NEAR EAST UNIVERSITY

DEPARTMENT OF COMPUTER ENGINEERING

MODULE HANDBOOK (MSc)

MS program, Computer Engineering Department

Course Unit Title	MS Thesis
Course Unit Code	COM500
Type of Course Unit	Compulsory
Level of Course Unit	MS program
National Credits	9
Number of ECTS Credits Allocated	30
Theoretical (hour/week)	-
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	-
Name of Lecturer (s)	-
Name of Assistant (s)	-
Mode of Delivery	Report, Presentation
Language of Instruction	English
Prerequisites	Passing 7 courses of MS program with CGPA $\geq$ 3.0 and Graduate seminar
Recommended Optional Programme Components	

Course description:

Program of research leading to M.S. degree, arranged between a student and the faculty member. Students register to this course in all semesters starting from the beginning of their third semester while the research program or write-up of the thesis is in progress.The MSc thesis is the development of research skills and the ability to analyze and present research results in a systematic and clear way. The thesis is the culmination of the MSc study program in which students show that they are able to design and conduct computer engineering research at an academic level, and are able to theoretically reflect on computer engineering topics.

Objectives of the course are to:

- Increase the student's scientific and technical competence in the area of study
- Develop an approach to research procedures and understand the importance of properly defining research problems
- Achieve an experience in critical scientific literature review
- Develop defensible conclusions
- Improve of technical writing skills
- Obtain an experience for orally presenting the research

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Adapt theories and the latest scientific knowledge to solve problems in computer engineering field	3, 4

2	Identify and construct a problem/thesis statement	3, 4
3	Carrying out the different phases of research in an independent manner within a previously agreed time span	3, 4
4	Develop defensible conclusions	
5	Apply a work ethic appropriate to the performance of scientific research	3, 4
6	Write, edit and present a well-structured thesis	3, 4

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	5
2	An ability to analyse and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	5
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	5
7	An ability to plan and carry out analytic, model and experimental investigations	5
8	An understanding of the role of engineers in society	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Literature surveys	
2	Literature surveys	
3	Literature surveys	
4	Thesis plan's preparation	
5	Collection and analysis of data	
6	Collection and analysis of data	
7	Research management	
8	Research management	
9	Research management	
10	Research management	
11	Research management	
12	Research management	
13	Research management	
14	thesis report submission	
15	Slide show preparation	
16	Presentation	Final

Recommended Sources

Will be required depending on the recommendation of the thesis supervisor and according to the

needs of the specific topics.

Assessment

MS Thesis is examined by 5 members of the examining committee including the supervisor (at least one member of the examining committee should be from a different department or from a different institution of higher education). Examining committee produces report signed by all members of jury with conclusion for acceptance or rejection of MS Thesis.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	-	-	-
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	1	60	60
E-learning activities	6	15	90
Quizzes	-	-	-
Midterm Examination	-	-	-
Final Examination (Presentation to the review board)	1	1	1
Self Study	15	40	600
Total Workload			751
Total Workload/25(h)			30.04
ECTS Credit of the Course			30

MS program, Computer Engineering Department

Course Unit Title	Advanced Applied Mathematics for Engineers
Course Unit Code	COM501
Type of Course Unit	Elective
Level of Course Unit	MSc.
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	1,2
Course Coordinator	-
Name of Lecturer(s)	Assist. Prof. Dr. Hüseyin Çamur
Name of Assistant(s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites and co-requisites	-
Recommended Optional Program Components	-

Course description:
Review of Vector Algebra, Complex Numbers. Review of Ordinary Differential Equations. Variations of Parameters and Cauchy-Euler Differential Equations. System of Linear Differential Equations. Laplace Transforms and Fourier Series. Beta Gamma Functions. Bessels Equations. Partial Differential Equations and Probability.

Objectives of the Course:
Its objective is to introduce mathematical techniques used widely in modern engineering studies, and which are especially relevant to students intending to pursue design and research..

Learning Outcomes

	When this course has been completed, the student should be able to	**Assessment.**
1	Apply knowledge of mathematics, science and engineering fundamentals to the solution of complex problems involved in different engineering areas.	1, 2
2	Identify, formulate, research literature and analyze mathematical models governing laws of physics and other engineering sciences.	1, 2
3	Design solution strategy for mathematical models arising in aerospace engineering, electrical engineering, Mechanical engineering and other in science and engineering disciplines	1, 2
4	Ability to address such problems in engineering, and to solve the problems	1, 2
5	Ability to cooperate with the team members	1, 2

Assessment Methods: 1. Written Exam, 2.Assignment 3. Project/Report, 4.Presentation, 5 Lab.Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	5

2	An ability to analyse and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	3
4	An ability to design and conduct advanced software projects	-
5	An ability to assess applicable methods and their limits	4
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	2
8	An understanding of the role of engineers in society	2
CL: Contribution Level (1:VeryLow, 2: Low, 3:Moderate4:High,5:VeryHigh)		

Course Contents

Week	Chapter		Assessment
1	1	Review of Vector Analysis and Complex Numbers	
2	1	Review of Vector Analysis and Complex Numbers	Assignment 1
3	2	Review of Ordinary Differential Equations	
4	2	Review of Ordinary Differential Equations	
5	3	Variations of Parameters, Cauchy-Euler Equations	
6	3	System of Linear Equations	Assignment 2
7	4	Laplace Transforms	
8	4	Laplace Transforms	
9			Mid-Term Exam
10	5	Fourier Series	
11	6	Beta Gamma Functions, Bessels Equations	Assignment 3
12	6	Beta Gamma Functions, Bessels Equations	
13	7	Partial Differential Equations	
14	7	Partial Differential Equations	Assignment 4
15	8	Probability and Statistics	
16			Final Exam.

Recommended Sources

Textbook:

Advanced Engineering Mathematics, Dennis G. Zill/Michael R. Cullen, 1992

Supplementary Material(s):

1. Engineering Mathematics, 2nd edition, Anthony Croft, Robert Davison, Martin Hargreaves, Adison-Wesley, 1997.
2. Advanced Engineering Mathematics, 10th edition, Erwin Kreyszig, 2011, John Wiley and Sons.
3. Advanced Engineering Mathematics, 4th edition, Peter V. O'Neil, 1995, Brooks/Cole Publishing Company.
4. Advanced Engineering Mathematics, Dennis G. Zill/Michael R. Cullen, 1992

Assessment

Attendance & Assignment	20%	
Midterm Exam(Written)	30%	
Quiz (Written)	-	
Final Exam(Written)	50%	
Total	100%	

ECTS Allocated Based on the Student Workload

Activities	Number	Duration (hour)	Total Workload (hour)
Course duration in class (including the Exam week)	16	4	64
Tutorials	-	-	-
Assignments	4	5	20
Project/Presentation/Report Writing	-	-	-
E-learning Activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	20	20
Final Examination	1	20	20
Self-Study	14	8	112
Total Workload			236
Total Workload/25(h)			9.44
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Expert Systems
Course Unit Code	COM502
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Assist. Prof. Dr. Imanov E.
Name of Lecturer (s)	Assist. Prof. Dr. Imanov E.
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	

Course description:

In this course students learn basic concepts and approaches of building and application of Expert Systems. This course includes the main definitions, structure and properties of ES, methods of knowledge acquisition and representations. Representation of knowledge by Object-attribute value triplets, Semantic networks, Frames, Logic programming, Neural networks, Production rules. Inference engine, forward and backward chaining mechanisms. Certainty factors and inference problems in expert systems. Also are conceded programming language Prolog and practical VP -ES and fuzzy Esplan.

Objectives of the Course:

- To have a basic understanding of the more advanced topics of Expert Systems such as Decision making, Rule base system, Inference problem, natural language processing.
- To give the students on opportunity to study and learn some concepts of Expert System.
- To evaluate and implement Expert Systems for solving synthetic and real-world problems

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Develop a thorough understanding on basic of the foundation of ES	1
2	Solving problem by Production rules and Certainty factors.	1
3	Knowledge representation in ES, Frames and Semantic networks models.	1
4	Decision making and Basic representation of Bayesian and probability.	1
5	The inference problem. Forward and Backward chining.	1
6	Programming language of ES Prolog, VP expert, fuzzy Esplan.	1.5

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3

2	An ability to analyze and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	3
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	3

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Introduction to Expert systems(ES)	
2	Building of ES.	
3	Knowledge base system.	
4	Knowledge representation in ES.	
5	Production rules.	
6	Certainty factors in ES.	
7		Midterm
8	The Frames models of knowledge representation.	
9	The Semantic networks model .	
10	Decision Making under uncertainty.	
11	The inference problem. Forward and Backward chining.	
12	Logical models in ES.	
13	Programming language of ES Prolog.	
14	Expert system-VP.	
15	Fuzzy expert system-Esplan	
16		Final

Recommended Sources

James P. Lgnızıo, Introduction to Expert System The Development and Implementation of rule based Expert System, McGraw Hill International Editions, Computer Science Series 1991.

Supplementary Course Material

Peter Jackson, Introductıon to Expert System, Addıson Wesley Longman Lımıted 1999

Assessment

Attendance/participation	10%	Less than 25% class attendance results in NA grade
Presentation	20%	Presentation
Midterm Exam	30%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	1	20	20
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	14	8	112
Total Workload			256
Total Workload/25(h)			10.24
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Fuzzy Systems
Course Unit Code	COM503
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr.Rahib H.Abiyev
Name of Lecturer (s)	Prof.Dr.Rahib H.Abiyev
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	-

Course description:

Fuzzy Sets. Mathematical Background of Fuzzy Systems. Representation of Fuzzy Sets. Properties of Fuzzy Sets. Fuzzy Relations and Functions. Fuzzy Arithmetic. Fuzzy Modelling. Decision Making in Fuzzy Conditions. Fuzzy Control Systems. Design Examples. Computer Simulations of Fuzzy Systems. Problems Using C++ and Matlab.

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Objectives of the Course:

- Teaching the basic of Fuzzy Sets and Systems
- To understand the properties of Fuzzy Sets
- To teach Fuzzy arithmetic, Fuzzy relations
- To develop students' skills and dispositions regarding modeling of Fuzzy Systems
- To develop apply Fuzzy theory for solving real world problems.

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Studying the basic of Fuzzy Sets. Understanding the properties and characteristics of Fuzzy Sets	1,2
2	Studying Fuzzy arithmetic, α cuts, Interval arithmetic.	1,2
3	Studying Fuzzy relations and designing fuzzy relational models.	1,2
4	Studying Fuzzy Inference Engine and its operating principles	1,2
5	Applying Fuzzy Theory to Control and Identification of dynamic systems	1,2
6	Modelling different fuzzy system	3,4

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of	3

	mathematic-scientific and engineering principles	
2	An ability to analyze and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design and conduct advanced software projects	-
5	An ability to assess applicable methods and their limits	3
6	An ability to identify, find and procure necessary information	2
7	An ability to plan and carry out analytic, model and experimental investigations	5
8	An understanding of the role of engineers in society	4

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction. Fuzzy Sets and Systems	
2		Representation of Fuzzy Sets. Properties of Fuzzy Sets.	
3		Operation on fuzzy sets	
4		Fuzzy Relations and Fuzzy Functions	
5		Fuzzy Arithmetic. Interval arithmetic.	
6		Fuzzy Arithmetic. α cuts	
7		Fuzzy logic, Boolean algebra.	
8		Linguistic variables. Fuzzy rule base.	
9		Fuzzy Relation. IF-Then relation.	Midterm
10		Fuzzy Modelling. Decision Making in Fuzzy Conditions	
11		Fuzzy Control Systems.	
12		Inference engine mechanism. Defuzzıfıcatıon	
13		Fuzzy Controllers. P, PD and PID Control Systems	
14		Design Examples. Computer Simulations of Fuzzy Systems.	
15		Fuzzy identification,	
16		Fuzzy classification	Final

Recommended Sources

Textbook:

1. Kevin M.Passino, Stephen Yukkovich. Fuzzy control, Addison Wesley Longman, Inc. Menlo Park, 1998, 475 p
2. Aliev R.A., and Aliev R.R., Soft Computing and its Application, World Scientific, New Jersey, London, Singapure, Hong Kong, 2001
3. Guanrong Chen, trung Tat Pham. Introduction to Fuzzy Systems. Chapman & Hall/CRC. Taylor & Franchis Group. 2006
4. Aliev R.A., Aliev F.T., Babaev M.D. Fuzzy process control and knowledge engineering in petrochemical and robotic manufacturing, Verlag TUV Rheinland GmbH, Koln, 1991, 147 p

Supplementary Course Material

- Set of laboratory works designed by lecturer

Assessment

Attendance	10%	
Assignment	20%	
Midterm Exam	30%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria
Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

1. Attendance to the course is mandatory.
2. Late assignments will not be accepted unless an agreement is reached with the lecturer.
3. Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
4. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
5. Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials			
Assignment	6	3	18
Project/Presentation/Report	1	10	10
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	30	30
Final Examination Study	1	30	30
Self Study	16	6	96
Total Workload			248
Total Workload/25(h)			9.92
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	STATISTICAL METHODS
Course Unit Code	COM505
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Assoc. Prof. Dr. Fa'eq Radwan
Name of Lecturer (s)	Assoc. Prof. Dr. Fa'eq Radwan
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Excel and related statistics packages

Course description:

Random Sampling, Picturing the Distribution, Sample Statistics, Point Estimation of the Mean and Variance, Confidence Intervals for the Mean and Variance, Point and Interval Estimation for the Difference of Two Means, and a Population Proportion, Tests of Statistical Hypotheses, Tests of Hypotheses on $\mu_1 - \mu_2$, Comparing Means and Variances, Estimating Proportions, Testing Hypotheses on Proportion, Comparing Two Proportions, Model and Parameter Estimation, Properties of Least Squares Estimators, Confidence Interval Estimation and Hypotheses Testing, Residual Analysis, Correlation, The Matrix Approach to Simple Linear Regression, The Matrix Approach to Multiple Linear Regression, Analysis of Variance Technique, Tests for the Equality of Several Variances, Single Degree of Freedom Comparisons, Multiple Comparisons, Latin Squares, Random-Effects Model, Design Models in Matrix Form, Randomized Complete Block Designs, Two-Factor Experiments With n >1 Observations Per Cell, 2^k Factorial Designs, Properties of Control Charts, $\bar{x}$ and R control Charts, p Charts and c Charts, Acceptance Sampling and Extension in Quality Control.

Objectives of the Course:

- To give the students an opportunity to study and learn some concepts of Statistical Methods.
- To gain an appreciation of the principal of Descriptive Statistics, Estimation, Inferences on Population Means, Inferences on Population Proportions, Simple Regression and Correlation, Multiple Linear Regression, Analysis of Variance, Design and Analysis of Multifactor Experiments, and Statistical Quality Control.

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Explain the principles of Statistical Methods.	1
2	Understand the theory of Descriptive Statistics and Estimation.	1
3	Understand the theory of Inferences on Population Means and Inferences on Population Proportions.	1
4	Understand the theory of Regression and Correlation, and Multiple Linear	1

	Regression.	
5	Understand the theory of Analysis of Variance and Design and Analysis of Multifactor Experiments.	1
6	Understand the theory of Statistical Quality Control.	1
7	Understand the applications of Statistical Methods.	
Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work		
Course's Contribution to Program		
		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyze and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	3
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	2
CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)		
Course Contents		
Week	Topics	Exam
1	Random Sampling, Picturing the Distribution.	
2	Sample Statistics, Point Estimation of the Mean and Variance.	
3,4	Confidence Intervals for the Mean and Variance, Point and Interval Estimation for the Difference of Two Means, and a Population Proportion.	
5,6	Tests of Statistical Hypotheses, Tests of Hypotheses on $\mu_1 - \mu_2$, Comparing Means and Variances, Estimating Proportions, Testing Hypotheses on Proportion, Comparing Two Proportions, Model and Parameter Estimation.	
7		Midterm
8	Properties of Least Squares Estimators, Confidence Interval Estimation and Hypotheses Testing, Residual Analysis, Correlation.	
9	.The Matrix Approach to Simple Linear Regression, The Matrix Approach to Multiple Linear Regression.	
10	Analysis of Variance Technique, Tests for the Equality of Several Variances.	
11,12	Single Degree of Freedom Comparisons, Multiple Comparisons, Latin Squares, Random-Effects Model.	
13,14	Design Models in Matrix Form, Randomized Complete Block Designs, Two-Factor Experiments With n >1 Observations Per Cell, 2^k Factorial Designs, Properties of Control Charts, $\bar{x}$ and R control Charts, p Charts and c Charts.	
15	Acceptance Sampling and Extension in Quality Control.	
16		Final

Recommended Sources

1 . J. S. Milton, Jesse C. Arnold. Introduction to Probability and Applications for Engineering and the Computing Sciences. Third Edition, McGraw-Hill, Inc.

2. Walter A. Rosenkrantz. Introduction to Probability and Statistics for Scientists and Engineers, McGraw-Hill, Inc.
3. Ronald E. Walpole. Raymond H. Myers. Sharon L. Myers. Probability and Statistics for Engineers and Scientists. ninth Edition. Prentice Hall Inc.

Assessment

Attendance/participation	10%	Less than 25% class attendance results in NA grade
Midterm Exam	40%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria
Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	-	-	-
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	14	8	112
Total Workload			236
Total Workload/25(h)			9.44
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Artificial Neural Networks
Course Unit Code	COM507
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Assist. Prof. Dr. Kamil Dimililer
Name of Lecturer (s)	Assist. Prof. Dr. Kamil Dimililer
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Computer programming skills

Course description:

This course explores the organization of synaptic connectivity as the basis of neural computation and learning. Perceptrons and dynamical theories of recurrent networks including amplifiers, attractors, and hybrid computation are covered. Additional topics include backpropagation and Hebbian learning, as well as models of perception, motor control, memory, and neural development.

Objectives of the Course:

- To give the students an opportunity to study and learn some concepts of Artificial Neural Networks
- To gain an appreciation of the principal components of Computational Intelligence
- To evaluate and implement Neural Networks for solving synthetic and real-world problems

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Explain the principles underlying Neural Networks	1
2	Understand the theoretical foundation of Neural Networks	1
3	Apply Neural Networks to find solutions to complex problems	1
4	Analyze parameter choices in the use of Neural Networks	1
5	Summarize current research in Neural Networks	1

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyse and solve problems scientifically	4

3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	3
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	2

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Introduction to Neural Networks	
2	Neural Computing	
3	Biological Neuron	
4	Definition of ANN	
5	Intelligent Computing	
6	Intelligent Computing	
7		Midterm
8	Traditional vs Neural Computing	
9	Hebbian Rule	
10	Classification on ANN	
11	Parameters of ANN	
12	XOR Problem	
13	Adaline Networks	
14	Recurrent Networks	
15	Hopfield Networks	
16		Final

Recommended Sources

- Simon Haykin, Neural Networks, 1994.
- Tom M. Mitchell, Machine Learning, 1997

Assessment

Attendance/participation	10%	Less than 25% class attendance results in NA grade
Midterm Exam	40%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	-	-	-
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	14	8	112
Total Workload			236
Total Workload/25(h)			9.44
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Advanced Image Processing
Course Unit Code	COM508
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Assist.Prof.Dr. Boran Şekeroğlu
Name of Lecturer (s)	Assist.Prof.Dr. Boran Şekeroğlu
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Computer programming skills

Course description:

Image Modelling. Two-Dimensional Signal Analysis. Image Processing Techniques. Image Enhancement. Image Compression. Image Restoration, Image Recognition. Region Extractions and Edge Detections. Problems Using C and Matlab. Laboratory Experiments.

Objectives of the Course:

- To give the students an opportunity to study and learn advanced concepts of Image Processing.
- To implement advanced image processing methods and algorithms to solve real-life problems.

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Implement advance image processing techniques	2
2	Understand the theoretical aspects of image processing	1
3	Analyze and compare image processing methods	2
4	Summarize current researches in real life applications of Image Processing	3

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3

2	An ability to analyze and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	2
5	An ability to assess applicable methods and their limits	4
6	An ability to identify, find and procure necessary information	5
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	2

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Introduction to Image Processing	
2	Fundamentals of Digital Imaging	
3	Image Enhancement in Spatial Domain	
4	Image Enhancement in Spatial Domain	
5	Image Enhancement in Frequency Domain	
6	Image Enhancement in Frequency Domain	
7		Midterm
8	Morphological Image Processing	
9	Morphological Image Processing	
10	Image Segmentation	
11	Image Restoration	
12	Object Recognition	
13	Review	
14	Review	
15		
16		Final

Recommended Sources

- Gonzalez and Woods "Digital Image processing"
- Gonzalez, Woods "Digital Image processing using Matlab"

Assessment

Assignments	30%	Programming and Research
Midterm Exam	25%	Written Exam
Final Exam	45%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	-	-	-
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	14	8	112
Total Workload			236
Total Workload/25(h)			9.44
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Parallel Computing
Course Unit Code	COM509
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof. Dr. Dogan Ibrahim
Name of Lecturer (s)	Prof. Dr. Dogan Ibrahim
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Computer programming skills

Course description:

Parallel computing is becoming a very important topic currently since the computing power of most single-core computers are rather limited. This course aims to teach the hardware and software principles of parallel computing architectures currently used in information technology.

Objectives of the Course:

- To give the students an opportunity to study and learn the hardware and software concepts of parallel computing
- To gain an appreciation of the importance of parallel computing in information technology
- To evaluate and implement parallel computing principles for the solution of complex scientific real-time problems

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Explain the principles of parallel computers	1
2	Understand the theoretical foundation of the parallel computing hardware	1
3	Understand the practical aspects of parallel computer structures	1
4	Apply parallel computing for the solutions of complex problems	1
5	Summarize current research in parallel computing	1

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	2
2	An ability to analyze and solve problems scientifically	2
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	3
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	2

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Introduction to parallel computing.	
2	Why parallel computing?	
3	Parallel computing hardware architectures.	
4	Scientific application areas of parallel computers.	
5	Introduction to parallel computing software.	
6	Principles of parallel algorithms.	
7		Midterm
8	Tasks, interactions, and mapping techniques.	
9	Basic communications operations.	
10	Message passing operations.	
11	Coding for message passing algorithms.	
12	Multiple threads and shared address spaces.	
13	Matrix algorithms in parallel programming.	
14	Sorting in parallel computing.	
15	Search algorithms in parallel computing.	
16		Final

Recommended Sources

- A. Grama., G. Karypis., V. Kumar., & A. Gupta, Introduction to Parallel Computing, Pearson, 2003.
- S. Razdan. Fundamentals of Parallel Computing, Alpha Science International Ltd, 2014.

Assessment

Attendance/participation	10%	Less than 25% class attendance results in NA grade
Midterm Exam	40%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	5	4	20
Project/Presentation/Report	-	-	-
E-learning activities	2	5	10
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	12	8	96
Total Workload			250
Total Workload/25(h)			10
ECTS Credit of the Course			10

MSc program, Computer Engineering Department

Course Unit Title	Object-Oriented Analysis and Design
Course Unit Code	COM513
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	1
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr.Rahib H.Abiyev
Name of Lecturer (s)	Prof.Dr.Rahib H.Abiyev
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Object oriented Programming

Course description:

The course will focus on the object-oriented approach for analysis and design. OO concepts through typical OO programming languages. Features and problems of complex systems, evolution the object-oriented model, foundations and elements of the object-oriented model, relationships among classes, relationships among objects, interplay of classes and objects, approaches to identifying classes and objects, object-oriented design methodologies, methodology notation (elements of UML or any other selected notation, class and object diagrams, interaction diagrams, state transition diagrams, process and module diagrams, etc.), applications and case studies, CASE tools. Students will gain an appreciation of the difference between writing programs and doing analysis and design. Problem formulation and decomposition (analysis) and solution building (design) will be covered.

Objectives of the Course:

- To understand the concepts and terms used in the object-oriented approach to systems analysis and design
- To study the application process of object-oriented analysis and design to software development.
- Pointing out the importance and function of each UML model throughout the process of object-oriented analysis and design and explaining the notation of various elements in these models..
- To develop students' skills and dispositions regarding modeling and solution of optimisation and other different problems using algorithm design techniques
- Providing students with the necessary knowledge and skills in using object-oriented CASE tools.

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Show the importance of systems analysis and design in solving complex problems	1,2
2	Show how the object-oriented approach differs from the traditional approach	1,2

	to systems analysis and design.	
3	Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, statechart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation.	1,2
4	Show the role and function of each UML model in developing object-oriented software	1,2

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply knowledge of mathematics, science, and programming	5
2	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design program modules to achieve the desired needs within realistic conditions	
5	Planning and carrying out programming experiments, and analyzing and evaluating the results	5
6	Ability to use the mathematical techniques, programming skills and necessary computer tools	4
7	An understanding of professional, ethical, legal, security and social issues and responsibilities that apply to software design.	4
8	An ability to work productively in a multidisciplinary team, in particular to carry out projects involving computer engineering and programming skills.	3
9	An ability to communicate effectively with a range of audiences	1
10	A recognition of the need for, and an ability to engage in life-long learning	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction, Object-Oriented Programming Languages and the object-oriented model	
2		Basic features object-oriented approach. Complex problems and complex systems	
3		Object-oriented analysis, design, and implementation, Advantages, Limitations and Applications of the object-oriented approach	
4		Models and modelling languages, UML.	
5		UML views and basic features, Object-oriented design methodologies, The rational unified proces	
6		Object-oriented CASE tools: Introducing Rational Rose	
7			Midterm
8		OO analysis, Identifying objects and classes, associations and aggregations, inheritance, group classes	
9		Object Oriented Design and Modelling using UML	
10		OO modeling. State diagrams	

11		Object Interactions and calibrations	
12		State and Activity Diagrams	
13		Component and Deployment Diagrams	
14		New diagrams in UML 2.x , Model Driven Architecture (MDA), Executable UML	
15		Case studies, Review	
16			Final

Recommended Sources

Textbook:

1. Bahrami, Ali. *Object Oriented Systems Development.* Boston, Massachusetts: The McGraw-Hill Companies, Incorporated, 2000.
2. Haigh, Andrew. *Object-Oriented Analysis & Design*. New York, New York: The McGraw-Hill Companies. 2001.

Supplementary Course Material

1. Johnsonbaugh, Richard, and Martin Kalin. 2000. *Object-Oriented Programming in C++*, 2nd edition. Upper Saddle River, New Jersey: Prentice Hall, Incorporated.

2. Deitel, H. M., and P. J. Deitel. 2000. *C++ How To Program*, 3rd edition. Upper Saddle River, New Jersey: Prentice-Hall, Incorporated.

3. Systems Analysis and Design Methods by Jeffrey L. Whitten, Lonnie D. Bentley, 7 th edition, ISBN 0-07-058224-6, Tata McGraw-Hill, 2007.

4. Bennett, Simon ; Skelton, John; Lunn, Ken (latest ed). Schuam's Outline of UML. New York: McGraw-Hill..

Assessment

Attendance	10%	
Assignment	15%	
Midterm Exam	35%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

6. Attendance to the course is mandatory.
7. Late assignments will not be accepted unless an agreement is reached with the lecturer.
8. Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
9. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
10. Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)

Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	6	5	30
Assignment	-	-	-
Project/Presentation/Report	-	-	-
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	30	30
Final Examination Study	1	30	30
Self Study	16	6	96
Total Workload			250
Total Workload/25(h)			10
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Genetic Algorithms
Course Unit Code	COM514
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof. Dr. Adil Amirjanov
Name of Lecturer (s)	Prof. Dr. Adil Amirjanov
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Computer programming skills

Course description:

Genetic algorithms based on principles from evolution theory are powerful and broadly applicable stochastic search and optimization techniques. Genetic algorithms belong to the larger class of evolutionary algorithms (EA), which generate solutions to optimization problems using techniques inspired by natural evolution, such as inheritance, mutation, selection, and crossover. The course is tended to introduce the central aspects of genetic algorithms and their applications to difficult-to-solve optimization problems in engineering and systems design.

Objectives of the Course:

- To give the students an opportunity to study and learn some concepts of Evolutionary Computation
- To gain an appreciation of the principal components of nature-inspired Genetic Algorithm
- To evaluate and implement Genetic Algorithm for solving synthetic and real-world problems

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Explain the principles underlying Evolutionary Computation in general and Genetic Algorithms in particular	1
2	Understand the theoretical foundation of Genetic algorithms	1
3	Apply Genetic Algorithms to find solutions to complex problems	1
4	Analyze parameter choices in the use of Genetic Algorithms	1
5	Summarize current research in Genetic Algorithms	1

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyze and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	3
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	2

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Principles of Darwinian evolution and natural genetics.	
2	Introduction to Evolutionary Computation.	
3	Major components of Genetic Algorithm (GA).	
4	Sample applications: numerical and combinatorial optimizations by using GA.	
5	Mathematical foundations of GA.	
6	Binary representation in GA. Simulating a genetic algorithm by hand on a simple test function.	
7		Midterm
8	Different selection operators in GA.	
9	Commonly used variation operators in genetic algorithms for binary and k-ary string codes.	
10	Commonly used variation operators for manipulating real-valued vectors	
11	Integer representation in GA.	
12	Crossover operators for manipulating permutations.	
13	Mutation operators for manipulating permutations.	
14	Constraint-handling techniques in GA.	
15	Multiobjective optimization techniques	
16		Final

Recommended Sources

- Eiben, A. E., Smith J. E., Introduction to Evolutionary Computing, Springer, 2008.
- Michalewicz , Zbigniew, Genetic Algorithms + Data Structures = Evolution Programs, 1994, Third Revised and Extended Edition, Springer, New York, 1999.
- Goldberg, David E., Genetic Algorithms: in Search, Optimization & Machine Learning, Addison-Wesley Publishing Company, Inc. New York, 1989.
- Geng, Mitsuo and Cheng, Runwei, Genetic Algorithms & Engineering Optimization, John Wiley & Sons, New York, 2000.

Assessment		
Attendance/participation	10%	Less than 25% class attendance results in NA grade
Midterm Exam	40%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria
Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	-	-	-
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	14	8	112
Total Workload			236
Total Workload/25(h)			9.44
ECTS Credit of the Course			10

MSc program, Computer Engineering Department

Course Unit Title	Design and Analysis of Algorithms
Course Unit Code	COM515
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr.Rahib H.Abiyev
Name of Lecturer (s)	Prof.Dr.Rahib H.Abiyev
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Data Structures and Algorithms

Course description:

Algorithm design techniques, algorithm analysis. Graph algorithms. Shortest paths. Maximum flow algorithm. Amortized Analysis, Algorithms for Parallel computers, Randomized algorithms, Backtracking, Graph coloring, Branch and Bound, Approximation Algorithms, NP-completeness, NP-complete problems.

Objectives of the Course:

- To understand algorithm design techniques and algorithm analysis
- To teach graph algorithms, shortest paths, max flow algorithms
- To teach amortised analysis methods, aproximation algorithms, backtraking, branch and bound techniqes.
- To develop students' skills and dispositions regarding modeling and solution of optimisation and other different problems using algorithm design techniques
- To apply algorithm design methods for solving real world problems.

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Studying the basic of Algorithm Design and Analysis techniques	1,2
2	Studying tree algorithms, graph algorithms, shortest path, max flow algorithms	1,2
3	Studying approximation algorithms, baktraking and branch and bound techniques	1,2
4	Applying algorithm design techniques to solution of different real world problems.	1,2

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply knowledge of mathematics, science, and programming	3
2	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design program modules to achieve the desired needs within realistic conditions	
5	Planning and carrying out programming experiments, and analyzing and evaluating the results	5
6	Ability to use the mathematical techniques, programming skills and necessary computer tools	4
7	An understanding of professional, ethical, legal, security and social issues and responsibilities that apply to software design.	4
8	An ability to work productively in a multidisciplinary team, in particular to carry out projects involving computer engineering and programming skills.	3
9	An ability to communicate effectively with a range of audiences	1
10	A recognition of the need for, and an ability to engage in life-long learning	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction to algorithm design and analysis.	
2		Graph algorithms, all-pairs shortest path.	
3		Max flow algorithms,	
4		Algorithms for Parallel computers, Pointer jumping	
5		Algorithms for Parallel computers CRCW versus EREW algorithms	
6		Amortized Analysis, Agregare method, accounting method	
7			Midterm
8		NP completeness, NP-complete problems	
9		Randomized algorithms	
10		Approximation algorithms, Vertex cover proble.	
11		Solution of set cover subset-sum, travling salesman problems with approximation algorithms	
12		Backtraking algorithm, Graph colouring	
13		Solution of vertex cover, set cover subset-sum, travling salesman problems with	
14		Branch and Bound, Solution of assignment, knapsack, travling salesman problems	
15		Review	
16			Final

Recommended Sources
Textbook:

1. Thomas H. Crmen, Charlesb E.Leiserson,Ronald L.Rivest, Introduction to Algorithms, McGraw-Hill Book Company,1990.
2. Rahib H. Abiyev. Algorithms. NEU-Press, Nicosia-2006. 209p.

Supplementary Course Material

- Set of laboratory works designed by lecturer

Assessment

Attendance	10%	
Assignment	15%	
Midterm Exam	35%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

11. Attendance to the course is mandatory.
12. Late assignments will not be accepted unless an agreement is reached with the lecturer.
13. Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
14. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
15. Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials			
Assignment	6	4	24
Project/Presentation/Report			
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	30	30
Final Examination Study	1	30	30
Self Study	16	6	96
Total Workload			244
Total Workload/30(h)			9.76
ECTS Credit of the Course			10

MSc program, Computer Engineering Department

Course Unit Title	Distributed Database Management Systems
Course Unit Code	COM517
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	1
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr.Adil Amirjanov
Name of Lecturer (s)	Prof.Dr.Adil Amirjanov
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Database Management Systems

Course description:

Introduction to Databases and Distributed Database Systems, Background, Distributed Database Architectures, Distributed Database Design, Horizontal Fragmentation, Vertical Fragmentation, Introduction to Query Processing, Query Processing in Distributed Databases, Query Optimization, Introduction to Transaction Management, Distributed Concurrency Control, Parallel DBMSs Issues, Distributed DBMS reliability,, Distributed Multidatabase systems

Objectives of the Course:

- To study concepts and techniques for the management of distributed data using distributed database management systems
- To study architecture of distributed database management systems,.
- To study query processing, and transaction management for distributed databases.
- To develop students' skills and dispositions regarding modeling and optimisation of distributed database design

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Understand major architectures of the DDBSs.	1,2
2	Understand design issues of a DDBS.	1,2
3	Understand fragmentation and its different types, concepts of replication.	1,2
4	Understand administration issues of DDBS, like failure recovery, transaction management and concurrency control.	1,2
5	Develope basic concepts of parallel databases and multidatabases	1,2,3

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply knowledge of mathematics, science, and	3

	programming	
2	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design program modules to achieve the desired needs within realistic conditions	
5	Planning and carrying out programming experiments, and analyzing and evaluating the results	5
6	Ability to use the mathematical techniques, programming skills and necessary computer tools	4
7	An understanding of professional, ethical, legal, security and social issues and responsibilities that apply to software design.	4
8	An ability to work productively in a multidisciplinary team, in particular to carry out projects involving computer engineering and programming skills.	3
9	An ability to communicate effectively with a range of audiences	1
10	A recognition of the need for, and an ability to engage in life-long learning	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction, Distributed data processing, advantages, disadvantages	
2		Architecture of Distributed Database Management Systems, Architectural models for Distributed DBMSs	
3		Distributed Database design. Design strategies. Fragmentation	
4		Query processing, Objectives.	
5		Layers of query processing	
6		Query decomposition and data localization. Decomposition and localization of distributed data	
7			Midterm
8		Optimization of distributed queries	
9		Distributed query optimization algorithms	
10		Transaction management, Types of transactions	
11		Distributed concurrency control	
12		Distributed DBMS reliability	
13		Multidatabase systems, Database integration	
14		Distributed Multidatabase systems, Parallel database.	
15		Review	
16			Final

Recommended Sources

Textbook:

1. M.Tamer Ozsu, Patrick Valduriez. Principles of Distributed Database systems.Prentice-Hall International Inc.,1991

Supplementary Course Material

1. Saeed K. Rahimi, Frank S. Haug. Distributed Database Management Systems: A Practical Approach. Wiley-IEEE Computer Society Pr; 1 edition (May 23, 2011), pp.896

Assessment

Attendance	10%	
Assignment	25%	
Midterm Exam	30%	Written Exam
Final Exam	35%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

16. Attendance to the course is mandatory.
17. Late assignments will not be accepted unless an agreement is reached with the lecturer.
18. Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
19. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
20. Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	5	4	20
Assignment	-	-	-
Project/Presentation/Report	1	30	30
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	25	25
Final Examination Study	1	30	30
Self Study	16	5	80
Total Workload			245
Total Workload/25(h)			9.96
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Soft Computing
Course Unit Code	COM519
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Assist. Prof. Dr. Imanov E.
Name of Lecturer (s)	Assist. Prof. Dr. Imanov E.
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	

Course description:

The aim of the course is to get a necessary knowledge on principal members of such kind of coalitions like Fuzzy Logic, neurocomputing, evolutionary computing, probabilistic computing, chaotic computing and machine learning. Hybrid intellectual systems. You will learn the basic principles of the Soft Computing methodology which is distinguished from the methodology based on Hard Computing Technology.

Objectives of the Course:

- To have a basic understanding of the more advanced topics of Soft Computing such as learning, natural language processing.
- To give the students an opportunity to study and learn some concepts of Evolutionary Computation.
- To give the students on opportunity to study and learn some concepts of Hybrid systems.
- To evaluate and implement Soft Computing for solving synthetic and real-world problems.

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Develop a thorough understanding on basic of the foundation of Soft Computing	1
2	Solving problem by Fuzzy mathematics, Fuzzy decision.	1
3	Decision making with Probabilistic reasoning.	1
4	Basic representation of Bayesian and decision tree.	1
5	Artificial neural network technology, Pattern recognition, GA	1,5
6	Hybrid systems, ES and ANN, ANN and Fuzzy logic	1

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL

1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyse and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	3
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	3
CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)		

Course Contents

Week	Topics	Exam
1	What is Soft Computing (SC)?	
2	Computational Intelligence.	
3	Fuzzy mathematics. Fuzzy optimization. Fuzzy relations.	
4	Fuzzy decision making.	
5	Probabilistic reasoning. Reasoning with uncertainty.	
6	Bayesian probability.	
7		Midterm
8	Decision Tree. Dempster – Shafer rule.	
9	Artificial Neural Networks, basic architectures and types of ANN.	
10	Learning of ANN. Neural expert systems (NES).	
11	Pattern recognition.	
12	ANN, NeroSell Program.	
13	Genetic algorithms (GA).	
14	Chaos theory.	
15	Emerging combined Soft Computing technologies. Nero fuzzy	
16		Final

Recommended Sources

1.R.A.Aliev, B,Fazlollahi and R.R.Aliev. "Soft Computing and its Applications in Business and Economics". Springer, 2004, pp.446.

2. Aliev R.A., Aliev R.R. "Soft Computing and its applications".World Scientific, USA, 2001, pp. 450.

Supplementary Course Material

3. Jose M. Benitez. Advances in Soft Computing, Springer-Verlag, New York, 2003, pp.400.

Assessment		
Attendance/participation	10%	Less than 25% class attendance results in NA grade
Presentation	20%	Presentation
Midterm Exam	30%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria
Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	1	20	20
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	14	8	112
Total Workload			256
Total Workload/25(h)			10.24
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Pattern Recognition
Course Unit Code	COM520
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr.Rahib H.Abiyev
Name of Lecturer (s)	Prof.Dr.Rahib H.Abiyev
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Computer programming skills

Course description:

This class deals with the fundamentals of characterizing and recognizing patterns and features of interest in numerical data. An introduction to the pattern recognition. Basic structure of Pattern Recognition system. Supervised and unsupervised systems. Syntactic and decision theoretic approach, Nonparametric decision theoretic classification. Linear and Nonlinear discriminant functions, linear separability. Training procedures. Error correction training procedures. Gradient techniques. Minimum squared error procedures. Clustering. Distance measures. Unsupervised and supervised clustering algorithms. Adaptive sample set construction, Batchelor and Wilkins algorithms, k-means algorithm. Graph-theoretical methods, spanning tree methods. Multilayer perceptron, Neural network based recognition. Radial based networks, Learning using gradient descent. Machine learning.

Objectives of the Course:

- To give the students an opportunity to study and learn some concepts of Pattern Recognition
- To gain an appreciation of the principal components of Intelligent Systems
- To evaluate and implement Pattern Recognition System for solving synthetic and real-world problems

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Explain the principles underlying Pattern Recognition	1
2	Understand the theoretical foundation of Pattern Recognition	1
3	Apply Pattern Recognition to find solutions to complex problems	1
4	Analyze parameter choices in the use of Pattern Recognition	1
5	Summarize current research in Pattern Recognition	1

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program		
		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyse and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	3
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	2
CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)		

Course Contents

Week	Topics	Exam
1	Introduction to Pattern Recognition. Syntactic and decision theoretic approach	
2	Nonparametric and Parametric approach. Nonparametric decision theoretic approach. Linear Discriminant analysis,	
3	Linear discriminant functions, decision surfaces, linear separability.	
4	Pricewise linear discriminant functions. Nonlinear discriminant functions	
5	Committee machines. Potential functions as discriminant functions	
6	Training procedures. Error correction training procedure.	
7	Gradient techniques. Minimum squared error procedures.	Midterm
8	Clustering. Distance measures. Unsupervised and supervised clustering algorithms.	
9	Adaptive sample set construction, Batchelor and Wilkins algorithms,	
10	k-means algorithm. k-nearest neighbors algorithm	
11	Supervised and Unsupervised Learning	
12	Graph-theoretical methods, spanning tree methods.	
13	Multilayer perceptron, Neural network based recognition. Radial based networks,	
14	Neural network based learning for recognition. Learning using gradient descent. Machine learning.	
15	Review	
16		Final

Recommended Sources

- Pattern Classification and Image Processing 2nd edition, Sing-Tze Bow., Marcel Dekker Inc., 2002
- Pattern Classification, Richard Duda, Peter Hart, David G. Stork, 2000
- Pattern Recognition and Machine Learning (Information Science and Statistics), Christopher

M. Bishop, 2007

- The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Second Edition Trevor Hastie, 2013

Assessment

Attendance/participation	10%	Less than 25% class attendance results in NA grade
Midterm Exam	40%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	4	3	12
Project/Presentation/Report	1	30	30
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	14	6	84
Total Workload			250
Total Workload/25(h)			10
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Advanced Numerical Methods
Course Unit Code	COM521
Type of Course Unit	Elective
Level of Course Unit	MSc.
National Credits	3
Number of ECTSCreditsAllocated	10
Theoretical (hour/week)	4
Practice(hour/week)	-
Laboratory (hour/week)	-
Year of Study	1
Semester when the course unit is delivered	1,2
Course Coordinator	-
Name of Lecturer(s)	Assist. Prof. Dr. Cemal Gövsa
Name of Assistant(s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites and co-requisites	-
Recommended Optional Program Components	-

Course description:

Nonlinear algebraic equations, sets of linear algebraic equations, eigenvalue problems, interpolation, curve fitting, ordinary differential equations, and partial differential equations, solution of partial differential equations of the parabolic, elliptic and hyperbolic type. Applications include thermodynamics, automatic control systems, kinematics, and design

Objectives of the Course:

1. code various numerical methods in a modern computer language.
2. develop appropriate numerical methods to solve a differential equation
3. derive appropriate numerical methods to solve algebraic and transcendental equations
4. derive appropriate numerical methods to solve algebraic and transcendental equations

Learning Outcomes

	When this course has been completed, the student should be able to	**Assessment.**
1	Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problem	1, 2
2	Apply numerical methods to obtain approximate solutions to mathematical problems.	1, 2
3	Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.	1, 2
4	Implement numerical methods in Matlab.	1, 2
5	Write efficient, well-documented Matlab code and present numerical results in an informative way	1,2

AssessmentMethods:1. Written Exam, 2.Assignment3. Project/Report, 4.Presentation, 5 Lab.Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	5
2	An ability to analyse and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	-
5	An ability to assess applicable methods and their limits	4
6	An ability to identify, find and procure necessary information	3
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	2
CL: Contribution Level (1:VeryLow, 2: Low, 3:Moderate4:High,5:VeryHigh)		

Course Contents

Week	Chapter		Assessment
1	1	Numerical Differentiation	
2	1	Numerical Differentiation: Finite differencing (backward, forward, central)	
3	1	Numerical Differentiation: Higher-order schemes	Assignment 1
4	2	Numerical Integration: Newton-Cotes	
5	2	Numerical Integration: Romberg integration	
6	2	Numerical Integration: Gauss Quadrature	
7	3	Ordinary Differential Equations: Initial Value Problems, Runge-Kutta Methods	
8	3	Ordinary Differential Equations: Initial Value Problems,Systems of ODES	Assignment 2
9			Mid-Term Exam
10	3	Ordinary Differential Equations: Boundary Value Problems, Shooting Method	
11	3	Ordinary Differential Equations: Boundary Value Problems,Direct Solution Method (Finite Difference) for linear BVPs	
12	4	Direct Solution Method (Finite Difference) for linear BVPs	Assignment 3
13	4	Direct Solution Method (Finite Difference) for linear BVPs	
14	5	Partial Differential Equations	
15	5	Partial Differential Equations	Assignment 4
16			Final Exam.

Recommended Sources

Textbook:

Gerald Recktenwald, Numerical Methods with MATLAB: Implementations and Applications, 2001, Prentice-Hall.

Supplementary Material

1. E. Kreyszig, Advanced engineering mathematics, 9th edition, Wiley, 2006
2. W. Cheney & D. Kincaid, Numerical mathematics and computing, Thomson, 2004.
3. D. M. Etter, Engineering problem solving with Matlab, Prentice-Hall, 1993

Assessment

Attendance & Assignment	20%	
Midterm Exam(Written)	30%	
Quiz (Written)	-	
Final Exam(Written)	50%	
Total	100%	

ECTS Allocated Based on the Student Workload			
Activities	**Number**	**Duration (hour)**	**Total Workload (hour)**
Course duration in class (including the Exam week)	16	4	64
Tutorials	-	-	-
Assignments	4	5	20
Project/Presentation/Report Writing	-	-	-
E-learning Activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	20	20
Final Examination	1	20	20
Self-Study	14	8	112
Total Workload			236
Total Workload/25(h)			9.44
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Cryptography and Network Security
Course Unit Code	COM522
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof. Dr. Fahreddin Sadikoglu Mammadov
Name of Lecturer (s)	Prof. Dr. Fahreddin Sadikoglu Mammadov
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	-

Course description:

Cryptographic algorithms. Public key encryption, differential and linear cryptanalysis, the Advanced Encryption Standard, Cryptographic hash functions, authentication protocols, key distribution protocols, key management, security protocol pitfalls, Internet cryptography, IP sec., SSL/TLS, e-mail security, firewalls.

Objectives of the Course:

- Develop an understanding of information assurance as practiced in networks and representative applications.
- Gain familiarity with prevalent network attacks, defences against them, and forensics to investigate the aftermath.
- Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
- Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.

Learning Outcomes

After completing the course the student will understand		Assessment
1	Classical Cryptosystems	1
2	DES - Data Encryption Standard	1
3	AES (Rijndael) - Advanced Encryption Standard	1
4	SHS - Secure Hash Algorithm and Standard	1
5	RSA - Public Key Algorithms	1
6	Elleptic Curve Cryptography	1

7	Diffie Hellman Key Exchange	1
8	Authentication and Digital Signature Principles	1
9	E-Commerce and Digital Cash	1
10	Error Correcting Codes	1

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyse and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	2
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	2

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Secure Communications. Security Attacks. Introduction to Symmetric and Public Key Algorithms. Block and Stream Ciphers. Cryptography Applications. Exercises, Computer Problems.	
2	Classical Cryptography Shıft Cipler. Frequency Distribution of English Letters. Affine Ciphers. Viegener Ciphers.Exercises, Computer Problems.	
3	The Playfair and ADFGX Ciplers. Hill Ciphers. Substitution and Tranposition Techniques. Exercises, Computer Problems.	
4	Basic Number Theory. Prime Member. Congruences. Chinese Remainder Theorem. Primitive Root. Square Root Modul on. Exercises, Computer Problems	
5	DEC. Differential Cryptoanalysis. Breaking DEC. Triple DEC. Blowfish. RC5. Exercises, Computer Problems.	
6	Public Key Cryptography. Rijndael. RSA. Exercises, Computer Problems.	
7		Midterm
8	Primarity Testing. Factoring. Discrete Logarithms.Exercises, Computer Problems	
9	Digital Signatures. RSA Elgamal Signatures. Probabilistic Signature.Exercises, Computer Problems.	
10	Mesage Authentication. MAC Hash Functions. Exercises, Computer Problems.	
11	Secure Electronic Transactions. E-Commera And Digital Cash.Exercises, Computer Problems.	
12	Key Establishment Protocols. Diffile Hellman Key Exchange. Kerberos.Exercises, Computer Problems.	

13	Elleptic Curve Cryptography.Introduction To Quantum Cryptography and DNA Computing.Exercises, Computer Problems.	
14	Error Correcting Codes.Hamming Code. Linear Code Confvolution Codes. Colay Codes. Exercises, Computer Problems.	
15	Cyclic Codes. BCH Codes.Reed Solomon Codes. Exercises, Computer Problems	
16		Final

Recommended Sources

1. Wade T., Lawrence C. Cryptography with Coding Theory. Prentice-Hall, NJ,2002
11. Stallings William. *Cryptography and network Security: Principle and Practice*. Prentice-Hall, NJ,1999

12. Menezes et all. *Handbook of Applied Cryptography*. CRC Press, FL,1997

13. Stallings W. *Network Security Essentials. Applications and Standards.* Prentice-Hall, NJ, 2000

14. Schneier, B. *Applied Cryptography: Protocols, Algorithms, and Source Code in C*, 2nd ed.New York: John Wiley & Sons, 1996

15. Stinson, D. R. *Cryptography: Theory and Practice*. 2nd Edition Boca Raton, FL: CRC Press, 2002

Assessment

Assignment	15%	Report
Laboratories	15%	Report
Midterm Exam	30%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload			
Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	3	2	6
Assignment	3	15	45
Project/Presentation/Report	-	-	-
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	14	5	70
Total Workload			245
Total Workload/25(h)			9.8
ECTS Credit of the Course			10

MSc program, Computer Engineering Department

Course Unit Title	Wireless and Mobile networks
Course Unit Code	COM523
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	1
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr.Fahreddin Sadikoglu
Name of Lecturer (s)	Prof.Dr.Fahreddin Sadikoglu
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Data Communication and Networking

Course description:

Introduction to Wireless and Mobile Networks, Wireless Transmission, Wireless and Mobile Network Architectures, Mobile Routing, Mobile IP, Transport Protocols over Wireless Networks, Cellular networks, Satellite Networks, Wireless LAN, Bluetooth Technology and Applications, Broadband Wireless Access, WiMax: Architectures and topologies, Ad Hoc Networks- Routing, Device and Service Discovery, QoS in Mobile Networks, Peer-to-Peer Networks and Applications.

Objectives of the Course:

- To study Mobile and Wireless Network technology, wireless transmission of data
- To study mobile networks and mobile computing
- To study he main characteristics of mobile IP, to illustrate traffic routing with mobile IP
- To develop applications that rely on wireless data communications including applications for the mobile technologies
- To develop students' skills and dispositions regarding to wireless data communications with the applications to the mobile technologies

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	describe wireless and mobile networks	1,2
2	apply advanced data communicating methods and networking protocols for wireless and mobile environments	1,2
3	creatively analyze mobile and wireless networks, select components and networks for particular application	1,2
4	develop applications that rely on wireless data communications including applications for the mobile phone	1,2,3
5	describe current and emerging interests in wireless and mobile computing and current capabilities, limitations and potential of each.	1,2

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work		
Course's Contribution to Program		
		CL
1	An ability to understand and apply knowledge of mathematics, science, and programming	3
2	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design program modules to achieve the desired needs within realistic conditions	
5	Planning and carrying out programming experiments, and analyzing and evaluating the results	5
6	Ability to use the mathematical techniques, programming skills and necessary computer tools	4
7	An understanding of professional, ethical, legal, security and social issues and responsibilities that apply to software design.	4
8	An ability to work productively in a multidisciplinary team, in particular to carry out projects involving computer engineering and programming skills.	3
9	An ability to communicate effectively with a range of audiences	1
10	A recognition of the need for, and an ability to engage in life-long learning	5
CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)		

Course Contents

Week	Chapter	Topics	Exam
1		Introduction to Wireless and Mobile Networks	
2		Wireless Transmission: Signals, Antennas, Signal Propagation,	
3		Multiplexing, Modulation, Spread Spectrum	
4		Wireless Medium Access Control	
5		Wireless Telecommunications Systems	
6		Cellular networks	
7			Midterm
8		Satellite Systems, Satellite Architectures, Satellite Routing, Satellite Channel Access, Satellite Handover, High Altitute Platforms, Applications.	
		Wireless LAN: IEEE 802.11, Bluetooth, RFID, Security issues	
9		Mobile Network Layer I: Problems of IP in Wireless, Principles behind Mobile IP, Problems, Security issues, DHCP.	
10		Mobile Network Layer II: Routing in Ad-hoc Networks, Wireless Sensor Networks	
11		Mobile Transport Layer	
12		Support for Mobility: File Systems, databases, WWW and Mobility, WAP	
13		QoS in Mobile Networks,	

14		Peer-to-Peer Networks and Applications	
15		Review	
16			Final

Recommended Sources

Textbook:

1. Kwok & Lau, "Wireless Internet and Mobile Computing: Interoperability and Performance," Wiley 2007, ISBN 97880847186796884

Supplementary Course Material

1. William Stallings.Wireless Communications & Networks - Publisher: Prentice Hall. 2005.

Assessment

Attendance	10%	
Assignment	25%	
Midterm Exam	30%	Written Exam
Final Exam	35%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

21. Attendance to the course is mandatory.
22. Late assignments will not be accepted unless an agreement is reached with the lecturer.
23. Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
24. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
25. Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	5	4	20
Assignment	-	-	-
Project/Presentation/Report	1	30	30
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	25	25
Final Examination Study	1	30	30
Self Study	16	5	80
Total Workload			245
Total Workload/25(h)			9.96

ECTS Credit of the Course	10

MS program, Computer Engineering Department

Course Unit Title	Scientific Research Methods
Course Unit Code	COM524
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof. Dr. İlkay Salihoğlu
Name of Lecturer (s)	Prof. Dr. İlkay Salihoğlu
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	-

Course description:

The course defines the understanding of science and engineering and describes the links between the interrelated technical subjects. Further, it considers the methods of scientific research and focuses on the five methods most widely used for natural sciences and engineering, giving much emphasis on experimental and field studies research methods. It also stresses the importance of integrated research methods. It stresses the important aspects of writing research proposal, presenting and report (thesis) writing. Finally it provides some information on research ethics and on controversies in research.

Objectives of the Course:

The objectives of this course are:

- to introduce some of the major issues in understanding of natural and technical sciences.,
- to gain an understanding of the nature of research,
- to make distinction among several research methods and their application,
- to gain some experience in writing research proposals,
- to provide some skills on reporting,
- to encourage the class to develop their own research methods for their further studies.

Learning Outcomes

Upon completion of this course the students will be able to:		Assessment
1	understand major paradigms in scientific and engineering research, their central concepts and problems,	1, 4
2	have awareness of the significant research methods within several fields	1, 4
3	analyze scientific and pseudo-scientific texts written by the others	1, 4
4	contrast scientific presentations	4

5	organize, conduct and manage scientific research with a special emphasis on ethics	1, 4
6	improve the skills in thesis writing and dissertation	4

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	2
2	An ability to analyse and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	1
4	An ability to design and conduct advanced software projects	2
5	An ability to assess applicable methods and their limits	4
6	An ability to identify, find and procure necessary information	5
7	An ability to plan and carry out analytic, model and experimental investigations	5
8	An understanding of the role of engineers in society	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Introduction	
2	Defining the Course	
3	Defining Research	
4	Defining Science	
5	Defining Engineering	
6	Methodology: Scientific Method	
7	Overview of Research Methods	
8	Research Ethics	
9	Literature Review	
10	Report Writing	
11	Report Writing	
12	Report Writing	
13	Presenting Report	
14	Some Guidelines for Thesis Writing and Dissertation	
15	Science and Public	
16		Final

Recommended Sources

- Legendre, Louis (2008) *Scientific Research and Discovery: Processes, Consequences and Practice*, Excellence in Ecology 16, Ed.O.Kinne, Luhe, Germany, Abridged electronic edition Avialable at: http://www.int-res.com/book-series/excellence-in-ecology/ee16/
- Beins, Bernard (2004) *Research Methods*, Pearson/Allyn and Bacon, , ISBN: 0205327710

- Booth, C.W., Gregory G.Colomb, and Joseph F.Williams (2008), The Craft of Research, Third Edition, The university of Chicago Press, Chicago and London, ISBN 0-226-06566-9
- Daly Janesse (1996), *Ethical Intersections*, Allen & Unwin, ISBN: 1864480505
- Davis Stephen, F., (2004), *An Introduction to Statistics and Research Methods*, Pearson/Prentice Hall, ISBN: 0131505114
- Gillham Bill (2000) *Case Study Research Methods*, Continuum, ISBN: 0826447961
- N.J.Salkind, J.Neil (1997) *Exploring Research*, third ed., Prentice Hall, New Jersey, ISBN: 0-13-520636-7
- Rosnow, L.Ralph and Rosenthal Robert (2004), *Beginning Behavioral Research*, fifth ed., Pearson (International Edition), New Jersay, ISBN: 0-13- 114730-7

Assessment

Research Paper	20%	
Presentation	40%	Presentation
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is necessary but not mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	1	30	30
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	-	-	-
Final Examination	1	40	40
Self Study	14	8	112
Total Workload			246
Total Workload/25(h)			9.84

ECTS Credit of the Course	10

MS program, Computer Engineering Department

Course Unit Title	Linear and Nonlinear Programming
Course Unit Code	COM525
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr.Rahib H.Abiyev
Name of Lecturer (s)	Prof.Dr.Rahib H.Abiyev
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Differential Equations

Course description:

Optimization Models Linear Programming . Feasibility and Optimality. Duality and Sensitivity . Representation of Constraints. The Simplex Method . Network Problems. Unconstrained Optimization. Newton's Method. Methods for Unconstrained Optimization. Nonlinear Least-Squares Data Fitting. Optimality Conditions for Constrained Problems. The Lagrange Multipliers and the Lagrangian Function. Optimality Conditions for Nonlinear Constraints . Feasible-Point Methods. Sequential Quadratic Programming. Reduced-Gradient Methods. Penalty and Barrier Methods. Interior-Point Methods for Linear and Convex Programming.

Objectives of the Course:

- Teaching the basic of Linear and Nonlinear Programming
- To understand. Optimization, constrained and unconstrained optimization
- To teach Newton method, Simplex method
- To teach methods of constrained and unconstrained optimization, optimality Conditions for Constrained Problems
- To develop students' skills and dispositions regarding modeling and solution of Linear and Nonlinear Programming Problems
- To develop and apply methods of Linear and Nonlinear Programming for solving real world optimization problems.

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Studying the basic of linear and nonlinear programming.	1,2
2	Understand simplex method used for solution of linear optimization models	1,2
3	Studying Newton method	1,2
4	Studying different methods of constrained and unconstrained optimization	1,2

5	Applying linear and nonlinear programming to solution of the optimisation problems.	1,2
6	Develop different programs for modeling of different linear and nonlinear programming problems	2

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyse and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design and conduct advanced software projects	-
5	An ability to assess applicable methods and their limits	4
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	5
8	An understanding of the role of engineers in society	4

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction. Optimization Models. Linear Programming	
2		Feasibility and Optimality.	
3		Duality and Sensitivity	
4		Optimization problems. Representation of Constraints	
5		The Simplex Method	
6		Solution of examples using the Simplex Method	
7		Network Problems. Network flow problems.	
8		Network Problems using simplex method	Midterm
9		Unconstrained Optimization. Newton's Method	
10		Methods for Unconstrained Optimization. Nonlinear Least-Squares Data Fitting.	
11		Optimality Conditions for Constrained Problems	
12		The Lagrange Multipliers and the Lagrangian Function	
13		Sequential Quadratic Programming.	
14		Feasible-Point Methods	
15		Interior-Point Methods.	
16		Penalty and Barrier Methods.	Final

Recommended Sources

Textbook:

1. Sephen G.Nash, Ariela Sofer.Linear and Nonlinear Programming. McGraw-Hill International Editions. 1996.
2. David G.Luenberger, Yinyu Ye. Linear and Nonlinear Programming. Third edition. New York:

Springer. pp. 546.2008.

Supplementary Course Material

- Set of laboratory works designed by lecturer

Assessment

Attendance	10%	
Assignment	15%	
Midterm Exam	35%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

26. Attendance to the course is mandatory.
27. Late assignments will not be accepted unless an agreement is reached with the lecturer.
28. Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
29. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
30. Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials			
Assignment	6	4	24
Project/Presentation/Report			
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	30	30
Final Examination Study	1	30	30
Self Study	16	6	96
Total Workload			244
Total Workload/25(h)			9.76
ECTS Credit of the Course			10

MSc program, Computer Engineering Department

Course Unit Title	Modern Control Theory
Course Unit Code	COM527
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr. Rahib Abiyev
Name of Lecturer (s)	Prof.Dr. Rahib Abiyev
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Real time systems

Course description:

This course is about control methods that can handle difficult situations or optimize performance. The course presents methods of getting mathematical models directly from data (system identification), so that one can start the control design process. It presents how to construct state estimates in real time based on feedback measurements, to use in modern state feedback control laws (Kalman and least squares filters). Methods of ensuring that the control design will work acceptably in spite of uncertainty in the model are presented (robust control). To optimize performance, design approaches are given that make controllers which can learn from previous experience in order to improve their performance (learning control), or that monitor changes in the system or disturbances and adjust the control actions accordingly (adaptive control). Methods of handling the influence of nonlinearities in the system are also given.

Objectives of the Course:

- To study State-space representation of linear and nonlinear systems
- To understand identification of and control of different dynamic systems
- To use least square method, recursive algorithm, Kalman filter in identification of and control of different systems
- To understand the Linear-quadratic optimal control.
- To understand stability and control problem of nonlinear systems.
- To study adaptive control, control using neural networks
- To demonstrate a broader understanding of the theoretical aspects of control by developing projects.

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	understand identification and control structure for dynamic systems	1,2
2	extend state-space analysis and gains an appreciation of recent advances in control engineering	1,2

3	Use least square method, recursive algorithm, Kalman filter in identification of and control of systems	1,2,3
4	Analyse stability and design control for dynamic plants	1,2,3

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply knowledge of mathematics, science, and programming	3
2	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design program modules to achieve the desired needs within realistic conditions	
5	Planning and carrying out programming experiments, and analyzing and evaluating the results	5
6	Ability to use the mathematical techniques, programming skills and necessary computer tools	4
7	An understanding of professional, ethical, legal, security and social issues and responsibilities that apply to software design.	4
8	An ability to work productively in a multidisciplinary team, in particular to carry out projects involving computer engineering and programming skills.	3
9	An ability to communicate effectively with a range of audiences	1
10	A recognition of the need for, and an ability to engage in life-long learning	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction. Control of systems.	
2		Concept of system identification. Types of system models and relationships. Least squares fit to data	
3		Singular value decomposition, pseudo-inverse, recursive least squares	
4		Least squares filters to reconstruct state, observers	
5		Kalman filters	
6		Recursive system identification, and discrete time adaptive control	
7			Midterm
8		Algorithms for developing a state space model from data	
9		Linear-quadratic optimal control. Predictive control. Liapunov equations and sensitivity derivatives. Eigenvector derivatives	
10		Nonlinear system properties. Liapunov stability, circle criterion, Popov stability	
11		Linear robust control, H-infinity theory,	
12		Nonlinear robust control. Nonlinear adaptive control. Sliding mode control	
13		Learning control, adaptive control.	

14		Disturbance identification and cancellation algorithms. Direct identification of controller gains.	
15		Adaptive Neural Control, System identification and control with Neural Networks.	
16			Final

Recommended Sources

Textbook:

1. William L. Brogan, Modern Control Theory, 3rd ed., Prentice-Hall, Englewood Cliffs, NJ, 1991.
2. Katsuhiko Ogata. Modern Control Engineering (5th Edition) 5th Edition, Prentice-Hall, Englewood Cliffs, NJ,2011.

Supplementary Course Material

Assessment

Attendance	10%	
Assignment	20%	
Midterm Exam	30%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

31. Attendance to the course is mandatory.
32. Late assignments will not be accepted unless an agreement is reached with the lecturer.
33. Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
34. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
35. Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	6	3	18
Project/Presentation/Report	1	30	30
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	27	27
Final Examination Study	1	30	30
Self Study	16	5	80

Total Workload	245
Total Workload/25(h)	9.96
ECTS Credit of the Course	10

MS program, Computer Engineering Department

Course Unit Title	Advanced Microprocessors
Course Unit Code	COM528
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof. Dr. Dogan Ibrahim
Name of Lecturer (s)	Prof. Dr. Dogan Ibrahim
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Computer programming skills

Course description:

Introduction to microprocessors, 8-bit microprocessor architecture, microprocessor programming examples,16-bit microprocessor architecture, 8086 instruction set, programming examples, microprocessor interfacing techniques, memory, input-output, and interrupts. Programming microcontrollers using high level languages (e.g. C)

Objectives of the Course:

- To give the students an opportunity to study and learn the basic architecture and programming of microprocessors
- To gain an appreciation of how the low level languages can be used in programming microprocessors
- To gain experience of using microcontrollers

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Explain the basic architecture of various microprocessor chips	1
2	Explain the basic features of various microcontroller chips	1
3	Describe the differences between microprocessors and microcontrollers	1
4	Explain the features of using a low-level programming language (assembler)	1
5	Explain programming for advanced features using an assembler	1

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyze and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5

4	An ability to design and conduct advanced software projects	5
5	An ability to assess applicable methods and their limits	3
6	An ability to identify, find and procure necessary information	2
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	1

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Principles of microprocessors	
2	The architecture of various microprocessors	
3	The architecture of popular 8-bit microprocessors	
4	Introduction to the PIC family of microcontrollers and explaining the differences between microprocessors and microcontrollers	
5	Program memory, data memory, interrupts, timers, registers	
6	Basic microcontroller based hardware setup	
7		Midterm
8	Introduction to the assembler programming language	
9	Using the assembler instruction set	
10	Assembler directives	
11	Input-output port programming	
12	Assembler programming for the peripheral devices	
13	Interrupt service routines and interrupt programming using the assembler language	
14	Microprocessor based project (hardware and software) design I using the assembler language	
15	Microcontroller based project (hardware and software) design II using the assembler language	
16		Final

Recommended Sources

- Bates, M.P. (2006). Interfacing PIC Microcontrollers: Embedded design with interactive simulation, Newnes, UK.
- Predko, M. (1998). Handbook of Microcontrollers, TAB Electronics Technical Library, McGraw-Hill.

Assessment

Attendance/participation	10%	Less than 25% class attendance results in NA grade
Midterm Exam	40%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for

Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	4	10	40
Project/Presentation/Report	-	-	-
E-learning activities	2	5	10
Quizzes	-	-	-
Midterm Examination	1	8	8
Final Examination	1	8	8
Self Study	14	8	112
Total Workload			242
Total Workload/25(h)			9.68
ECTS Credit of the Course			10

MSc program, Computer Engineering Department

Course Unit Title	Simulation Modeling and Analysis
Course Unit Code	COM530
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	1
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr. Dogan Ibrahim
Name of Lecturer (s)	Prof.Dr. Dogan Ibrahim
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	System simulation

Course description:

Fundamental theoretical concepts of discrete simulation. A selected simulation language to be taught. Overview of analog computer simulation. Review of basic probability and statistics. Selecting input probability distribution, random number generators, output data analysis for a single system, statistical techniques for comparing alternative systems, simulation languages and GPSS.

Objectives of the Course:

- To understand how simulation modeling can be utilized in solving various real world problems
- To design and implement a system model using a simulation language, as well as select the appropriate analysis method
- To understand the randomness in a system and how to model it
- to solve real-life problems by using simulation.
- To demonstrate a broader understanding of the theoretical aspects and basics of simulation modeling, by developing large simulation projects.

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	study simulation principles	1,2
2	create simulation models of various types	1,2,3
3	Analyze and design discrete-event simulation algorithms.	1,2,3
4	Output analysis for discrete-event simulation algorithms.	1,2

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply knowledge of mathematics, science, and	3

	programming	
2	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design program modules to achieve the desired needs within realistic conditions	
5	Planning and carrying out programming experiments, and analyzing and evaluating the results	5
6	Ability to use the mathematical techniques, programming skills and necessary computer tools	4
7	An understanding of professional, ethical, legal, security and social issues and responsibilities that apply to software design.	4
8	An ability to work productively in a multidisciplinary team, in particular to carry out projects involving computer engineering and programming skills.	3
9	An ability to communicate effectively with a range of audiences	1
10	A recognition of the need for, and an ability to engage in life-long learning	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction to simulation, modelling and analysis. Basic Simulation Modeling	
2		Model classification, Building Simulation Models.	
3		Simulation Languages for Modeling. Principles of simulation system design.	
4		Continuous systems modelling. Parallel process modelling. Petri nets and finite automata in simulation.	
5		Simulation Models. Monte Carlo Simulation	
6		Data Collection and Analysis	
7			Midterm
8		Input Modelling, Histograms , Probability Distributions	
		Random-Numbers and Random-Variate Generation.	
9		Output Data Analysis	
10		Model Design, Parallel and Distributed Simulation	
11		Analysis of Finite-Horizon simulations, Analysis of Steady-state simulations	
12		Discrete event simulations. Models o queuing systems.	
13		Simulation and optimisation	
14		Case Study Student Presentations	
15		Review	
16			Final

Recommended Sources

Textbook:

1. A. Law, and Kelton, Simulation Modeling & Analysis, McGraw Hill Publishing Co., 4th Edition, 2007.

Supplementary Course Material

1. J. Banks, J. Carson, B. Nelson, D.Nicol, Discrete-Event System Simulation, 5th edition, Pearson Ed, 2014.
2. Fishwick P.: Simulation Model Design and Execution, PrenticeHall, 1995, ISBN 0-13-098609-7

Assessment

Attendance	10%	
Assignment	25%	
Midterm Exam	30%	Written Exam
Final Exam	35%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

36. Attendance to the course is mandatory.
37. Late assignments will not be accepted unless an agreement is reached with the lecturer.
38. Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
39. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
40. Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	4	5	20
Project/Presentation/Report	1	30	30
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	25	25
Final Examination Study	1	30	30
Self Study	16	5	80
Total Workload			245
Total Workload/25(h)			9.96
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Advanced Microcontroller Programming
Course Unit Code	COM534
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof. Dr. Dogan Ibrahim
Name of Lecturer (s)	Prof. Dr. Dogan Ibrahim
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Computer programming skills

Course description:

Microcontrollers versus microprocessors, microcontroller architectures, types of microcontrollers, microcontroller system development cycle, basic microcontroller programming in C, microcontroller interface programming, microcontroller interrupt handling mechanisms, using external interrupts, using timer interrupts, microcontroller C programming in real-time, advanced real-time programming for parallel and serial input-output, microcontroller busses, microcontroller system design examples using C.This course is programming microcontrollers using high level languages (e.g. C)

Objectives of the Course:

- To give the students an opportunity to study and learn the programming techniques of microcontrollers
- To gain an appreciation of how the high level languages can be used to program microcontrollers
- To gain experience of using advanced features such as interrupts and timers in high level languages

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Explain the basic features of microprocessors	1
2	Explain the basic features of microcontrollers	1
3	Describe the differences between microprocessors and microcontrollers	1
4	Explain the features of a C language for microcontrollers	1
5	Explain programming for advanced features	1

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of	3

	mathematic-scientific and engineering principles	
2	An ability to analyze and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	5
5	An ability to assess applicable methods and their limits	3
6	An ability to identify, find and procure necessary information	2
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	1

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Principles of microprocessors	
2	Differences between microprocessors and microcontrollers	
3	Introduction to various microcontroller architectures	
4	Introduction to the PIC family of microcontrollers	
5	Program memory, data memory, interrupts, timers	
6	Basic microcontroller based hardware setup	
7		Midterm
8	Introduction to the mikroC programming language	
9	mikroC data types, operators, conditional operators	
10	Arrays, structures, unions, pointers	
11	Input-output port programming	
12	Programming for the Timers	
13	Interrupt service routines and interrupt programming	
14	Microcontroller based project (hardware and software) design I	
15	Microcontroller based project (hardware and software) design II	
16		Final

Recommended Sources

- Ibrahim,D. (2014). PIC Microcontroller Projects: Basic to Advanced, Newnes, UK.

Assessment

Attendance/participation	10%	Less than 25% class attendance results in NA grade
Midterm Exam	40%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	2	15	30
Project/Presentation/Report	-	-	-
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	9	9
Final Examination	1	9	9
Self Study	14	9	126
Total Workload			238
Total Workload/25(h)			9.52
ECTS Credit of the Course			10

MSc program, Computer Engineering Department

Course Unit Title	Machine learning
Course Unit Code	COM535
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr. Rahib Abiyev
Name of Lecturer (s)	Prof.Dr. Rahib Abiyev
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Introduction to Artificial Intelligence

Course description:

This course provides a broad introduction to machine learning. Supervised learning- generative/discriminative learning, parametric/non-parametric learning, neural networks, support vector machines; Unsupervised learning- clustering, dimensionality reduction, kernel methods; Learning theory- bias/variance tradeoffs; VC theory; large margins; reinforcement learning and adaptive control. The course will also discuss recent applications of machine learning, such as to robotic control, data mining, autonomous navigation, bioinformatics, speech recognition, and text and web data processing.

Objectives of the Course:

- To study theory, and the practice of learning.
- To understand range of learning algorithms, supervised and unsupervised algorithms
- To use supervised learning algorithm for learning systems.
- To train simple problems using unsupervised learning algorithm , k-means clustering.
- To demonstrate a broader understanding of the theoretical aspects of machine learning algorithms

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	use supervised learning, such as LMS or backpropagation in the parameter update of the system	1,2,3
2	use unsupervised learning, such as k-means algorithm in the parameter update of the system	1,2,3
3	Prepare project using machine learning algorithms (given by the instructor)	1,2,3
4	determine when learning is likely to succeed, when it is cost-effective, and when to use which learning algorithm	1,2,3

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply knowledge of mathematics, science, and	3

	programming	
2	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design program modules to achieve the desired needs within realistic conditions	
5	Planning and carrying out programming experiments, and analyzing and evaluating the results	5
6	Ability to use the mathematical techniques, programming skills and necessary computer tools	4
7	An understanding of professional, ethical, legal, security and social issues and responsibilities that apply to software design.	4
8	An ability to work productively in a multidisciplinary team, in particular to carry out projects involving computer engineering and programming skills.	3
9	An ability to communicate effectively with a range of audiences	1
10	A recognition of the need for, and an ability to engage in life-long learning	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction to Machine learning. Model and Cost Function, Parameter learning	
2		Linear Regression with one and Multiple Variables. Regression Model	
3		Supervised Learning, LMS, recursive LMS	
4		Multilayer Perceptrons. Perceptron learning	
5		Non-parametric methods. Linear Discrimination.	
6		Neural network learning, Cost Function and parameters. backpropagation	
7			Midterm
8		Support vector machines. Kernels	
9		Unsupervised learning. Clustering, K-means clustering.	
10		Dimensionality Reduction Principal Component Analysis	
11		Factor analysis model	
12		Learning theory. derivative based, derivative free learning. Genetic Algorithms	
13		Reinforcement Learning	
14		Linear quadratic regulation (LQR). LQG. Q-learning. Value function approximation	
15		Project presentation	
16			Final

Recommended Sources

1. Stephen Marsland. Machine Learning: An Algorithmic Perspective. 2011 by Chapman and Hall/CRC,p. 406

2. Tom Mitchell, Machine Learning, McGraw Hill, 1997.

Supplementary Course Material

1. Bishop, C. (2006). Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.

Assessment

Attendance	10%	
Assignment	20%	
Midterm Exam	30%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

41. Attendance to the course is mandatory.
42. Late assignments will not be accepted unless an agreement is reached with the lecturer.
43. Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
44. Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
45. Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	6	3	18
Project/Presentation/Report	1	30	30
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	27	27
Final Examination Study	1	30	30
Self Study	16	5	80
Total Workload			245
Total Workload/25(h)			9.96
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Machine Vision
Course Unit Code	COM536
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Assist.Prof.Dr. Boran Şekeroğlu
Name of Lecturer (s)	Assist.Prof.Dr. Boran Şekeroğlu
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Computer programming skills

Course description:

Image, its properties, analysis, preprocessing. Shape representation. Shape Description Techniques,Regions and Edges. Curves and surfaces. Dynamic vision. Object recognition, Image understanding. 3D vision. Geometry and radiometry of 3D vision. Mathematical morphology of machine vision. Robot Vision and Programming, Pattern Matching Techniques, Motion analysis. Problems Using C and Matlab. Laboratory Experiments.

Objectives of the Course:

- To give the students an opportunity to study and learn advanced concepts of Image Processing.
- To implement advanced image processing methods and algorithms to solve real-life problems.

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Implement machine vision techniques	2
2	Understand the theoretical aspects of machine vision	1
3	Analyze and compare machine vision applications	2
4	Summarize current researches and developments in real life applications	3

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyse and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	4

4	An ability to design and conduct advanced software projects	2
5	An ability to assess applicable methods and their limits	4
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	5
8	An understanding of the role of engineers in society	3

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Introduction to Computer Vision	
2	Image Acquisition and Representation	
3	Segmentation Problem	
4	Image Analysis	
5	Shape Description Techniques	
6	Review	
7		Midterm
8	Robot Vision and Programming	
9	Robot Vision and Programming	
10	Pattern Matching Techniques	
11	Pattern Matching Techniques	
12	Real-time Pattern Recognition Systems	
13	Review	
14	Review	
15		
16		Final

Recommended Sources

- E.R. Davies, "Computer and Machine Vision: Theory, Algorithms, Practicalities", Fourth Edition.

Assessment

Assignments	25%	Programming and Research
Midterm Exam	30%	Written Exam
Final Exam	45%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	-	-	-
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	14	8	112
Total Workload			236
Total Workload/25(h)			9.44
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Software Architecture
Course Unit Code	COM537
Type of Course Unit	Elective
Level of Course Unit	Master's Degree (Second Cycle)
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	-
Name of Lecturer (s)	-
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	
Recommended Optional Programme Components	

Course description:
Introduction to Software Architecture, Stakeholders and Their Business Goals, Software Quality Attributes, Middleware Architectures and Technologies, Service-Oriented Architectures and Technologies, Software Architecture Process, Documenting, Semantic Web, Aspect Oriented Architectures, Model-Driven Architecture, Software Product Lines.

Objectives of the Course:

- to provide an overview of software architecture
- to design and implementation of an application

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Analyze, evaluate and compare software architectures	1, 2
2	Apply different software techniques and documentation	1, 2, 3

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	5
2	An ability to analyze and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	5
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	5

7	An ability to plan and carry out analytic, model and experimental investigations	5
8	An understanding of the role of engineers in society	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Introduction to e-Government	
2	Stakeholders and Their Business Goals	
3	Software Quality Attributes, Case Study	
4	Middleware Architectures and Technologies	
5	Service-Oriented Architectures and Technologies	
6	Advanced Middleware Technologies	
7	Software Architecture Process	
8		Midterm
9	Documenting a Software Architecture	
10	Case Study Design, Middleware Case Study	
11	Semantic Web	
12	Aspect Oriented Architectures	
13	Model-Driven Architecture	
14	Software Product Lines	
15	Review of the Semester	
16		Final

Recommended Sources

- Ian Gorton, Essential Software Architecture, Second Edition, Springer-Verlag, 2011
- Raghvinder S. Sangwan, Software and Systems Architecture in Action, CRC Press, 2014
- Simon Brown, Software Architecture for Developers, Leanpub, 2014

Assessment

Project	20%	
Assignments	20%	
Attendance/participation	-	
Midterm Exam	20%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for graduate Studies

Course Policies

- Attendance to the course is necessary but not mandatory.

- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations
- Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	2	15	30
Project/Presentation/Report	1	40	40
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	20	20
Final Examination	1	30	30
Self Study	14	8	112
Total Workload			296
Total Workload/30(h)			9.87
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Data Mining
Course Unit Code	COM538
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Assist. Prof. Dr Ümit İlhan
Name of Lecturer (s)	Assist. Prof. Dr Ümit İlhan
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Database Design Skills

Course description:

Introduction, Machine Learning and Classification, Input, Output, Preparing the data and mining it, Classification, Evaluation and Credibility, Data Preparation for Knowledge Discovery, clustering, Associations, Visualization, Summarization and Deviation Detection, Applications.

Objectives of the Course:

- To give information about Data Mining Concepts.
- To teach methods and tools that would be used for analyzing and interpreting various types of data.
- To introduce different methods of classification of data and decision making.

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Understand statistical analysis methods and concepts	1
2	Identify various data types and formats and how data is collected	1
3	Analyze various data sets using different analysis methods and interpret results	1
4	Learn basic data mining concepts such as clustering, classification, prediction	1
5	Learn how to use a quantitative data analysis software tool	1

Assessment Methods: 1. Written Exam, 2. Project/Report, 3. Presentation

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyse and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5

4	An ability to design and conduct advanced software projects	3
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	2

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Introduction. Data collecting, basic formats	
2	Data summarization and exploration	
3	Basic statistical concepts and methods	
4	Data mining concepts	
5	Data preprocessing and preperation techniques	
6	Classification methods and statistical learning theory	
7	Clustering methods (kmeans, hierarchical)	
8	Examination	Midterm
9	Decision trees and decision rules	
10	Association rules	
11	Regression models	
12	Feature selection models	
13	Data Warehousing	
14	Multicriteria decision making techniques	
15	Web Data Mining	
16	Examination	Final

Recommended Sources

- J. Han, M. Kamber, and J. Pei, Data Mining: Concepts and Techniques, Second Edition, 3rd Ed. 2012
- I.H.Witten, E. Frank, M.A. Hall, Data Mining, Practical Machine Learning Toolls and Techniques 3rd Ed. 2011

Assessment

Attendance/participation	-	-
Project/Presentation	30%	
Midterm Exam	30%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	1	50	-
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	30	30
Self Study	14	8	112
Total Workload			286
Total Workload/30(h)			9.53
ECTS Credit of the Course			10

MSc program, Computer Engineering Department

Course Unit Title	Advanced Data Communication and Networking
Course Unit Code	COM539
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	1
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr.Fahreddin Sadikoglu
Name of Lecturer (s)	Prof.Dr.Fahreddin Sadikoglu
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Advanced Data Communication and Networking

Course description:

The course covers advanced concepts of the analysis and design of data networks and their operation; architecture, media, communication channel characteristics, routing, protocols and protocol architecture, including modeling and performance analysis. Includes network simulation.

Objectives of the Course:

- Introduce the student to advanced networking concept
- Describe the functionality of networking components
- Explains networking protocols such as TCP/IP and HTTP Articulate how the Internet Protocol is implemented in a network
- Describe how routers and routing protocols operate
- Allow the student to gain expertise in the design and maintenance of individual networks

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Independently understand data communication systems, computer networks	1,2
2	Identify and use network protocols , apply them in networking	1,2
3	creatively analyze networks, select components of networks for particular application	1,2
4	develop applications that use network components and devices to provide a business with internetworking capabilities	1,2,3
5	describe current and emerging interests in advanced data communication and networking	1,2

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply knowledge of mathematics, science, and programming	3
2	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design program modules to achieve the desired needs within realistic conditions	
5	Planning and carrying out programming experiments, and analyzing and evaluating the results	5
6	Ability to use the mathematical techniques, programming skills and necessary computer tools	4
7	An understanding of professional, ethical, legal, security and social issues and responsibilities that apply to software design.	4
8	An ability to work productively in a multidisciplinary team, in particular to carry out projects involving computer engineering and programming skills.	3
9	An ability to communicate effectively with a range of audiences	1
10	A recognition of the need for, and an ability to engage in life-long learning	5
CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)		

Course Contents

Week	Chapter	Topics	Exam
1		Introduction to data Networks	
2		Communication and techniques in a layered network architecture	
3		IP addressing, DNS, HTTP, peer-to-peer systems, socket programming	
4		Types of communication, network congestion,	
5		Network transport architectures, TCP, UDP, TCP congestion control	
6		Protocols, TCP/IP. Subnetting	
7		Routing, Routing algorithms, RIP,OSPF,IGRP, BGIP	Midterm
8			
		Local area networks, Ethernet and WiFi, Wireless communication, Bluetooth, RFID	
9		Multicasting.	
10		IP multicast protocols	
11		Multi-protocol label switching	
12		Multi-protocol label switching	
13		Multimedia communications and quality of service. QoS Networks, Network measurement, inference, and management	
14		Network experimentation and performance analysis	

15		Review	
16			Final

Recommended Sources

Textbook:

1. Behrouz A Forouzan.Data Communications and Networking, 3/e,
2. James F. Kurose and Keith W. Ross. Computer Networking - A Top Down Approach, 6th edition, Addison-Wesley. ISBN-10: 0-13-285620-4 (5th, 4th editions also OK)

Supplementary Course Material

1. Bill Buchanan. Advanced Data Communications and Networks Paperbackm Chapman Hall, 1998

Assessment

Attendance	10%	
Assignment	25%	
Midterm Exam	30%	Written Exam
Final Exam	35%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
- Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	5	4	20
Assignment	4	4	16
Project/Presentation/Report	1	30	30
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	25	25
Final Examination Study	1	30	30
Self Study	16	4	64
Total Workload			245

Total Workload/25(h)	9.96
ECTS Credit of the Course	10

BS program, Computer Engineering Department

Course Unit Title	Advanced Computer System Architecture
Course Unit Code	COM540
Type of Course Unit	Elective
Level of Course Unit	Master Degree
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	Spring
Course Coordinator	Prof. Dr Dogan Ibrahim
Name of Lecturer (s)	Prof. Dr Dogan Ibrahim
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	COM256 Computer Architectue and Organisation
Recommended Optional Programme Components	

Course description:

This course deals with the design and performance evaluation of advanced/highperformance computer systems. The emphasis is on microprocessors, chip-multiprocessors and memory hierarchy design. Data storage and low-power dissipation schemes presented. Special attention is paid to pipelining, ILP (instruction-level parallelism), DLP (data-level parallelism) and TLP (thread-level parallelism) using hardware and/or software techniques to yield high performance. Multicore systems, Multiprocessors, distributed processing. Grid and Cloud computing.

Objectives of the Course:

- fundamental knowledge of computer hardware and computer systems, with an emphasis on system design and performance
- to understand the principles of organisation computer systems and operation of a memory hierarchy
- to understand the organisation of current generation parallel computer systems

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Understand the inner workings and performance capabilities of advanced microprocessors.	1,2
2	An ability to evaluate hardware accelerators targeting at applications with substantial data-leve parallelism (DLP).	1,2
3	Learn software-driven techniques to match application requirements to available pipelined hardware in order to obtain high performance.	1,2,3
4	An ability to design microprocessor-based systems by accounting for performance and power dissipation.	2,3,4
5	An ability to anticipate hardware performance improvements based on established rules from past experiences with computer technology.	1,2,3
6	Learn the multiscalar, superpipelined, multithreaded, simultaneous multithreaded, vector, and multicore processors.	1,2,3,4
7	Understand the forces behind the computer industry's shift to multicore processors.	1,2

8	An ability to design advanced memory hierarchies.	1,2,3,4,5
9	An ability to select appropriate computer systems for given application domains.	1,2,3

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	Ability to understand and apply knowledge of mathematics, science, and engineering	3
2	An ability to analyze a problem, identify and define the computing requirements appropriate to its solution	3
3	An ability to apply mathematical foundations, algorithmic principles, and computer engineering techniques in the modelling and design of computer-based systems	3
4	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social aspects	5
5	Planning and carrying out experiments, as well as to analyze and interpret data	3
6	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice	5
7	An understanding of professional, ethical, legal, security and social issues and responsibilities that apply to engineering	5
8	An ability to work productively in a multidisciplinary team, in particular to carry out projects involving computer engineering skills	5
9	An ability to communicate effectively with a range of audiences	5
10	A recognition of the need for, and an ability to engage in life-long learning	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction, History of Calculation and Computer Architecture	
2		Influence of Technology and Software on Instruction Sets Complex Instruction. Set Evolution: Stack and GPR Architectures	
3		Multiprogramming, Pipelining. Pipline hazards.	
4		Pipelining. Pipline hazards.	
5		Multilevel Memories, Caches, Cache optimisation	
6		Virtual memory. Performance optimisation	
7		Instruction level paralelisim. Instruction scheduling	
8			Midterm
9		Parallelism, Instruction level Parallelism (ILP), dependences and Its Exploitation	
10		Data level Parallelism, Vector, SIMD, GPU architectures	
9		Thread level Parallelism, Multicore systems	
10		Thread level Parallelism, Multicore systems	
13		Multiprocessors, distributed memory processors, shared memory, centralised shared memory, distributed shared memory,	
14		Cluster, Grid and Cloud computing	
15		Review	
16			Final

Recommended Sources

Textbooks:

- J.L.Hennesy and D.A.Patterson, Computer Architecture A Quantitative Approach, 5th or later Edition, Morgan Kaufmann Publishers, 2012

Supplementary Course Material

- Michel Dubois, Murali Annavaram, and Per Stenström. Parallel Computer Organization and Design. Cambridge University Press, 2012.
- Patterson, D. A., and J. L. Hennessy. *Computer Organization and Design: The Hardware/Software Interface*, 3rd ed. San Mateo, CA: Morgan Kaufman, 2004. ISBN: 1558606041.

Assessment

Attendance	10%	
Assignment	10%	
Quizzes	-	
Presentation	-	
Project	-	
Midterm Exam	30%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is necessary but not mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
- Students must upload their homework and project to a Web Server.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	4	10	40
Project/Presentation/Report	-	-	-
E-learning activities	2	5	10
Quizzes	-	-	-
Midterm Examination	1	8	8
Final Examination	1	8	8

Self Study	14	8	112
Total Workload			242
Total Workload/25(h)			9.68
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Advanced Software Engineering
Course Unit Code	COM541
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof. Dr. Adil Amirjanov
Name of Lecturer (s)	Prof. Dr. Adil Amirjanov
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Computer programming skills

Course description:

This course is designed to present students with an overview of advanced topics in Software Engineering. The course will describe modern methods of software development, process models, assessment methodologies and tools. Different concepts in software engineering covering an overview of topics in software life cycle, project planning, software management, requirements capture and analysis, human factors, functional specification, software architecture, design methods, programming for reliability and maintainability, testing methods, configuration management, system delivery and maintenance, process and product evaluation and improvement and project documentation. Approaches for software development, namely the structured paradigm and the object-oriented paradigm, will be discussed. Software process, software life-cycle models and phases using objected-oriented approaches will be emphasized.

Objectives of the Course:

- To develop the students expertise and skills in software engineering
- To convey an understanding of the essential elements of software measurement and testing
- To analyze and apply different system models in software design
- To explore the practice of software architecting as applied to the development of enterprise systems

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Describe, apply and critique several well-known software metrics	1
2	Apply several well-known models to present software system from different perspective	1
3	Apply an advanced knowledge of the issues, techniques and processes involved in architecture design	1
4	Employ the UML superstructure for software design	
5	Describe and apply several well-known software testing techniques	1

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	4
2	An ability to analyze and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	5
5	An ability to assess applicable methods and their limits	5
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	4

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Introduction. Software Development Models.	
2	Functional and non-functional requirements. Software metrics. Measurable requirements.	
3	System models: Context models, Process models, Behavioural models, etc.	
4	Object models. Software design with UML.	
5	Use-case and class diagrams.	
6	Interaction and activity diagrams.	
7		Midterm
8	State and package diagrams.	
9	Software architectural design.	
10	Repository and Pipeline architectures.	
11	Client-Server and Layered architectures	
12	Common Object Request Broker Architecture (CORBA)	
13	Specification and model-based testing.	
14	Domain and domain matrix testing	
15	Integration, system and acceptance testing.	
16		Final

Recommended Sources

- R.S. Pressman, "Software Engineering: a Practitioner's Approach", McGraw–Hill, 2001.
- Sommerville, "Software Engineering", Addison-Wesley, 2007.
- K. Naik, P. Tripathy, Software testing and quality assurance: Theory and practice, Wiley, 2008.
- G. Booch, J. Rumbaugh, I. Jacobson, "The Unified Modeling Language User Guide", Addison Wesley, Reading MA, 1999.

- Pierre-Alain Muller, “Instant UML”, Wrox Press Ltd., 2000.
- W. Boggs, M. Boggs, “UML with Rational Rose”, BPB Publications, 1999.

Assessment

Attendance/participation	10%	Less than 25% class attendance results in NA grade
Midterm Exam	40%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Students may use calculators during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	-	-	-
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination	1	30	30
Final Examination	1	35	35
Self Study	14	8	112
Total Workload			241
Total Workload/25(h)			9.64
ECTS Credit of the Course			10

MSc program, Computer Engineering Department

Course Unit Title	Autonomous Robotics
Course Unit Code	COM542
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Prof.Dr. Rahib Abiyev
Name of Lecturer (s)	Prof.Dr. Rahib Abiyev
Name of Assistant (s)	
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Robotics

Course description:

Introduce the student to advance topics in autonomous robotics. This should be of interest to graduate students in computer engineering working in robotics or intelligent control and machine learning as applied to robotics at NEU. Different kinds of information processing techniques and control architectures will be considered. The topics include localization and mapping. sensing and control ideas, path planning, obstacle avoidance, navigation. Vehicles (or robots) motion modelling and control. The intelligent aspect of mobile robots will be the focus. Emphasis is on hands-on implementation with soccer robots as test beds.

Objectives of the Course:

- To study design principles of autonomous robots (vhecles).
- To study Robotic Perception, Motion, and Control
- To study localization and mapping algorithms to enable vehicles to navigate in unknown environment
- To study path planning and obstacle avoidance algorithms of mobile robots.
- To demonstrate a broader understanding of the theoretical aspects of robot motion algorithms

Learning Outcomes

At the end of the course the student should be able to		Assessment
1	Design robotic workcell.	1,2,3
2	Develop motion and measurement models for various vehicles and robots	1,2,3
3	Program robots to perform complex motions and paths	1,2,3
4	Work safely in a team environment	1,2,3

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply knowledge of mathematics, science, and programming	3
2	An ability to analyze a problem, identify and define the computing requirements	5

	appropriate to its solution	
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design program modules to achieve the desired needs within realistic conditions	
5	Planning and carrying out programming experiments, and analyzing and evaluating the results	5
6	Ability to use the mathematical techniques, programming skills and necessary computer tools	4
7	An understanding of professional, ethical, legal, security and social issues and responsibilities that apply to software design.	4
8	An ability to work productively in a multidisciplinary team, in particular to carry out projects involving computer engineering and programming skills.	3
9	An ability to communicate effectively with a range of audiences	1
10	A recognition of the need for, and an ability to engage in life-long learning	5

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1		Introduction to autonomous robotics	
2		Coordinate Transforms and Motion Modeling	
3		Robotic Perception, Motion, and Control	
4		Robotic Control,	
5		Simultaneous Localization and Mapping	
6		Path-Planning and Navigation	
7			Midterm
8		Motion Planning: Potential field method	
9		Motion Planning: PRM, RRT + variants	
10		Obstacle avoidance	
11		Adaptive algorithms. adaptive control of robots	
12		Supervised and unsupervised learning	
13		Markov Decision Processes & Reinforcement learning	
14		Case Study: Robots, Soccer robots, Quadrotor Helicopters, Review	
15		Project presentation	
16			Final

Recommended Sources

1. Siegwart, R., Nourbakhsh, I. R., & Scaramuzza, D. (2011). Introduction to Autonomous Mobile Robots (Intelligent Robotics and Autonomous Agents), 2 nd Ed., the MIT Press, Cambridge, MA.

Supplementary Course Material

1. Choset, H., Lynch, K. M., Hutchinson, S., Kantor, G., Burgard, W., Kavraki, L. E., & Thrun, S. (2005). Principles of Robot Motion: Theory, Algorithms, and Implementations (Intelligent Robotics and Autonomous Agents), the MIT Press, Cambridge, MA
2. Ronald C Arkin: Behavior-based Robotics, MIT press, 1998

3. Robin R. Murphy: Introduction to AI Robotics, MIT Press, 2000

Assessment

Attendance	10%	
Assignment	20%	
Midterm Exam	30%	Written Exam
Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Undergraduate Studies

Course Policies

- Attendance to the course is mandatory.
- Late assignments will not be accepted unless an agreement is reached with the lecturer.
- Students cannot use text books during exam. Cell phones and computers must be switched off during the exam.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations.
- Attacks performed against University/lecturer resources are expressly prohibited.

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	16	4	64
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	1	48	48
E-learning activities	-	-	-
Quizzes	-	-	-
Midterm Examination Study	1	27	27
Final Examination Study	1	30	30
Self Study	16	5	80
Total Workload			245
Total Workload/25(h)			9.96
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Theory of Computation
Course Unit Code	COM555
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	10
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Assist. Prof. Dr. Melike Şah Direkoğlu
Name of Lecturer (s)	Assist. Prof. Dr. Melike Şah Direkoğlu
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	

Course description:

Introduction to theory of computation, automata theory, computability theory and complexity theory. Mathematical notions, terminology and definitions. Definition and examples of finite automata, designing finite automata and regular expressions. Turing machines, Church-Turing thesis, decidability and reducibility. Complexity theory: Classes P, NP and NP-Completeness.

Objectives of the Course:

- To give the students an opportunity to study the theory of computation and its concepts
- To learn automata theory (deterministic, nondeterministic), computability theory and complexity theory (Classes P, NP and NP-Completeness)
- To understand how to design finite automata
- To learn the principles of Turing machines, Church-Turing thesis, decidability and reducibility

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Identify basic mathematical notions, terminology, definitions, theorems and proofs.	1, 3
2	Explore and design finite automata and convert regular expressions to finite state automaton.	1, 3
3	Inspect Turing Machines, its extensions and Church-Turing thesis.	1, 3
4	Identify limits of computability and can determine whether a problem is decidable or not (undecidable).	1, 3
5	Have ability to formally determine time space complexity classes (P, NP, NP-Complete) of decidable problems.	1, 3

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program		
		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	4
2	An ability to analyze and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	4
4	An ability to design and conduct advanced software projects	2
5	An ability to assess applicable methods and their limits	4
6	An ability to identify, find and procure necessary information	3
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	3
CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)		

Course Contents		
Week	Topics	Exam
1	Introduction to the theory of computation. Basic concepts	
2	Terminology and Definitions. Set Theory, Graph Theory, Functions and Relations	
3	Deterministic and Nondeterministic Finite Automata (DFA and NFA), Designing DFA and NFA.	
4	Automata and Languages	
5	Converting NFA to Equivalent DFA	
6	Regular Languages, Regular Operations and Proofs with NFA	
7		Midterm
8	Regular Expressions, Converting Regular Expression to Equivalent NFA	
9	Undecidable Problems and Reducibility	
10	Turing Machines (TMs), Turing Machine Variants; Multitape TMs, Nondeterministic TMs, Enumerators	
11	Algorithms, Hilbert's Theorem, Church-Turing Thesis	
12	Computational Complexity; Space Complexity, Time Complexity	
13	Time Complexity; Class P, Class NP and NP Completeness	
14	Analyzing Time Complexity of Algorithms using TMs	
15		Final

Recommended Sources

- M.Sipser, *Introduction to the Theory of Computation*, PWS Publishing Company, 2004, 2nd edition.

Assessment		
Projects and Class Presentations	30%	
Midterm Exam	30%	Written Exam

Final Exam	40%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Graduate Studies

Course Policies

- Attendance to the course is mandatory.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (excluding Exam weeks)	14	4	56
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	3	30	90
E-learning activities	14	1	14
Quizzes	-	-	-
Midterm Examination	1	20	20
Final Examination	1	30	30
Self Study	14	3	42
Total Workload			252
Total Workload/25(h)			10.08
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Semantic Web Technologies
Course Unit Code	COM556
Type of Course Unit	Elective
Level of Course Unit	MSc program
National Credits	3
Number of ECTS Credits Allocated	11
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	Assist. Prof. Dr. Melike Şah Direkoğlu
Name of Lecturer (s)	Assist. Prof. Dr. Melike Şah Direkoğlu
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programme Components	Computer programming skills

Course description:

In this course students will be introduced to the Semantic Web vision, as well as, the languages and tools useful in Semantic Web programming. They will understand how this technology revolutionizes the World Wide Web and its uses. Ontology languages (RDF, RDF-S and OWL) and technologies (explicit metadata, ontologies, logic, and inference) will be covered. In addition, students will be exposed to; ontology engineering, application scenarios, Semantic Web Query Languages, Description Logic and state of the art Semantic Web applications, such as linked data development. Student will also learn how to develop semantic applications with Java and Jena APIs.

Objectives of the Course:

- To give the students an opportunity to study and learn Semantic Web vision and its importance
- To learn the fundamental technologies of the Semantic Web, such as XML, RDF, RDFS, OWL, ontology engineering, SPARQL queries and description logic
- To learn the state-of-the-art Semantic Web applications
- To gain an experience of developing a real-world Semantic Web application using Semantic Web technologies and programming skills

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Understand the concept structure of the Semantic Web technology and how this technology revolutionizes the World Wide Web and its uses	1, 2, 3, 4
2	Understand the concepts of metadata, semantics of knowledge, resource and ontology descriptions in XML, RDF and web ontology language (OWL)	1, 2, 3
3	Understand and use Semantic Web query languages (SPARQL)	1, 2, 3
4	Use ontology engineering approaches in semantic applications	1, 2, 3, 4
5	Develop semantic applications for real-world use cases	2, 3, 4

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program

		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	3
2	An ability to analyze and solve problems scientifically	4
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	5
5	An ability to assess applicable methods and their limits	4
6	An ability to identify, find and procure necessary information	4
7	An ability to plan and carry out analytic, model and experimental investigations	5
8	An understanding of the role of engineers in society	3

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Topics	Exam
1	Semantic Web – Introduction and Vision	
2	Structured Web Documents – XML, RDF	
3	RDF (cont.), RDFS	
4	Web Ontology Language - OWL	
5	Ontology Engineering (Protégé)	
6	Ontology Engineering (cont. with Protégé OWL API)	
7	Discovering Information – Querying (SPARQL)	
8	SPARQL (cont.)	
9	State of the art Semantic Web Applications (E-learning, etc.)	
10	Description Logic	
11	Reasoning (Fact++); Rules (SWRL)	
12	Building Semantic Web Applications (Apache Jena Framework)	
13	Building Semantic Web Applications (cont.)	
14	Linked Data development and its applications	
15		Final

Recommended Sources

Textbooks

- A Semantic Web Primer, third edition, MIT Press, 2012, Grigoris Antoniou, Paul Groth, Frank van Harmelen and Rinke Hoekstra, http://mitpress.mit.edu/books/semantic-web-primer-0
- The XML 1.1 Bible, 3rd edition. Wiley, Hoboken, NJ 2004, Elliotte Rusty Harold, http://www.cafeconleche.org/books/bible3/
- The Description Logic Handbook, Cambridge University Press, 2003, Franz Baader (Ed.), http://www.cambridge.org/uk/catalogue/catalogue.asp?isbn=0521781760
- Handbook of Research on Emerging Rule-Based Languages and Technologies: Open Solutions

and Approaches (2 Volumes), IGI Global, Hershey, PA, 2009, Adrian Giurca, Dragan Gasevic, Kuldar Taveter (Eds.), http://www.igi-global.com/reference/details.asp?ID=34422

- Advances in Semantic Computing, e-Book, Technomathematics Research Foundation, 2010, Manish Joshi, Harold Boley, Rajendra Akerkar (Eds.), http://www.tmrfindia.org/eseries/ebookV2.html

Other Resources

Here are some recommended tools for use in this class.

- Protégé: An excellent ontology editor, http://protege.stanford.edu/
- Fact++: A GPL-licensed OWL-DL reasoner, http://owl.man.ac.uk/factplusplus/
- Jena - A Java framework for building Semantic Web applications. Includes RDF and OWL APIs, and the ability to read/write RDF/XML into these APIs, http://jena.apache.org/

Journals

- Journal of Web Semantics, Elsevier B.V., T. Finin, R. Mizoguchi, S. Staab (Eds.), http://www.journals.elsevier.com/journal-of-web-semantics/
- International Journal On Semantic Web and Information Systems, IGI Global, Hershey, PA, B. Amit Sheth, Gottfried Vossen, Martin Hepp (Eds.) http://www.ijswis.org/
- *Semantic Web – Interoperability, Usability, Applicability,* Pascal Hitzler, Krzysztof Janowicz (Eds.) http://www.semantic-web-journal.net/

Websites

- *W3C Semantic Web Activity*, http://www.w3.org/2001/sw/
- W3C *RDF Working Group,* http://www.w3.org/2011/rdf-wg/wiki/Main_Page
- W3C *OWL Working Group,* http://www.w3.org/2007/OWL/wiki/OWL_Working_Group
- W3C *RIF Working Group,* http://www.w3.org/2005/rules/wiki/RIF_Working_Group
- *RuleML,* http://ruleml.org/
- *semanticweb.org,* http://semanticweb.org
- *SemWebCentral,* http://www.semwebcentral.org/
- W3Schools, http://www.w3schools.com/
- Linked Data Platform Working Group, http://www.w3.org/2012/ldp/wiki/Main_Page
- W3C Government Linked Data Working Group, http://mayor2.dia.fi.upm.es/oeg-upm/index.php/en/standardization-activities/185-w3c-sparql-working-group

Assessment

Assignments and presentations	20%	
Project including class presentation	50%	
Final Exam	30%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Near East University Academic Regulations for Graduate Studies

Course Policies

- Attendance to the course is mandatory.
- Cheating and plagiarism will not be tolerated. Cheating will be penalized according to the Near East University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (excluding exam weeks)	14	4	56
Labs and Tutorials	-	-	-
Assignment	3	20	60
Project/Presentation/Report	1	50	50
E-learning activities	14	2	28
Quizzes	-	-	-
Midterm Examination	-	-	-
Final Examination	1	20	20
Self Study	14	3	42
Total Workload			256
Total Workload/25(h)			10.24
ECTS Credit of the Course			10

MS program, Computer Engineering Department

Course Unit Title	Graduate Seminar
Course Unit Code	COM591
Type of Course Unit	Compulsory
Level of Course Unit	MS program
National Credits	NC (non-credit)
Number of ECTS Credits Allocated	20
Theoretical (hour/week)	-
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	-
Semester when the course unit is delivered	-
Course Coordinator	-
Name of Lecturer (s)	-
Name of Assistant (s)	-
Mode of Delivery	Report, Presentation
Language of Instruction	English
Prerequisites	Passing 7 courses of MS program with CGPA ≥ 3.0
Recommended Optional Programme Components	

Course description:

This course will engage students in actual research in computer engineering. Graduate seminar is a written work on a specific topic prepared and orally presented by graduate students and assessed by the supervisor. The supervisor of the graduate seminar is the supervisor of the MS thesis. The topics covered in graduate seminar are the same that will be presented in MS thesis. Graduate seminar should cover several (3-4, or more) related scientific papers in a given area with some conclusions for a research that will be done in MS thesis.

Objectives of the Course are:

- To provide instruction in qualitative research methods
- To provide hands on research experience
- To achieve an experience in critical scientific literature review
- To gain an understanding of the topics that need to be covered in details in MS thesis
- To obtain an experience for orally presenting and documenting a seminar.

Learning Outcomes

After completing the course the student will be able to		Assessment
1	Apply different research methods	3, 4
2	Make review and interpretation of scientific literature	3, 4
3	Collect and analyze data for the research topics	3, 4
4	Identify direction of a research in MS thesis	3, 4
5	Improve techniques of oral and written presentations	3, 4
6	Understand the ethics of scientific community	3, 4

Assessment Methods: 1. Written Exam, 2. Assignment, 3. Project/Report, 4. Presentation, 5. Lab. Work

Course's Contribution to Program		
		CL
1	An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles	5
2	An ability to analyze and solve problems scientifically	5
3	An ability to apply innovative computational methods to problem-solving	5
4	An ability to design and conduct advanced software projects	3
5	An ability to assess applicable methods and their limits	4
6	An ability to identify, find and procure necessary information	5
7	An ability to plan and carry out analytic, model and experimental investigations	4
8	An understanding of the role of engineers in society	5
CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)		

Course Contents

Week	Topics	Exam
1	Literature surveys	
2	Literature surveys	
3	Literature surveys	
4	Seminar plan's preparation	
5	Collection and analysis of data	
6	Collection and analysis of data	
7	Research management	
8	Research management	
9	Research management	
10	Research management	
11	Research management	
12	Research management	
13	Research management	
14	Seminar report submission	
15	Slide show preparation	
16	Presentation	Final

Recommended Sources

Will be required depending on the recommendation of the graduate seminar supervisor and according to the needs of the specific topics.

Assessment

Graduate seminar is assessed by the student's supervisor. The supervisor will evaluate:

- Communication skills
- Knowledge base (literature review)

- Research methods used
- Critical thinking

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including Exam weeks)	-	-	-
Labs and Tutorials	-	-	-
Assignment	-	-	-
Project/Presentation/Report	1	45	45
E-learning activities	5	15	75
Quizzes	-	-	-
Midterm Examination	-	-	-
Final Examination (Presentation to the review board)	1	1	1
Self Study	15	25	375
Total Workload			496
Total Workload/25(h)			19.84
ECTS Credit of the Course			20