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				

ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

COURSE SYLLABUS
ALGORITHMS AND PROGRAMMING WITH JAVA-I

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Algorithms and Programming with Java-I	CENG 101	Fall	3	0	2	4	6
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)	Asst. Prof. Yüksel Arslan,						
Course objective	• To understand the use of predefined classes and objects. • To understand fundamentals of a computer and programming topics, • To develop basic computational thinking skills, i.e., algorithmic thinking • To get familiar with fundamental concepts and terminology in computer programming • To be able to use an integrated development environment to design and write code in the Java programming language. • To define and correctly use data types, decision structures, arrays, conditionals and loops. • To understand the use of predefined classes and objects.						

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	

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
Algorithms and Programming with Java-II	CENG 102	Spring	3	0	4	5	8
Prerequisites	Algorithms and Programming with Java-I						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery (face to face,distance learning)	Lecture (if needed on line teaching)						
Learning and teaching strategies	Lecturing, discussion and submission.						
Instructor (s)	Dr.Cevdet Dengi, Dr.Sarper Alkan						
Course objective	• To continue learning the Java language and understand more advanced features and semantics of the Java programming • Proficient programming in the Java language and analyze, design, development, and debugging techniques appropriate for the Java • To understand the concepts of classes, objects, and encapsulation • To apply object-oriented design techniques for building complex programs in a systematic manner. • To become familiar with common user-interface components and apply them to real world problems • To understand several sorting and searching algorithms, and estimate						

	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. o Implementation of classes, inheritance, interfaces, methodology for object oriented design and development. o Graphical user interfaces design, (buttons, text components, drawing exc.). o Input/output files reading and writing and exception handling, recursion, searching and sorting algorithms. o 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; o Solve real problems pertaining to mathematics, modeling and computation with the basic knowledge of computer literacy, design and programming skills o Have learned and understood more advanced features and semantics of the Java language o Have proficient programming skills in the Java language and analyze, design, develop and debug problems appropriately for Java o Employ object-oriented design and development through Implementation of classes, inheritance, interfaces, methodology and understand the concepts of classes, objects and encapsulation o Apply object-oriented design techniques for building complex programs systematically o 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

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
COMPUTER ENGINEERING DEPARTMENT

Course Information

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Data Structures and Algorithms	CENG 213	Fall	3	0	0	3	5
Prerequisites	CENG 102 – Computer Programming Java II						
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)	Dr. Ender Sevinç						
Course objective	To introduce you to data structures, an issue central to the art of computer programming.						
Course Content	The course covers algorithm analysis, selection/insertion/bubble sort quicksort and merge-sort algorithms, linear data structures, stacks, queues, linked lists, trees, priority queues, heaps, hash tables, graphs. Other content of this course is to teach students fundamentals of C/C++ language. C is a powerful computer programming language that is appropriate for technically oriented people with little or no programming experience and for experienced programmers to use in building substantial information systems						

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	

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
Data Structures and Algorithms II	CENG 214	Spring	3	0	0	3	5
Prerequisites	CENG 213 –Data Structures and Algorithms						
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)	Dr. Ender Sevinç						
Course objective	Implement and analyze elementary data structures including trees, tries, tables, and graphs. Explore different searching, maintenance, sorting and traversal algorithms using these data structures.						
Course Content	Trees, search trees, balanced search trees: AVL, B-Tree, red-black trees, tries, Huffman compression coding, hash tables, graphs and graph traversal algorithms, Dijkstra shortest path, PRIM's spanning tree algorithm						
References	i. Frank M. Carrano and Timothy Henry, "Data Abstraction & Problem Solving with C++", 7th Ed., 2016, Pearson.						

	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	*To teach the basics of discrete mathematical structures*						
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

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***

	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	ECTS
Probability and Statistics for Engineers	CENG 236	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)	Hakan Çağlar, Assoc. Prof.						
Course objective	Probability and statistics is a mathematical discipline which are widely used in industrial and agricultural production, science and technologies. This course is one of the important basic courses for engineering students that shall know the general conceptions and methods about probability and statistics. It is also introduced the concept of random events, the relationship between events and calculations related. The concept and the properties of conditional probability. total probability formula and Bayes' Rule. The concept of independent events. Two dimensional random variables. The concepts and properties of probability distribution function (pdf) and probability density function (pdf) of continuous						

	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	o Define the principal concepts about probability, its features. o Solve the problems about permutation, combination and Binomial Theorem. o Calculate probabilities using Conditional probability, Rule of total probability and Bayes' theorem. o Explain the concept of a random variable and the probability distributions. o Define the concept of a random variable, express the features of discrete and continuous random variables. o Formulate the distribution functions. o Calculate the expected value, variance and the moments. o Explain major distributions of random variables. o Define the discrete distributions and solve the problems about these distributions. o 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; o Understand the basic knowledge on fundamental probability concepts, including random variable, probability of an event, additive rules and conditional probability o Understand the concept of Bayes' theorem, the basic statistical concepts and measures o Understand several well-known distributions, including Binomial, Geometrical, Negative Binomial, Pascal, Normal and Exponential Distribution o Understand the concepts of various parameter estimation methods, like

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

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

ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING AND ARCHITECTURE
COMPUTER ENGINEERING DEPARTMENT

COURSE INFORMATION

Course Name	Code	Sem.	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Programming Languages	CENG 241	Fall	3	0	0	3	6
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)	Ahmet Serkan Karataş, PhD						
Course objective	Aim of this course is to introduce the student to the fundamental concepts and paradigms of programming languages and to provide the tools necessary to critically evaluate existing and future programming languages.						
Course Content	Values and types in programming languages, concept of variables and storage, scope and binding strategies, types of abstraction, control of flow						
References	1. Programming Language Design Concepts, David A. Watt, John Wiley						

	& 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

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
Formal Languages and Automata Theory	CENG 256	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	*To teach the basics of formal languages, abstract machines and automata theory together with complexity analysis*						
Course Content	• Mathematical concepts; alphabets and languages • Regular languages and finite automata • Context-free languages and pushdown automata • Recursively enumerable sets and Turing machines						

	• The language hierarchy • Correspondence between grammars and automata • Determinism vs. nondeterminism
References	Lewis, H.R and Papadimitriou, C.H. *Elements of the Theory of Computation (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

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
Web Design and Programming	CENG 361	Fall	3	0	0	3	5
Prerequisites	Java-II						
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)	Ahmet COŞAR, PhD						
Course objective	*To teach the basics of discrete mathematical structures*						
Course Content	○ HTML ○ JavaScript ○ CSS ○ HTTP ○ Ajax						

	○ 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

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
Operating Systems	CENG 301	Fall	3	0	0	3	6
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)	Cevdet Dengi, PhD						
Course objective	To teach operating system concepts.						
Course Content	Operating Systems Overview, Process Management, Memory Management, Storage Management, Protection and Security						
References	1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne (2014): Operating System Concepts, 9th Edition, John Wiley & Sons. 2. Andrew S. Tanenbaum, Herbert Boss (2014): Modern Operating						

	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***

	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	ECTS
Computer Architecture	CENG 332	Fall	3	0	0	3	6
Prerequisites	None						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery	Face to face/Distance Education						
Learning and teaching strategies	Lectures, Problem Solving.						
Instructor (s)	Atila BOSTAN						
Course objective	To teach fundamental units and running principles of computer systems including memory, CPU and I/O units.						
Course Content	Computer components, Von Neumann architecture, instruction execution, interrupts, bus structure and interconnection of components, memory: internal memory, cache and virtual memory, external memories. CPU: ALU, floating point arithmetic, instruction sets, addressing modes and formats; control unit: hardwired and micro-programmed control units.						
References	○ Randal E. Bryant and David R. O'Hallaron, Computer Systems: A Programmer's Perspective, International Edition, Pearson Higher Education, Second Edition, 2011						

	○ 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***

	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/wee k)	Laboratory (hours/week)	National Credit	ECT S
Computer Networks	CENG 336	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)	Yüksel ARSLAN, PhD						
Course objective	*To teach the foundation of computer networks and how to design complex computer networks*						
Course Content	○ OSI model introduction ○ Explanation, technologies, protocols of each OSI layer ○ Client-server and peer to peer programming ○ Networking equipment						

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 demostrations
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.					

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/wee k)	National Credit	ECT S
Database Management Systems	CENG 351	Fall	3	0	0	3	5
Prerequisites	Data Structures						
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)	Ahmet COŞAR, PhD						
Course objective	*To teach the database management systems, Relational database design principles*						
Course Content	o Files: Sequential and direct Access o Hash-based indexing, B-tree indexing o Relational model o Database design, ER diagrams, 1NF, 2NF, 3NF, BCNF, +NF						

	○ 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 aplications 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

Computer Graphics	CENG 378	Spring	3	0	0	3	6
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)	Sarper ALKAN, PhD						
Course objective	CENG 378 introduces the basic concepts of computer graphics and demonstrates the application of computer science to the field of computer graphics. This course provides the studens with the necessary knowledge for developing and implementing computer graphics applications.						
Course Content	Human vision system. Images and displays. Texture mapping and ray-tracing. Modelling transformations. Fixed function pipelinge. Rasterization. Shading. Shadows. Computer graphics applications.						
References	1. Peter Shirley and Steve Marschner, "Fundamentals of Computer Graphics", 3rd Edition, A K Peters, 2009, ISBN 978-1568814698 2. Donald D. Hearn and M. Pauline Baker, "Computer Graphics with OpenGL", 3rd Edition, Prentice Hall, 2004, ISBN 978-0130153906 3. James D. Foley, Andries van Dam, Steven K. Feiner, and John F. Hughes, "Computer Graphics: Principles and Practice", 2nd Edition, Addison Wesley, 1995, ISBN 978-0201848403 4. Mike Bailey and Steve Cunningham, "Graphics Shaders", A K Peters, 2009, ISBN 978-1568813349 5. Peter Shirley and R. Keith Morley, "Realistic Ray Tracing", 2nd Edition, A K Peters, 2003, ISBN 978-1568814612						

	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	ECTS

Intro. To Signal Processing for Comp. Engineers	CENG 384	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)	Hakan Çağlar, Assoc. Prof.						
Course objective	The concept of sampling of continuous-time signals to produce discrete-time signals and the importance and application of the Nyquist sampling theorem. Understand discrete Fourier transforms (DFT) and be able to use them to characterize discrete-time signals. Z-transforms of discrete-time signals. The concepts of linearity, causality, and stability. Linear time-invariant discrete-time systems in time domain use of convolution (impulse response) and difference equations, and in frequency domain use of discrete-time Fourier transforms (frequency response) and z-transforms (transfer functions). Know how to represent discrete-time systems using block diagrams. Techniques for implementation of discrete-time systems. Understand the basic concepts of infinite-impulse-response digital filters (IIR), finite impulse-response digital filters (FIR)and their application areas. Know how to design finite- and infinite impulse response filters. The concept of the fast Fourier transform (FFT).						
Course Content	o Discrete -Time Signals & Systems o Linear Time Invariant Systems, Sampling Theorem, Nyquist Rate o Frequency Domain Representation of Discrete-Time Signals & Systems o Z-Transform, Inverse Z-Transform and its applications						

	○ 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 Ronal W. Schafer, 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

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. Dicrste 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

Software Engineering	SENG 211	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)	Hakan Çağlar, Assoc. Prof.						
Course objective	The objective of this course is to provide students a common understanding of software engineering principles & software processes. It is organized so as to, first, provide a general introduction to software development and identify the important phases & milestones of software project. Then, each of the phases is examined in detail, in order to give the student a picture of the current state of software development. students learn the theoretical and practical aspects of specification and design, development, verification and validation and documentation stages of SE. More, this course enables students to realize software specification and design phases of sample projects.						
Course Content	• Introduction to SW engineering & SW code of ethics • SW development processes • SW gates (SRR, CDR, TRR..) IEEE standards & documentation • Requirement Engineering • System & software engineering • SW architecture • Security engineering • SW Testing						

	• 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. Maximm 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 requiremets for?, Requiremets 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/wee	Application (hours/week	Laboratory (hours/week	National	ECT

			k)	)	)	Credit	S
Software Requirements Engineering	SENG 311	Spring	3	0	0	3	6
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)	Sarper ALKAN, PhD						
Course objective	To teach the fundamentals of software requirements engineering						
Course Content	The role of software requirements engineering in the software development process flow. Mission statement, customers, and stakeholders. Elicitation of software requirements. Writing a requirements document. Risk management of software requirements. Requirements validation and verification. Formal methods. Requirements specification and agile methods. Requirements management and value engineering.						
References	1. Wiegers, Karl, and Joy Beatty. Software requirements. Microsoft Press, 2013. ISBN-13: 978-0735679665 2. Laplante, Phillip A. Requirements engineering for software and systems (3rd edition). CRC Press, 2017. ISBN-13: 978-1138196117						
Learning outcomes	After taking this course students will be able to; 1. Understand the concept of software requirements and its role in software						

	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

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***

	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/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	*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.*						
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 demostrations

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.					

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

ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING
SOFTWARE ENGINEERING DEPARTMENT

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Object Oriented Software Eng.	SENG 244	Fall	3	0	0	3	6
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)	Cevdet Dengi, PhD						
Course objective	To teach software engineering concepts using object oriented programming paradigm.						
Course Content	Modelling, Requirement Analysis , Design, Testing, Configuration Management, Project Management, Software Life Cycle						
References	1. Bernd Bruegge and Allen H. Dutoit (2010): Object-Oriented Software						

	Engineering Using UML, Patterns, and Java, 3rd edition. Pearson 2. Timothy C. Lethbridge and Robert Laganiere (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

ANKARA SCIENCE UNIVERSITY
FACULTY OF ENGINEERING AND ARCHITECTURE
SOFTWARE ENGINEERING DEPARTMENT

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Software Validation and Verification	SENG 322	Spring	3	0	0	3	6
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)	A. Serkan Karakaş, Dr.						
Course objective	To provide an understanding on the place of software verification and validation throughout the software life cycle while focusing particularly on software testing						
Course Content	Basic concepts in software verification and validation, software testing techniques (black-box testing, white-box testing, etc.), test adequacy and coverage criteria, automated testing tools and techniques, testing lifecycle and test management, non-functional testing, formal methods for software						

	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.					

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
Software Project Management	SENG 442	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)	Hakan Çağlar, Assoc. Prof.						
Course objective	Within this course, software engineering and project management methodologies considering both practical and theoretical aspects for large scale software development will be studied in details. By taking this course, you will get sufficient knowledge about software project management methodologies, SW project planning, controlling, tracking, and finalizing.						
Course Content	o Development methodologies o Sizing & cost estimation o Project planning, work breakdown structures (WBS)						

	○ 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 idetification, 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 & stuff 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

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

Course Name	Code	Semester	Theory (hours/ week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Machine Learning	SENG 3xx	Fall/ Spring	3	0	0	3	5
Prerequisites	None						
Course Language	English						
Course Type	Technical Elective						
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	To teach basics of machine learning						
Course Content	Supervised and unsupervised learning algorithms, applying these algorithms to real world problems.						
References	For each lecture for this course students can find numerous resources in the Internet.						
Learning outcomes	After taking this course students will be able to; 1. Learn supervised and unsupervised learning algorithms						

	2. Best practices in machine learning

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