linear programming modeling and solution techniques.
Method of Delivery	Lecture, Question and Answer, Problem Solving, Code writing
Course Content	Topics of this course include theory, algorithms, and computational aspects of linear programming; formulation of problems as linear programs; duality and sensitivity analysis; primal-dual simplex methods; the transportation, transshipment and assignment algorithms; extensions of linear programming; integer programming formulations and solution methods.

CME724 Introduction to Natural Language Processing

Course Name	Introduction to Natural Language Processing
Course Code	CME724
Course Credits	3
Course ECTS	8
Couse Objectives	Purpose of this course is to understand the structure of natural languages, To make sense of texts and to classify texts, To use natural language as an interface between computers and people, To translate languages with computers.
Method of Delivery	Lecture, Question and Answer, Problem Solving, Code writing.
Course Content	The morphological analysis of language; Part-of-Speech Tagging, information retrieval, machine translation.

CME797 Seminar

Course Name	Seminar
Course Code	CME797
Course Credits	0
Course ECTS	6
Couse Objectives	Gain the oral presentation and discussion ability by determining the goals of Master Thesis and road map of Master Thesis
Method of Delivery	The mode of delivery of this course is face to face
Course Content	Literature survey of Master Thesis. Presentation of the Master Thesis study.

CME798 M.Sc. Field of Specialization

Course Name	M.Sc. Field of Specialization
Course Code	CME798
Course Credits	0

Course ECTS	4
Couse Objectives	Have analytical and theoretical thinking ability for Master Thesis.
Method of Delivery	The mode of delivery of this course is face to face
Course Content	General scientific knowledge related to the thesis.

CME799 M.Sc. Thesis Research

Course Name	M.Sc. Thesis Research
Course Code	CME799
Course Credits	0
Course ECTS	26
Couse Objectives	Gain ability about getting the scientific information, its evaluation and interpretation by conductive scientific research.
Method of Delivery	The mode of delivery of this course is face to face
Course Content	Studies of Master Thesis.