



BİLGİSAYAR MÜHENDİSLİĞİ BÖLÜMÜ

MÜFREDAT EL KİTABI

ANKARA, 2022



COMPUTER ENGINEERING DEPARTMENT

CURRICULUM HANDBOOK

ANKARA, 2022

ANKARA BİLİM ÜNİVERSİTESİ

BİLGİSAYAR MÜHENDİSLİĞİ BÖLÜMÜ

2020-2021 yılı Güz döneminde eğitim-öğretim hayatına başlayan Bilgisayar Mühendisliği Bölümü, alanında yetkin ve mesleğinin gerekliliklerini özümsemiş Mühendisler yetiştirmeyi amaçlamaktadır.

MİSYON

Bilgisayar mühendislerinin çeşitli alanlardaki mesleki uygulamaları gerçekleştirebilmeleri için modern bilgisayar teknolojilerini iyi bilmesi, en iyi ve probleme en uygun veri yapılarını, ileri düzey algoritmaları seçerek doğru bir şekilde kullanabilmeleri gereklidir, bu zor problemleri çözen yazılım sistemlerini tasarlayıp en düşük maliyetle inşa etmeleri ancak böyle mümkün olacaktır. Bilgisayar Mühendisliği bölümünde verilmekte olan veri yapıları, algoritmalar, işletim sistemleri, veritabanları, bilgisayar grafikleri ve bilgisayar ağları gibi dersler ile mezunlarımızın bu konular ve benzer kritik alanlardan da sıçrama yapabilecekleri şekilde mesleki yeterliliği hedeflenmektedir. Bilgisayar Mühendisliği, Yazılım Mühendisliğine benzer şekilde yazılım geliştirme, denetleme ve doğrulama testlerinin yapılması ve bakımı için sistematik, disiplinli ve hesaplanabilir bir yaklaşım kullanarak standart mühendislik prensiplerini uygulamaya dikkat etmektedir.

VİZYON

Apple, Google, Microsoft ve Facebook firmalarının hepsi bilgisayar / yazılım şirketleridir ve dünyanın en değerli 5 markası arasındadır. Dünyanın en değerli şirketi olan Amazon ise, çevrim içi kitap satarak e-ticarete başlamıştır ve şimdi her kategoride çevrim içi alışveriş için bilgisayar sistemlerini ve yazılımlarını kullanmaktadır. Bu yazılım şirketlerinin her biri Mercedes-Benz, Toyota ve Volkswagen gibi en değerli otomobil üretim firmalarından 5 ila 10 kat daha değerlidir. Bilgisayar mühendisleri için bilgisayar oyunu geliştirme, e-ticaret uygulamaları, e-devlet uygulamaları, iş yazılımı geliştirme, veritabanı tasarımı ve yönetimi, bilgisayar sistemi ve ağ yönetimi olmak üzere birçok istihdam alanı bulunmaktadır. Bilgisayar mühendislerine gelecekte olacak ihtiyaç açıktır ve bu ihtiyaç bilgisayar elektroniği ve yazılımındaki ilerlemelerle artmaya devam edecektir.

ANKARA SCIENCE UNIVERSITY

DEPARTMENT OF COMPUTER ENGINEERING

Beginning its education in 2020-2021 Fall Term, the Department of Computer Engineering aims to raise engineers who are competent in fields of Computer Engineering and who have internalized the requirements of their profession.

MISSION

In order for Computer engineers to accomplish applications of their profession in various fields, they need to know modern computer technologies well, select the best and most suitable data structures to the problem at hand, advanced level algorithms and correctly implement them. Main reason behind this is the fact that these difficult problems require software systems to be designed by them and they, in turn, should be constructed with the least cost possible. Lectures being given in the Computer Engineering department such as data structures, algorithms, operating systems, databases, computer graphics and computer networks will enable our graduates to propagate their proficiency further from these subjects and similar critical fields. Computer Engineering, similar to Software Engineering, strives to apply standard engineering principles using a systematical, disciplined and calculable approach for performing software development, control and verification tests and maintenance.

VISION

Apple, Google, Microsoft and Facebook are computer / software companies and they are among the 5 most valued brands in the world. The most valuable brand, Amazon, started in e-commerce by selling online books and nowadays, they are engaged in online shopping within every category of items using computer systems and software. Each one of these software companies is 5 to 10 times more valuable than the most valued car production companies like Mercedes-Benz, Toyota and Volkswagen. There exist many employment fields for Computer engineers such as video game development, e-commerce applications, e-devlet applications, business software development, database design and management, computer system and network management. The need for new Computer engineers in the future is clear and this need will keep on rising with the breakthroughs in computer electronics and software.

	I. YARIYIL				
Kod	Ders adı	T	U	UK	AKTS
CENG 101	Algorithms and Programming with Java I	3	2	4	6
OHS 101	Occupational Health and Safety I	1	0	1	1
ENG 101	Academic English I	2	0	2	2
MATH 101	Calculus I	4	0	4	6
PHY 101	Physics I	3	2	4	6
EEE 103	Molecular Biology ang Biochemistry	3	0	3	5
HIS 101	Principles of Ataturk and History of Revolutions I	2	0	2	2
TUR 101	Turkish I	2	0	2	2
	Open Course I	0	0	0	0
Semester Credits		20	4	22	30

	II. YARIYIL				
Kod	Ders adı	T	U	UK	AKTS
CENG 102	Algorithms and Programming with Java II	3	4	5	8
OHS 102	Occupational Health and Safety II	1	0	1	1
ENG 102	Academic English II	2	0	2	2
MATH 102	Calculus II	4	0	4	6
PHY 102	Physics II	3	2	4	6
HIS 102	Principles of Ataturk and History of Revolutions II	2	0	2	2
TUR 102	Turkish II	2	0	2	2
	Non-Departmental Elective I	2	0	3	3
	Open Course II	0	0	0	0
Semester Credits		19	6	23	30

	III. YARIYIL				
Kod	Ders adı	T	U	UK	AKTS
EEE 203	Digital Design	3	2	4	5
CENG 281	Electrical Circuits	3	2	4	5
CENG 213	Data Structures and Algorithms	3	0	3	5
CENG 223	Discrete and Combinatorial Math.	3	0	3	5
CENG 241	Programming Languages	3	0	3	6
ENG 201	Academic English III	2	0	2	2
	Non-Departmental Elective II	3	0	3	3
Semester Credits		20	4	22	31

	IV. YARIYIL				
Kod	Ders adı	T	U	UK	AKTS
CENG 214	Algorithms II	3	0	3	6
CENG 256	Formal Languages and Automata Theory	3	0	3	6
MATH 224	Linear Algebra & Differential Equations	3	0	3	5
CENG 236	Probability and Statistics for Engineers	3	0	3	5
SENG 244	Object Oriented Software Engineering	3	0	3	6
ENG 202	Academic English IV	2	0	2	2
Semester Credits		17	0	17	30

	V. YARIYIL				
Kod	Ders adı	T	U	UK	AKTS
CENG 301	Operating Systems	3	0	3	6
CENG 351	Database Management Systems	3	0	3	6
SENG 211	Software Engineering	3	0	3	5
CENG 361	Web Design and Programming	3	0	3	5
ENG 301	Academic English V	2	0	2	2
	Technical Elective I	3	0	3	5
Semester Credits		17	0	17	29

	VI. YARIYIL				
Kod	Ders adı	T	U	UK	AKTS
CENG 332	Computer Architecture	3	0	3	6
CENG 336	Computer Networks	3	0	4	6
CENG 378	Computer Graphics	3	0	3	6
	Technical Elective II	3	0	3	5
CENG 384	Intro. to Signals Processing for Comp. Engineers	3	0	3	5
ENG 302	Academic English VI	2	0	2	2
Semester Credits		82	0	18	30

	VII. YARIYIL				
Kod	Ders adı	T	U	UK	AKTS
CENG 491	Graduation Project I	3	2	4	5
	Technical Elective III	3	0	3	5
	Technical Elective IV	3	0	3	5
	Technical Elective V	3	0	3	5
	Technical Elective VI	3	0	3	5
	Non-Departmental Elective III	3	0	3	3
CCE 401	Critical Thinking, Creativity and Entrepreneurship	2	0	2	2
Semester Credits		20	2	21	30

	VIII. YARIYIL				
Kod	Ders adı	T	U	UK	AKTS
CENG 492	Graduation Project II	3	2	4	5
CENG 410	Long Term Practice	0	16	8	25
Semester Credits		3	18	12	30
	TOPLAM KREDİ				

Tech elective (SEÇMELİ) DERSLER					
Kod	Ders adı	T	U	UK	AKTS
CENGTE	Business Intelligence (Unit 14)	3	0	3	5
CENGTE	Machine Learning (Unit 26)	3	0	3	5
CENGTE	Artificial Intelligence (Unit 27)	3	0	3	5
SENG 311	Software Requirements Engineering				
SENG 324	Software Design Patterns				
SENG 322	Software Validation and Verification				
SENG 442	Software Project Management				

Course Content	• Define the fundamentals of computers, introduce topics of computer engineering and programming with Java. • Introduce computer organization and peripherals • Give an overview of the Binary number system, logic gates and adders, flip-flop and registers • Explain RAM and hard disk concepts • Explain the role of microprocessors and machine language • Introduce programming with Java • Explain fundamental data types • Explain decision making structures • Explain control flow and looping • Explain the role of classes and objects in Java • Define the attribute and method features of Java • Define simple data structures such as arrays and array lists
References	Big Java: Late Objects, by Cay S. Horstmann, John Wiley & Sons Inc., ISBN: 978-1-118-08788-6 Java Software Solutions: Foundations of Program Design, Lewis & Loftus, 8th Edition, Pearson
Learning outcomes	After taking this course students will be able to; • Understand the basic knowledge of computers, topics of computer engineering and programming with Java • Understand the basic concepts of computer organization and its peripherals • Understand basic electronical elements which form up a computer and their basic calculation principles • Develop programs in Java in order to solve beginner level problems • Have gained the necessary knowledge to continue with studying further Java course subjects

SUBJECTS BY WEEKS

Weeks	Subjects
1. Week	Fundamental concepts of Computer science
2. Week	Basics of Computer Architecture
3. Week	Computer Programs, Java Programming Language
4. Week	Software errors, Problem Solving, Fundamentals of Algorithm Design
5. Week	Fundamental Data Types
6. Week	Input and Output, Display the results, Problem solving, Java String type
7. Week	Decision using if Statement, Comparing Numbers and Strings, Multiple Alternatives
8. Week	Midterm Exam
9. Week	Nested Branches, Problem Solving
10. Week	Loops, Implement while, for and do loops
11. Week	Read and Process data set, Problem Solving: Storyboards, Common Loop algorithms, Nested Loops, their applications
12. Week	Methods, Implementing Methods
13. Week	Decomposing complex tasks into simpler ones
14. Week	Arrays & Array List, Arrays, Enhanced For Loop
15. Week	Two Dimensional Arrays, Array & Array Lists
16. Week	Final Exam

ASSESSMENT METHOD

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	12	%30
Application	0	%0
Fieldwork	0	%0
Practice	0	%0

Homework Assessment	0	%0
Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%40
Total	26	%100
Contribution of semester Works to success points	13	%60
Contribution of final exam to success points	1	%40
Total	14	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory	12	2	24
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	6	84
Presentation / Seminar Preparation			
Project			
Homework assignment			
Midterms (Study duration)	1	15	15
Final Exam (Study duration)	1	20	20
Total Workload			185
Total Workload/30 hours			6.17
ECTS			6.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		

Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	
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1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

**ANKARA SCIENCE
UNIVERSITYFACULTY OF
ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

COURSE SYLLABUS

Calculus I

Course Information

[illegible]

Subjects by weeks

Weeks	Subjects
1. week	Appendix D: Trigonometry, The Limit of a Function, Calculating Limits using the Limit Laws
2. week	Limits at Infinity; Horizontal Asymptotes Continuity
3.week	Derivatives and Rates of Change The Derivative as a Function Differentiation Formulas
4.week	Derivatives of Trigonometric Functions The Chain Rule Implicit Differentiation
	Quiz-1
5.week	Related Rates Linear Approximations and Differentials Inverse Functions Exponential Functions and Their Derivatives
6.week	Logarithmic Functions Derivatives of Logarithmic Functions Inverse Trigonometric Functions, Hyperbolic Functions
7.week	Indeterminate Forms and l'Hospital's rule Maximum and Minimum Values The Mean Value Theorem How Derivatives Affect the Shape of a Graph Summary of Curve Sketching
	Quiz-2
8.week	Midterm Exam
9.week	Optimization problems Antiderivatives
10.week	Areas and Distances The Definite Integral The Fundamental Theorem of Calculus

11.week	Indefinite Integrals and the Net Change Theorem The Substitution Rule Integration by Parts	Quiz-3
12.week	Trigonometric Integrals Trigonometric Substitution	
13.week	Integration of Rational Functions by Partial Fractions Improper Integrals	
14.week	Areas Between Curves Volumes Volumes by Cylindrical Shells	HW
15.week	Average Value of a Function Arc length Area of a Surface of Revolution	Quiz-4
16.week	Final Exam	

Assessment Method

Semester Works	Number	Contribution
Attendance	14	0%
Laboratory	0	0%
Application	0	0%
Fieldwork	0	0%
Practice	13	0%
Homework Assessment	1	0%
Quiz	4	20%
Presentation	0	0%
Project	0	0%
Seminar	0	0%
Mid-term Exam(s)	1	30%
Final Exam	1	50%
Total	30	100%
Contribution of semester Works to success points	29	50%
Contribution of final exam to success points	1	50%
Total	30	100%

Workload and ECTS Calculation

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	4	56
Laboratory	0	0	0
Application	0	0	0
Specific practical training	0	0	0
Field activities	0	0	0
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	6	84
Presentation / Seminar Preparation	0	0	0
Project	0	0	0
Homework assignment	1	8	8
Quiz	0	0	0
Midterms (Study duration)	1	14	14
Final Exam (Study duration)	1	18	18
Total Workload	180		
Total Workload/30 hours	6		
ECTS	6		

Program Learning Outcomes - Course Learning Outcomes Matrix

Program Outcomes	Course Learning Outcomes				
	LO1	LO2	LO3	LO4	LO5
1 Qualified knowledge of mathematics, science, and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.	5			5	
2 An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.		5			
3 An ability to design a complex system, process, device, or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.					
4 Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.					5
5 Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.			5		

6 Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.					
7 Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.					
8 Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.					
9 To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.					
10 Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.					
11 Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.					

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING AND ARCHITECTURE
PHY 101 SYLLABUS

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Probability Theory		Fall	3	0	0	3	5
Prerequisites							
Course Language	English						
Course Type	Compulsory						
Mode of	Face to face						
Learning and teaching strategies	Lecturing, discussion and submission.						
Instructor (s)	Dr. Neslihan GÖKÇEK, Dr. Vedat TANRIVERDİ						
Course objective	Upon the successful completion of this course, students will establish the relationship between mechanics and engineering. This includes to provide students the concepts of mechanics with defining and solving problems.						
Course Content	Basic information about the concepts of nature of matter, mechanics, kinetics and dynamics						
References	1. R. A. Serway & J. W. Jewett, Physics for Scientists and Engineers (6th Ed.), Brooks Cole (2007). 2. H. D. Young and R. A. Freedman, University Physics 12th-14th Ed. Pearson (2008, 2016). 3. Principles of Physics by Halliday, Resnick, and Walker (10th Edition), John Wiley (2014)						
Learning outcomes	1. Learn the basic concepts of mechanics, kinetics and dynamics 2. Apply the topics of mechanics to their own engineering science 3. Improve the ability of student's solution perspective for different kinds of new problems 4. Modelling a new problem related with the concepts of mechanics and interpret the results 5. The ability to analyze a problem graphically						

Form IVb (English): Subjects by weeks

Weeks	Subjects
1. Week	Physics and measurement
2. Week	Motion in one dimension
3. Week	Vectors
4. Week	Motion in two dimensions
5. Week	The laws of motion
6. Week	Circular motion and other applications of Newton's laws
7. Week	Circular motion and other applications of Newton's laws
	Midterm Exam
8. Week	Energy and energy transfer
9. Week	Energy and energy transfer
10. Week	Potential energy
11. Week	Linear momentum and collisions
12. Week	Rotation of a rigid object and about a fixed axis
13. Week	Rotation of a rigid object and about a fixed axis
14. Week	Angular momentum

Assessment Method

I. Assignments & Quizzes : 10%

- II. Midterm Exam (closed book) : 40%
- III. Final Exam: (closed book) : 50%

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	18	5	90
Presentation / Seminar Preparation			
Project			
Homework assignment	9	5	45
Midterms (Study duration)	1	8	8
Final Exam (Study duration)	1	12	12
Total Workload			197
Total Workload/30 hours			6.56
ECTS			5

Form VIIb (English): THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Course Outcomes				
	1	2	3	4	5
1	5	5	5	5	5
2		2	5	5	
3			5	5	
4				4	4
5		2		5	
6					
7					
8					
9					
10					
11					

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	and compare the performance of different algorithms
Course Content	Material covered in the Algorithms and Programming with Java-II course (Java II) is the continuation of the Algorithms and Programming with Java-I course (Java I). We assume, students have successfully taken and passed the Java I course. The Java II course will continue to explore the Java language and fundamentals, and gives you an opportunity to put the basic computer literacy, design and programming skills to solve real problems of mathematics, modeling, and computation. ○ Implementation of classes, inheritance, interfaces, methodology for object oriented design and development. ○ Graphical user interfaces design, (buttons, text components, drawing exc.). ○ Input/output files reading and writing and exception handling, recursion, searching and sorting algorithms. ○ Java Collections Frameworks will be presented from the perspective of a library use. Student will get weekly 4 hours of Lab experiments and many small projects, and home works. The ultimate goal is to produce a commercial-quality program, which is well structured, documented, bug-free and easy to use. Students will be expected to display creativity and an ability to learn independently.
References	Big Java: Late Objects, by Cay S. Horstmann, John Wiley & Sons Inc., ISBN: 978-1-118-08788-6 Java Software Solutions: Foundations of Program Design, Lewis & Loftus, 8th Edition, Pearson
Learning outcomes	After taking this course students will be able to; ○ Solve real problems pertaining to mathematics, modeling and computation with the basic knowledge of computer literacy, design and programming skills ○ Have learned and understood more advanced features and semantics of the Java language ○ Have proficient programming skills in the Java language and analyze, design, develop and debug problems appropriately for Java ○ Employ object-oriented design and development through Implementation of classes, inheritance, interfaces, methodology and understand the concepts of classes, objects and encapsulation ○ Apply object-oriented design techniques for building complex programs systematically ○ Become familiar with common user-interface problems and apply related solutions to real world problems

	○ Have understood several sorting and searching algorithms, estimate and compare space and time limitations of different algorithms
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Subjects by weeks

Weeks	Subjects
1. Week	Ch.8 Objects and Classes To understand the concepts of classes, objects, and encapsulation. The public interface of a class, implementing instance method, constructors. To be able to design, implement and test your own classes. Static variables and static methods.
2. Week	Ch.8 Objects and Classes Week 1 topics continue
3. Week	Ch.9 Inheritance & Interface Inheritance and inheritance hierarchies, implementation of subclasses that inherit and override superclass methods, the concept of polymorphism. Common superclass Object and its methods and working with interface types
4. Week	Ch.9 Inheritance & Interface Week 3 topics continue
5. Week	Ch.12 Object Oriented Design Inheritance, aggregation, and dependency relationships between classes using UML class diagrams. Object oriented design techniques to building complex programs. Package usage to organize programs
6. Week	Ch.10 Graphical User Interfaces Implementation of basic graphical user interfaces, buttons, text fields, and other components to a frame window, handle events that are generated by buttons. Programming that display simple drawings.
7. Week	Ch.11 Advanced User Interfaces Layout managers to arrange user-interface components in a container. Common user-interface components, such as radio buttons, check boxes, and menus. events handling generated by user-interface components. Effective Java documentation.

8. Week	Midterm Exam
9. Week	Ch.7 Input/output and Exception Handling Read and Write text files, text input and output. Process command line arguments. Exception handling, throwing and catching exceptions, some examples and programming tips. Implementation programs that propagate checked exceptions and handling input errors.
10. Week	Ch.7 Input/Output and Exception Handling Week 9 topics continue
11. Week	Ch.13 Recursion The relationship between recursion and iteration, Use recursive helper methods. When the use of recursion affects the efficiency of an algorithm, efficiency of algorithm. Analyze problems much easier to solve by recursion. Recursive structures using mutual recursion
12. Week	Ch.14 Sorting & Searching Several sorting and searching algorithms and their performance evaluations. Analyzing the performance of the selection sort algorithm, analyzing the merge sort algorithm. To estimate and compare the performance of algorithms. Estimating the running time of an algorithm. Sorting and Searching in the Java Library
13. Week	Ch.14 Sorting & Searching Week 12 topics continue
14. Week	Ch.15 The Java Collections Framework Overview of the collection framework and the collection classes supplied in the Java library. Linked lists, sets, maps implementation. To choose appropriate collections for solving programming problems. To study applications of stacks and queues
15. Week	Ch.15 The Java Collections Framework Week 14 topics continue
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	14	%35
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	0	%0
Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%40
Total	30	%100
Contribution of semester Works to success points	15	%60
Contribution of final exam to success points	1	%40
Total	16	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory	14	4	56
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	6	84
Presentation / Seminar Preparation			
Project			
Homework assignment	7	4	28
Midterms (Study duration)	1	15	15
Final Exam (Study duration)	1	20	20
Total Workload			245
Total Workload/30 hours			8.17
ECTS			8.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X

An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING AND ARCHITECTURE
ALL ENGINEERING DEPARTMENTS

Course Information

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Calculus II	MATH 102	Fall	4	0	0	4	6
Prerequisites	Math 101						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery	Face to face						
Learning and Teaching strategies	Lecturing, discussion, and submission						
Instructor(s)	Dr. Berrin Şentürk, Dr. Neslihan Ayşen Özbay						
Course objective	The main objective for this course is to acquaint you with fundamental calculus concepts involving functions of more than one variable, and to help you to understand and apply such functions in a variety of settings. The course aims to study infinite sequences and series, convergence test for series, absolute and conditional convergence, and Taylor polynomials and power series, volumes of rotation, integration techniques, partial derivatives, and local extrema of two variable functions, double and triple integrals.						
Course content	Sequences, Series, Taylor Series, Vectors in R^2 and R^3 , Dot and Cross Products, Lines and Planes in R^3 , Functions of Several Variables, Limits and Continuity, Partial Derivatives, Directional Derivatives, Maximum and Minimum Values, Lagrange Multipliers, Double Integrals, Triple Integrals, Vector Functions, Limits and Derivatives.						
References	1. Calculus (Metric Version), 8th (or 7th) Edition, by James Stewart 2. Calculus, 14th Edition, by George B. Thomas (Supplementary Book) 3. Calculus, Multivariable 2nd Edition by Brian E. Blank, Steven G. Krantz						
Learning Outcomes	Upon successful completion of this course, a student will be able to: 1. Test series for convergence and divergence, represent elementary and transcendental functions of one variable as Taylor or Maclaurin series 2. Perform vector operations such as vector addition, scalar multiplication, dot product and cross product 3. Relate vector operations to geometric notions and structures such as distance, projection, orthogonality, parallelism, lines, and planes in R^3 4. Solve maximum and minimum problems and apply the method of Lagrange multipliers for multivariable functions 5. Evaluate limits, partial derivatives, directional derivatives, multiple integrals of multivariable functions 6. Compute limits, derivative and integrals of vector functions. 7. Expose to the concept of three-dimensional analytical geometry.						

Subjects by weeks

Weeks	Subjects
1. week	11.1 Sequences 11.2 Series 11.3 The integral test, the Limit of a Function,

2. week	11.4 The comparison tests 11.5 Alternating series
3. week	11.6 Absolute Convergence, the Ratio and Root Tests 11.8 Power Series
4. week	11.9 Representation of Functions as Power Series 11.10 Taylor and Maclaurin Series
5. week	12.1 3D Coordinate Systems 12.2 Vectors 12.3 The Dot Product 12.4 The Cross Product
6. week	12.5 Equations of Lines and Planes 12.6 Cylinders and Quadric Surfaces
7. week	13.1 Vector functions and space curves 13.2 Derivatives and integrals of vector functions 13.3 Arc Length
8. week	Midterm Exam
9. week	13.4 Velocity and Acceleration 14.1 Functions of Several Variables
10. week	14.2 Limits and Continuity 14.3 Partial Derivatives
11. week	14.4 Tangent Planes and Linear Approximations 14.5 The chain rule 14.6 Directional Derivatives and the Gradient Vector
12. week	14.7 Maximum and Minimum Values 14.8 Lagrange Multipliers
13. week	15.1 Double integrals over rectangles 15.2 Double integrals over general regions 15.3 Double integrals in polar coordinates
14. week	15.6 Triple integrals 15.7 Triple integrals in cylindrical coordinates
15. week	15.8 Triple integrals in spherical coordinates 15.9 Change of variable in multiple integrals
16. week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	0%
Laboratory	0	0%
Application	8	0%
Fieldwork	0	0%
Practice	0	0%

Homework Assessment	1	5%
Quiz	0	0%
Presentation	0	0%
Project	0	0%
Seminar	0	0%
Mid-term Exam(s)	1	40%
Final Exam	1	55%
Total	30	100%
Contribution of semester Works to success points	29	45%
Contribution of final exam to success points	1	55%
Total	30	100%

Workload and ECTS Calculation

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	4	56
Laboratory	0	0	0
Application	0	0	0
Specific practical training	0	0	0
Field activities	0	0	0
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	6	84
Presentation / Seminar Preparation	0	0	0
Project	0	0	0
Homework assignment	1	5	5
Quiz	0	0	0
Midterms (Study duration)	1	15	15
Final Exam (Study duration)	1	20	20
Total Workload	180		
Total Workload/30 hours	6		
ECTS	6		

Program Learning Outcomes - Course Learning Outcomes Matrix

Program Outcomes	Course Learning Outcomes				
	LO1	LO2	LO3	LO4	LO5
1 Qualified knowledge of mathematics, science, and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.	5			5	
2 An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.		5			
3 An ability to design a complex system, process, device, or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.					

4 Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.					5
5 Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.			5		
6 Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.					
7 Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.					
8 Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.					
9 To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.					
10 Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.					
11 Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.					

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING AND ARCHITECTURE
PHY 102 SYLLABUS

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Probability Theory		Spring	3	0	0	3	5
Prerequisites							
Course Language	English						
Course Type	Compulsory						
Mode of	Face to face						
Learning and teaching strategies	Lecturing, discussion and submission.						
Instructor (s)	Dr. Neslihan GÖKÇEK, Dr. Vedat TANRIVERDİ						
Course objective	Upon the successful completion of this course, students will establish the relationship between electricity, magnetism and engineering. This includes to provide students the concepts of electricity and magnetism with defining and solving problems.						
Course Content	Basic concepts of electricity and magnetism such as circuits, Gauss's Law, Faraday's Law						
References	1. R. A. Serway & J. W. Jewett, Physics for Scientists and Engineers (6th Ed.), Brooks Cole (2007). 2. H. D. Young and R. A. Freedman, University Physics 12th-14th Ed. Pearson (2008, 2016). 3. Principles of Physics by Halliday, Resnick, and Walker (10th Edition), John Wiley (2014)						
Learning outcomes	1. Learn the basic concepts of electricity and magnetism 2. Apply the topics of electromagnetism to their own engineering science 3. Improve the ability of student's solution perspective for different kinds of new problems 4. Modelling a new problem related with the concepts of electromagnetism and interpret the results 5. Enabling interactive thinking with other fields of sciences such as electric and electronics engineering						

Course Schedule

Weeks	Subjects
1. Week	Electric fields
2. Week	Electric fields
3. Week	Gauss's law
4. Week	Electric potential
5. Week	Electric potential
6. Week	Capacitance and dielectrics
7. Week	Current and resistance
	Midterm Exam
8. Week	Current and resistance
9. Week	Direct current circuits
10. Week	Magnetic fields
11. Week	Sources of magnetic fields
12. Week	Sources of magnetic fields
13. Week	Faraday's law
14. Week	Inductance

Assessment Method

- I. Assignments & Quizzes : 10%
- II. Midterm Exam (closed book) : 40%

III. Final Exam: (closed book) : 50%

Form VIb (English): WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	18	5	90
Presentation / Seminar Preparation			
Project			
Homework assignment	9	5	45
Midterms (Study duration)	1	8	8
Final Exam (Study duration)	1	12	12
Total Workload			197
Total Workload/30 hours			6.56
ECTS			5.00

Form VIIb (English): THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Course Outcomes				
	1	2	3	4	5
1	5	5	5	5	5
2		2	5	5	
3			5	5	
4				4	
5		2		5	
6					
7					
8					
9					
10					
11					

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

References	i. Paul Deitel & Harvey Deitel, "C++ : How to program / P.J. Deitel, H.M. Deitel, 8th Ed., 2016, Pearson ii. Frank M. Carrano and Timothy Henry, "Data Abstraction & Problem Solving with C++", 7th Ed., 2016, Pearson.
Learning outcomes	After taking this course students will be able to; 1. Examine the loop structures of either a recursive non-recursive algorithms and infer its asymptotic running time and express its efficiency using big-Oh notation 2. Assess the relative advantages of using array linked list implementations in efficiently solving search problems with concurrent insertion, and/or deletions on collections of data, design 3. Implement efficient computer programs running at the cost of $O(\log n)$ per searching, insertion and/or deletion of data items by employing correct variants of tree data structures covered in the course. 4. Develop efficient applications that require an order on data items by appropriately selecting the right sorting algorithm. 5. Describe the usage of various data structures. 6. Explain the operations for maintaining common data structures.

Course Schedule

Week	Topic
1	Introduction to C++ Programming
2	Introduction to Classes, Objects and Strings
3	Control Statements
4	Functions
5	Recursion
6	Arrays and Vectors
7	Pointers
	Midterm
8	Link-Based Implementations
9	Stacks
10	List & List Implementations
11	Sorting (selection, bubble, insertion)
12	Sorting (merge sort, quicksort, radix)
13	Queues & Priority Queues

14	Algorithm Efficiency
	Final

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project			
Homework assignment	14	2	28
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			144
Total Workload/30 hours			4.88
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		

Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	
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1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	ii. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction To Algorithms", The MIT Press; 3rd edition
Learning outcomes	After taking this course students will be able to; 1. Describe, explain, and use abstract data types including trees, tries, tables, and graphs 2. Explore the use of in-memory and external memory data structures 3. Implement a variety of algorithms such as searching, sorting, and traversal 4. Implement abstract data types using both contiguous and linked representations 5. Apply graph-based solutions to complex problems.

Course Schedule

Week	Topics (tentative)
1	Trees
2	Tree Implementations
3	Binary Tree, Binary Search Trees
4	Heaps,
5	Priority Queue
6	Dictionaries (Hashing)
7	Balanced Search Trees
	Midterm
8	Balanced Search Trees (2-3, 2-3-4 Trees)
9	Balanced Search Trees (Red-Black, AVL)
10	Graphs
11	Graphs
12	Applications of Graphs
13	Applications of Graphs
14	Processing data in external storage(B Tree)

14	Design of Algorithms (Dynamic Prog.)
	Final

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project			
Homework assignment	14	2	28
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			144
Total Workload/30 hours			4.88
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical				X	

knowledge in these areas in complex engineering problems.					
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

**ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Discrete Mathematics	CENG 223	Fall	3	0	0	3	5
Prerequisites	None						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery (face to face, distance learning)	Face to face/Distance Learning/Hybrid						
Learning and teaching strategies	Lecturing, discussion and submission.						
Instructor (s)	Mert ÖZARAR, PhD						
Course objective	<i>To teach the basics of discrete mathematical structures</i>						
Course Content	• Propositional Logic • Predicate Logic • Sets and Functions • Integers and Algorithms						

	• Induction and Recursion • Counting • Relations • Graphs • Trees
References	K. H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill, Seventh Edition, 2011.
Learning outcomes	After taking this course students will be able to; 1. know discrete maths 2. know basic concepts of data structures 3. understand the building blocks of computer science

Subjects by weeks

Weeks	Subjects
1. Week	Propositional Logic: Logic, Equivalences
2. Week	Predicate Logic: Predicates and Quantifiers, Nested Quantifiers
3. Week	Methods of Proof, Natural Deduction (additional material)
4. Week	Sets and Functions: Sets, Set Operations, Functions
5. Week	Growth of Functions, Complexity of Algorithms
6. Week	Integers: Integers and Division, Integers and Algorithms
7. Week	Midterm exam

8. Week	Applications of Number Theory (plus Basics of Cryptography)
9. Week	Induction and Recursion: Sequences and Summations, Mathematical Induction
10. Week	Recursive Definitions and Structural Induction, Recursive Algorithms
11. Week	Counting: Permutations and Combinations, Recurrence Relations
12. Week	Solving Recurrence Relations, Generating Functions, Inclusion and Exclusion
13. Week	Graphs: Int to Graphs, Terminology, Representing Graphs, Connectivity
14. Week	Euler and Hamiltonian Paths, Shortest Path Problem, Coloring
15. Week	Trees: Int. to Trees, Applications of Trees, Spanning Trees, Minimum Spanning Trees
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%5
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	2	%25
Presentation	0	%0

Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%40
Total	18	%100
Contribution of semester Works to success points	3	%60
Contribution of final exam to success points	1	%40
Total	18	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project			
Homework assignment	14	2	28
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			144

Total Workload/30 hours		4.88
ECTS		5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about			X		

entrepreneurship and innovation; information on sustainable development.					
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	5. Compute eigenvectors and eigenvalues of a matrix and apply them to some diagonalization processes.
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Subjects by weeks

Weeks	Subjects
1.week	Introduction to Differential Equations, General and Particular Solutions
2. week	Separable Equations and Applications, Linear 1st Order Equations
3.week	Substitution Methods and Exact Equations Quiz-1
4.week	Second Order Linear Differential Equations, General Solutions of Linear Equations
5.week	Homogeneous Equations with Constant Coefficients
6.week	Method of Undetermined Coefficients Quiz-2
7.week	Variation of Parameters, Systems of Differential Equations
8.week	Midterm Exam
9.week	Introduction to Linear Systems, Matrices and Gaussian Elimination, Reduced-Row Echelon Matrices
10.week	Matrix Operations, Inverses of Matrices
11.week	Determinants, Vectors and Vector Spaces
12.week	Subspaces, Linear Combinations, and Independence of Vectors Quiz-3
13.week	Row and Column Spaces, Orthogonal Vectors in $\mathbb{R}^n$
14.week	Eigenvalues and Eigenvectors Quiz-4
15.week	Diagonalization of Matrices and Applications
16.week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	0%
Laboratory	0	0%
Application	0	0%
Fieldwork	0	0%
Practice	14	0%
Homework Assessment	0	0%
Quiz	4	20%
Presentation	0	0%
Project	0	0%
Seminar	0	0%
Mid-term Exam(s)	1	30%
Final Exam	1	50%
Total	30	100%
Contribution of semester Works to success points	29	50%
Contribution of final exam to success points	1	50%
Total	30	100%

Workload and ECTS Calculation

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory	0	0	0
Application	0	0	0
Specific practical training	0	0	0
Field activities	0	0	0
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation	0	0	0
Project	0	0	0
Homework assignment	0	0	0
Quiz	0	0	0
Midterms (Study duration)	1	15	15
Final Exam (Study duration)	1	23	23
Total Workload	150		
Total Workload/30 hours	5		
ECTS	5		

Program Learning Outcomes - Course Learning Outcomes Matrix

Program Learning Outcomes	Course Learning Outcomes				
	LO1	LO2	LO3	LO4	LO5
1 Qualified knowledge of mathematics, science, and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.	5			5	
2 An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.		5			
3 An ability to design a complex system, process, device, or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.					
4 Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.					5
5 Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.			5		
6 Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.					
7 Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.					
8 Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.					

9 To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.					
10 Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.					
11 Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.					

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

**ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Digital Design	EEE 203	Fall	3	0	2	4	5
Prerequisites	None						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery	Face to face/Distance Education						
Learning and teaching strategies	Lectures, Experiments, Problem Solving.						
Instructor (s)	Hakan Çağlar, Assoc.Prof..						
Course objective	To provide an understanding on the running principles and to teach fundamental concepts used in analysis and design of digital circuits and systems.						
Course Content	Number systems and codes, Boolean algebra and logic gates, minimization of Boolean functions, combinational circuits, design of combinational circuits, analysis and design of sequential circuits, flip-flops, counters, shift registers, memory elements, programmable logic devices (PLD), design with PLDs. Introduction to alu and microinstructions						
References	○ M. Morris Mano, Michael D. Ciletti, Digital Design: International Editions, >= 5th Edition, 2012 Pearson. ○ Digital Design, Principles and Practices, Author: John F. Wakerly, Pearson International Edition						

	○ Digital Design and Computer Architecture, D. Harris, S. Harris (Author), Morgan Kaufmann
Learning outcomes	After taking this course, students will be able to; ○ Able to analyze and design combinational circuits and optimize the design using tools such as Boolean algebra, Karnaugh map ○ Use arithmetic circuits using half adders, subtractors and full adders, subtractors in design solutions ○ Understand running principles synchronous sequential circuits with flip-flops, shift registers and counters, ○ Recognize ALU fundamentals and operations

Subjects by weeks

Weeks	Subjects
1	Number systems, conversion between binary, decimal, octal, hexadecimal systems, negative number representations
2	Boolean algebra, Boolean functions, logic gates, propagation delay, hazards, glitches
3	Canonical and standard forms Lab. Experiment: Construction of simple combinational circuits
4	Minimization of Boolean functions, 3 and 4 variable Karnaugh map method, NAND and NOR implementations, don't care conditions
5	Minimization of Boolean functions, 3 and 4 variable Karnaugh map method, NAND and NOR implementations, don't care conditions
6	Binary adder, subtractor, decimal adder, ripple adder
7	Definition of encoders and decoders, cascading decoders, definition of multiplexers and demultiplexers, expanding multiplexers. Combinational Programmable Logic Devices (PAL, PLA, GAL) Lab. Experiment: 4-bit ripple adder, usage of oscilloscope with logic channels, delay measurements
8	Definition of D-latch, D-flip-flop, JK-flip-flop, T-flip-flop, master-slave configuration. Asynchronous preset and clear inputs. Analysis of synchronous sequential circuits with D-flip-flops. Finding characteristic tables, state tables and state diagrams
9	Definition of D-latch, D-flip-flop, JK-flip-flop, T-flip-flop, master-slave configuration. Asynchronous preset and clear inputs. Analysis of synchronous sequential circuits with D-

	flip-flops. Finding characteristic tables, state tables and state diagrams
10	Design of synchronous sequential circuits with D-flip-flops
11	Finite state machines and design examples
12	Ripple counter and its disadvantages, synchronous serial and parallel counters, MSI counters, shift registers. Lab. Experiment: Flip-flops and MSI counter circuits
13	Introduction to memory devices: ROM, RAM, CPLDs and FPGAs
14	Introduction to ALU operations and microinstructions
15	Review of topics and contemporary implementations
16	Review of topics and contemporary implementations

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	12	%20
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Quizzes	4	%10
Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%40
Total	33	%100
Contribution of semester Works to success	32	%60

points		
Contribution of final exam to success points	1	%40
Total	33	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory	12	2	24
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	2	28
Presentation / Seminar Preparation			
Project			
Quizzes	4	4	16
Midterms (Study duration)	1	10	10
Final Exam (Study duration)	1	20	20
Total Workload			131
Total Workload/30 hours			4.66
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*
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	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.					X
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.					X
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.		X			
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.	X				
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.	X				
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.	X				
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.	X				

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	distributions, random variable independency, the distribution of functions with respect to random variables. Expectation and variance of Binomial distribution, Poisson distribution, Uniform distribution, Exponential distribution and Normal distribution. The definition, properties and calculations of covariance and correlation coefficient. We stress theory and practice combined, in order to help students promote their ability of applying statistical methods in their daily life and scientific research.
Course Content	○ Define the principal concepts about probability, its features. ○ Solve the problems about permutation, combination and Binomial Theorem. ○ Calculate probabilities using Conditional probability, Rule of total probability and Bayes' theorem. ○ Explain the concept of a random variable and the probability distributions. ○ Define the concept of a random variable, express the features of discrete and continuous random variables. ○ Formulate the distribution functions. ○ Calculate the expected value, variance and the moments. ○ Explain major distributions of random variables. ○ Define the discrete distributions and solve the problems about these distributions. ○ Define the continuous distributions and solve the problems about these distributions.
References	Probability, Random Variables, and Stochastic Process 4th Edition A. Papulis, S.U.Pillai ISBN-13: 978-0071226615
Learning outcomes	After taking this course students will be able to; ○ Understand the basic knowledge on fundamental probability concepts, including random variable, probability of an event, additive rules and conditional probability ○ Understand the concept of Bayes' theorem, the basic statistical concepts and measures ○ Understand several well-known distributions, including Binomial, Geometrical, Negative Binomial, Pascal, Normal and Exponential Distribution ○ Understand the concepts of various parameter estimation methods, like

	method of moments, maximum likelihood estimation (Expected value).
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Subjects by weeks

Weeks	Subjects
1. Week	Introduction to Probability theory, some definitions, relative frequency definition, classical definition of probability theory, basic for statistics
2. Week	Probability and Induction, Causality Versus Randomness. Historical perspective, gambling and games of chance.
3. Week	The Axioms of Probability, Set Theory, set operations, mutually exclusive sets, De Morgan's Law, duality principle. Probability space, Equality of events.
4. Week	Axiomatic definition of events, Probability masses. Conditional Probability, Total probability and Bayes' theorem, Independence
5. Week	Repeated Trials, Combined Experiments, Cartesian product of two experiments, Independent experiments.
6. Week	Bernoulli Trials, Fundamental theorem, Most likely number of successes, Bernoulli's Theorem and Games of Chance, related problems.
7. Week	The Concept of a Random Variable. Introduction, Random variable, Events generated by Random variables, Probability Distribution and Probability Density Functions, Properties of Distribution functions.
8. Week	Midterm Exam
9. Week	Continuous, Discrete and Mixed type RV, Specific Random Variables, Existence theorem, Continuous type Random variables, Normal (Gaussian) Distribution, Exponential Distribution, Chi-Square Distribution, Rayleigh Distribution, Uniform Distribution, Beta Distribution, Laplace Distribution.
10. Week	Discrete type Random Variables, Bernoulli Distribution, Poisson Distribution, Binomial Distribution. Conditional Distributions. Extensions to Total Probability and Bayes' Theorem. Asymptotic Approximations for Binomial Random Variable, related problems.
11. Week	Functions of One Random Variable. The Random Variable $g(x)$, The Distribution of $g(x)$, Quantization Mean and Variance, Conditional Mean,

	Variance, Moments.
12. Week	Estimate of the Mean of $g(x)$, Chebyshev Inequality, Markov Inequality, Characteristic Functions, Discrete type RV, Moment theorem, related problems
13. Week	Two Random Variables. Bivariate Distributions, Joint Density, Probability Masses, Independence, Discrete type RV, One Function of Two Random Variables I 6-3
14. Week	Two Functions of Two Random Variables, Joint Moments, Joint Characteristic Functions, Conditional Distributions, Conditional Expected Values and related problems.
15. Week	Introduction to Statistics. Introduction, Introduction to Estimation Theory, Parameter Estimation, Hypothesis Testing Problems.
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%5
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	4	%20
Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%45

Total	20	%100
Contribution of semester Works to success points	4	%55
Contribution of final exam to success points	1	%45
Total	19	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	4	56
Presentation / Seminar Preparation			
Project			
Homework assignment	4	5	20
Midterms (Study duration)	1	15	15
Final Exam (Study duration)	1	20	20
Total Workload			153
Total Workload/30 hours			5.15
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			

To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	& Sons, 2004 2. The C++ (3rd Ed.), Bjarne Stroustrup, Addison Wesley Publishing Company, 1997
Learning outcomes	After taking this course students will be able to; 1. know value and type systems used in different programming languages 2. know the relations between variables and storage 3. understand binding and scope strategies 4. understand the importance of abstraction and means to achieve it 5. understand control flow mechanisms used in programming languages belonging to different families

Subjects by weeks

Weeks	Subjects
1. Week	Introduction to programming languages
2. Week	Values & Types
3. Week	Values & Types
4. Week	Values & Types
5. Week	Variables & Storage
6. Week	Variables & Storage
7. Week	Mid- term exam
8. Week	Bindings & Scope

9. Week	Bindings & Scope
10. Week	Procedural Abstraction
11. Week	Procedural Abstraction
12. Week	Data Abstraction
13. Week	Data Abstraction
14. Week	Type Systems
15. Week	Control Flow
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	3	%30
Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%30

Final Exam	1	%40
Total	19	%100
Contribution of semester Works to success points	18	%60
Contribution of final exam to success points	1	%40
Total	19	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	6	84
Presentation / Seminar Preparation			
Project			
Homework assignment	3	15	45
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			175

Total Workload/30 hours		5.83
ECTS		6.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.					X
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.				X	
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.			X		
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.		X			
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.	X				
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.			X		
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.				X	
Information on business practices such as project management, risk management and change management; awareness about		X			

entrepreneurship and innovation; information on sustainable development.					
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.		X			

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	• The language hierarchy • Correspondence between grammars and automata • Determinism vs. nondeterminism
References	Lewis, H.R and Papadimitriou, C.H. <i>Elements of the Theory of Computation</i> (2nd ed.), Prentice-Hall, 1998.
Learning outcomes	Computer Science needs mathematical languages to abstract away from particulars of computing machinery and to concentrate on systematicity, capacity, and efficiency of computing in the abstract. Theory of formal languages studies such languages while automata theory studies their acceptors. Both theories have found scientific and practical use in all areas of computer science and engineering. In fact, description of any computational process can be recast in formal language theory or automata theory. From this perspective, the theory can be seen as a vehicle for communicating the ideas clearly and precisely among computer scientists.

Subjects by weeks

Weeks	Subjects
1. Week	Review of discrete maths and computational structures
2. Week	Finite representations of languages
3. Week	Alphabets and Languages
4. Week	Regular languages, Equivalence of DFA and NFA
5. Week	Deterministic Finite Automata (DFA) Theory
6. Week	Non-deterministic Finite Automata (NFA) Theory and The Pumping Lemma

7. Week	Midterm exam
8. Week	Context-free Languages, Parse Trees and Derivations
9. Week	Pushdown Automata Theory
10. Week	The Pumping Theorem and its Applications
11. Week	Correspondence between grammars and automata, Closure Properties
12. Week	Recursively enumerable sets and Linear Bounded Automata Theory
13. Week	Turing Machines and its Extensions
14. Week	The Language Hierarchy, Church-Turing Thesis
15. Week	Introduction to Complexity Theory and The Halting Problem
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%5
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	3	%30

Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%35
Total	18	%100
Contribution of semester Works to success points	3	%65
Contribution of final exam to success points	1	%35
Total	18	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project			
Homework assignment	14	2	28
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2

Total Workload		144
Total Workload/30 hours		4.88
ECTS		5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			

Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	○ PHP ○ XML, XSL ○ DOM ○ jQuery
References	Web Programming with HTML5, CSS, and JavaScript, John Dean, 2019.
Learning outcomes	After taking this course students will be able to; 1. design and build web pages 2. create web-based applications with Forms and Ajax 3. create web server side application codes

Subjects by weeks

Weeks	Subjects
1. Week	HTML
2. Week	HTML
3. Week	HTML
4. Week	CSS
5. Week	CSS
6. Week	JavaScript
7. Week	Midterm exam

8. Week	DOM
9. Week	Forms
10. Week	HTTP
11. Week	Ajax
12. Week	Web server side application
13. Week	DOM
14. Week	jQuery
15. Week	PHP
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution (%)
Attendance	14	5
Laboratory	0	0
Application	0	0
Fieldwork	0	0
Practice	0	0
Homework Assessment	2	25
Presentation	0	0
Project	0	0

Seminar	0	0
Mid-term Exams	1	30
Final Exam	1	40
Total	18	100
Contribution of semester Works to success points	3	60
Contribution of final exam to success points	1	40
Total	18	100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project			
Homework assignment	14	2	28
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			144

Total Workload/30 hours		4.88
ECTS		5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about			X		

entrepreneurship and innovation; information on sustainable development.					
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	Systems, 4th Edition, Pearson Education
Learning outcomes	After taking this course students will know about; 1. Operating system form and function 2. Software structure: abstraction, modularity, interface vs. implementation, layers 3. Concurrent execution: problems and solutions 4. Storage and I/O: files, interrupts, and processes

Subjects by weeks

Weeks	Subjects
1. Week	Introduction to Operating Systems
2. Week	System Structures
3. Week	Process concept
4. Week	Multithreaded Programming
5. Week	Process Scheduling
6. Week	Synchronization and Deadlocks
7. Week	Mid- term exam
8. Week	Memory Management Strategies
9. Week	Virtual Memory Management

10. Week	File Systems
11. Week	Implementing File Systems
12. Week	Mass Storage Structure
13. Week	I/O Systems
14. Week	System Protection
15. Week	System Security
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	2	%20
Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%40
Final Exam	1	%40
Total	18	%100

Contribution of semester Works to success points	17	%60
Contribution of final exam to success points	1	%40
Total	18	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project			
Homework assignment	2	8	28
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			144
Total Workload/30 hours			4.88
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*
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	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	○ William Stallings, “Computer Organization and Architecture: Designing for Performance”, 7/E, Prentice Hall, 2010, ISBN-10: 0135064171, ISBN-13: 9780135064177 ○ David A. Patterson, John L. Hennessy, Computer organization and design (2nd ed.): the hardware/software interface, Morgan Kaufmann Publishers Inc., San Francisco, CA, 1998 ○ Tanenbaum, Structured Computer Organization, 5/E, Prentice Hall, 2006, ISBN-10: 0131485210, ISBN-13: 9780131485211 ○ Douglas E. Comer, Essentials of Computer Architecture: International Edition, Pearson Higher Education, 2005, ISBN-10: 0131964267, ISBN-13: 9780131964266 ○ Nick Carter, Schaum's Outline of Computer Architecture 1st Edition (2002), ISBN: 9780071362078
Learning outcomes	After taking this course, students will be able to; • Describe structure of a computer system • Explain how units of a computer system work together • Recognize memory organization and its usage in computer systems • Use basics of internal data representation for data manipulation • Experiment with low level programming • Compare the performance of different computer architectures • Develop assembly programs to better understand internal workings of a computer system

Subjects by weeks

Weeks	Subjects
1	Overview of Computer System
2	Representing and Manipulating Information
3	Machine-Level Representation of Programs
4	The Y86 Instruction Set Architecture
5	Overview of Logic Design and the Hardware Control Language (HCL)
6	A Sequential Implementation
7	General Principles of Pipelining. Pipelined Implementations

8	Storage Technologies. The Memory Hierarchy. Locality
9	Cache Memories
10	Writing Cache-Friendly Code
11	Physical and Virtual Addressing. Address Spaces.
12	VM as a Tool for Caching. VM as a Tool for Memory Management. VM as a Tool for Memory Protection.
13	Address Translation. Memory Mapping. Dynamic Memory Allocation. Garbage Collection.
14	System-Level I/O
15	Review of topics and contemporary implementations
16	Review of topics and contemporary implementations

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Quizzes	4	%20
Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%35
Final Exam	1	%45
Total	20	%100

Contribution of semester Works to success points	19	%65
Contribution of final exam to success points	1	%45
Total	20	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	4	56
Presentation / Seminar Preparation			
Project			
Quizzes	4	10	40
Midterms (Study duration)	1	15	15
Final Exam (Study duration)	1	30	30
Total Workload			183
Total Workload/30 hours			6.1
ECTS			6.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*
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	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.				X	
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.		X			
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.	X				
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.			X		
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.	X				
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.	X				
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.	X				
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.		X			

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

References	(Main)Computer Networking, J.F. Kurose and K.W. Ross, 2010, Addison Wesley (Recommended) Computer Networks, L.L. Peterson and B.S.Davie, 2007, Morgan Kaufman
Learning outcomes	After taking this course students will be able to; 1. know how computer networks and Internet work 2. know how to design complex networks 3. know how to design software running on computer networks

Subjects by weeks

Weeks	Subjects
1. Week	Introduction to computer networks. Open System Interface (OSI) seven model architecture description
2. Week	Physical layer, protocols, technologies and practical systems used at physical layer
3. Week	Data link layer, protocols, technologies, and practical systems used at physical layer
4. Week	Data link layer, protocols, technologies and practical systems used at physical layer (cntd.)
5. Week	Network layer, protocols, technologies and practical systems used at physical layer (cntd.)
6. Week	Network layer, protocols, technologies and practical systems used at physical layer (cntd.)
7. Week	Network layer, protocols, technologies and practical systems used at physical layer (cntd.)
8. Week	Midterm exam

9. Week	Transport layer, protocols, technologies, and practical systems used at physical layer (cntd.)
10. Week	Transport layer, protocols, technologies, and practical systems used at physical layer (cntd.)
11. Week	Transport layer, protocols, technologies, and practical systems used at physical layer (cntd.)
12. Week	Presentation layer
13. Week	Application Layer
14. Week	Application Layer (cntd.)
15. Week	Project demonstrations
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%5
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	0	%0
Presentation	0	%0
Project	1	%25
Seminar	0	%0

Mid-term Exams	1	%30
Final Exam	1	%40
Total	18	%100
Contribution of semester Works to success points	3	%60
Contribution of final exam to success points	1	%40
Total	18	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project	14	2	28
Homework assignment			
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			144
Total Workload/30 hours			4.88
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.		x			
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.			x		
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.					x
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				x	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.			x		
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.			x		
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		x			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.					x
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.				x	
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of		x			

the legal consequences of engineering solutions.					
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1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	○ Relational algebra: select, project, join, division ○ Integrity constraints, Primary keys, Foreign keys ○ SQL query language ○ Transaction management ○ Concurrency control ○ Recovery
References	Database Management Systems, 3Ed, Raghu Ramakrishnan, 2018.
Learning outcomes	After taking this course students will be able to; 1. design and build relational databases 2. write relational SQL queries 3. develop applications systems using relational databases

Subjects by weeks

Weeks	Subjects
1. Week	Files: sequential and direct access
2. Week	Hash-based indexing, B-tree indexing
3. Week	Relational model, ER diagrams
4. Week	Database design, 1NF, 2NF, 3NF, BCNF, 4NF
5. Week	Database design, 1NF, 2NF, 3NF, BCNF, 4NF
6. Week	Relational algebra: select, project, join, division

7. Week	Midterm exam
8. Week	Integrity constraints, Primary keys, Foreign keys, General constraints
9. Week	SQL query language
10. Week	SQL query language
11. Week	SQL query language
12. Week	Transaction management: commit, abort, recovery
13. Week	Concurrency control
14. Week	2 Phase Locking, Serializability
15. Week	Deadlock detection and prevention
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution (%)
Attendance	14	5
Laboratory	0	0
Application	0	0
Fieldwork	0	0
Practice	0	0
Homework Assessment	2	25

Presentation	0	0
Project	0	0
Seminar	0	0
Mid-term Exams	1	30
Final Exam	1	40
Total	18	100
Contribution of semester Works to success points	3	60
Contribution of final exam to success points	1	40
Total	18	100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project			
Homework assignment	14	2	28
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2

Total Workload		144
Total Workload/30 hours		4.88
ECTS		5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			

Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

**ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF COMPUTER ENGINEERING**

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS

	6. Kevin Suffern, "Ray Tracing from the Ground Up", A K Peters, 2007, ISBN 978- 1568812724
Learning outcomes	After taking this course students will be able to; 1. know hardware and software components of graphical systems 2. know basic concepts of 2D and 3D geometric transformations 3. understand two dimensional viewing: viewing pipelines clipping and windowing 4. understand three dimensional viewing: projections, viewing pipelines, transformations clipping and surface detection 5. know basics of illumination models and surface rendering

Subjects by weeks

Weeks	Subjects
1. Week	Introduction to computer graphics and human vision system
2. Week	Review of mathematics: vectors, matrices, linear algebra, analytic geometry, lines planes...
3. Week	Ray tracing
4. Week	Texture mapping
5. Week	Modeling transformations in ray tracing
6. Week	Mid- term exam
7. Week	Introduction to fixed function pipeline and transformations
8. Week	Rasterization

9. Week	Shading (Flat, Gouraud, Phong) and texture mapping
10. Week	Vertex and pixel shaders
11. Week	Mid-term exam
12. Week	Vertex and pixel shaders continued, Vertex arrays buffers and indexed rendering
13. Week	Shadows
14. Week	Shadow mapping and depth buffer
15. Week	Graphics in the real world Blender and unity
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	3	%30
Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	2	%40
Final Exam	1	%30

Total	20	%100
Contribution of semester Works to success points	19	%70
Contribution of final exam to success points	1	%30
Total	20	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	6	84
Presentation / Seminar Preparation			
Project			
Homework assignment	4	5	20
Midterms (Study duration)	1	10	10
Final Exam (Study duration)	1	10	10
Total Workload			166
Total Workload/30 hours			5.53
ECTS			6.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.					X
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.					X
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.			X		
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.		X			
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.			X		
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.		X			
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.		X			

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

**ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECT S

	○ Block Transform & Signal Flow Graph Representation of LTI Systems, Difference Equations ○ Digital Filter Design, IIR & FIR Filters and their applications ○ Discrete Fourier Transform (DFT) & Fast Fourier Transform (FFT) ○ Linear Convolution of two Signals, Circular convolution with Aliasing
References	Discrete-Time Signal Processing, 3rd edition, Alan V. Oppenheim and Ronald W. Schaffer, 2013 Pearson Education ISBN10: 1292025727
Learning outcomes	○ After taking this course students will be able to; ○ Understand basics of discrete-time signal, convolution, impulse and frequency response concepts for linear, time-invariant (LTI) systems, difference equation realization of LTI systems and discrete-time Fourier transform and basic properties of these. ○ Understands periodic sampling of analog signals and the relation between Fourier transforms of the sampled analog signal and the resulting sampled discrete-time signal. ○ Z-Transform and inverse Z- Transform, and their applications. Solution for difference equation by using z-Transforms. ○ Understands signal flow graph and block diagram representations of difference equations that realize digital filters, for IIR filter realization & for FIR filter realization. ○ Understands definitions and basic properties of forward and inverse discrete Fourier transform and their computation by fast algorithms, namely FFT. ○ Learns basic digital signal processing application on 1-D speech signal, 2-D image and 3-D video signals.

Subjects by weeks

Weeks	Subjects
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1. Week	Introduction. Discrete-time signals: Sequences, Discrete-time Systems in the time domain. Discrete-time systems in the time domain. Linear time-invariant systems, properties of Linear time-invariant systems. Linear constant-coefficient difference equations. Memoryless systems, Causability, Stability.
2. Week	Frequency domain representation of discrete-time signals and systems. Fourier Transforms of discrete-time signals. Eigen functions for Linear time-invariant systems, output for complex exponentials.
3. Week	Discrete Time Fourier Transforms (DTFT) and properties. Fourier Transform Theorems, Parseval's theorem, Convolution theorem, Modulation or Windowing theorem. Time shifting and Frequency shifting.
4. Week	
5. Week	Introduction to Z- transform. Convergence for the z-Transform. Inverse z-Transforms. Z-Transforms properties; Linearity, Time Shifting, Multiplication by Exponential sequence, Time reversal. Differentiation of $X(z)$. Convolution of discrete sequences. Sampling of Continuous-Time Signals. Frequency-domain representation of sampling. Sampling theory. Nyquist Rate. Reconstruction of bandlimited signals from its samples.
6. Week	Discrete-time processing of analog signals. Analog to digital (A/D) conversion and analysis of quantization error. Digital to Analog conversion (D/A). Multirate signal processing. Decimation and interpolation filters.
7. Week	Transform analysis of linear time-invariant systems. Frequency response of LTI systems. System functions for systems characterized by linear constant-coefficient difference equation. Linear systems with linear phase.
8. Week	Midterm Exam
9. Week	Structures for Discrete-Time Systems. Block Diagram representation of linear constant-coefficient difference equations, Signal flow graph representation of linear constant-coefficient difference equations. Basic structures for IIR Filters, and basic structures for FIR Filters. Direct form and cascaded form. Discrete Filter Design Techniques. Design of discrete-time IIR filters from continuous-time filters, Bilinear transformation design. Design of FIR filter by

	windowing. Optimum approximation of FIR filters.
10. Week	
11. Week	Discrete Fourier Transform (DFT). Representation of periodic sequences: Discrete Fourier Series. Properties of the Discrete Fourier series. Discrete Fourier transforms and their properties. Linear convolution using DFT. Discrete Cosine Transforms (DCT) and applications.
12. Week	Computation of the Discrete Fourier Transform. Efficient computation of the Discrete Fourier transform. Fast Fourier Transform (FFT) algorithms. Practical considerations and applications.
13. Week	Project presentations
14. Week	Project presentations
15. Week	Project presentations
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%5
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	4	%10
Presentation	1	%0

Project	1	%20
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%40
Total	22	%100
Contribution of semester Works to success points	21	%60
Contribution of final exam to success points	1	%40
Total	22	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	3	42
Presentation / Seminar Preparation			
Project	1	15	15
Homework assignment	4	5	20
Midterms (Study duration)	1	15	15
Final Exam (Study duration)	1	20	20
Total Workload			154

Total Workload/30 hours		5.15
ECTS		5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about			X		

entrepreneurship and innovation; information on sustainable development.					
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

**ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS

	• CASE tolls • SW application development, Re-use, Legacy systems, RMA analysis
References	Software Engineering 10th Edition by Ian Sommerville, Pearson Education, 2015 ISBN: 9781292096131 Software Engineering A PRACTITIONER' S APPROACH 8th Edition by Roger S. Pressman, Bruce R. Maxim Mc Graw Hill Education
Learning outcomes	After taking this course students will be able to; ▪ Define engineering, software, computer and system engineering ▪ Define software processes ▪ Gather the software requirements ▪ Define software design and architecture ▪ Learn the software verification and validation

Subjects by weeks

Weeks	Subjects
1. Week	Introduction to software engineering, FAQs about software engineering, costs of software engineering, activity cost distribution, attributes of good sw, key challenges facing sw engineering, professional and ethical responsibility
2. Week	Systems engineering fundamentals, brief history of systems engineering, success ratio of IT projects, main purpose of systems engineering, systems engineering enviroment, system lifecycle functions, basic systems theory concepts
3. Week	Main principles & fundamentals of systems engineering, characteristis end responsibilities, systems engineering activities across system life cycle, key system engineering concepts, context diagrams, system boundries & interfaces, systems decomposition & abstraction, multiple system views systems engineering standards

4. Week	Software process models, process iteration and activities (sw specification, sw design & implementation, sw validation, sw evolution), rational unified process (RUP), software engineering standards (commercial & military), component based, re-used oriented, extreme programming, Legacy systems.
5. Week	Requirement analysis, definition of requirement, purpose of requirement analysis, risk & problems, what are requirements for?, Requirements analysis task areas and requirement analysis questions,
6. Week	Types of requirements (functional, performance, state/mod, interface ect.), requirements measures (speed, ease of use, portability, robustness, reliability...), requirements quality metrics (verifiability, consistency, singularity, clarity, completeness, feasibility etc.), writing good requirements, requirements template, requirements decomposition. Software requirement specification (SRS) outlines.
7. Week	Security engineering, information warfare fundamentals, software attack phases, what is security (confidentiality, integrity, availability CIA), functionality vs assurance, security threats & risk analysis, elements of cryptography, ciphers, public key cryptography , RSA, digital signatures, hash functions.
8. Week	Midterm Exam
9. Week	Software Project planning, project management plan (PMP), Critical Milestones, activities & review meetings (SRR, SDR, PDR, CDR, TRR),
10. Week	System & software architecture (central, distributed...), software design, software design description (SDD), software modelling, UML diagrams, use cases and boundaries, software design tools.
11. Week	Test engineering, validation and verification process, Test and Integration Plan (TIP), Test scenarios, Test procedures, Test data, unit testing, integration test, Test Readiness Review (TRR), Test CASE tools, Load Test (Load Runner), Software bug managements, version management & control.
12. Week	Project presentations ...
13. Week	Project presentations...

14. Week	Project presentations...
15. Week	Project presentations...
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%5
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	2	%15
Presentation	0	%0
Project	1	%30
Seminar	0	%0
Mid-term Exams	1	%20
Final Exam	1	%30
Total	19	%100
Contribution of semester Works to success points	4	%70
Contribution of final exam to success points	1	%30
Total	19	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	3	42
Presentation / Seminar Preparation			
Project	14	3	42
Homework assignment	2	2	4
Midterms (Study duration)	1	10	10
Final Exam (Study duration)	1	15	15
Total Workload			155
Total Workload/30 hours			5.15
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and				X	

conditions; the ability to apply modern design methods for this purpose.					
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

**ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF SOFTWARE ENGINEERING**

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National	ECT

	development lifecycle 2. know basic requirements elicitation techniques 3. know how to write a software requirements document 4. understand requirements risk management 5. understand agile methodologies 6. understand value engineering of requirements
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Subjects by weeks

Weeks	Subjects
1. Week	Introduction to software requirements engineering
2. Week	Missien statement, customers, and stakeholders
3. Week	Requirements elicitation
4. Week	Writing requirements document
5. Week	IEEE standards for software requirements
6. Week	Requirements risk management
7. Week	Mid-term exam
8. Week	Standards for verification and validation
9. Week	Formal methods

10. Week	Examples of formal methods: category theory, model checking
11. Week	Requirements specification and agile methodologies
12. Week	Tool support for requirements engineering
13. Week	Requirements management
14. Week	Value engineering of requirements
15. Week	Value engineering of requirements continued
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	4	%30
Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%40
Total	20	%100

Contribution of semester Works to success points	19	%60
Contribution of final exam to success points	1	%40
Total	20	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	6	84
Presentation / Seminar Preparation			
Project			
Homework assignment	4	4	16
Midterms (Study duration)	1	8	8
Final Exam (Study duration)	1	16	16
Total Workload			166
Total Workload/30 hours			5.53
ECTS			6.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*
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	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.		X			
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.		X			
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.			X		
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.		X			
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.					X
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.			X		
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.					X
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.		X			

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

**ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/w eek)	Applicatio n (hours/wee	Laboratory (hours/week)	National Credit	ECTS

				k)			
Software Design Patterns	SENG 324	Spring	3	0	0	3	5
Prerequisites	None						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery (face to face,distance learning)	Face to face/Distance Learning/Hybrid						
Learning and teaching strategies	Lecturing, discussion and submission.						
Instructor (s)	Yüksel ARSLAN, PhD						
Course objective	<i>The goal of this course to arm the students with the knowledge needed in architecting effective and maintainable complex software systems of high quality by applying design patterns.</i>						
Course Content							
References	Head First Design Patterns, Eric Freeman, Elisabeth Freeman, Bert Bates, O'Reilly 2009						
Learning outcomes	After taking this course students will be able to; 1. know architecting effective and maintainable complex software systems 2. know the rationale and benefits of design patterns in architecting software systems						

Subjects by weeks

Weeks	Subjects
1. Week	Welcome to design patterns
2. Week	A refresher on Object-Oriented Design and UML
3. Week	Observer pattern
4. Week	Decorator pattern
5. Week	Factory pattern
6. Week	Singleton pattern
7. Week	Command pattern
8. Week	Midterm exam
9. Week	Adapter pattern
10. Week	Iterator pattern
11. Week	State pattern
12. Week	Proxy pattern
13. Week	Model view controller
14. Week	Patterns in real world
15. Week	Project demonstrations

16. Week	Final Exam
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Assessment Method

Semester Works	Number	Contribution
Attendance	14	%5
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	0	%0
Presentation	0	%0
Project	1	%25
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%40
Total	18	%100
Contribution of semester Works to success points	3	%60
Contribution of final exam to success points	1	%40
Total	18	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project	14	2	28
Homework assignment			
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			144
Total Workload/30 hours			4.88
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.		X			
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.					X
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.			X		
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.			X		
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.			X		
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.			X		
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.	X				
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of	X				

the legal consequences of engineering solutions.					
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1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	Engineering Using UML, Patterns, and Java, 3rd edition. Pearson 2. Timothy C. Lethbridge and Robert Laganier (2001): Object-Oriented Software Engineering, 2nd edition. McGraw-Hill 3.
Learning outcomes	After taking this course students will be able to; 1. Analyze, design and develop a system within the framework of the systems engineering lifecycle. 2. Apply tools and methodologies, including project management, relevant to industry-standard modelling methodologies and object oriented programming. 3. Analyze system quality, risk and reliability, and standards applied in the development of systems. 4. Explain, evaluate and critique own work in a team and that of team members.

Subjects by weeks

Weeks	Subjects
1. Week	Introduction to Software Engineering
2. Week	Modeling with UML
3. Week	Project Organization and Communication
4. Week	Requirements Elicitation
5. Week	Analysis
6. Week	System Design

7. Week	Mid- term exam
8. Week	Object Design: Reusing Pattern Solutions
9. Week	Object Design: Specifying Interfaces
10. Week	Mapping Models to Code
11. Week	Testing
12. Week	Rationale Management
13. Week	Configuration Management
14. Week	Project Management
15. Week	Software Life Cycle
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	2	%20
Presentation	0	%0

Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%40
Final Exam	1	%40
Total	18	%100
Contribution of semester Works to success points	17	%60
Contribution of final exam to success points	1	%40
Total	18	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project			
Homework assignment	2	8	28
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			144

Total Workload/30 hours		4.88
ECTS		5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about			X		

entrepreneurship and innovation; information on sustainable development.					
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	verification
References	Mauro Pezzè, Michal Young: Software Testing and Analysis: Process, Principles and Techniques, Wiley, ISBN 0471455938
Learning outcomes	After taking this course students will be able to; 1. Understand and apply the concepts and theory related to software verification and validation 2. Identify and use different testing techniques and design test plans 3. Use various testing frameworks and testing tools

Subjects by weeks

Weeks	Subjects
1. Week	Introduction to software verification and validation
2. Week	Challenges in software testing
3. Week	Specification-based testing
4. Week	Structural and syntax-based testing
5. Week	Model-checking
6. Week	Model-based testing
7. Week	Mid- term exam
8. Week	Fault-based testing

9. Week	Static and dynamic validation techniques
10. Week	Run-time verification
11. Week	Automated testing tools
12. Week	Management of the testing process
13. Week	Test documentation
14. Week	Software quality metrics
15. Week	Software testing in the lifecycle and code inspections
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	4	%40
Presentation	0	%0
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%25

Final Exam	1	%35
Total	20	%100
Contribution of semester Works to success points	19	%65
Contribution of final exam to success points	1	%35
Total	20	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project			
Homework assignment	4	15	60
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			176
Total Workload/30 hours			5.87
ECTS			6.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.					X
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.				X	
An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.		X			
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.					X
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.			X		
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.			X		
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.			X		
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.			X		
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.				X	
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of		X			

the legal consequences of engineering solutions.					
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1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

	○ Project risk management ○ Quality management, ISO 900x, CMMI ○ Configuration & change management ○ Project performance tracking & monitoring ○ Team management & organization
References	Project Management: A Systems Approach to Planning, Scheduling, and Controlling, Harold Kerzner, 8th Ed., John Wiley & Sons, 2003., Software Engineering 10th Edition by Ian Sommerville, Pearson Education, 2015 ISBN: 9781292096131 A Guide to the Project Management Body of Knowledge PMBOK® Guide2000, 3rd Edition, PMI, 2001.
Learning outcomes	After taking this course students will be able to; 1. know discrete maths 2. know basic concepts of data structures 3. understand the building blocks of computer science

Subjects by weeks

Weeks	Subjects
1. Week	Introduction to software project management, what is software project, large scale software project complexity, case studies of successful and failed software projects, software ethics.
2. Week	Development methodologies; Waterfall, V Model, Spiral, Incremental, Prototyping, Agile development, pros and cons.
3. Week	Size & cost estimation, cost-benefit analysis, cash-flow forecasting, net present value (NPV), Function point analysis (FPA), COCOMO software sizing estimation, Line of code (LOC) estimation

4. Week	Software project planning, project scope and objectives, estimate effort for activity, resource allocation, project planning case tools (MS projects, ...)
5. Week	Work Breakdown Structures (WBS) & Product Breakdown Structure (PBS) decomposition of system, project scheduling, critical path method.
6. Week	Project risk management, common project risks, risk identification, estimation, evaluation, risk management, education strategies, Risk monitoring, risk avoidance and transfer.
7. Week	Software metric plan, software metrics, quality metrics, progress metric, sizing metrics, metric plan management
8. Week	Midterm Exam
9. Week	Software Quality management, ISO 900x family standards, Quality control vs quality assurance, SEI Capability Maturity Model Integration (CMM-I), CMM history, process models, Maturity Models (CMM 5 level definition), Kay process areas Key practices
10. Week	SW project performance tracking & monitoring, monitoring framework & check points, Ghann charts & Slip charts methods. Earn Value Analysis (EVA), schedule performance index (SPI), cost performance index (SPI), estimation to complete (ETC), project re-planning.
11. Week	Configuration management & change management, SW changes (corrective, adaptive, perfective, preventive), configuration management aspects (identification, control & change management, auditing, accounting). Baseline & vision management
12. Week	Project team management & organization, organizational planning, roles & responsibilities, monitoring & team management, organization & staff acquisition, team development, staff requirements, stakeholder analysis, organization charts.
13. Week	Project presentations...
14. Week	Project presentations...
15. Week	Project presentations...

16. Week	Final Exam
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Assessment Method

Semester Works	Number	Contribution
Attendance	14	%5
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	2	%15
Presentation	0	%0
Project	1	%30
Seminar	0	%0
Mid-term Exams	1	%20
Final Exam	1	%30
Total	19	%100
Contribution of semester Works to success points	4	%70
Contribution of final exam to success points	1	%30
Total	19	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	3	42
Presentation / Seminar Preparation			
Project	14	3	42
Homework assignment	2	2	4
Midterms (Study duration)	1	10	10
Final Exam (Study duration)	1	15	15
Total Workload			155
Total Workload/30 hours			5.15
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.				X	
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.					X

An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.				X	
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.				X	
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.		X			
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.		X			
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.		X			
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.				X	

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

**ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

COURSE INFORMATION

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	2. Best practices in machine learning
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Subjects by weeks

Weeks	Subjects
1. Week	Introduction to machine learning, linear algebra review
2. Week	One variable and multivariable regression
3. Week	Octave, Matlab, Python tutorial
4. Week	Logistic regression
5. Week	Regularized logistic regression
6. Week	Neural networks
7. Week	Neural networks: Learning
8. Week	Midterm exam
9. Week	Improving machine learning algorithm
10. Week	Support vector machines
11. Week	Unsupervised learning
12. Week	Anomaly detection
13. Week	Gaussian mixture models

14. Week	Hidden markov models
15. Week	Application example: Photo OCR
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%5
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	0	%0
Presentation	0	%0
Project	1	%25
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%40
Total	18	%100
Contribution of semester Works to success points	3	%60
Contribution of final exam to success points	1	%40
Total	18	%100

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory			
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation			
Project	14	2	28
Homework assignment			
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			144
Total Workload/30 hours			4.88
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science and related engineering discipline; ability to use theoretical and practical knowledge in these areas in complex engineering problems.					X
An ability to identify, formulate, and solve complex engineering problems; the ability to select and apply appropriate analysis and modeling methods for this purpose.				X	

An ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions; the ability to apply modern design methods for this purpose.					X
Ability to develop, select and use modern techniques and tools necessary for the analysis and solution of complex problems in engineering applications; ability to use information technologies effectively.			X		
Ability to design, conduct experiments, collect data, analyze and interpret results to investigate complex engineering problems or discipline-specific research topics.				X	
Ability to work effectively in disciplinary and multidisciplinary teams; self-study skills.			X		
Ability to communicate effectively in verbal and written Turkish; knowledge of at least one foreign language; ability to write effective reports and understand written reports, to prepare design and production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.				X	
Awareness of the necessity of lifelong learning; the ability to access information, follow developments in science and technology, and constantly renew oneself.			X		
To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.			X		
Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.			X		
Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.		X			

1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

