İTÜ
DERS KATALOG FORMU
(COURSE CATALOGUE FORM)

Dersin Adı	**Course Name**
Algoritma Analizi II	Analysis of Algorithms II

Kodu (Code)	**Yarıyılı (Semester)**	**Kredisi (Local Credits)**	**AKTS Kredisi (ECTS Credits)**	**Ders Uygulaması, Saat/Hafta (Course Implementation, Hours/Week)**		
				Ders (Theoretical)	**Uygulama (Tutorial)**	**Laboratuar (Laboratory)**
BLG 336E	6	3	5	3	-	-

Bölüm / Program (Department/Program)	Bilgisayar Müh / Bilgisayar Müh. (Computer Eng./Computer Eng.)		
Dersin Türü (Course Type)	Zorunlu (Compulsory)	**Dersin Dili (Course Language)**	İngilizce (English)
Dersin Önkoşulları (Course Prerequisites)	BLG 335/BLG 335E veya BLG381/BLG381E		

Dersin mesleki bileşene katkısı, % (Course Category by Content, %)	**Temel Bilim (Basic Sciences)**	**Temel Mühendislik (Engineering Science)**	**Mühendislik Tasarım (Engineering Design)**	**İnsan ve Toplum Bilim (General Education)**
	20%	10%	70%	-

Dersin İçeriği

(Course Description)

Bu ders zaman iyi zaman performansına sahip algoritmaların tasarım ve performans analizlerinin öğrenilmesini hedefler. Basics of algorithm analysis. Asymptotic Notation; Graphs. Greedy algorithms; Divide and conquer; Dynamic programming; Network Flow; NP and computational intractability-I

This course aims to study the methods for designing efficient algorithms and to evaluate their performance (mainly in term of time). Algoritma Analizinin Temelleri; Asimptotik Notasyon; Çizgeler; Açgözlü Algoritmalar; Parçala-Yen; Dinamik Programlama ; Ağ Akışı; NP ve Hesapsal Çetinlik

Dersin Amacı

(Course Objectives)

1. Algoritma alanında matemaiksel düşünme pratiği vermek
2. Algoritma seviyesinde karmaşıklığın önemini anlamak
3. Değişik algoritma türlerini tanımak
4. Bazı problemler ve onların algoritmik çözümleri hakkında bilgi sahibi olmak.
5. Değişikalgoritma türlerinin ortak özellikleri hakkında bilgi sahibi olmak.

1. Practice mathematical thinking in the domain of algorithms.
2. Understand the importance of complexity in algorithmic level.
3. Be familiar with different classes of algorithms.
4. Be familiar with various problems and their algorithmic solutions.
5. Be familiar with the common properties of the different classes of algorithms.

Dersin Öğrenme Çıktıları

(Course Learning Outcomes)

Bu dersi başarıyla tamamlayan öğrenciler şunlara sahip olur:

I. Verilen bir algoritma (ya da problemin) karmaşıklığını hesaplayabilmek
II. Verilen bir algoritmanın zaman karmaşıklığını hesaplayabilmek
III. Değişik amaçlar için kullanılan algoritmaların bazı hedefler ve durumlar için karmaşıklıklarını hesaplamak
IV. Verilen bir problemi çözen bir yazılımı, belli bir performans kriterini göz önünde tutarak gerçekleme.

Students who pass the course will be able to:

I. Ability to formulate the complexity of a given algorithm (problem) .
II. Ability to analyze the complexity of a given algorithm in terms of time .
III. Ability to compare the complexities of some algorithms used for the same purpose under various conditions .
IV. Ability to develop a program to solve a specific problem considering some performance criteria .

Ders Kitabı (Textbook)	Introduction to Algorithms , 2nd Edition,T.H.Cormen, C.E. Leiserson, R.L. Rivest, MIT J. Kleinberg and E. Tardos, Algorithm Design, Addison Wesley, 2006.		
Diğer Kaynaklar (Other References)	Introduction to Algorithms, Cormen, Leiserson and Rivest, The MIT Pres/McGraw-Hill.		
Ödevler ve Projeler (Homework & Projects	C++'da projeler.		
	Projects by using C++.		
Laboratuar Uygulamaları (Laboratory Work)			
Bilgisayar Kullanımı (Computer Use)	Zorunlu		
	Must		
Diğer Uygulamalar (Other Activities)			
Başarı Değerlendirme Sistemi (Assessment Criteria)	**Faaliyetler (Activities)**	**Adedi (Quantity)**	**Değerlendirmedeki Katkısı, % (Effects on Grading, %)**
	Yıl İçi Sınavları (Midterm Exams)	**1**	**30%**
	Kısa Sınavlar (Quizzes)		
	Ödevler (Homework)	**3**	**30%**
	Projeler (Projects)		
	Dönem Ödevi/Projesi (Term Paper/Project)		
	Laboratuar Uygulaması (Laboratory Work)		
	Diğer Uygulamalar (Other Activities)		
	Final Sınavı (Final Exam)	**1**	**40%**

DERS PLANI

Hafta	Konular	Dersin Çıktıları
1	*Giriş, örnek problemler*	4
2	*Giriş, örnek problemler*	4
3	*Algoritma Analizinin Temelleri*	4
4	*Çizgeler*	1,2
5	*Açgözlü Algoritmalar-I*	1,2
6	*Açgözlü Algoritmalar-II*	1,2,3
7	*Parçala-Yen-I*	1,2,3
8	*Parçala-Yen-II*	1,2,3
9	*Dinamik Programlama*	1,2
10	*Ağ Akışı-I*	1,2
11	*Ağ Akışı-II*	1,2,3
12	*NP ve Hesapsal Çetinlik-I*	1,2
13	*NP ve Hesapsal Çetinlik-I*	1,2,3
14	*Genel tekrar*	

COURSE PLAN

Weeks	Topics	Course Outcomes
1	*Introduction. Some representative problems.*	4
2	*Introduction. Some representative problems.*	4
3	*Basics of algorithm analysis.*	4
4	*Graphs.*	1,2
5	*Greedy algorithms-I.*	1,2
6	*Greedy algorithms-II.*	1,2,3
7	*Divide and conquer-I*	1,2,3
8	*Divide and conquer-II*	1,2,3
9	*Dynamic programming.*	1,2
10	*Network Flow-I*	1,2
11	*Network Flow-II*	1,2,3
12	*NP and computational intractability-I*	1,2
13	*NP and computational intractability-II*	1,2,3
14	*Course overview*	

Relationship between the Course and Computer Engineering Curriculum

(1: "Little", 2: "Partial", 3: "Full", Leave blank if your answer is "None")

Computer Engineering Department Program Outcomes and Performance Criteria				Level of Contribution		
				1	2	3
a	**an ability to apply knowledge of mathematics, science, and engineering to the field of computer engineering**				X	
	a1	**Acquiring knowledge of mathematics, science and engineering**				
		PC.a1	answers questions on mathematics	X		
		PC.a2	answers questions on science and engineering	X		
	a2	**Applying knowledge of mathematics**				X
		PC.a3	applies mathematical principles to obtain analytical or numerical solutions to computer engineering problems			X
		PC.a4	chooses appropriate mathematical methods/approaches for a given problem			X
	a3	**Applying knowledge of science and engineering fundamentals**				X
		PC.a5	applies science and engineering principles to model and solve computer engineering problems			X
b	**an ability to design and conduct experiments, as well as to analyze and interpret data**				X	
	b1	**Designing experiments**		X		
		PC.b1	selects variables, appropriate equipment, test apparatus, model, etc	X		
		PC.b2	chooses the effective measure(s) by which the outcome or the alternative will be evaluated	X		
	b2	**Conducting experiments**			X	
		PC.b3	uses appropriate measurement techniques to collect data		X	
		PC.b4	documents collection procedures so that the experiment may be repeated		X	
	b3	**Analyzing data**			X	
		PC.b5	selects and uses appropriate tools (i.e., statistical and graphical) to analyze data		X	
	b4	**Interpreting data**			X	
		PC.b6	interprets results with respect to the original hypothesis		X	
c	**an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability**					X
	c1	**Identifying stated needs and determining functional requirements and limitations**				X
		PC.c1	describes scope of the problem and specifies the requirements based on the desired needs			X
		PC.c2	selects appropriate methods satisfying the constraints and the requirements			X
	c2	**Developing a design**			X	
		PC.c3	applies appropriate design methods			X
		PC.c4	designs a software system, component or process			X
		PC.c5	designs a hardware system, component or process			
		PC.c6	presents the complete design with appropriate tools	X		
	c3	**Implementing the design**			X	
		PC.c7	develops a solution/prototype based on the design		X	
	c4	**Testing and validating the developed solution**			X	
		PC.c8	describes test cases and strategies		X	
		PC.c9	debugs the developed solution and corrects detected errors		X	
d	**an ability to observe and examine an existing structure or system in a criticizing attitude and finally correct or enhance it**				X	
		PC.d1	observes an existing hardware/software system to analyze its functionality		X	
		PC.d2	analyzes outputs given certain well-chosen inputs that cover different possible cases		X	
		PC.d3	finds and corrects defects of a system		X	
		PC.d4	enhances a system according to the requirements		X	

e	**an ability to function on multi-disciplinary teams**					
	PC.e1	participates effectively as a team member in a long-term group/multi-disciplinary project team				
	PC.e2	takes and fulfills responsibilities in the team				
	PC.e3	participates in the development of ideas				
	PC.e4	incorporates feedback from others into revisions/improvements				
f	**an ability to identify, formulate, and solve engineering problems**					X
	PC.f1	identifies a computer engineering problem				X
	PC.f2	formally describes constituents of a computer engineering problem				X
	PC.f3	develops a solution for a computer engineering problem				X
g	**an understanding of professional and ethical responsibility**			X		
	PC.g1	is aware of the code of ethics that guide the professional practice of engineering		X		
	PC.g2	identifies and defines ethical issues concerning a decision				
	PC.g3	evaluates and judges a situation in practice, using facts and a professional code of ethics				
h	**an ability to communicate effectively**			X		
	h1	**Written communication of information, concepts, and ideas effectively**		X		
	PC.h1	writes a document using an appropriate format and grammar and uses discipline-specific conventions including citations		X		
	h2	**Orally communicating information, concepts, and ideas effectively**				
	PC.h2	plans, prepares, and delivers a well-organized, logical oral presentation; explains when questioned				
	h3	**Graphically communicating information, concepts, and ideas**		X		
	PC.h3	uses professional graphics on written and oral presentations		X		
i	**the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context**					
	PC.i1	lists several types of impacts an engineering solution might have				
	PC.i2	defines key terms associated with understanding of a societal context including society, culture, and global society				
	PC.i3	recognizes the engineering aspects of a global problem				
j	**a recognition of the need for, and an ability to engage in life-long learning**				X	
	j1	**Demonstrating an awareness of what needs to be learned**			X	
	PC.j1	determines what needs to be learned in an actual project			X	
	j2	**Ability to engage in life-long learning**			X	
	PC.j2	applies the learning plan to an actual research project and/or independent learning opportunity			X	
	PC.j3	attends seminars and training activities				
k	**a knowledge of contemporary issues**					
	PC.k1	identifies engineering problems with potential environmental impact issues				
	PC.k2	lists and describes major socio-economic issues				
	PC.k3	lists and describes major political issues at national or international levels				
l	**an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice**					X
	PC.l1	uses engineering techniques, skills, and tools to monitor performance of an engineering system and/or create an engineering design				X
	PC.l2	uses engineering techniques, skills, and tools to acquire information needed for decision-making			X	
	PC.l3	selects appropriate techniques and tools for a specific engineering task				X
m	**an ability to adapt to changing conditions**				X	
	PC.m1	adapts to new tools and approaches			X	
	PC.m2	practices different team roles in a working group				
	PC.m3	is aware of emerging fields and adapts to them			X	

Düzenleyen (Prepared by)	***Tarih (Date)***	***İmza (Signature)***
	Apr 8, 2013	