KARABÜK ÜNİVERSİTESİ

LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ

DEPARTMENT OF COMPUTER ENGINEERING

Content of Ph.D. Degree in Computer Engineering (English)

COURSE CODE	COURSE NAME AND CONTENTS	T	A	C	ECTS
CME801	**Decision Support Systems**	**3**	**0**	**3**	**8**
Aim and Content	The aim of this course is to explain how decision support mechanisms can be effectively provided by using information systems (Geographic Information Systems, Management Information Systems, etc.), information technologies (software, hardware, web technologies, mobile technologies, etc.), and decision-making methods (decision trees, mathematical programming, artificial neural networks, operations research, simulation, etc.). Introduction to decision support systems, system concept, types of decision-making, general characteristics, structure, and components of decision support systems. Computer support in decision making, decision support system software. Information systems: non-spatial (Management Information Systems, Banking Information Systems, etc.) and spatial information systems (Geographic Information Systems, Urban Information Systems, Disaster Information Systems, etc.). Web and mobile technologies. Linear Programming (Mathematical Modeling). Intelligent Decision Support Systems; Expert Systems, Genetic Algorithms, Fuzzy Logic, Artificial Neural Networks. Game Theory, Decision Trees, Introduction to Simulation. Performance analysis of decision support systems.				
CME802	**Special Topics in Computer Engineering**	**3**	**0**	**3**	**8**
Aim and Content	To develop applications in specific areas of computer engineering. The content of this course may vary from semester to semester. Definition and necessity of modeling and simulation, overview of simulation languages and language selection, mathematical methods required for modeling dynamic systems, modeling techniques for dynamic systems, similarities between different engineering systems, modeling of various engineering systems, frequency domain behavior and interpretation, time domain behavior and interpretation, system design and component/parameter selection.				
CME804	**Paralel Algorithms**	**3**	**0**	**3**	**8**
Aim and Content	Course Objective: To teach parallel computer architectures and the parallel algorithms used in these architectures. Course Content: Parallel programming models, parallel data structures, parallel merging algorithms, parallel search algorithms in CRCW, EREW, and CREW models.				
CME807	**Virtual Reality**	**3**	**0**	**3**	**8**
Aim and	Course Objective: To teach the fundamentals of virtual reality and how to develop virtual reality applications.				

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Content	Course Content: Virtual reality concepts, virtual reality interface techniques and programming, physical interface devices and programming, creation of virtual reality graphics, virtual reality applications.

CME810	**Genetic Algorithms and Optimization**	**3**	**0**	**3**	**8**	
Aim and Content	Course Objective: To provide knowledge on the structure and operation of genetic algorithms, a branch of artificial intelligence used for solving engineering problems, and to relate them with other optimization techniques. Course Content: Artificial intelligence concepts, optimization, history and basic concepts of genetic algorithms, genetic operators, and their application areas.					

CME817	**Wireless Computer Networks**	**3**	**0**	**3**	**8**	
Aim and Content	Course Objective: To understand the fundamentals, architecture, and topologies of wireless networks. Course Content: Basics of wireless transmission, wireless network topologies and architectures, wireless local area networks (IEEE 802.11x family, HIPERLAN, Bluetooth, IRDA, and other protocols), wireless sensor networks, wireless ATM, and cellular systems (GSM/GPRS).					

CME820	**Advanced Algorithm Analysis**	**3**	**0**	**3**	**8**	
Aim and Content	Course Objective: To learn the skills necessary for designing and analyzing advanced computer algorithms. Course Content: Algorithm analysis and design, asymptotic notations, probabilistic and randomized algorithms, sorting and statistics, dynamic programming, greedy algorithms, amortized analysis, graph algorithms, shortest path algorithms, multithreaded algorithms, matrix operations, FFT, string matching, computational geometry, NP-completeness, and approximation algorithms.					

CME821	**Evolutionary Computing**	**3**	**0**	**3**	**8**	
Aim and Content	Course Objective: The aim of this course is to teach the fundamental theories and methodologies of evolutionary computation and the application of evolutionary computation techniques to various engineering problems. Course Content: Introduction. Main approaches: genetic algorithms, genetic programming, evolutionary strategies. Introduction to genetic algorithms: standard genetic algorithm, comparison with other methods. Mathematical foundations: schema theorem, building block hypothesis, encoding, performance evaluation, performance scaling. Genetic operators: crossover, mutation, reproduction, selection methods. Advanced operators: diploid structures, dominance mechanisms, inversion and other recombination approaches, niches and specialization, sharing and crowding. Parallel genetic algorithms. Island models. Application of statistical analysis methods in population genetics. Application areas. Current research topics.					

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ASLI GİBİDİR

CME823	**Databases**	**3**	**0**	**3**	**8**
Aim and Content	Course Objective: To teach database management, DBMS structures, and relational database systems. Course Content: Data models, databases, relational structures, relational algebra, query languages, and database/query optimization.				
CME833	**Language Theory**	**3**	**0**	**3**	**8**
Aim and Content	Course Objective: To provide graduate and PhD students with in-depth knowledge of language theory to assist in their advanced studies. Course Content: The role of language theory in computer science, language theory in programming languages and compiler design, grammar definitions and classifications (Type-3, Type-2, Type-1, Type-0), linear grammars, context-free grammars, language classes, membership problems and algorithms, solvable and unsolvable problems.				
CME836	**Mobile Services**	**3**	**0**	**3**	**8**
Aim and Content	To develop applications by understanding the structure of mobile applications and the technologies they use. Mobile platforms are currently at the center of attention for both users and organizations. Many companies and enterprises are rapidly migrating to the cloud, relying on its fast and convenient mechanisms and services for users. Today, mobile applications for platforms such as Blackberry OS, Android, iOS, and Blackberry 10, as well as for a wide range of new mobile devices, are highly popular. In this course, students will learn the fundamentals of mobile application development, along with the requirements and constraints specific to mobile systems. The accepted mobile environments for this course are Blackberry OS and Blackberry 10. Through an application- and project-based approach, students will design and develop various mobile applications. They will also utilize device hardware features to create user-friendly applications that facilitate tasks.				
LUEE801	**Scientific Research Techniques and Research Ethics**	**3**	**0**	**3**	**8**
Aim and Content	Course Objective: To teach the fundamental concepts of research, scientific research processes, preparation of research proposals, qualitative and quantitative methods, data collection and analysis techniques, validity and reliability, scientific writing, citation methods, bibliography organization, technology use in research, and research ethics. Course Content: Topics include research concepts, problem definition, proposal preparation, scientific methods, data analysis, validity and reliability, literature review, thesis and article writing techniques, scientific reporting, citation and bibliography, technology in research, and evaluation of research and publication ethics.				
CME896	**Ph.D. Qualification**	**0**	**1**	**0**	**26**
Aim and Content	The purpose of the PhD qualifying examination is to determine whether the student possesses the fundamental knowledge required to conduct doctoral-level research, has attained sufficient scientific maturity, and is ready to engage in research at the doctoral level. The PhD qualifying examination covers fundamental courses at the undergraduate and graduate levels, as well as special topics related to the student's doctoral research.				

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CME897	**Ph.D. Seminar**	**0**	**2**	**0**	**6**
Aim and Content	Course Objective: To prepare, present, and submit a seminar on a selected topic related to the student's research field. Course Content: Determining seminar topics, preparing a study on the topic, oral presentation, and written submission to the instructor.				
CME8098D	**Course Field of Specialization**	**4**	**0**	**0**	**4**
Aim and Content	Course Objective: To enable the student to gain advanced knowledge, research experience, and contribute to the academic literature in a chosen field during the coursework period. Course Content: Independent research and advanced study in a specialized field during coursework period.				
CME8098T	**Thesis Field of Specialization**	**4**	**0**	**0**	**4**
Aim and Content	Course Objective: To enable the student to gain advanced knowledge, research experience, and contribute to the academic literature in a chosen field during the thesis period. Course Content: Independent research and advanced study in a specialized field during the thesis period.				
CME899	**Ph.D. Thesis Research**	**0**	**1**	**0**	**26**
Aim and Content	Course Objective: To conduct research, analyze and synthesize findings, and write and present the doctoral dissertation according to academic standards. Course Content: Thesis preparation, research, data analysis, synthesis, and presentation according to academic writing principles.				

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