



BİLİŞİM SİSTEMLERİ MÜHENDİSLİĞİ BÖLÜMÜ

MÜFREDAT EL KİTABI

ANKARA, 2025



INFORMATION SYSTEMS ENGINEERING DEPARTMENT

CURRICULUM HANDBOOK

ANKARA, 2025

ANKARA BİLİM ÜNİVERSİTESİ

BİLİŞİM SİSTEMLERİ MÜHENDİSLİĞİ BÖLÜMÜ

2022-2023 yılı Güz döneminde eğitim-öğretim hayatına başlayan Bilişim Sistemleri Mühendisliği Bölümü, Bilişim Sistemleri Mühendisliği alanında yetkin ve mesleğinin gerekliliklerini özümsemiş Mühendisler yetiştirmeyi amaçlamaktadır.

MİSYON

Bilişim Sistemleri 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. Bilişim Sistemleri 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. Bilişim Sistemleri Mühendisliği programında, karmaşık bilgi sistemlerini tasarlamak, geliştirmek ve yönetmek için bilgisayar bilimi, temel mühendislik ve işletme yönetimi ilkelerini bütünleştiren çok disiplinli bir yaklaşım uygulanmaktadır.

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. Bilişim sistemleri 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. Bilişim sistemleri mühendislerine gelecekte olacak ihtiyaç açıktır ve bu ihtiyaç bilgisayar elektroniği ve yazılımındaki ilerlemelerle artmaya devam edecektir.

ANKARA SCIENCE UNIVERSITY

DEPARTMENT OF INFORMATION SYSTEMS ENGINEERING

Beginning its education in 2022-2023 Fall Term, the Department of Information Systems Engineering aims to raise engineers who are competent in fields of Information Systems Engineering and who have internalized the requirements of their profession.

MISSION

In order for Information Systems 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. The 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 Information Systems 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. Information Systems Engineering focuses on the application of a multidisciplinary approach that integrates computer science, fundamental engineering and business management principles to design, develop and manage complex information systems.

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 Information Systems 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 Information Systems 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	0	3	5
PHY 103	Physics I Lab	0	2	1	1
	Non-Departmental Elective I	3	0	3	3
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	28
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	0	3	5
PHY 104	Physics II Lab	0	2	1	1
HIS 102	Principles of Ataturk and History of Revolutions II	2	0	2	2
TUR 102	Turkish II	2	0	2	2
BIO 101	Molecular Biology and Biochemistry	3	0	3	5
	Open Course II	0	0	0	0
	Semester Credits	20	6	23	32
III. YARIYIL					
Kod	Ders adı	T	U	UK	AKTS
ISE 211	IT Systems and Security	3	0	3	5
EEE 203	Digital Design	3	2	4	5
CENG 213	Data Structures and Algorithms	3	0	3	5
CENG 223	Discrete and Combinatorial Math.	3	0	3	5
SENG 231	Data Science with Python	3	0	3	5
ENG 201	Academic English III	2	0	2	2
	Non-Departmental Elective II	3	0	3	3
	Semester Credits	20	2	21	30
IV. YARIYIL					
Kod	Ders adı	T	U	UK	AKTS
CENG 214	Algorithms II	3	0	3	6
ISE 222	Data Intelligence And Decision Support Systems	3	0	3	6
MATH 224	Linear Algebra & Differential Equations	3	0	3	5

MATH 206	Probability Theory and Statistics	3	0	3	5
SENG 264	Intro. to AI & Machine Learning	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 321	Software Engineering	3	0	3	6
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	30
VI. YARIYIL					
Kod	Ders adı	T	U	UK	AKTS
ISE 322	Business Process Support	3	0	3	6
ISE 332	Human Computer Interface	3	0	3	6
CENG 336	Computer Networks	3	0	4	6
ISE 350	Data Warehousing and Mining	3	0	3	5
	Technical Elective II	3	0	3	5
ENG 302	Academic English VI	2	0	2	2
	Semester Credits	17	0	18	30
VII. YARIYIL					
Kod	Ders adı	T	U	UK	AKTS
ISE 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
ISE 492	Graduation Project II	3	2	4	5
ISE 490	Long Term Practice	0	16	8	25
	Semester Credits	3	18	12	30
TOPLAM KREDİ		134	34	151	240

COURSE INFORMATION (1st semester)

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. Faruk Tokdemir, Asst. Prof. Hasan Karaaslan						
Course objective	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<p>After taking this course students will be able to;</p> <ul style="list-style-type: none"> • 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 electrical elements which form up a computer and their basic calculation principles • Develop programs in Java in order to solve beginner level problems 						

	<ul style="list-style-type: none"> • Have gained the necessary knowledge to continue with studying further Java course subjects
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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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Calculus I	MATH 101	Fall	4	0	0	4	6
Prerequisites	None						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery	Face to face						
Learning and Teaching strategies	Lecturing, discussion, and submission						
Instructor(s)	Dr. Berrin Şentürk, Dr. Neslihan Ayşen Özbay, Dr. Seher Fişekci Par						
Course objective	The main goals of the course are to develop and strengthen the students' problem-solving skills and to teach them to read, write, and think in the language of mathematics. Students should be able to apply the tools of calculus to a variety of problem situations.						
Course content	The concepts of Limit and Continuity. The Derivative, Applications of the Derivative. Transcendental functions. Critical Points. Asymptotes. Curve sketching. The Integration, Fundamental Theorem of Calculus. Techniques of Integration, Applications of the Integral.						
References	<ol style="list-style-type: none"> 1. Calculus (Metric Version), 8th (or 7th) Edition, by James Stewart 2. Calculus, 14th Edition, by George B. Thomas (Supplementary Book) 						
Learning Outcomes	<p>Upon successful completion of this course, a student will be able to:</p> <ul style="list-style-type: none"> • Recall definitions, statements of theorems, certain examples and counterexamples pertaining to functions of one variable. • Calculate limits and continuity for functions of one variable. • Calculate the derivatives of elementary and transcendental functions of one variable, tangent line, the chain rule, and implicit differentiation. • Compute the integrals of elementary and transcendental functions of one variable, method of substitution, integration by parts, powers and products of trigonometric functions, trigonometric substitution, and partial fractions. • Solve problems of related rates, minimum-maximum, linear approximations, graphing functions, length of a curve, planar area, and volume. 						

SUBJECTS BY WEEKS

Weeks	Subjects
1. Week	Appendix D: Trigonometry, The Limit of a Function, Calculating Limits using the Limit Laws
2. Week	Limits at Infinity; Horizontal Asymptotes Continuity

3. Week	Derivatives and Rates of Change The Derivative as a Function Differentiation Formulas
4. Week	Derivatives of Trigonometric Functions The Chain Rule Implicit Differentiation
5. Week	Related Rates Linear Approximations and Differentials Inverse Functions Exponential Functions and Their Derivatives
6. Week	Logarithmic Functions Derivatives of Logarithmic Functions Inverse Trigonometric Functions, Hyperbolic Functions
7. Week	Indeterminate Forms and l'Hospital's rule Maximum and Minimum Values The Mean Value Theorem How Derivatives Affect the Shape of a Graph Summary of Curve Sketching
8. Week	Midterm Exam
9. Week	Optimization problems Antiderivatives
10. week	Areas and Distances The Definite Integral The Fundamental Theorem of Calculus
11. Week	Indefinite Integrals and the Net Change Theorem The Substitution Rule Integration by Parts
12. Week	Trigonometric Integrals Trigonometric Substitution
13. Week	Integration of Rational Functions by Partial Fractions Improper Integrals
14. Week	Areas Between Curves Volumes Volumes by Cylindrical Shells
15. Week	Average Value of a Function Arc length Area of a Surface of Revolution
16. Week	Final Exam

ASSESSMENT METHOD

Semester Works	Number	Contribution
Attendance	14	0%
Laboratory	0	0%
Application	0	0%
Fieldwork	0	0%
Practice	14	0%
Homework Assessment	0	0%
Quiz	0	0%
Presentation	0	0%
Project	0	0%
Seminar	0	0%
Mid-term Exam(s)	1	40%

Final Exam	1	60%
Total	30	100%
Contribution of semester Works to success points	29	40%
Contribution of final exam to success points	1	60%
Total	30	100%

WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	4	56
Laboratory	0	0	0
Application	0	0	0
Specific practical training	0	0	0
Field activities	0	0	0
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	6	84
Presentation / Seminar Preparation	0	0	0
Project	0	0	0
Homework assignment	0	0	0
Quiz	0	0	0
Midterms (Study duration)	1	17	17
Final Exam (Study duration)	1	23	23
Total Workload	180		
Total Workload/30 hours	6		
ECTS	6		

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Phsics I	PHY101	Fall	3	0	0	3	5
Prerequisites							
Course Language	English						
Course Type	Compulsory						
Mode of	Face to face						
Learning and teaching strategies	Lecturing, discussion and submission.						
Instructor (s)	Dr. Neslihan GÖKÇEK, Dr. Vedat TANRIVERDİ						
Course objective	Upon the successful completion of this course, students will establish the relationship between mechanics and engineering. This includes to provide students the concepts of mechanics with defining and solving problems.						
Course Content	Basic information about the concepts of nature of matter, mechanics, kinetics and dynamics						
References	<p>1. R. A. Serway & J. W. Jewett, Physics for Scientists and Engineers (6th Ed.), Brooks Cole (2007).</p> <p>2. H. D. Young and R. A. Freedman, University Physics 12th-14th Ed. Pearson (2008, 2016).</p> <p>3. Principles of Physics by Halliday, Resnick, and Walker (10th Edition), John Wiley (2014)</p>						
Learning outcomes	<ul style="list-style-type: none"> • Learn the basic concepts of mechanics, kinetics and dynamics • Apply the topics of mechanics to their own engineering science • Improve the ability of student's solution perspective for different kinds of new problems • Modeling a new problem related with the concepts of mechanics and interpret the results • The ability to analyze a problem graphically 						

SUBJECTS BY WEEKS

Weeks	Subjects
1. Week	Physics and measurement
2. Week	Motion in one dimension
3. Week	Vectors
4. Week	Motion in two dimensions
5. Week	The laws of motion
6. Week	Circular motion and other applications of Newton's laws

7.	Week	Circular motion and other applications of Newton's laws
		Midterm Exam
8.	Week	Energy and energy transfer
9.	Week	Energy and energy transfer
10.	Week	Potential energy
11.	Week	Linear momentum and collisions
12.	Week	Rotation of a rigid object and about a fixed axis
13.	Week	Rotation of a rigid object and about a fixed axis
14.	Week	Angular momentum

ASSESSMENT METHOD

- I. Assignments & Quizzes : 10%
- II. Midterm Exam (closed book) : 40%
- III. Final Exam: (closed book) : 50%

WORKLOAD AND ECTS CALCULATION

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

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

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

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Physics I Lab	PHY103	Fall	0	0	2	1	1
Prerequisites							
Course Language	English						
Course Type	Compulsory						
Mode of	Face to face						
Learning and teaching strategies	Application Analyze Reporting						
Instructor (s)	Dr. Neslihan GÖKÇEK, Dr. Vedat TANRIVERDİ						
Course objective	Upon the successful completion of this course, students will establish the relationship between mechanics and engineering. This includes to provide students the concepts of mechanics with doing experiments.						
Course Content	Measurements, motion in one dimension, Hooke's law, application of Newton's laws, conservation of energy and momentum						
References	1. R. A. Serway & J. W. Jewett, Physics for Scientists and Engineers (6th Ed.), Brooks Cole (2007). 2. H. D. Young and R. A. Freedman, University Physics 12th-14th Ed. Pearson (2008, 2016). 3. Principles of Physics by Halliday, Resnick, and Walker (10th Edition), John Wiley (2014)						
Learning outcomes	1. Learn how to apply the basic concepts of mechanics, kinetics by experiments 2. The ability to analyze a problem graphically 3. Learn to work within a group						

Form IVb (English): Experiment Names

Weeks	Experiment Names
1. Week	Preparation
2. Week	Significant Figures and Measurement
3. Week	Significant Figures and Measurement
4. Week	Calculating Gravitational Acceleration

5.	Week	Calculating Gravitational Acceleration
6.	Week	Hooke's Law
7.	Week	Hooke's Law
8.	Week	Newton's Second Law
9.	Week	Newton's Second Law
10.	Week	Parallel and Series Connections of Springs
11.	Week	Parallel and Series Connections of Springs
12.	Week	Collisions in One Dimension
13.	Week	Collisions in One Dimension

Assessment Methods:

	Type	Total Contribution
1	The first three experiments	40
2	The last three experiments (%66) and final exam(%33)	60

COURSE INFORMATION (2nd semester)

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Algorithms and Programming with Java-II	CENG 102	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. Faruk Tokdemir, Asst. Prof. Hasan Karaaslan						
Course objective	<ul style="list-style-type: none">• 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	<p>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.</p> <ul style="list-style-type: none">• Implementation of classes, inheritance, interfaces, methodology for object oriented design and development.• Graphical user interfaces design, (buttons, text components, drawing exc.).• Input/output files reading and writing and exception handling, recursion, searching and sorting algorithms.• Java Collections Frameworks will be presented from the perspective of a library use.• Student will get weekly 4 hours of Lab experiments and many small projects, and home works. The ultimate goal is to produce a commercial-quality program, which is well structured, documented, bug-free and easy to use. Students will be expected to display creativity and an ability to learn independently.						

References	<p>Big Java: Late Objects, by Cay S. Horstmann, John Wiley & Sons Inc., ISBN: 978-1-118-08788-6</p> <p>Java Software Solutions: Foundations of Program Design, Lewis & Loftus, 8th Edition, Pearson</p>
Learning outcomes	<p>After taking this course students will be able to;</p> <ul style="list-style-type: none"> • Solve real problems pertaining to mathematics, modeling and computation with the basic knowledge of computer literacy, design and programming skills • Have learned and understood more advanced features and semantics of the Java language • Have proficient programming skills in the Java language and analyze, design, develop and debug problems appropriately for Java • Employ object-oriented design and development through Implementation of classes, inheritance, interfaces, methodology and understand the concepts of classes, objects and encapsulation • Apply object-oriented design techniques for building complex programs systematically • Become familiar with common user-interface problems and apply related solutions to real world problems • Have understood several sorting and searching algorithms, estimate and compare space and time limitations of different algorithms

Subjects by weeks

Weeks	Subjects
1. Week	<p>Ch.8 Objects and Classes</p> <p>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.</p>
2. Week	<p>Ch.8 Objects and Classes</p> <p>Week 1 topics continue</p>
3. Week	<p>Ch.9 Inheritance & Interface</p> <p>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</p>
4. Week	<p>Ch.9 Inheritance & Interface</p> <p>Week 3 topics continue</p>
5. Week	<p>Ch.12 Object Oriented Design</p> <p>Inheritance, aggregation, and dependency relationships between classes using UML class diagrams. Object oriented design techniques to building complex programs. Package usage to organize programs</p>
6. Week	<p>Ch.10 Graphical User Interfaces</p>

	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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Calculus II	MATH 102	Spring	4	0	0	4	6
Prerequisites	Math 101						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery	Face to face						
Learning and Teaching strategies	Lecturing, discussion, and submission						
Instructor(s)	Dr. Berrin Şentürk, Dr. Neslihan Ayşen Özbay, Dr. Seher Fişekçi Par						
Course objective	The main objective for this course is to acquaint you with fundamental calculus concepts involving functions of more than one variable, and to help you to understand and apply such functions in a variety of settings. The course aims to study infinite sequences and series, convergence test for series, absolute and conditional convergence, and Taylor polynomials and power series, volumes of rotation, integration techniques, partial derivatives, and local extrema of two variable functions, double and triple integrals.						
Course content	Sequences, Series, Taylor Series, Vectors in R^2 and R^3 , Dot and Cross Products, Lines and Planes in R^3 , Functions of Several Variables, Limits and Continuity, Partial Derivatives, Directional Derivatives, Maximum and Minimum Values, Lagrange Multipliers, Double Integrals, Triple Integrals, Vector Functions, Limits and Derivatives.						
References	<ul style="list-style-type: none"> • Calculus (Metric Version), 8th (or 7th) Edition, by James Stewart • Calculus, 14th Edition, by George B. Thomas (Supplementary Book) • Calculus, Multivariable 2nd Edition by Brian E. Blank, Steven G. Krantz 						
Learning Outcomes	<p>Upon successful completion of this course, a student will be able to:</p> <ul style="list-style-type: none"> • Test series for convergence and divergence, represent elementary and transcendental functions of one variable as Taylor or Maclaurin series • Perform vector operations such as vector addition, scalar multiplication, dot product and cross product • Relate vector operations to geometric notions and structures such as distance, projection, orthogonality, parallelism, lines, and planes in R^3 • Solve maximum and minimum problems and apply the method of Lagrange multipliers for multivariable functions • Evaluate limits, partial derivatives, directional derivatives, multiple integrals of multivariable functions • Compute limits, derivatives and integrals of vector functions. • Expose to the concept of three-dimensional analytical geometry. 						

Subjects by weeks

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

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

Assessment Method

Semester Works	Number	Contribution
Attendance	14	0%

Laboratory	0	0%
Application	8	0%
Fieldwork	0	0%
Practice	0	0%
Homework Assessment	1	5%
Quiz	0	0%
Presentation	0	0%
Project	0	0%
Seminar	0	0%
Mid-term Exam(s)	1	40%
Final Exam	1	55%
Total	30	100%
Contribution of semester Works to success points	29	45%
Contribution of final exam to success points	1	55%
Total	30	100%

Workload and ECTS Calculation

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

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECT S
Physics II	PHYS 102	Fall	3	2	0	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)							
Course objective	The main objective of this course is to teach students the fundamental laws of electricity and magnetism and how to use this knowledge in understanding the operation of basic electrical and magnetic circuit elements. This course will also teach students the description of light as electromagnetic waves.						
Course Content	Definition of charge and electric fields. Determination of electric field due to a point charge or to a charge distribution. Using Gauss's law for symmetric charge distributions. Definition of electric potential and capacitance. Foundation of basic circuit elements. Definition of magnetic field and source of magnetic fields. Inductance and analyses of basic direct and alternating circuits. Using Maxwell's laws to describe the light as an electromagnetic wave.						
References	<ul style="list-style-type: none"> SEARS AND ZEMANSKY'S University Physics with Modern Physics, 15th Ed. by Young and Freedman, Pearson (2020). Physics for Scientists and Engineers 8th Ed with Modern Physics by Serway and Jewett, Thomson, Brooks/Cole. 						
Learning outcomes	After taking this course, <ul style="list-style-type: none"> Learning significance and accuracy concepts in a measurement. Applying knowledge of math, science, and engineering to everyday mechanical physics problems. Learning how to communicate and share scientific ideas. Learning concept of motion and its application to one- and multi-dimension problems. Application of Newton's laws and conservation laws to broad range of problems including planetary motion and fluid mechanics. 						

Form IVb (English): Subjects by weeks

Weeks	Subjects
1. Week	Course Introduction and Vector Calculus Review
2. Week	Ch21.Electric Charge and Electric Field
3. Week	Ch.22.Gauss's Law
4. Week	Ch23.Electric Potential
5. Week	Ch. 24. Capacitance and Dielectrics
6. Week	Ch. 25. Current, Resistance, and Electromotive Force
7. Week	Ch. 26. Direct-Current Circuits
8. Week	MIDTERM
9. Week	Ch. 27. Magnetic Field and Magnetic Forces
10. Week	Ch. 28. Sources of Magnetic Field
11. Week	Ch. 29. Electromagnetic Induction
12. Week	Ch. 30. Inductance
13. Week	Ch. 31. Alternating Current
14. Week	Ch. 32. Electromagnetic Waves
15. Week	Catch-up and review /
16. Week	Final Exam

Form Vb (İngilizce): Assessment Method

Semester Works	Number	Contribution
Attendance	14	%0
Laboratory	4-7	%15
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	0	%0
Presentation	0	%0
Quiz	5	%10
Project	0	%0
Seminar	0	%0
Mid-term Exams	1	%35
Final Exam	1	%40
Total	16	%100
Contribution of midterm to success points	1	%40
Contribution of final exam to success points	1	%60
Total		%100

Form VIb (English): WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	4	56
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(quiz)	14	2	28
Midterms (Study duration)	1	10	10

Final Exam (Study duration)	1	16	16
Total Workload			180
Total Workload/30 hours			6.00
ECTS			6.00

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Physics II Lab	PHY104	Spring	0	0	2	1	1
Prerequisites							
Course Language	English						
Course Type	Compulsory						
Mode of	Face to face						
Learning and teaching strategies	Lecturing, discussion and submission.						
Instructor (s)	Dr. Neslihan GÖKÇEK, Dr. Vedat TANRIVERDİ						
Course objective	Upon the successful completion of this course, students will establish how to measure the basic quantities in electricity and magnetism.						
Course Content	Basic measurements and experiments on electricity and magnetism.						
Learning outcomes	<ul style="list-style-type: none">• Learn the basic circuit elements e.g. resistor, capacitor, coil• Learn how to measure the basic quantities of electricity and magnetism.• Learn the basic applications of electromagnetism.• Learn how to draw a graph and represent basic findings.• To make group work						

Course Schedule

Weeks	Subjects
1. Week	Introduction to laboratory
2. Week	Introduction to laboratory
3. Week	Color codes for resistors and measurements
4. Week	Color codes for resistors and measurements
5. Week	Verifying Ohm's law
6. Week	Verifying Ohm's law
7. Week	Resistors in Series and Parallel

8.	Week	Resistors in Series and Parallel
9.	Week	Equipotential Lines and Electric Field
10.	Week	Equipotential Lines and Electric Field
11.	Week	Charging and discharging a capacitor
12.	Week	Charging and discharging a capacitor
13.	Week	Magnetic fields
14.	Week	Magnetic fields

Assessment Method

- I. Lab Reports: 80%
- II. Final Exam: (closed book): 20%

Form VIb (English): WORKLOAD AND ECTS CALCULATION

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)			
Laboratory	7	2	14
Application			
Specific practical training			
Field activities			
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	7	2	14
Presentation / Seminar Preparation			
Project			
Homework assignment			
Midterms (Study duration)			
Final Exam (Study duration)	1	10	10
Total Workload			38
Total Workload/30 hours			1.27
ECTS			1

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

Program Outcomes	Course Outcomes				
	1	2	3	4	5
1	5	5	5	5	5
2		2	5	5	
3			5	5	

4				4	
5		2		5	
6					
7					
8					
9					
10					
11					

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/ week)	Application (hours/ week)	Laboratory (hours/ week)	National Credit	ECTS
Molecular biology and Biochemistry	BIO101	Fall	3	0	0	3	5
Prerequisites	None						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery	Face to face						
Learning and teaching strategies	Lecturing, discussion and submission.						
Instructor (s)	Ayşe ÖZDEMİR, PhD						
Course objective	Students should have learn molecular biology, biochemistry and genetics to understand basic applications of biology in engineering.						
Course Content	Introduction to Human Genome Project and its medical results, gene sequencing and relationship to hereditary genetic diseases. Introduction of molecular and cellular biology, cells, inheritance and gene expression. Biological molecules and structure and organization of cells, DNA replication, transcription and translation, regulation of gene expression. Introduction to computer algorithms used in bioinformatics research and applications.						
References	<ul style="list-style-type: none"> • Campbell Biology, Lisa Urry, Michael Cain, et al., 12th Ed.,2020. • BRS Biochemistry, Molecular Biology & Genetics, 8.th ed., M.A. Lieberman, R. Ricer • Lodish, U. H. (2016). Molecular Cell 						
Learning outcomes	After taking this course students will be able to; <ul style="list-style-type: none"> • know basic concepts of molecular biology and genetics and their applications in engineering • learn the fundamentals of biological processes • have knowledge about bioinformatic tools 						

Subjects by weeks

Weeks	Subjects
1. Week	Themes of Biology
2. Week	The Chemical Foundation of Life
3. Week	Biological Macromolecules
4. Week	Cellular Organization

5.	Week	Cellular Metabolism
6.	Week	Cell Communication
7.	Week	Cell Cycle
8.	Week	Midterm Exam
9.	Week	Mendel Genetics
10.	Week	The Molecular Basis of Inheritance
11.	Week	Gene Expression
12.	Week	Biotechnology
13.	Week	Molecular Evolution and Its Mechanisms
14.	Week	Why Bioinformatics? Biological Big Data and Databases
15.	Week	Repeat
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	0	0%
Quiz	0	0%
Presentation	0	0%
Project	0	0%
Seminar	0	0%
Mid-term Exams	1	40%
Final Exam	1	60%
Total	30	100%
Contribution of semester Works to success points	29	40%
Contribution of final exam to success points	1	60%
Total	30	100%

Workload and ECTS Calculation

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory	0	0	0
Application	0	0	0
Specific practical training	0	0	0
Field activities	0	0	0
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	7	4	28
Presentation / Seminar Preparation	0	0	0
Project	0	0	0
Homework assignment	0	0	0
Quiz	0	0	0
Midterms (Study duration)	1	35	35
Final Exam (Study duration)	1	45	45
Total Workload	150		
Total Workload/30 hours	5		
ECTS	5		

Program Learning Outcomes - Course Learning Outcomes Matrix

Program Learning Outcomes	Course Learning Outcomes				
	LO1	LO2	LO3	LO4	LO5
PO-1				4	
PO-2			4		
PO-3		3			
PO-4			5		
PO-5			3		
PO-6			5		
PO-7			5		
PO-8				4	
PO-9					5
PO-10	4				
PO-11			5		

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
IT Systems and Security	ISE 211	Fall	3	0	0	3	5
Prerequisites							
Course Language	English						
Course Type	Compulsory						
Mode of Delivery (face to face, distance learning)	Face to face						
Learning and teaching strategies	Lecturing, discussion and submission.						
Instructor (s)							
Course objective	This course is designed to provide students with a foundational understanding of Information Systems (IS) as they apply to computer industry.						
Course Content	Information Systems fundamentals; IS infrastructure; Managing Information Systems; Information Systems for commerce and collaboration; security, privacy and ethics for Information Systems.						
References	<p>1. Introduction to Information Systems, R. Kelly Rainer, Brad Prince, 2020, John Wiley & Sons,</p> <p>2. Introduction to Management Information Systems, Rafael Lapiedra Alcamí and Carlos Devece Carañana, ISBN: 978-84-695-1639-0, 2012</p> <p>3. Fundamentals of Information Systems by Ralph Stair, George Reynolds, Cengage Learning, 2013, ISBN-13 978-1133629627</p>						
Learning outcomes	<p>After taking this course students will be able to:</p> <ul style="list-style-type: none"> • Distinguish data from information • Demonstrate an understanding of the scope, purpose, and value of information systems in an organization. • Demonstrate an understanding of principles, issues, and trends in managing information systems infrastructure and services • Demonstrate an understanding of processes involved in securing Information Systems. • Demonstrate an understanding of ethical issues associated with integrating information systems into society. 						

SUBJECTS BY WEEKS

Weeks	Subjects
1. Week	Introduction to Information Systems
2. Week	Organizational Strategy and Competitive Advantage

3. Week	Ethics and Privacy
4. Week	Information Security and Controls
5. Week	Data and Knowledge Management
6. Week	Telecommunications and Networking
7. Week	E-Business and E-Commerce
8. Week	Mid Term Exam
9. Week	Wireless, Mobile Computing, and Mobile Commerce
10 Week	Social Computing
11. Week	Information Systems Within Organization
12. Week	Customer Relationship Management
13 Week	Supply Chain Management
14. Week	Business Analytics
15. Week	Acquiring Information Systems and Applications
16. Week	Final Exam

ASSESSMENT METHOD

Semester Works	Number	Contribution
Attendance		
Laboratory		
Application		
Fieldwork		
Practice		
Homework Assessment	1	%20
Quiz		
Presentation		
Project		
Seminar		
Mid-term Exams	1	%40
Final Exam	1	%40
Total		%100
Contribution of semester Works to success points		%60
Contribution of final exam to success points		%40
Total		%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	14	4	56
Presentation / Seminar Preparation			
Project			
Homework assignment	2	10	20
Quiz			
Midterms (Study duration)	1	10	10
Final Exam (Study duration)	1	20	20
Total Workload		148	
Total Workload/30 hours		4,93	
ECTS		5	

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

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)							
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	<ul style="list-style-type: none"> • 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	<p>After taking this course, students will be able to;</p> <ul style="list-style-type: none"> • 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 points	32	%60
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	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

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							
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	<p>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.</p> <p>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</p>						
References	<ul style="list-style-type: none"> Paul Deitel & Harvey Deitel, "C++ : How to program / P.J. Deitel, H.M. Deitel, 8th Ed., 2016, Pearson Frank M. Carrano and Timothy Henry, "Data Abstraction & Problem Solving with C++", 7th Ed., 2016, Pearson. 						
Learning outcomes	<p>After taking this course students will be able to;</p> <ul style="list-style-type: none"> 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 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. 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. Develop efficient applications that require an order on data items by appropriately selecting the right sorting algorithm. Describe the usage of various data structures. Explain the operations for maintaining common data structures. 						

Subjects by weeks

Weeks	Subjects
1. Week	Introduction to C++ Programming
2. Week	Introduction to Classes, Objects and Strings
3. Week	Control Statements
4. Week	Functions
5. Week	Recursion
6. Week	Arrays and Vectors
7. Week	Pointers
8. Week	Mid Term Exam
9. Week	Link-Based Implementations
10. Week	Stacks
11. Week	List & List Implementations
12. Week	Sorting (selection, bubble, insertion)
13. Week	Sorting (merge sort, quicksort, radix)
14. Week	Queues & Priority Queues
15. Week	Algorithm Efficiency
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance		
Laboratory		
Application		
Fieldwork		
Practice		
Homework Assessment	3	15%
Quiz	1	7%
Presentation		
Project		
Seminar		

Mid-term Exams	1	33%
Final Exam	1	45%
Total	5	100%
Contribution of semester Works to success points		
Contribution of final exam to success points		
Total	5	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
Quiz	1	1	1
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload		145	
Total Workload/30 hours		4.84	
ECTS		5.00	

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Discrete and Combinatorial Math.	CENG 223	Fall	3	0	0	3	5
Prerequisites	None						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery (face to face, distance learning)	Face to face/Distance Learning/Hybrid						
Learning and teaching strategies	Lecturing, discussion and submission.						
Instructor (s)	Mert ÖZARAR, PhD						
Course objective	<i>To teach the basics of discrete mathematical structures</i>						
Course Content	<ul style="list-style-type: none"> • 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; <ul style="list-style-type: none"> • know discrete maths • know basic concepts of data structures • 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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/ week)	Application (hours/ week)	Laboratory (hours/ week)	National Credit	ECTS
Graduation Project-1	CENG 491	Fall	3	2	0	4	5
Prerequisites	SENG 244 - Object Oriented Software Engineering CENG 256 - Formal Languages and Automata Theory CENG 214 – Algorithms II						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery (face to face, distance learning)	Face to face, distance learning						
Learning and teaching strategies	Project, discussion, presentation and submission.						
Instructor (s)	Supervisor						
Course objective	Students will plan a project due to Software Management Life Cycle Processes, Identify a problem, Determine Requirements, make a plan and analysis of the problem/project, prepare a system design, decomposing the system and address the design goals Finally prepare an SRS and present it.						
Course Content	Students are expected to apply knowledge and experience gained during their undergraduate studies to design and implement a solution for a software problem/project. As the first part of their graduation projects, students design a system, process, application or product under real world constraints and requirements in CENG 491 course for design. Then the students then implement solutions to those problems in CENG 492 course for implementation.						
References	Related books, documents						
Learning outcomes	After taking this course students will be able to; <ol style="list-style-type: none"> 1. Apply the project management methodology. 2. Propose a complex real-life project using multiple areas of knowledge. 3. Identify, solve, simulate, and design an engineering problem. 4. Demonstrate written communication skills at a professional level by preparing reports. 						

	<p>5. Demonstrate oral communication skills at a professional level by giving a presentation to the faculty.</p> <p>6. Work effectively in teamwork.</p> <p>7. Incorporate critical, analytical, strategic, and creative thinking.</p> <p>8. Gain professional discipline in time management and organizational skills</p>
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Subjects by weeks

Weeks	Subjects
17. Week	Project Study (Project Identification)
18. Week	Project Study (Project Identification)
19. Week	Project Study (Project Identification)
20. Week	Project Study (Project Identification)
21. Week	Project Study (Requirements Elicitation)
22. Week	Project Study (Requirements Elicitation)
23. Week	Project Study (Requirements Elicitation)
24. Week	Project Study (Analysis & Design)
25. Week	Project Study (Analysis & Design)
26. Week	Project Study (Analysis & Design)
27. Week	Project Study (Analysis & Design)
28. Week	Project Study (Analysis & Design)
29. Week	Project Study (Analysis & Design)
30. Week	Project Study (Analysis & Design)
31. Week	Project Study (Analysis & Design)
32. Week	Presentation and project draft submission

Assessment Method

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

Workload and ECTS Calculation

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	5	70
Laboratory			
Application			
Specific practical training			
Field activities	3	3	9
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)			
Presentation / Seminar Preparation	1	10	10
Project	1	60	60

Homework assignment			
Quiz			
Midterms (Study duration)			
Final Exam (Study duration)			
Total Workload	149		
Total Workload/30 hours	4,97		
ECTS	5,00		

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Data Intelligence And Decision Support Systems	ISE 222	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)	Dr. Ender Sevinç						
Course objective	<ul style="list-style-type: none"> • Describe and identify the components of a rule-based Decision Support System (DSS). • Describe and identify the need, appropriateness and benefit of decision support and expert systems in the enterprise. • Identify and evaluate decision support systems in the marketplace. • Quantify (cost/benefits) the implementation of an automated decision support system. • Design a simple decision support system. • Convey complex DSS concepts in a sound, coherent, and compelling fashion to management. 						
Course Content	This course focuses on design, development, and implementation of effective systems for meeting information needs of management decision-makers. The course explains both model-based and data-based decision support systems and their use by business managers. Decision Support Systems (DSS) are addressed at three levels: general theory, implications for DSS design, and code/rule-based development. Data mining, developing business intelligence with analytics and modeling are reviewed. Data warehousing and DSS across cultures associated with transnational systems are also addressed.						
References	Sauter, V.L. (2011, February). "Intelligence", Hoboken, NJ: Wiley Publications, ISBN 978-0-470-43374-4						
Learning outcomes	<p>After taking this course students will be able to;</p> <ol style="list-style-type: none"> 1. Make data analytics in Python/R languages. 2. Discuss the theoretical foundation of data analytics that determine decision-making processes in management or business environments, 3. Apply a range of descriptive analytic techniques to convert data into actionable insight using a range of statistical techniques, 4. Investigate a range of predictive analytic techniques to discover new knowledge for forecasting future events, 						

	<p>5. Demonstrate prescriptive analytic methods for finding the best course of action for a situation.</p> <p>6. Students can focus on the "Big Picture", cover analytics, understand strong common sense and make integration of intelligence.</p>
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SUBJECTS BY THE WEEKS

Weeks	Subjects
33. Week	Introduction to DSS.
34. Week	Decision Making
35. Week	Decision Making
36. Week	Data Component
37. Week	Data Component
38. Week	Model Component
39. Week	Model Component
40. Week	Mid Term Exam
41. Week	Intelligence And Decision Support Systems
42. Week	Intelligence And Decision Support Systems
43. Week	User Interface for DSS
44. Week	Designing A Decision Support System
45. Week	Object-Oriented Technologies And DSS Design
46. Week	Implementation And Evaluation
47. Week	Implementation And Evaluation
48. Week	Final Exam

Assessment Method

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

Project		
Seminar		
Mid-term Exams	1	35%
Final Exam	1	45%
Total	4	100%
Contribution of semester Works to success points	3	55%
Contribution of final exam to success points	1	45%
Total	4	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	7	98
Presentation / Seminar Preparation			
Project			
Homework assignment			
Quiz	1	1	1
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload		145	
Total Workload/30 hours		4.84	
ECTS		5.00	

Course Learning Outcomes - Program Outcomes Matrix

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

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Linear Algebra and Differential Equations	MATH 224	Spring	3	0	0	3	5
Prerequisites	Math 101						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery	Face to face						
Learning and Teaching strategies	Lecturing, discussion, and submission.						
Instructor	Dr. Berrin Şentürk						
Course objective	This course aims to make the students familiar with the fundamental uses of linear algebra and differential equations in modeling mathematical and physical problems. Students should be able to understand how linear algebra is used to approximate equations in multidimensional settings, model and solve problems using matrices and differential equations.						
Course content	Systems of differential equations, classification of differential equations. First, second-order, and higher order linear differential equations. Method of undetermined coefficient, variation of parameters and Laplace transformation. Systems of linear equations, elimination methods, matrices and matrix operations. Invertible matrices, determinants. Vector spaces, basis, and dimension. Inner product spaces, orthogonality, orthogonal basis, rank and nullity. Eigenvalues and eigenvectors. Diagonalization of Matrices.						
References	<ul style="list-style-type: none"> Elementary Linear Algebra with Applications, Bernard Kolman and David R. Hill, 2014, 9th ed., new int. ed., Pearson Advanced Engineering Mathematics, Cengage Learning, Peter V. O'Neil Differential Equations and Linear Algebra, C.H. Edwards & D.E. Penney, 2010, 4th Edition, Prentice Hall 4. Elementary Differential Equations and Boundary Value Problems, 2013, Tenth Edition, William E. Boyce & Richard C. DiPrima, Wiley 						
Learning Outcomes	<p>Upon successful completion of this course, a student will be able to:</p> <ul style="list-style-type: none"> Express basic skills of ordinary differential equations and how such equations are used in engineering and science. Demonstrate ability to think critically by determining and using appropriate techniques for solving a variety of differential equations. Solve systems of linear equations; know the properties of matrices, compute, and use determinants to solve system of linear equations. Analyze vectors in Euclidean spaces geometrically and algebraically, discuss the concepts of span, linear independence, basis, dimension, and apply these concepts to various vector spaces. Determine and use orthogonality to find a basis for the null space of a matrix. Compute eigenvectors and eigenvalues of a matrix and apply them to some diagonalization processes. 						

Subjects by weeks

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

Assessment Method

Semester Works	Number	Contribution
Attendance	14	0%
Laboratory	0	0%
Application	0	0%
Fieldwork	0	0%
Practice	10	0%
Homework Assessment	2	5%
Quiz	2	5%
Presentation	0	0%
Project	0	0%
Seminar	0	0%
Mid-term Exam(s)	1	40%
Final Exam	1	50%
Total	30	100%
Contribution of semester Works to success points	29	50%
Contribution of final exam to success points	1	50%
Total	30	100%

Workload and ECTS Calculation

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory	0	0	0
Application	0	0	0
Specific practical training	0	0	0
Field activities	0	0	0
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation	0	0	0
Project	0	0	0
Homework assignment	2	3	6
Quiz	2	4	8
Midterms (Study duration)	1	9	9
Final Exam (Study duration)	1	15	15
Total Workload		150	
Total Workload/30 hours		5	
ECTS		5	

Program Learning Outcomes - Course Learning Outcomes Matrix

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

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

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Probability Theory and Statistics	MATH 206	Spring	3	0	0	3	5
Prerequisites	Math 101						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery	Face to face						
Learning and Teaching strategies	Lecturing, discussion, and submission						
Instructor(s)	Department Instructor(s)						
Course objective	<p>Statistics and probability are two important sciences for dealing with variability, uncertainty and complexity in engineering, business, and many real-life applications. The overall course objective is to understand basic concepts of probability and statistics and to be able to use them to solve engineering problems. This course helps students to make inferences and justify conclusions from data collection, and use independence and conditional probability to interpret data. The course aims to learn to set up and work with discrete and continuous random variables and their distributions, know what the expectation and variance mean, and understand the law of large numbers and the central limit theorem.</p>						
Course content	<p>Basic concepts of probability (sample spaces and events, permutations, combinations, conditional probability, and independence). Discrete and continuous random variables, their probability distributions, expected value and distribution parameters. Discrete probability distributions: Binomial, geometric, negative binomial, Poisson distributions. Continuous probability distributions: uniform, normal, exponential, gamma, and chi-squared distributions. Jointly distributed and independent Random Variables. Covariance and correlation. The sampling distribution of sample mean. Central Limit Theorem and its applications. Estimation. Confidence Intervals, Hypothesis Testing.</p>						
References	<ul style="list-style-type: none"> • Probability & Statistics for Engineers & Scientists Ninth Edition, Ronald E. Walpole, R.H. Myers, S.H. Myers, Keying Ye • Probability and Statistics for Engineers and Scientists, Jay L. Devore, 5-th edition, ISBN 0-534-37281-3 • Probability, Random Variables, and Stochastic Process 4th Edition A. Papoulis, S.U. Pillai ISBN-13: 978-0071226615 						
Learning Outcomes	<p>Upon successful completion of this course, a student will be able to:</p> <ul style="list-style-type: none"> • Understand the basic knowledge on fundamental probability concepts, including random variables, probability of an event, additive rules, and conditional probability • Understand the concept of Bayes' theorem, the basic statistical concepts, and measures • Find expected values and variances of both discrete and continuous random variables • Understand several well-known distributions, including Binomial, Geometrical, Negative Binomial, Pascal, Normal and Exponential Distribution • Understand the concepts of various parameter estimation methods, like method of moments, maximum likelihood estimation (Expected value). 						

Subjects by weeks

Weeks	Subjects
1.week	Introduction to Probability theory, Sample Spaces and Events, Axioms, Interpretations, and Properties of Probability
2. week	Counting Methods, Conditional Probability Baye's Theorem Independence
3.week	Random Variables Probability Distributions for Discrete Random Variables
4.week	Probability Distributions for Continuous Variables Cumulative Distribution Functions
5.week	Conditional Distribution Joint Probability Distributions
6.week	Mean of a Random Variable, Expected Value and Standard Deviation
7.week	Variance and Covariance Conditional Expected Values
8.week	Midterm Exam
9.week	Chebyshev Inequality The Binomial Distribution The Hypergeometric Distribution
10.week	Geometric Distribution Negative Binomial Distribution Poisson Distribution
11.week	The Normal (Gaussian) Distribution Gamma Distributions, Exponential and Chi-Squared Distributions Other Continuous Distributions
12.week	Moment Generating Functions Random Sampling, Some Important Statistics
13.week	Sampling distributions Central Limit Theorem
14.week	Sampling Distribution of S^2 t-Distribution
15.week	Confidence Intervals for a Population Mean Testing Hypotheses About a Population Mean

16.week	Final Exam
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Assessment Method

Semester Works	Number	Contribution
Attendance	14	0%
Laboratory	0	0%
Application	12	0%
Fieldwork	0	0%
Practice	0	0%
Homework Assessment	2	10%
Quiz	0	0%
Presentation	0	0%
Project	0	0%
Seminar	0	0%
Mid-term Exam(s)	1	35%
Final Exam	1	55%
Total	30	100%
Contribution of semester Works to success points	29	45%
Contribution of final exam to success points	1	55%
Total	30	100%

Workload and ECTS Calculation

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	3	42
Laboratory	0	0	0
Application	0	0	0
Specific practical training	0	0	0
Field activities	0	0	0
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)	14	5	70
Presentation / Seminar Preparation	0	0	0
Project	0	0	0
Homework assignment	2	5	10
Quiz	0	0	0
Midterms (Study duration)	1	12	12
Final Exam (Study duration)	1	16	16
Total Workload		150	
Total Workload/30 hours		5	
ECTS		5	

Program Learning Outcomes - Course Learning Outcomes Matrix

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

<p>9 To act in accordance with the ethical principles, professional and ethical responsibility awareness; information about standards used in engineering applications.</p>		<p>5</p>			
<p>10 Information on business practices such as project management, risk management and change management; awareness about entrepreneurship and innovation; information on sustainable development.</p>	<p>5</p>				
<p>11 Information about the effects of engineering applications on health, environment and safety in universal and social dimensions and the problems reflected in the engineering field of the age; awareness of the legal consequences of engineering solutions.</p>					

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/ week)	Application (hours/ week)	Laboratory (hours/ week)	National Credit	ECTS
Introduction to AI and Machine Learning	SENG 264	Fall	3	0	0	3	5
Prerequisites	CENG 101, MATH 101						
Course Language	English						
Course Type	Compulsory/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)	Dr. Sarper ALKAN						
Course objective	To teach the basics of machine learning along with tensorflow framework						
Course Content	Introduction to machine learning with python and tensorflow. Linear regression, logistic regression, basics of neural network operation and training. Decision tree and support vector machine classifiers. Unsupervised learning and recommender systems.						
References	1. 2.						
Learning outcomes	After taking this course students will be able to; <ul style="list-style-type: none"> • Learn supervised and unsupervised machine learning algorithms • Implement the algorithms using python, scikit-learn and tensorflow • Fine tune the machine learning algorithms • Learn the best practices in machine learning 						

Subjects by weeks

Weeks	Subjects
49. Week	Introduction to machine learning, Python tutorial
50. Week	Numpy and Pandas tutorial
51. Week	Machine learning basics: Linear regression
52. Week	Regression with multiple input variables
53. Week	Classification with logistic regression

54.	Week	Scikit-Learn and Tensorflow tutorial
55.	Week	Neural networks
56.	Week	Mid Term Exam
57.	Week	Neural network training
58.	Week	Decision trees
59.	Week	Support vector machines
60.	Week	Practical advice for machine learning
61.	Week	Unsupervised learning
62.	Week	Clustering algorithms
63.	Week	Recommender systems
64.	Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	5
Laboratory		0
Application		0
Fieldwork		0
Practice		0
Homework Assessment		0
Quiz	2	20
Presentation		0
Project		0
Seminar		0
Mid-term Exams	1	35
Final Exam	1	40
Total		100
Contribution of semester Works to success points		60
Contribution of final exam to success points		40
Total		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			
Quiz	2	7	14
Midterms (Study duration)	1	10	10
Final Exam (Study duration)	1	14	14
Total Workload	150		
Total Workload/30 hours	5		
ECTS	5		

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

COURSE INFORMATION (5th semester)

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	<ul style="list-style-type: none">Abraham Silberschatz, Peter B. Galvin, Greg Gagne (2014): Operating System Concepts, 9th Edition, John Wiley & Sons.Andrew S. Tanenbaum, Herbert Boss (2014): Modern Operating Systems, 4th Edition, Pearson Education						
Learning outcomes	After taking this course students will know about; <ul style="list-style-type: none">Operating system form and functionSoftware structure: abstraction, modularity, interface vs. implementation, layersConcurrent execution: problems and solutionsStorage 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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Database Management Systems	CENG 351	Fall	3	0	0	3	6
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, Prof.Dr.						
Course objective	<ul style="list-style-type: none"> • To teach the database management systems, • Relational database design principles 						
Course Content	<ul style="list-style-type: none"> • Files: Sequential and Direct Access • Hash-based indexing, B-tree indexing • Relational model • 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, 3 rd Ed, Raghu Ramakrishnan, 2018.						
Learning outcomes	After taking this course students will be able to; <ol style="list-style-type: none"> 1. design and build relational databases 2. write relational SQL queries 1. develop applications systems using relational databases 						

Subjects by weeks

Weeks	Subjects
1. Week	Files: sequential and direct access
2. Week	Hash-based indexing, B-tree indexing
3. Week	Relational model, ER diagrams
4. Week	Database design, 1NF, 2NF, 3NF, BCNF, 4NF
5. Week	Database design, 1NF, 2NF, 3NF, BCNF, 4NF
6. Week	Relational algebra: select, project, join, division
7. Week	Midterm exam
8. Week	Integrity constraints, Primary keys, Foreign keys, General constraints
9. Week	SQL query language
10. Week	SQL query language
11. Week	SQL query language
12. Week	Transaction management: commit, abort, recovery
13. Week	Concurrency control
14. Week	2 Phase Locking, Serializability
15. Week	Deadlock detection and prevention
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution (%)
Attendance	14	5
Laboratory	0	0
Application	0	0
Fieldwork	0	0
Practice	0	0
Homework Assessment	2	25
Presentation	0	0
Project	0	0
Seminar	0	0
Mid-term Exams	1	30
Final Exam	1	40
Total	18	100
Contribution of semester Works to success points	3	60
Contribution of final exam to success points	1	40
Total	18	100

WORKLOAD AND ECTS CALCULATION

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

Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload			144
Total Workload/30 hours			4.88
ECTS			5.00

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

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

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Software Engineering	SENG 321	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)	Prof.Dr.Hakan Çağlar.						
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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Software Engineering 10th Edition by Ian Sommerville, Pearson Education, 2015 ISBN: 9781292096131 • Software Engineering A PRACTITIONER' S APPROACH 8th Edition by Roger S. Pressman, Bruce R. Maxim Mc Graw Hill Education 						
Learning outcomes	<p>After taking this course students will be able to;</p> <ul style="list-style-type: none"> • Define engineering, software, computer and system engineering • Define software processes • Gather the software requirements 						

	<ul style="list-style-type: none"> • Define software design and architecture • Learn the software verification and validation
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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 environment, system lifecycle functions, basic systems theory concepts
3. Week	Main principles & fundamentals of systems engineering, characteristics and responsibilities, systems engineering activities across system life cycle, key system engineering concepts, context diagrams, system boundaries & interfaces, systems decomposition & abstraction, multiple system views systems engineering standards
4. Week	Software process models, process iteration and activities (sw specification, sw design & implementation, sw validation, sw evolution), rational unified process (RUP), software engineering standards (commercial & military), component based, re-used oriented, extreme programming, Legacy systems.
5. Week	Requirement analysis, definition of requirement, purpose of requirement analysis, risk & problems, what are requirements for?, Requirements analysis task areas and requirement analysis questions,
6. Week	Types of requirements (functional, performance, state/mod, interface ect.), requirements measures (speed, ease of use, portability, robustness, reliability...), requirements quality metrics (verifiability, consistency, singularity, clarity, completeness, feasibility etc.), writing good requirements, requirements template, requirements decomposition. Software requirement specification (SRS) outlines.
7. Week	Security engineering, information warfare fundamentals, software attack phases, what is security (confidentiality, integrity, availability CIA), functionality vs assurance, security threats & risk analysis, elements of cryptography, ciphers, public key cryptography , RSA, digital signatures, hash functions.
8. Week	Midterm Exam
9. Week	Software Project planning, project management plan (PMP), Critical Milestones, activities & review meetings (SRR, SDR, PDR, CDR, TRR),

10. Week	System & software architecture (central, distributed...), software design, software design description (SDD), software modelling, UML diagrams, use cases and boundaries, software design tools.
11. Week	Test engineering, validation and verification process, Test and Integration Plan (TIP), Test scenarios, Test procedures, Test data, unit testing, integration test, Test Readiness Review (TRR), Test CASE tools, Load Test (Load Runner), Software bug managements, version management & control.
12. Week	Project presentations ...
13. Week	Project presentations...
14. Week	Project presentations...
15. Week	Project presentations...
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance	14	%5
Laboratory	0	%0
Application	0	%0
Fieldwork	0	%0
Practice	0	%0
Homework Assessment	2	%15
Presentation	0	%0
Project	1	%30
Seminar	0	%0
Mid-term Exams	1	%20
Final Exam	1	%30
Total	19	%100

Contribution of semester Works to success points	4	%70
Contribution of final exam to success points	1	%30
Total	19	%100

WORKLOAD AND ECTS CALCULATION

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

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

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

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	None						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery	Face to Face						
Learning and Teaching Strategies	Lecturing, Discussion and project						
Instructor (s)	Assc. Prof. Dr.Ender Sevinç						
Course Objective	<ul style="list-style-type: none"> • Understand basic web technologies (HTML, CSS stylesheets). • Understand PHP, forms and DB interaction effectively • Understand the use of event-driven programming in JavaScript. • Use AJAX tools to build web pages that connect to servers. • Write their own server-side code to provide access to a database 						
Course Content	<ul style="list-style-type: none"> • HTML 5.0 • CSS 3.0 • PHP 8.1.x • JavaScript and DOM. HTML Form Generation, • Database Interaction with PHP.. • JavaScript ES6 and more recent • Prototype and jQuery frameworks • AJAX (Asynchronous JavaScript And XML) 						
References	<ul style="list-style-type: none"> • Stepp, M. Miller, J. and Kirst, V., Web Programming Step by Step, 2009 (or newer edition such as 2nd Ed. In 2012) • Robbins, J. Niederst, Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript and Web Graphics, 2012 						
Learning Outcomes	<p>To be able to define the main components of web architecture, To be able to explain the purpose of using front-end and back-end web technologies, To explain the formation of HTML language, To be able to identify HTML tags, To be able to express the concept, types and benefits of CSS, To be able to edit text using style, To explain the working principle of JavaScript codes, To be able to use JavaScript variables, To be able to explain the server-side compilation process, To be able to use PHP functions, To be able to create web forms, To be able to perform server-side database operations</p>						

Subjects by Weeks

Weeks	Subjects
1. Week	The Internet and the World Wide Web
2. Week	Basic HTML
3. Week	Cascading Style Sheets (CSS)

4. Week	Page Layout
5. Week	PHP for server-side programming
6. Week	Advanced PHP syntax
7. Week	HTML forms and server-side data
8. Week	Midterm Exam
9. Week	Relational Databases and SQL
10. Week	Interacting with a database using PHP
11. Week	JavaScript For Interactive Web Pages
12. Week	Document Object Model (DOM)
13. Week	JQuery library
14. Week	Events And The Prototype Library
15. Week	AJAX and XML
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance & Contribution to Lecture		
Laboratory		
Application		
Fieldwork		
Practice		
Homework Assessment		
Quiz		
Presentation		
Project	1	%30
Seminar		
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	1	30	30
Homework Assignment			
Midterms (Study Duration)	1	2	2
Final Exam (Study Duration)	1	2	2
Total Workload		146	
Total Workload/30 hours		4,86	
ECTS		5	

Course Learning Outcomes - Program Outcomes Matrix

Program Outcomes	Contribution Level*				
	1	2	3	4	5
Qualified knowledge of mathematics, science, and related engineering disciplines; 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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Business Process Support	ISE 322	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)	Dr. Ender Sevinç						
Course objective	Using data and information to support business processes and tools and technologies for data science, Basic concepts of business support: Careful consideration of what is desired from data science results; Expected value as a basic evaluation framework; Consideration of appropriate comparative bases, Various evaluation criteria; Estimating costs and benefits; Calculating expected profit; Establishing basic methods for benchmarking.						
Course Content	The course covers the basic structure and fundamental principles of data analytics thinking. There are also specific areas where intuition, creativity and common sense are used, senses and domain knowledge. The data perspective will provide students with structure and principles, which in turn will provide them with a framework to systematically analyze such problems. Data science libraries, frameworks, modules and toolkits are great for doing data science.						
References	<ol style="list-style-type: none"> 1. Foster Provost and Tom Fawcett, "Data Science for Business", First Ed., July 2013, O'Reilly Media, ISBN: 978-1-449-36132-7 2. Joel Grus, "Data Science from Scratch", 1st Ed., 2015, O'Reilly Media. 						
Learning outcomes	<p>After taking this course students will be able to;</p> <ol style="list-style-type: none"> 7. Performing data analytics in Python/R languages. 8. Understand the principles of looking at business problems from a data perspective and extracting useful information from data. 9. Discuss the implications of using data and information to support business processes in a real-world scenario. 10. Explore the tools and technologies associated with data science and how they support business processes. 11. Demonstrate the use of data science techniques to make recommendations to support real-world business problems. 						

Subjects by weeks

Weeks	Subjects
1. Week	Data Science Analytics with Python or R
2. Week	Data Science Analytics with Python or R
3. Week	Introduction Data-Analytic Thinking
4. Week	Business Problems and Data Science Solutions
5. Week	Business Problems and Data Science Solutions
6. Week	Introduction to Predictive Modeling: From Correlation to Supervised Segmentation.
7. Week	Model Fitting to Data
8. Week	Midterm Exam
9. Week	Overcompliance and Avoidance
10. Week	Overcompliance and Avoidance
11. Week	Similarity, Neighbors and Sets
12. Week	Similarity, Neighbors and Sets
13. Week	Decision Analytical Thinking : What is a Good Model?
14. Week	Decision Analytical Thinking : What is a Good Model?
15. Week	Visualizing Model Performance
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance		
Laboratory		
Application		
Fieldwork		
Practice		
Homework Assessment		
Quiz	2	15%
Presentation		
Project		
Seminar		

Mid-term Exams	1	35%
Final Exam	1	50%
Total	4	100%
Contribution of semester Works to success points	3	50%
Contribution of final exam to success points	1	50%
Total	4	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
Quiz	1	1	1
Midterms (Study duration)	1	2	2
Final Exam (Study duration)	1	2	2
Total Workload		145	
Total Workload/30 hours		4.84	
ECTS		5.00	

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/ week)	Application (hours/ week)	Laboratory (hours/ week)	National Credit	ECTS
Human Computer Interface	ISE 332	Spring	3	0	0	3	5
Prerequisites							
Course Language	English						
Course Type	Compulsory						
Mode of Delivery (face to face, distance learning)	Face to face						
Learning and teaching strategies	Lecturing, discussion, and submission.						
Instructor (s)							
Course objective	<p>This course is designed to teach students how computers communicate with people. It introduces the methodology for designing and testing user interfaces, various interaction styles such as menus, command lines, GUIs, and virtual reality, interaction techniques (including voice, gesture, eye movements), design guidelines, and user interface management system software. At the end of the course, students will have gained a more in-depth understanding of what makes a sleek and usable design, and the effect of a good design on functionality, user satisfaction, and productivity. Throughout the course, students will design a small user interface, program a prototype, and test the result for usability.</p>						
Course Content	Usability, user-centered design, user/task analysis, direct manipulation, graphical design						
References	<p>1. Designing the User Interface: Strategies for Effective Human-Computer Interaction (6th Edition), Pearson, 2017, Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, Niklas Elmqvist, Nicholas Diakopoulos.</p> <p>2. Human-Computer Interaction (3rd Edition), 2003, Pearson, Alan Dix, Janet E. Finlay, Gregory D. Abowd, Russell Beale</p>						
Learning outcomes	<p>After taking this course students will be able to:</p> <ul style="list-style-type: none"> • Demonstrate knowledge of foundations and terminology of field of human-computer interaction • Demonstrate knowledge of methods for user-centered design of human-computer interfaces • Demonstrate knowledge of methods for evaluating human-computer interfaces • Apply knowledge requirements analysis, design, implementation, and evaluation of a graphical user interface • Apply knowledge to analyze design and evaluate the usability of real-world human-computer interfaces; 						

Subjects by weeks

Weeks	Subjects
1. Week	Human-computer interaction (HCI) paradigms
2. Week	Interaction design basics
3. Week	HCI in software process
4. Week	Design rules
5. Week	Implementation support
6. Week	Evaluation techniques
7. Week	Universal design
8. Week	Midterm Exam
9. Week	Cognitive models
10. Week	Socio-organizational issues and requirements
11. Week	Communication and collaboration models
12. Week	Task analysis
13. Week	Dialog notations and design
14. Week	Models of system
15. Week	Modeling rich interaction
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance		
Laboratory		
Application		
Fieldwork		
Practice		
Homework Assessment	1	%20
Quiz		
Presentation		
Project		
Seminar		
Mid-term Exams	1	%40
Final Exam	1	%40
Total		%100
Contribution of semester Works to success points		%60
Contribution of final exam to success points		%40
Total		%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	2	10	20
Quiz			
Midterms (Study duration)	1	10	10
Final Exam (Study duration)	1	20	20
Total Workload		148	
Total Workload/30 hours		4,93	
ECTS		5	

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	X				

production reports, to make effective presentations, to give clear and understandable instructions and receiving skills.					
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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
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	<i>To teach the foundation of computer networks and how to design complex computer networks</i>						
Course Content	<ul style="list-style-type: none"> • OSI model introduction • Explanation, technologies, protocols of each OSI layer • Client-server and peer to peer programming • Networking equipment 						
References	<ul style="list-style-type: none"> • (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; <ul style="list-style-type: none"> • know how computer networks and Internet work • know how to design complex networks • know how to design software running on computer networks 						

Subjects by weeks

Weeks	Subjects
1. Week	Introduction to computer networks. Open System Interface (OSI) seven model architecture description
2. Week	Physical layer, protocols, technologies and practical systems used at physical layer

3. Week	Data link layer, protocols, technologies, and practical systems used at physical layer
4. Week	Data link layer, protocols, technologies and practical systems used at physical layer (cntd.)
5. Week	Network layer, protocols, technologies and practical systems used at physical layer (cntd.)
6. Week	Network layer, protocols, technologies and practical systems used at physical layer (cntd.)
7. Week	Network layer, protocols, technologies and practical systems used at physical layer (cntd.)
8. Week	Midterm exam
9. Week	Transport layer, protocols, technologies, and practical systems used at physical layer (cntd.)
10. Week	Transport layer, protocols, technologies, and practical systems used at physical layer (cntd.)
11. Week	Transport layer, protocols, technologies, and practical systems used at physical layer (cntd.)
12. Week	Presentation layer
13. Week	Application Layer
14. Week	Application Layer (cntd.)
15. Week	Project demonstrations
16. Week	Final Exam

Assessment Method

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

Project	1	%25
Seminar	0	%0
Mid-term Exams	1	%30
Final Exam	1	%40
Total	18	%100
Contribution of semester Works to success points	3	%60
Contribution of final exam to success points	1	%40
Total	18	%100

WORKLOAD AND ECTS CALCULATION

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

THE COURSE LEARNING OUTCOMES - PROGRAM OUTCOMES MATRIX

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

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/week)	Application (hours/week)	Laboratory (hours/week)	National Credit	ECTS
Data Warehousing and Mining	ISE 350	Spring	3	0	0	3	5
Prerequisites							
Course Language	English						
Course Type	Compulsory						
Mode of Delivery (face to face, distance learning)	Face to face						
Learning and teaching strategies	Lecturing, discussion, and submission.						
Instructor (s)							
Course objective	<p>“Data Mining” can be referred to as knowledge mining from data, knowledge extraction, data/pattern analysis, data archaeology, and data dredging. It also introduces data mining and data warehousing concepts. Data warehousing, OLAP technology, data preparation, association rule mining, classification and prediction, clustering, mining complex types of data, web mining, multi-relational data mining are the basic concepts covered in this course.</p>						
Course Content	<p>Examining and involvement of the 9-step Knowledge Discovery in Databases (KDD) process, which data can be mined and used to enhance businesses, data patterns which can be visualized to understand the data better, the process, tools, and its future by modern standards. It will also talk about the increasing importance of transforming unprecedented quantities of digital data into business intelligence, giving users an informational advantage.</p>						
References	<ul style="list-style-type: none"> • Data Mining: Concepts and Techniques, 2nd Ed., Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, ISBN 13: 978-1-55860-901-3 • Data Mining Introductory and Advanced Topics, M. Dunham, Prentice Hall, ISBN: 0-13-088892-3 • Data Mining Practical Machine Learning Tools and Techniques, 4th Ed., Witten & Frank, Morgan Kaufmann 						
Learning outcomes	<p>After taking this course students will be able to:</p> <ul style="list-style-type: none"> • Understand data warehousing, OLAP technology, data preparation, association rule mining, classification and prediction, clustering, mining complex types of data, web mining, multi-relational data mining are the basic concepts covered in this course. 						

Subjects by weeks

Weeks	Subjects
1. Week	Introduction, data preprocessing
2. Week	Data preprocessing & Data Warehousing
3. Week	Association Rule Mining
4. Week	Association Rule Mining
5. Week	Frequent Patterns, Associations & Correlations
6. Week	Frequent Patterns, Associations & Correlations
7. Week	Classification and Prediction
8. Week	Mid Term Exam
9. Week	Classification and Prediction
10 Week	Prediction-2
11. Week	Recommender Systems
12. Week	Recommender Systems
13 Week	Recommender Systems
14. Week	Cluster Analysis
15. Week	Mining Stream, Time Series
16. Week	Final Exam

Assessment Method

Semester Works	Number	Contribution
Attendance		
Laboratory		
Application		
Fieldwork		
Practice		
Homework Assessment		
Quiz		
Presentation		
Project	1	%30
Seminar		
Mid-term Exams	1	%25
Final Exam	1	%45
Total	3	%100
Contribution of semester Works to success points	2	%55
Contribution of final exam to success points	1	%45
Total	3	%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	2	10	20
Quiz			
Midterms (Study duration)	1	10	10
Final Exam (Study duration)	1	20	20
Total Workload		148	
Total Workload/30 hours		4,93	
ECTS		5	

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	X				

presentations, to give clear and understandable instructions and receiving skills.					
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

COURSE INFORMATION

	Code	Semester	Theory (hours/ week)	Application (hours/ week)	Laboratory (hours/ week)	National Credit	ECTS
Graduation Project-1	ISE 491	Fall	3	2	0	4	5
Prerequisites	SENG 244 - Object Oriented Software Engineering CENG 256 - Formal Languages and Automata Theory CENG 214 – Algorithms II						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery (face to face, distance learning)	Face to face, distance learning						
Learning and teaching strategies	Project, discussion, presentation and submission.						
Instructor (s)	Supervisor						
Course objective	Students will plan a project due to Software Management Life Cycle Processes, Identify a problem, Determine Requirements, make a plan and analysis of the problem/project, prepare a system design, decomposing the system and address the design goals Finally prepare an SRS and present it.						
Course Content	<ul style="list-style-type: none"> Students are expected to apply knowledge and experience gained during their undergraduate studies to design and implement a solution for a software problem/project. As the first part of their graduation projects, students design a system, process, application or product under real world constraints and requirements in CENG 491 course for design. Then the students then implement solutions to those problems in CENG 492 course for implementation. 						
References	Related books, documents						
Learning outcomes	After taking this course students will be able to; <ul style="list-style-type: none"> Apply the project management methodology. Propose a complex real-life project using multiple areas of knowledge. Identify, solve, simulate, and design an engineering problem. Demonstrate written communication skills at a professional level by preparing reports. 9. Demonstrate oral communication skills at a professional level by giving a presentation to the faculty. 10. Work effectively in teamwork. 11. Incorporate critical, analytical, strategic, and creative thinking.						

	12. Gain professional discipline in time management and organizational skills
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Subjects by weeks

Weeks	Subjects
17. Week	Project Study (Project Identification)
18. Week	Project Study (Project Identification)
19. Week	Project Study (Project Identification)
20. Week	Project Study (Project Identification)
21. Week	Project Study (Requirements Elicitation)
22. Week	Project Study (Requirements Elicitation)
23. Week	Project Study (Requirements Elicitation)
24. Week	Project Study (Analysis & Design)
25. Week	Project Study (Analysis & Design)
26. Week	Project Study (Analysis & Design)
27. Week	Project Study (Analysis & Design)
28. Week	Project Study (Analysis & Design)
29. Week	Project Study (Analysis & Design)
30. Week	Project Study (Analysis & Design)
31. Week	Project Study (Analysis & Design)
32. Week	Presentation and project draft submission

Assessment Method

Semester Works	Number	Contribution
Attendance		
Laboratory		
Application		

Fieldwork		
Practice		
Homework Assessment		
Quiz		
Presentation	1	30%
Project	1	70%
Seminar		
Mid-term Exams		
Final Exam		
Total	2	100%
Contribution of semester Works to success points		
Contribution of final exam to success points		
Total	2	100%

Workload and ECTS Calculation

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	5	70
Laboratory			
Application			
Specific practical training			
Field activities	3	3	9
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)			
Presentation / Seminar Preparation	1	10	10
Project	1	60	60
Homework assignment			
Quiz			
Midterms (Study duration)			
Final Exam (Study duration)			
Total Workload		149	

Total Workload/30 hours	4,97
ECTS	5,00

Course Learning Outcomes - Program Outcomes Matrix

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

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

COURSE INFORMATION

Course Name	Code	Semester	Theory (hours/ week)	Application (hours/ week)	Laboratory (hours/ week)	National Credit	ECTS
Graduation Project - 2	ISE 492	Fall	3	2	0	4	5
Prerequisites	CENG 491 Graduation Project I CENG 301 - Operating System CENG 351 - Database Management Systems						
Course Language	English						
Course Type	Compulsory						
Mode of Delivery (face to face, distance learning)	Face to face, distance learning						
Learning and teaching strategies	Project, discussion, presentation and submission.						
Instructor (s)	Supervisor						
Course objective	Students will present a project due to Software Management Life Cycle Processes, After SRS in CENG 492, the students are expected to put all together, implement and code the project due their plan. They will show the test and put the project into use. Finally they will present in groups their projects and final project plan.						
Course Content	Students are expected to apply knowledge and experience gained during their undergraduate studies to design and implement a solution for a software problem/project. The course aims to provide senior students an integrative real-life experience to effectively design, simulate, implement and test software systems. In CENG 492, students realize a product from conceptual design to the working system. As the second part of their graduation projects, the students then implement solutions to those problems in CENG 492 course for implementation. Testing and maintenance issues are also expected to be shown.						
References	Related books, documents						
Learning outcomes	After taking this course students will be able to; <ol style="list-style-type: none"> 13. Apply the project management methodology. 14. Propose a complex real-life project using multiple areas of knowledge. 15. Identify, solve, simulate, and design an engineering problem. 16. Demonstrate written communication skills at a professional level by preparing reports. 						

	<p>17. Demonstrate oral communication skills at a professional level by giving a presentation to the faculty.</p> <p>18. Work effectively in teamwork.</p> <p>19. Incorporate critical, analytical, strategic, and creative thinking.</p> <p>20. Gain professional discipline in time management and organizational skills,</p> <p>21. Recognize global and societal issues to develop sustainable engineering solutions.</p> <p>22. Interact with practicing professionals in multiple disciplines.</p>
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Subjects by weeks

Weeks	Subjects
33. Week	Apply project management fundamentals
34. Week	Apply project management fundamentals
35. Week	Project Study (Implementation)
36. Week	Project Study (Implementation)
37. Week	Project Study (Implementation)
38. Week	Project Study (Implementation)
39. Week	Project Study (Implementation)
40. Week	Project Study (Implementation)
41. Week	Project Study (Implementation)
42. Week	Project Study (Implementation)
43. Week	Project Study (Implementation)
44. Week	Project Study (Implementation)
45. Week	Project Study (Implementation)
46. Week	Project Study (Test & Verification)
47. Week	Project Study (Deployment)
48. Week	Completing the project & presentation of the whole project

Assessment Method

Semester Works	Number	Contribution
Attendance		
Laboratory		

Application		
Fieldwork		
Practice		
Homework Assessment		
Quiz		
Presentation	1	40%
Project	1	60%
Seminar		
Mid-term Exams		
Final Exam		
Total	2	100%
Contribution of semester Works to success points		
Contribution of final exam to success points		
Total	2	100%

Workload and ECTS Calculation

Activities	Number	Duration (hour)	Total Workload
Course Duration (x14)	14	5	70
Laboratory			
Application			
Specific practical training			
Field activities	3	3	9
Study Hours Out of Class (Preliminary work, reinforcement, preparation for the exams)			
Presentation / Seminar Preparation	1	20	20
Project	1	60	60
Homework assignment			
Quiz			
Midterms (Study duration)			
Final Exam (Study duration)			

Total Workload	159
Total Workload/30 hours	5,30
ECTS	5,00

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

