



**TOBB
ECONOMICS AND TECHNOLOGY
UNIVERSITY**

**ELECTRICAL AND ELECTRONICS
ENGINEERING DEPARTMENT**

UNDERGRADUATE PROGRAM

10 February 2006

ELECTRICAL AND ELECTRONICS ENGINEERING UNDERGRADUATE PROGRAM

Department's Goal

To teach the fundamental theoretical principles, applications, and skills in Electrical Engineering using up-to-date technologies, and to educate students towards being equipped with the knowledge and abilities to use and also to advance the rapidly growing Engineering Technologies.

Department's Long Terms Goals

To place our department among the top 5 Computer Engineering departments in terms of education and research activities; and to make it a leader in providing education, research, and service to the public in Information Technologies at institutional, regional, and international levels.

About

Undergraduate Electrical Engineering Program started in 2004-2005 academic year. It started with the goal to serve the needs of private firms and public institutions.

Rapid developments in electrical and electronics engineering technologies require electrical engineers to have a constantly changing perspective in their work fields and interests. Some of these recent developments are in the following fields:

- Robotics and sensing
- Optics and Photonics
- Nanotechnology
- High speed (> Gbps) internet
- Thermal imaging and night vision

Our department programs are designed to serve these changes and according to the ABET criteria. With elective courses we offer, all of our university students are given an opportunity to learn and apply new technologies.

Research Topics

- Control Theory
- Digital Signal Processing
- Communication systems
- VLSI Design
- Microwaves
- Antennas and Wave Propagation
- Biomedical Systems and Medical Imaging
- Optics and Photonics
- Robotics

Job Prospects

Our future department graduates can find jobs both in government and private sectors. Following are some examples:

- Defense industry
- Universities
- Research and Development (R&D) Centers, Technoparks
- Private entrepreneurship

In addition to these, our university will help our students to gain the knowledge and the tools towards being entrepreneurs and establish their own companies. Those who want to pursue academic careers can also proceed with our graduate program as well as other universities'.

Department Laboratories

Each new TOBB ETU student receives a personal laptop computer of his or her own. All areas of the campus is covered with wireless and wireline access to the network and Internet. Besides, the university hosts several computer labs with personal desktop computers. Further, the department has these labs:

- Logic design lab
- Microprocessors lab
- Electrical Circuits lab
- Electronics lab
- Communications lab
- Control lab

Science Laboratories

TOBB ETU hosts Physics I and II Labs, Chemistry Lab, Electronics I and II Labs, Digital Electronics Lab, Thermodynamics and Heat Lab, Microprocessor Lab, PLC/punematic Lab, Force-Motor Labs. Other labs are also planned. University's policy is to offer at least one lab course in each semesters to students in all years.

ELECTRICAL AND ELECTRONICS ENGINEERING UNDERGRADUATE PROGRAM (2004-2005)

1. YEAR // 1. SEMESTER						
Course Code	Course Title	(T+İ+A)	L-L-C	ECTS	Credits	R/E
MÜH 100	Introduction to Engineering	(0.5+0.5+1)	2-0-2	3	2	R
MAT 101	Calculus I	(4+0+0)	3-2-4	6	4	R
FİZ 101	Physics I	(3+0+0)	3-0-3	5	3	R
FİZ 101L	Physics I Laboratory	(1+0+0)	0-2-1	2	1	R
KİM 101	General Chemistry	(3+0+0)	3-0-3	5	3	R
KİM 101L	General Chemistry Laboratory	(1+0+0)	0-2-1	2	1	R
MAK 101	Computer Aided Technical Drawing I	(0.75+0+2.25)	2-2-3	5	3	R
BİL 100	Information Technologies	-	2-2-0	0	-	R
TÜR 101	Turkish I	(0+2+0)	2-0-2	3	2	R
İNG 101	English I	(0+2+0)	1-2-2	3	2	R
Semester total				34	21	

1. YEAR // 2. SEMESTER						
Course Code	Course Title	(T+İ+A)	L-L-C	ECTS	Credits	R/E
MAT 102	Calculus II	(4+0+0)	3-2-4	6	4	R
FİZ 102	Physics II	(3+0+0)	3-0-3	5	3	R
FİZ 102L	Physics II Laboratory	(1+0+0)	0-2-1	2	1	R
BİL 102	Computer Programming	(0.75+0+2.25)	2-2-3	5	3	R
BİL 264	Logic Design	(1+0+2)	3-0-3	4	3	R
BİL 264L	Logic Design Laboratory	(0+0+1)	0-2-1	2	1	R
TÜR 102	Turkish II	(0+2+0)	2-0-2	3	2	R
İNG 102	English II	(0+2+0)	1-2-2	3	2	R
OEG 100	Introduction to Co-Op Education	(0+0+0)	1-0-0	0	0	R
Semester total				30	19	

2. YEAR // 3. SEMESTER						
Course Code	Course Title	(T+İ+A)	L-L-C	ECTS	Credits	R/E
ELE 201	Circuit Theory I	(1.5+0+1.5)	3-0-3	4	3	R
ELE 201L	Circuit Theory I Laboratory	(0.5+0+0.5)	0-2-1	2	1	R
ELE 221	Semiconductor Devices and Modelling	(1.5+0+1.5)	3-0-3	5	3	R
MAK 207	Materials Science	(0.5+0+1.5)	2-0-2	3	2	R
MAK 207L	Materials Science Laboratory	(0.25+0+0.75)	0-2-1	2	1	R
MAT 201	Linear Algebra	(3+0+0)	3-0-3	5	3	R
MAT 202	Differential Equations	(3+0+0)	3-0-3	5	3	R
İNG 201	English Reading and Conversation	(0+2+0)	1-2-2	3	2	R
AİT 201	Principles of Atatürk and Contemporary History I	(0+2+0)	2-0-2	3	2	R
	Second Foreign Language I	(0+2+0)	1-2-2	3	2	R

Semester total	35	22	
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2. YEAR // 4. SEMESTER						
Course Code	Course Title	(T+İ+A)	L-L-C	ETCS	Credits	R/E
ELE 202	Circuit Theory II	(0+0+3)	3-0-3	5	3	R
ELE 222	Analog Elektronik	(0+0+3)	3-0-3	4	3	R
ELE 222L	Analog Elektronik Laboratory	(0+0+1)	0-2-1	2	1	R
ELE 231	Electromagnetic Field Theory	(1+0+2)	3-0-3	5	3	R
MAT 204	Complex Calculus	(1.5+0+1.5)	3-0-3	5	3	R
AİT 202	Principles of Atatürk and Contemporary History II	(0+2+0)	2-0-2	3	2	R
İNG 202	English for Business	(0+2+0)	1-2-2	3	2	R
	Second Foreign Language II	(0+2+0)	1-2-2	3	2	R
Semester total				30	19	

3. YEAR // 5. SEMESTER						
Course Code	Course Title	(T+İ+A)	L-L-C	ETCS	Credits	R/E
ELE 321	Digital Elektronik	(0+0+3)	3-0-3	4	3	R
ELE 321L	Digital Electronics Laboratory	(0+0+1)	0-2-1	2	1	R
ELE 331	Electromagnetic Wave Theory	(1+0+2)	3-0-3	5	3	R
ELE 371	Signals And Systems	(0.25+0+2.75)	3-0-3	5	3	R
ELE 395	Professional English I	(0+2+0)	1-2-2	3	2	R
BİL 332	Numerical Methods	(2+0+1)	3-0-3	5	3	R
MAT 224	Probability and Statistics	(2.25+0+0.75)	3-0-3	5	3	R
	Second Foreign Language III	(0+2+0)	1-2-2	3	2	R
Semester total				32	20	

3. YEAR // 6. SEMESTER						
Course Code	Course Title	(T+İ+A)	L-L-C	ETCS	Credits	R/E
ELE 301	Control Systems I	(0+0+3)	3-0-3	4	3	R
ELE 301L	Control Systems I Laboratory	(0+0+1)	0-2-1	2	1	R
ELE 361	Communication Systems I	(0+0+3)	3-0-3	4	3	R
ELE 361L	Communication Systems I Laboratory	(0+0+1)	0-2-1	2	1	R
ELE 372	Digital Signal Processing	(0+0+3)	3-0-3	5	3	R
ELE 396	Professional English II	(0+2+0)	1-2-2	3	2	R
İKT 321	Engineering Economics	(0+3+0)	3-0-3	4	3	R
BİL 362	Microprocessors	(0+0+3)	3-0-3	4	3	R
BİL 362L	Microprocessors Laboratory	(0+0+1)	0-2-1	2	1	R
	Second Foreign Language IV	(0+2+0)	1-2-2	3	2	R
Semester total				33	22	

4. YEAR // 7. SEMESTER						
Course Code	Course Title	(T+İ+A)	L-L-C	ETCS	Credits	R/E
ELE 491	Senior Design Project I	(0+0+3)	1-4-3	5	3	R
ELE 495	Professional English III	(0+2+0)	1-2-2	3	2	R
	Technical Elective	(0+0+9)	9-0-9	15	9	E

	Cultural Elective	(0+3+0)	0-0-3	5	3	E
	Second Foreign Language V	(0+2+0)	1-2-2	3	2	R
Semester total				31	19	

4. YEAR // 8. SEMESTER

Course Code	Course Title	(T+Ī+A)	L-L-C	ETCS	Credits	R/E
ELE 492	Senior Design Project II	(0+0+3)	0-6-3	5	3	R
ELE 496	Professional English IV	(0+2+0)	1-2-2	3	2	R
	Technical Elective	(0+0+9)	0-0-9	15	9	E
	Cultural Elective	(0+3+0)	0-0-3	5	3	E
	Second Foreign Language VI	(0+2+0)	1-2-2	3	2	R
Semester total				31	19	
<i>Total Credits</i>				256	161	

NOTE:

1. **T:** Basic sciences, **Ī:** Human-Social Sciences, **A:** Courses related to main subject
2. **L-L-C:** Lecture-Lab-Credits

COURSE CODING

1xx = 1. Year Level 2xx = 2. Year Level 3xx = 3. Year Level 4xx = 4. Year Level

x0x = Circuits and Systems
 x1x = Robotics
 x2x = Electronics
 x3x = Electromagnetics and Wave Propagation
 x4x = Biomedical Systems
 x5x = Optics and Photonics
 x6x = Communication Systems
 x7x = Signal Processing
 x8x = Power Systems
 x9x = Co-op Education/Graduation Design Project

REQUIRED-ELECTIVE (Distribution of Credit Hours)

Semester	REQUIRED	ELECTIVE
1	21	-
2	19	-
3	22	-
4	19	-
5	20	-
6	22	-
7	7	12
8	7	12
TOTAL 159 (%100)	137 (%85)	24 (%15)

BASIC SCIENCES – HUMAN-SOCIAL SCIENCES – COMPUTER SCIENCE (Distribution of Credit Hours)

Semester	Basic Sciences	Human-Social Sciences	Engineering Sciences	Total
1	13.25	4.5	3.25	21
2	9.75	4	5.25	19
3	10.25	6	5.75	22
4	2.5	6	10.5	19
5	5.5	4	10.5	20
6		7	15	22
7		7	12	19
8		7	12	19
TOTAL (%100)	41.25(%25.6)	45.5(%28.3)	74.25(%46.1)	161(%100)

REQUIRED CULTUREL COURSES

Course Code	Course Title	Credits
BİL 100	Information Technologies	-
AİT 201	Principles of Atatürk and Contemporary History I	(2-0)2
AİT 202	Principles of Atatürk and Contemporary History II	(2-0)2
TÜR 101	Turkish I	(2-0)2
TÜR 102	Turkish I	(2-0)2
İNG 101	English I	(1-2)2
İNG 102	English I	(1-2)2
İNG 201	English Reading and Comprehension	(1-2)2
İNG 202	Business English	(1-2)2
BİL 395	Professional English I	(1-2)2
BİL 396	Professional English II	(1-2)2
BİL 495	Professional English III	(1-2)2
BİL 496	Professional English IV	(1-2)2

GENERAL ENGINEERING COURSES

Course Code	Course Title	Credits
MÜH 100	Introduction to Engineering	(2-0)2
MAT 101	Calculus I	(3-2)4
MAT 102	Calculus I	(3-2)4
MAT 201	Linear Algebra	(3-0)3
MAT 202	Differential Equations	(3-0)3
MAT 204	Complex Calculus	(3-0)3
MAT 224	Probability and Statistics	(3-0)3
MAK 101	Computer Aided Technical Drawing I	(2-2)3
MAK 207	Material Science	(2-0)2
MAK 207L	Material Science Laboratory	(0-2)1
FİZ 101	Physics I	(3-0)3
FİZ 101L	Physics I Laboratory	(0-2)1
FİZ 102	Physics II	(3-0)3
FİZ 102L	Physics II Laboratory	(0-2)1
KİM 101	General Chemistry	(3-0)3
KİM 101L	General Chemistry Laboratory	(0-2)1
BİL 332	Numerical Methods	(3-0)3

TECHNICAL ELECTIVES

Course Code	Course Title	Credits
ELE 401	Linear Systems	(3-0)3
ELE 402	Control Systems II	(3-0)3
ELE 403	Nonlinear Systems	(3-0)3
ELE 404	Digital Control of Dynamic Systems	(3-0)3
ELE 405	Industrial Control Systems	(3-0)3
ELE 411	Robotics and sensing	(3-0)3
ELE 412	Mechatronics System Design	(3-0)3
ELE 412L	Mechatronics System Design Laboratory	(0-2)1
ELE 413	Electrical Machinery Design	(3-0)3
ELE 414	Fuzzy Logic	(3-0)3
ELE 415	Drive Systems	(3-1)4
ELE 416	Intelligent Systems	(3-0)3
ELE 421	Semiconductor Device Technology	(3-0)3
ELE 422	VLSI Design	(3-0)3
ELE 423	High Power Electronic Circuits	(3-0)3
ELE 424	Circuit Synthesis	(3-0)3
ELE 431	Microwaves	(3-0)3
ELE 432	Antennas and Wave Propagation	(3-0)3
ELE 441	Biomedical Engineering	(3-0)3
ELE 442	Medical Imaging	(3-0)3
ELE 451	Optics	(3-0)3
ELE 452	Photonics	(3-0)3
ELE 453	Optical Communications	(3-0)3
ELE 461	Communication Electronics	(3-0)3
ELE 462	Communication Systems II	(3-0)3
ELE 463	Communication Networks	(3-0)3
ELE 464	Digital Communications	(3-0)3
ELE 465	Radar and Sonar Systems	(3-0)3
ELE 471	Detection and Estimation Theory	(3-0)3
ELE 472	Information Theory	(3-0)3
ELE 473	Digital Image Processing	(3-0)3
ELE 481	Power System Analysis I	(3-0)3
ELE 482	Power System Analysis II	(3-0)3
ELE 483	Isolation in Power Systems	(3-0)3
ELE 484	Power System Protection	(3-0)3
ELE 485	Energy Disribution I	(3-0)3

ELE 486	Energy Distribution II	(3-0)3
ELE 487	Energy Transmission Lines	(3-0)3
ELE 488	Lighting Techniques	(3-0)3
Technical Electives	Maximum 2 from other departments with the permission of the chairman	

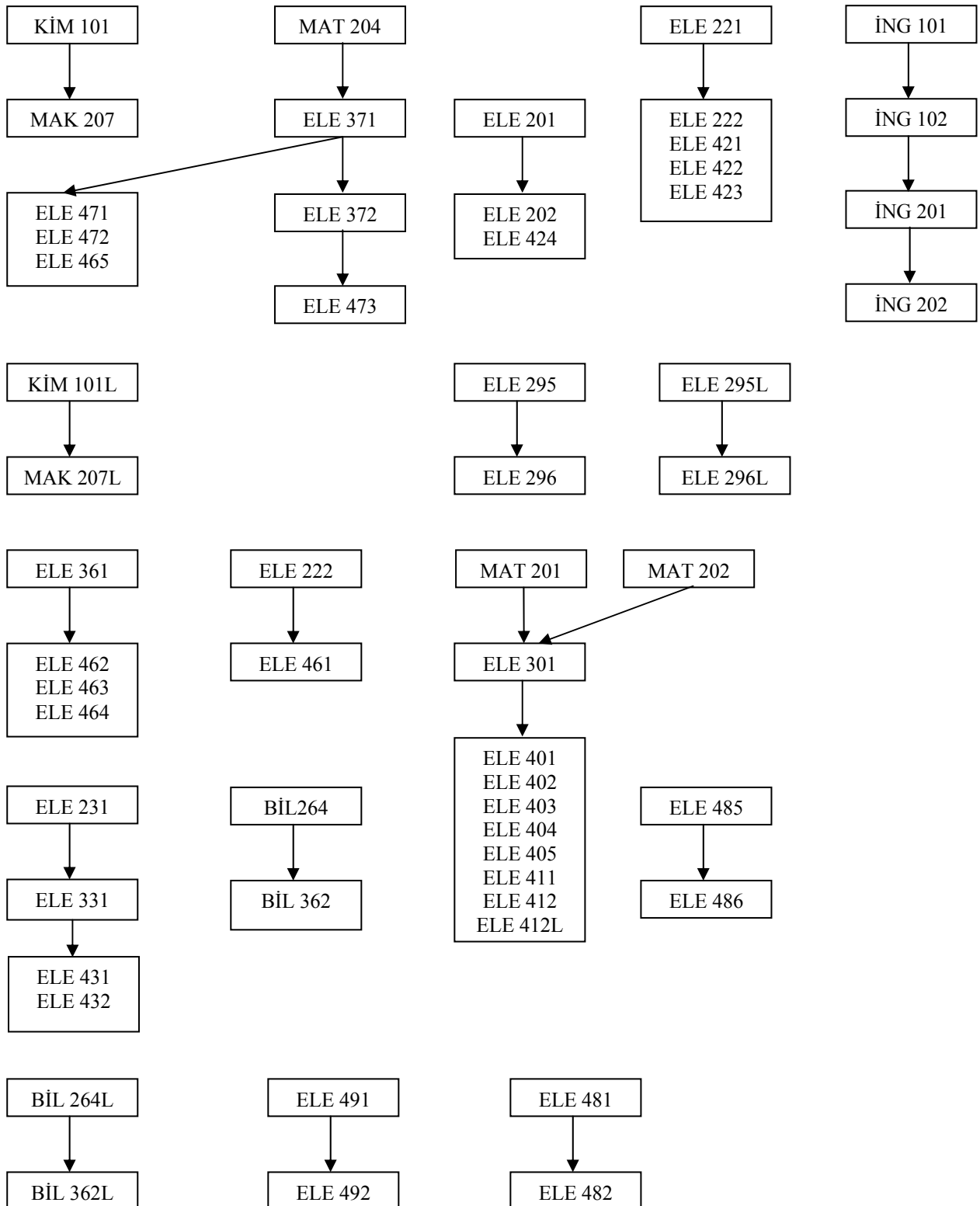
SERVICE COURSES

Course Code	Course Title	Credits
ELE 295	Foundations of Electrical and Electronics Engineering	(3-0)3
ELE 295L	Foundations of Electrical and Electronics Engineering Laboratory	(0-2)1
ELE 296	Electronic Systems	(3-0)3
ELE 296L	Electronic Systems	(0-2)1

CULTURAL ELECTIVE COURSES

These courses are chosen from the departments of the Faculty of Arts and Sciences, Faculty of Economics and Administrative Sciences, Faculty of Arts and Foreign Language Department in consultation with the student academic advisor.

PREREQUISITES



COURSES

REQUIRED NON-ELECTRICAL ENGINEERING COURSES

Course Name	Information Technologies
Course Code	BİL 100
Prerequisites	-
Required/Elective	R
Credit	Non-credit (2-2)0
Description	Fundamentals of computers and informatics. Computer hardware. Software concepts. Programming languages. Operating systems and application software. Word processors, electronic spreadsheets, presentation software and databases. Computer Networks and Internet. Designing web pages. Computer ethics.
Textbook	1. A.Yazici, M.Erten, E.Dogdu, C.Akyel and A. Üstün, <i>Bilgisayar Okuryazarlığı: ECDL ve Micorsoft Office 2003</i> , TOBB-ETU, 2005 2. T.J.O'Leary & L.I. O'Leary, <i>Computing Essentials 2005 Complete Edition</i> , McGraw-Hill International, 2005, ISBN: 0-07-284607-5

Course Name	Principles of Atatürk and The History of Turkish Revolution I
Course Code	AİT 201
Prerequisites	-
Required/Elective	R
Credit	(2-0) 2
Description	Reform movements and political developments during the establishment of The Republic of Turkey. Analysis and interpretation of the events at the time of National Struggle for independence under the leadership of Mustafa Kemal Atatürk.
Textbook	1. Lord Kinros, <i>Atatürk: Bir Milletten Yeniden Doğuşu</i> , Türkçesi: Nejdet Sander, 12. Basım, Altın Kitaplar, 2002 2. Feroz Ahmad, <i>The Making of Modern Turkey</i> , Mobipocket e-Books, 2005 3. Kemal Karpat, <i>Social Change and Politics in Turkey</i> , Brill Leiden, 1973 4. Eric Jan Zürcher, <i>Turkey: A Modern History</i> , 3rd. Ed., Tauris Publications, 2004 5. Bernard Lewis, <i>The Emergence of Modern Turkey</i> , 3rd. Ed., Oxford University Press, 2001

Course Name	Principles of Atatürk and The History of Turkish Revolution II
Course Code	AİT 202
Prerequisites	-
Required/Elective	R
Credit	(2-0) 2
Description	Discussion of Atatürk's Principles and Revolution. Restructuring of the state and the nation during 20 th century. Discussion of political, social, economical, and cultural changes with a reflection upon today's problems.

Textbook	<ol style="list-style-type: none"> 1. Lord Kinross, Atatürk: Bir Milletten Yeniden Doğuşu, Türkçesi: Nejdett Sander, 12. Basım, Altın Kitaplar, 2002 2. Feroz Ahmad, The Making of Modern Turkey, Mobipocket e-Books, 2005 3. Kemal Karpat, Social Change and Politics in Turkey, Brill Leiden, 1973 4. Eric Jan Zürcher, Turkey: A Modern History, 3rd. Ed., Tauris Publications, 2004 5. Bernard Lewis, The Emergence of Modern Turkey, 3rd. Ed., Oxford University Press, 2001
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Course Name	Turkish Language I
Course Code	TÜR 101
Prerequisites	-
Required/Elective	R
Credit	(200) 2
Description	Introduction to languages, families of languages, the position of Turkish among the world languages, oral and written narrative strategies, diction, speed reading, effective public speaking, sentence analysis, mechanics of writing (spelling and punctuation).
Textbook	<ol style="list-style-type: none"> 1. Noam Chomsky, Dil ve Zihin, Ayraç Yay., Ankara 2001. 2. Fatma Erkman-Akerson, Türkçe Örneklerle Dile Genel Bir Bakış, İst. 2000. 3. Prof. Dr. Doğan Aksan, Anlambilim, Engin Yay., Ank. 1999. 4. Prof. Dr. Mustafa Özkan, Tarih İçinde Türk Dili, Filiz Kitabevi, İst.1997. 5. Prof. Dr. Mehmet Kaplan, Sevgi ve İlim, Dergâh Yay., İst. 2002. 6. Hilmi Yavuz, Dilin Dili, Arma Yay., İst. 1991. 7. Michel Foucault, Kelimeler ve Şeyler, İmge Yay., çev: Mehmet Ali Kılıçbay, Ankara 1994. 8. Tarık Buğra, Düşman Kazanmak Sanatı, Ötüken Yay., İst. 1979. 9. Oktay Sinanoğlu, "Bye-Bye" Türkçe, Otopsi Yay.,4.bs., İst. 2002. 10. Prof. Dr. Doğan Aksan, Şiir Dili ve Türk Şiir Dili, Engin Yay., Ank.1995. 11. Reha Oğuz Türkkkan, Anlayarak Çok Hızlı Okuma, Alfa Yay., İst. 2000.

Course Name	Turkish Language II
Course Code	TÜR 102
Prerequisites	-
Required/Elective	R
Credit	(2-0) 2
Description	The art of writing, selection of topics and main ideas, outlines, paragraphs, literary genres, articles, essays, strategies for story writing, academic research, theses, reports, resumes, poetry and its components, text analysis.
Textbook	<ol style="list-style-type: none"> 1. Fevziye Abdullah Tansel, İyi ve Doğru Yazma Usûlleri I-II, Kubbealtı Neşr.,İst.1985. 2. Prof. Dr. Mustafa Özkan, Tarih İçinde Türk Dili, Filiz Kitabevi, İst.1997. 3. Dr. Ali Yakıcı vd., Üniversiteler İçin Türk Dili ve Kompozisyon Bilgileri, I-II, Ank. 2004.

	<p>4. Muharrem Ergin, Üniversiteler İçin Türk Dili, Bayrak yay., İst.1995.</p> <p>5. Noam Chomsky, Dil ve Zihin, Ayraç Yay., Ankara 2001.</p> <p>6. Robert A. Day, Bilimsel Bir Makale Nasıl Yazılır ve Yayımlanır?, Çeviri: Gülay Aşkar Altay, Tübitak Yay. 1996.</p> <p>7. Emel Kefeli, Anlatım Tekniği Olarak Mektup, Kitabevi, İst. 2002.</p> <p>8. Fatma Erkman-Akerson, Türkçe Örneklerle Dile Genel Bir Bakış, İst. 2000.</p> <p>9. Prof. Dr. Doğan Aksan, Anlambilim, Engin Yay., Ank. 1999.</p> <p>10. Cemil Meriç, Kirk Ambar, İletişim Yay., c.1, İst.1980.</p> <p>11. Berna Moran, Türk Romanına Eleştirel Bir Bakış, İletişim Yay., İst.1983.</p> <p>12. Prof. Dr. Şerif Aktaş, Roman Sanatı ve Roman İncelemesine Giriş, Ankara 2000</p>
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Course Name	English I
Course Code	İNG 101
Prerequisites	-
Required/Elective	R
Credit	(1-2) 2
Description	Improving reading and writing skills via taking account of the acquired linguistic input integrating critical thinking techniques and current approaches into lessons. To equip students with language skills which helps them to achieve competency in academic studies, identifying the essential information in the text, constructing the paragraph, raising the awareness of students to identify implications, to equip students grammatical structures which enhances competency, to achieve fluency by means of using effective speaking strategies.
Textbook	<p>1. Smalley, R., Ruetten M. And Kozyrev, J., "Refining Composition Skills Rhetoric and Grammar".Fifth Edition. Heinle&Heinle. Boston.2000.</p> <p>2. Foley, M., and Hall, D., "Longman Advanced Learners' Grammar".Pearson Education Limited.2003.</p>

Course Name	English II
Course Code	İNG 102
Prerequisites	İNG 101
Required/Elective	R
Credit	(1-2) 2
Description	To equip students with advance reading and writing skills, writing essays, grammatical structures which enable students to make effective achieving fluency in speech and to improve the contextual factors.
Textbook	<p>1. Smalley, R., Ruetten M. And Kozyrev, J., "Refining Composition Skills Rhetoric and Grammar".Fifth Edition. Heinle&Heinle. Boston.2000.</p> <p>2. Foley, M., and Hall, D., "Longman Advanced Learners' Grammar".Pearson Education Limited.2003.</p>

Course Name	English Reading and Comprehension
Course Code	İNG 201
Prerequisites	İNG 102
Required/Elective	R

Credit	(1-2) 2
Description	To improve academic reading, writing and speaking skills. To achieve competency in expressing ideas orally in academic settings, to improve competency in grammar, to improve presentation skills.
Textbook	1. Smalley, R., Ruetten M. And Kozyrev, J., "Refining Composition Skills Rhetoric and Grammar".Fifth Edition. Heinle&Heinle. Boston.2000. 2. Foley, M., and Hall, D., "Longman Advanced Learners' Grammar".Pearson Education Limited.2003.

Course Name	Business English
Course Code	ING 202
Prerequisites	ING 201
Required/Elective	R
Credit	(1-2) 2
Description	Analyzing advanced texts at discourse level, teaching advanced vocabulary which contributes to student's acquisition of vocabulary related to his/her major, finding relevant information easily by applying various reading techniques, summarizing, , paraphrasing, writing reports and essays, developing skimming and scanning techniques, speaking activities, and advanced grammar exercises.
Textbook	1. Blanchard, K, and Root, C., "For Your Information 4-Advanced Reading Skills"Addison Wesley Longman.2000. 2. Foley, M., and Hall, D., "Longman Advanced Learners' Grammar".Pearson Education Limited.2003

Course Name	Professional English I
Course Code	ELE 395
Prerequisites	-
Required/Elective	R
Credit	(1-2) 2
Description	TBA
Textbook	

Course Name	Professional English II
Course Code	ELE 396
Prerequisites	-
Required/Elective	R
Credit	(1-2) 2
Description	TBA
Textbook	

Course Name	Professional English III
Course Code	ELE 495
Prerequisites	-
Required/Elective	R
Credit	(1-2) 2
Description	TBA

Textbook	
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Course Name	Professional English IV
Course Code	ELE 496
Prerequisites	-
Required/Elective	R
Credit	(1-2) 2
Description	TBA
Textbook	

Course Name	Second Foreign Language I
Course Code	
Prerequisites	-
Required/Elective	R
Credit	(1-2) 2
Description	TBA
Textbook	

Course Name	Second Foreign Language II
Course Code	
Prerequisites	-
Required/Elective	R
Credit	(1-2) 2
Description	TBA
Textbook	

Course Name	Second Foreign Language III
Course Code	
Prerequisites	-
Required/Elective	R
Credit	(1-2) 2
Description	TBA
Textbook	

Course Name	Second Foreign Language IV
Course Code	
Prerequisites	-
Required/Elective	R
Credit	(1-2) 2
Description	TBA
Textbook	

Course Name	Second Foreign Language V
Course Code	
Prerequisites	-

Required/Elective	R
Credit	(1-2) 2
Description	TBA
Textbook	

Course Name	Second Foreign Language VI
Course Code	
Prerequisites	-
Required/Elective	R
Credit	(1-2) 2
Description	TBA
Textbook	

CO-OP EDUCATION

Course Name	INTRODUCTION TO CO-OP EDUCATION
Course Code	OEG 100
Prerequisites	-
Required/Elective	R
Credit	(1-0) 1
Description	TBA
Textbook	-

Course Name	CO-OP EDUCATION I
Course Code	OEG 200
Prerequisites	OEG 100
Required/Elective	R
Credit	(0-0) 0
Description	TBA
Textbook	-

Course Name	CO-OP EDUCATION II
Course Code	OEG 300
Prerequisites	OEG 200
Required/Elective	R
Credit	(0-0) 0
Description	TBA
Textbook	-

Course Name	CO-OP EDUCATION III
Course Code	OEG 400
Prerequisites	OEG 300
Required/Elective	R
Credit	(0-0) 0
Description	TBA
Textbook	-

GENERAL ENGINEERING SUBJECTS

Course Name	Introduction to Engineering
Course Code	MÜH 100
Prerequisites	-
Required/Elective	R
Credit	(2-0) 2
Description	Who is engineer? Engineering ethics. Problem solving approach. Introduction to design. Engineering communications. Numbers (Errors, accuracy, precision, significant figures). Presentation with tables and graphs (Various graphs, extrapolation, interpolation, regression). Statistics. Materials science. Thermodynamics laws. Metric unit systems and unit conversions. Introduction to electricity. Introduction to circuits. Mass, charge, momentum, energy, money conservation.
Textbook	<ol style="list-style-type: none"> 1. M.T. Holtzapple and W. Dan Reece, <i>Foundations of Engineering</i>, McGraw-Hill, 2003. 2. J. Wickert, <i>An Introduction to Mechanical Engineering</i>, Thomson Brooks Cole, 2004, ISBN 053439132X.

Course Name	Calculus I
Course Code	MAT 101
Prerequisites	-
Required/Elective	R
Credit	(3-2) 4
Description	Numbers, absolute values, inequalities, mathematical induction, coordinate systems and lines, complex numbers, functions, composite functions, trigonometric functions, limits of functions, continuity, properties of continuous functions, derivative, rate of change, Mean Value Theorem and its applications, maximum and minimum values and its applications, curve sketching, differentials and their applications, integral, Fundamental Theorem of Calculus, functions defined by integrals, techniques of integration, area, volume and arc length.
Textbook	<ol style="list-style-type: none"> 1. C.H. Edwards, D.E. Penney, <i>Matematik Analiz ve Analitik Geometri</i>, Cilt 1, 5. baskı, Çeviri Editörü Prof.Dr. Ömer Akın, Palme Yayıncılık, 2001, ISBN 975-7477-99-0. 2. C.H. Edwards, D.E. Penney, <i>Calculus with Analytical Geometry</i>, 5th Edition, Prentice Hall, 1998, ISBN 0-13-736331-1. 3. G.L. Bradley, K.J. Smith, <i>Calculus</i>, 2nd Edition, Prentice Hall, 1999, ISBN 0-13-660135-9 . 4. D. Varberg, E.J. Purcell, S.E. Ridgon, <i>Calculus</i>, 8th Edition, Prentice Hall, 1999, ISBN 0-13-081137-8. 5. R.A. Silverman, <i>Calculus with Analytical Geometry</i>, Prentice Hall, 1984, ISBN 0-13-111634-7.

Course Name	Calculus II
Course Code	MAT 102
Prerequisites	-
Required/Elective	R
Credit	(3-2) 4
Description	Sequences, series, power series, polar coordinates, vectors in R ³ , curves, equations of lines and planes, limit and continuity for multi-variable functions, partial differentiation, gradient vector,

	tangent planes, directional derivatives, conditional and unconditional maximum and minimum, Lagrange multipliers, multiple integrals, line integrals and independence of path, surface integrals.
Textbook	<ol style="list-style-type: none"> 1. C.H. Edwards, D.E. Penney, <i>Matematik Analiz ve Analitik Geometri</i>, Cilt 2, 5. baskı, Çeviri Editörü Prof.Dr. Ömer Akın, Palme Yayıncılık, 2001, ISBN 975-8624-02-4. 2. C.H. Edwards, D.E. Penney, <i>Calculus with Analytical Geometry</i>, 5th Edition, Prentice Hall, 1998, ISBN 0-13-736331-1. 3. G.L. Bradley, K.J. Smith, <i>Calculus</i>, 2nd Edition, Prentice Hall, 1999, ISBN 0-13-660135-9. 4. D. Varberg, E.J. Purcell, S.E. Ridgon, <i>Calculus</i>, 8th Edition, Prentice Hall, 2000, ISBN 0-13-081137-8.

Course Name	Linear Algebra
Course Code	MAT 201
Prerequisites	-
Required/Elective	R
Credit	(3-0) 3
Description	Vector spaces, vector subspaces, linear dependence and independence, basis and dimension, basis for the 4 fundamental subspaces of matrix, orthogonality and the Gram-Schmidt method for orthogonalization, linear transformations, null spaces and the concept of a rank, matrices and determinants, solution of $Ax = b$ systems of linear equations using Gauss and Gauus-Jordan elimination and back substitution, invertibility of a matrix and finding inverses, LU factorization of a matrix, the characteristic polynomial, eigenvalues and eigenvectors, and diagonalization of a matrix, computing powers A^k powers of a matrix A , symmetric and positive definite matrices, real eigenvalues and orthogonal eigenvectors, linear transformations and changing basis, projections, matrix and vector norms.
Textbook	<ol style="list-style-type: none"> 1. B. Kolman and D.R. Hill, <i>Uygulamalı Lineer Cebir</i>, Çeviri Editörü Ömer Akın, Palme Yayıncılık, 2002, ISBN 975-8624-11-3 2. B. Kolman and D.R. Hill, <i>Elementary Linear Algebra</i>, 8th Edition, Pearson Education, 2004, ISBN: 0-13-121933-2. 3. G. Nikos and D. Joyner, <i>Linear Algebra with Applications</i>, Brooks Cole, 1998, ISBN 0176410864. 4. P.V.O'Neil, <i>Advanced Engineering Mathematics</i>, 5th Edition, Brooks Cole, 2003, ISBN 0534400779 . 5. E.Kreyszig, <i>Advanced Engineering Mathematics</i>, 8th Edition, John Wiley, 1999, ISBN 0-471-33328-X.

Course Name	Differential Equations
Course Code	MAT 202
Prerequisites	MAT102
Required/Elective	R
Credit	(3-0) 3
Description	First order differential equations. Nonlinear equations which can be reduced to linear form. Equations with constant coefficients. Systems of linear equations. Laplace transformations. Differential equations with variable coefficients and series solutions. Partial differential equations, Solutions with separation of variables. Fourier series and Fourier integrals, Orthogonal functions and their applications to boundary and initial value problems.
Textbook	1. C.H. Edwards, J.R., D.E. Penney, <i>Differential Equations and Boundary Value Problems: Computing and Modeling</i> , 3 rd Edition,

	Prentice-Hall, 2004, ISBN 0130652458. 2. E. Kreyszig, <i>Advanced Engineering Mathematics</i> , 8 th Edition, John Wiley, 1999, ISBN 0-471-33328-X.
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Course name	Complex Calculus
Course code	MAT 204
Prerequisites	--
Required/Elective	R
Credit	(3-0) 3
Description	Algebra of complex numbers, polar representation of complex numbers, derivatives of complex functions, analytic functions, Cauchy-Riemann equations, power series. Simple functions, transformation of simple functions. Linear fractional transformations, contour integrals. Cauchy integral theorem, Cauchy integral formula. Series, singularity points, Taylor expansion, Laurent expansion, Residues, residue theorems. Generalized integrals.
Textbook	1. K. Özkin, <i>Kompleks Analiz</i> , Ankara Üniversitesi, 1989. 2. Lars Ahlfors, <i>Complex Analysis</i> , McGraw-Hill, 3rd Edition, 1979, ISBN: 0070006571.

Course Name	Probability and Statistics
Course Code	MAT 224
Prerequisites	-
Required/Elective	R
Credit	(3-0) 3
Description	Fundamental concepts: probability and statistics. Sample spaces, events and probability concept. Discrete and continuous probability distributions. Descriptive statistics and frequency analysis. Sampling distributions, parameter estimation, statistical intervals and tests of hypotheses on a single sample and two samples. Nonparametric tests. Single-factor analysis of variance. Simple linear regression and correlation.
Textbook	1. J.S. Milton, J.C. Arnold, <i>Introduction to Probability and Statistics</i> , McGraw-Hill, 2003, ISBN 0-07-119859-8. 2. J.L. Devore, <i>Probability and Statistics</i> , Thomson, 2004, ISBN: 0-534-46683-4 3. M. Bayazıt, B. Oğuz, <i>Mühendisler için İstatistik</i> , Birsen Yayınevi, 1998, ISBN: 975-511-102-6

Course Name	Physics I
Course Code	FİZ 101
Prerequisites	-
Required/Elective	R
Credit	(3-0) 3
Description	One dimensional motion, vectors, two-dimensional motion, the laws of motion, circular motion and other applications, work and energy, potential energy and conservation of energy, linear momentum and collisions, rotation of a rigid body about a fixed axis, rolling motion and angular momentum, static, oscillatory motion, the law of universal gravitation.
Textbook	1. R.A. Serway, R.J. Beichner, <i>Fen ve Mühendislik için Fizik 1</i> , Palme Yayıncılık, Çeviri Editörü: Prof. Dr. Kemal Çolakoğlu, 2002, ISBN 975-8624-22-9.

	<p>2. P.M. Fishbane, S. Gasiorowicz, S.T. Thornton, <i>Temel Fizik</i>, Cilt 1, Yayına Hazırlayan: Prof. Dr. Cengiz Yalçın, Arkadaş Yayınevi, 2003, ISBN 975-509-368-9.</p> <p>3. F.W. Sears, M.W. Zemansky, H.D. Young, <i>University Physics</i>, 17th Edition, Addison Wesley, 1987, ISBN 0-201-06694-7.</p>
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Course Name	
Course Code	FİZ 101L
Prerequisites	-
Required/Elective	R
Credit	(0-2) 1
Description	Importance of experimental studies. Experiment 1: Sound Waves, Experiment 2: Statics, Experiment 3: Stress and Strain, Experiment 4: Conservation of Energy, Experiment 5: Dynamic Motion, Experiment 6: Circular Motion, Experiment 7: Mechanical Waves, Experiment 8: Microwave Optics, Experiment 9: Simple Pendulum.
Textbook	<p>1. R.A. Serway, R.J. Beichner, <i>Fen ve Mühendislik için Fizik 1</i>, Palme Yayıncılık, Çeviri Editörü: Prof. Dr. Kemal Çolakoğlu, 2002, ISBN 975-8624-22-9.</p> <p>2. P.M. Fishbane, S. Gasiorowicz, S.T. Thornton, <i>Temel Fizik</i>, Cilt 1, Yayına Hazırlayan: Prof. Dr. Cengiz Yalçın, Arkadaş Yayınevi, 2003, ISBN 975-509-368-9.</p> <p>3. F.W. Sears, M.W. Zemansky, H.D. Young, <i>University Physics</i>, 17th Edition, Addison Wesley, 1987, ISBN 0-201-06694-7.</p>

Course Name	
Course Code	FİZ 102
Prerequisites	-
Required/Elective	R
Credit	(3-0) 3
Description	Charge and electric field, Gauss law, electric potential, capacitance and capacitors, current and resistance, electromotive force, circuits and magnetic field, Ampere's law, Faraday's law of inductance, inductance and magnetic properties of materials, RL circuits, electromagnetic waves.
Textbook	<p>1. R.A. Serway, R.J. Beichner, <i>Fen ve Mühendislik için Fizik 1</i>, Palme Yayıncılık, Çeviri Editörü: Prof. Dr. Kemal Çolakoğlu, 2002, ISBN 975-8624-22-9.</p> <p>2. P.M. Fishbane, S. Gasiorowicz, S.T. Thornton, <i>Temel Fizik</i>, Cilt 1, Yayına Hazırlayan: Prof. Dr. Cengiz Yalçın, Arkadaş Yayınevi, 2003, ISBN 975-509-368-9.</p> <p>3. F.W. Sears, M.W. Zemansky, H.D. Young, <i>University Physics</i>, 17th Edition, Addison Wesley, 1987, ISBN 0-201-06694-7.</p>

Course Name	
Course Code	FİZ 101L
Prerequisites	-
Required/Elective	R
Credit	(0-2)1
Description	Importance of experimental studies. Experiment 1: Coulomb balance, Experiment 2: Coulomb potential and Coulomb field of metal spheres, Experiment 3: Charge, equipotential and field mapper, Experiment 4: Magnetic field of solenoids, Experiment 5: Electrical fields and potentials of plate capacitors, Experiment 6:

	Faraday ice pail, Experiment 7: Magnetic induction, Experiment 8: Inductance of solenoids.
Textbook	<ol style="list-style-type: none"> 1. R.A. Serway, R.J. Beichner, <i>Fen ve Mühendislik için Fizik 1</i>, Palme Yayıncılık, Çeviri Editörü: Prof. Dr. Kemal Çolakoğlu, 2002, ISBN 975-8624-22-9. 2. P.M. Fishbane, S. Gasiorowicz, S.T. Thornton, <i>Temel Fizik</i>, Cilt 1, Yayına Hazırlayan: Prof. Dr. Cengiz Yalçın, Arkadaş Yayınevi, 2003, ISBN 975-509-368-9. 3. F.W. Sears, M.W. Zemansky, H.D. Young, <i>University Physics</i>, 17th Edition, Addison Wesley, 1987, ISBN 0-201-06694-7.

Course Name	Computer Aided Technical Drawing I
Course Code	MAK 101
Prerequisites	-
Required/Elective	R
Credit	(2-2) 3
Description	Introduction to computer aided technical drawing. Geometrical constructions. Principles of orthographic projection; projection of principal views from three dimensional models. Drawing techniques for basic manufacturing processes and standard features. Projection of third principal view from two given principal views; free hand drawing techniques. Three dimensional drawing techniques; simple shapes, inclined surfaces, skewed surfaces. Principles of dimensioning. Solid modeling. Principles of sectioning; full and half sections. Further work on sectioning, conventional practices. Screw threads and threaded fasteners.
Textbook	<ol style="list-style-type: none"> 1. Şen, İ.Z., ve Özçilingir, N., <i>Teknik Resim-Temel Bilgiler</i>, Deha Yayıncılık, İst., 2002. 2. Şen, İ.Z., ve Özçilingir, N., <i>Makine Resmi</i>, Deha Yayıncılık, İstanbul, 2004, ISBN 975-95660-7-9. 3. Şen, İ.Z., ve Bora, H., <i>Bilgisayar Destekli Çizim</i>, Deha Yayıncılık, İstanbul, 2003. 4. Giesecke, E. Frederick, et. al., <i>Technical Drawing</i>, 12th Edition, Prentice-Hall, Inc., Upper Saddle River, N.J., 2003, ISBN: 0-13-008183-3.

Course name	Materials Science
Course code	MAK 207
Prerequisites	KİM 101
Required/Elective	R
Credit	(2-0) 2
Description	Introduction to materials, Atomic structure, Crystal structures, Imperfections in solids, Diffusion, Mechanical testing and properties: Tensile test, Hardness test, Bending and torsion test, Impact test, Fatigue test, Creep test, Phase diagrams: Types of phase diagrams, Iron-Carbon phase diagrams, Material systems: Ferrous materials, Non-Ferrous materials, Polymers, Ceramics, Composites.
Textbook	<ol style="list-style-type: none"> 1. D.R. Askeland, <i>The Science and Engineering of Materials</i>, PWS-Kent Publishing Co., Third Edition, 1995. 2. W.D. Callister, <i>Materials Science and Engineering: An Introduction</i>, John Wiley & Sons, 5. Edition, 2000, ISBN 0-471-32013-7.

Course name	Materials Science Laboratory
Course code	MAK 207L

Prerequisites	KIM 101L
Required/Elective	R
Credit	(0-2) 1
Description	Metallography: Examination of microstructures, sampling, mounting, grinding, polishing and etching. Mechanical tests: Tensile test, compression test, hardness test, bending test, torsion test, fatigue test, impact test, creep test.
Textbook	1. D.R. Askeland, <i>The Science and Engineering of Materials</i> , Thomson Publishing Co., 4th Edition, 2003. 2. W.D. Callister, <i>Materials Science and Engineering: An Introduction</i> , John Wiley & Sons, Fifth Edition, 2000, ISBN 0-471-32013-7.

Course Name	Engineering Economics
Course Code	İKT 321
Prerequisites	-
Required/Elective	R
Credit	(3-0) 3
Description	Fundamentals of engineering economics: fundamental concepts of economics; cost, interest, interest rates, the time value of money, inflation, taxes, cash-flow analysis, compounding, valuation, investment analysis and strategies, replacement and retirement decisions, depreciation methods, decision under risk and uncertainty, decision tree applications.
Textbook	1. W.G. Sullivan, E.M. Wicks, J. Luxhoj, <i>Engineering Economy</i> , Prentice Hall, 12th Edition, 2003, ISBN 0130673382. 2. L. Blank and A. Tarquin, <i>Engineering Economy</i> , McGraw Hill, Fifth Edition, 2002.

Course Name	Numerical Methods
Course Code	BİL 332
Prerequisites	MAT 101
Required/Elective	R
Credit	(3-0)3
Description	Approximations. Truncation and rounding errors. Numerical solution of algebraic equations. Methods for the solution of linear algebraic systems: Gaussian Elimination method. LU-decomposition and iteration schemes. Matrix inversion. Interpolation: Lagrange, Newton and Gauss formulae. Numerical integration: Trapezoidal, Simpson and Romberg methods. Introduction to numerical solution of differential equations.
Textbook	1. S.C.Chapra & R.P.Canale, <i>Numerical Methods for Engineers with Programming and Software Applications</i> , 4th. Ed. Mc-Graw-Hill, 2002, ISBN:0-07-243193-8 2. J.Mathews & J.Fink, <i>Numerical Methods using Matlab</i> , 4nd. Ed., Pearson, 2004, ISBN:0-13-191178-3

DEPARTMENTAL COURSES

Course Name	Logic Design
Course Code	BİL 264
Prerequisites	-
Required/Elective	R
Credit	(3-0)3
Description	Binary systems and codes. Boolean Algebra. Digital logic gates. Simplification of Boolean functions. Combinational logic. Synchronous sequential logic. Counters. Design problems.
Textbook	<ol style="list-style-type: none"> 1. M.M.Mano, <i>Digital Design</i>, 3rd. Ed., Prentice Hall, 2001, ISBN:0-13-0621218 2. V.T. Rhyne, <i>Fundamentals of Digital Systems Design</i>, Prentice-Hall, Inc. 3. T.L. Floyd, <i>Digital Fundamentals</i>, A. Bell & Howell Company. 4. D.D. Gajski, <i>Principles of Digital Design</i>, Prentice-Hall, Inc. 5. M.M. Mano, <i>Sayısal Tasarım</i>, Çeviri: S. Bogosyan, Milli Eğitim Bakanlığı Yayınları. 6. Y. İstefanopulos , B. Sankur, <i>Bilgisayar Mantık Devreleri</i>, Boğaziçi Üniversitesi Yayınevi, 1994

Course Name	Logic Design Laboratory
Course Code	BİL 264L
Prerequisites	-
Required/Elective	R
Credit	(0-2)1
Description	Introduction to integrated circuit data sheets and laboratory equipments. Simplification and implementation of Boolean functions using logic gates. Function implementation using gates, and combinational logic gates (multiplexers and decoders), Flip flops, shift registers and counters. Oscillator design.
Textbook	<ol style="list-style-type: none"> 1. M.M.Mano, <i>Digital Design</i>, 3rd. Ed., Prentice Hall, 2001, ISBN:0-13-0621218 2. V.T. Rhyne, <i>Fundamentals of Digital Systems Design</i>, Prentice-Hall, Inc. 3. T.L. Floyd, <i>Digital Fundamentals</i>, A. Bell & Howell Company. 4. Daniel D. Gajski, <i>Principles of Digital Design</i>, Prentice-Hall, Inc. 5. M.M. Mano, <i>Sayısal Tasarım</i>, Çeviri: S.Bogosyan, Milli Eğitim Bakanlığı Yayınları. 6. Y. İstefanopulos ve B. Sankur, <i>Bilgisayar Mantık Devreleri</i>, Boğaziçi Üniversitesi Yayınevi, 1994. 7. M.Ö. Efe, <i>BİL264L Deney Föyleri</i>, TOBB-ETÜ, 2005.

Course Name	Circuit Theory I
Course Code	ELE 201
Prerequisites	-
Required/Elective	R
Credit	(3-0)3
Description	Fundamental concepts, node and mesh analysis, circuit theorems, energy and power. Operational amplifiers, first and second order circuits, natural response and forced response, simple state space equations.
Textbook	1. R.C. Dorf, J.A. Svoboda, <i>Introduction to Electric Circuits</i> , Wiley, ISBN: 0471447951.

	2. J.W. Nilsson and S.A. Riedel, Electric Circuits , Prentice – Hall 3. J.D. Irwin, Basic Engineering Circuit Analysis, Macmillan Publishing Company 4. Y. Tokad, Lectures in Circuit Analysis, in Turkish.
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Course Name	Circuit Theory I Laboratory
Course Code	ELE 201L
Prerequisites	-
Required/Elective	R
Credit	(0-2)1
Description	1. Kirchhoff laws, voltage and current division 2. Superposition principle and Thevenin equivalent 3. Operational amplifiers 4. First order circuits 5. Dynamic system applications
Textbook	ELE 201L Laboratory Manual

Course name	Semiconductor Devices and Modelling
Course code	ELE 221
Prerequisites	-
Required/Elective	R
Credit	(3-0) 3
Description	Basic semiconductor concept. Physical electronics, physical properties of P-N diodes. Bipolar junction transistors (BJT). Field effect transistors (FET, MOSFET). Transistor biasing and small signal models. Unipolar junction transistors (UJT). P-N-P-N switching circuits, Negative resistive microwave circuits. Lasers. Analysis of electronics circuits by using SPICE.
Textbook	1. B.G. Streetman ve S. Banerjee, <i>Solid State Electronic Devices</i> , Prentice Hall Series, 2000. 2. A.S. Sedra ve K.C. Smith, <i>Microelectronic Circuits</i> , Oxford University Press, 1998. 3. J. Millman ve A. Grabel, <i>Mircoelectronics</i> , McGraw-Hill, ISBN: 007042330X

Course Name	Circuit Theory II
Course Code	ELE 202
Prerequisites	ELE 201
Required/Elective	R
Credit	(3-0)3
Description	Sinusoidal current and voltages, phasors, power and power compensation factor, resonance, Bode plots, topology, mutual inductance, transformers, two-port circuits, complex frequency, transfer functions, convolution, Fourier series and its applications in circuit analysis.
Textbook	1. R.C. Dorf, J.A. Svoboda, <i>Introduction to Electric Circuits</i> , Wiley, ISBN: 0471447951. 2. J.W. Nilsson and S.A. Riedel, <i>Electric Circuits</i> , Prentice Hall, 7th Ed., 2004, ISBN: 0131465929. 3. J.D. Irwin, <i>Basic Engineering Circuit Analysis</i> , Macmillan Publishing Company 4. Y. Tokad, <i>Lectures in Circuit Analysis</i> , in Turkish.

Course name	Analog Electronics
Course code	ELE 222
Prerequisites	ELE 221
Required/Elective	R
Credit	(3-0) 3
Description	Frequency response of one stage transistor circuits. Multistage amplifiers. Bode plots. DC, RC and transformer coupled amplifiers. Differential amplifiers. Current mirror. Operational amplifiers. Power amplifiers. Feedback in amplifiers. Power supply regulators. Noise in amplifiers.
Textbook	1. B.G. Streetman ve S. Banerjee, <i>Solid State Electronic Devices</i> , Prentice Hall Series, 2000. 2. A.S. Sedra ve K.C. Smith, <i>Microelectronic Circuits</i> , Oxford University Press, 1998. 3. J. Millman ve A. Grabel, <i>Microelectronics</i> , McGraw-Hill, ISBN: 007042-330X 4. M.S. Türköz, <i>Elektronik Devreleri 1 ve 2</i> , Sistem Yayıncılık, 3. Basım, 1995, ISBN: 9757397016

Course name	Analog Electronics Laboratory
Course code	ELE 222L
Prerequisites	--
Required/Elective	R
Credit	(0-2) 1
Description	Usage of laboratory equipments and measuring devices. Current, voltage, resistance measurements and monitoring with osilloscope. 1. Diodes a) Forward and reverse biasing b) Obtaining current voltage characteristics c) Half wave rectifier d) Full wave rectifier e) Bridge rectifier f) Obtaining characteristics of zener diodes 2. Bipolar Junction Transistor a) 6 different methods in NPN BJT DC biasing b) Obtaining characteristics in 4 quadrature c) Determining Early voltage d) Determining h_{FE} 3. Amplifiers a) Common emitter transistor DC biasing and gain b) Common base transistor DC biasing and gain c) Obtaining gain changes with respect to frequency changes 4. JFET and MOSFET a) DC biasing of JFET and obtaining characteristics b) DC biasing of MOSFET and obtaining characteristics 5. Amplifiers a) Amplifiers with FET and gain b) Amplifiers with MOSFET and gain c) Obtaining gain changes with respect to frequency changes
Textbook	1. B.G. Streetman ve S. Banerjee, <i>Solid State Electronic Devices</i> , Prentice Hall Series, 2000. 2. A.S. Sedra ve K.C. Smith, <i>Microelectronic Circuits</i> , Oxford University Press, 1998. 3. J. Millman ve A. Grabel, <i>Microelectronics</i> , McGraw-Hill, ISBN: 007042-330X 4. M.S. Türköz, <i>Elektronik Devreleri 1 ve 2</i> , Sistem Yayıncılık, 3.

	Basim, 1995, ISBN: 9757397016
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Course name	Electromagnetic Field Theory
Course code	ELE 231
Prerequisites	--
Required/Elective	R
Credit	(3-0) 3
Description	Vector analysis, scalar and vector products. Orthogonal coordinate systems, gradient, divergence, and curl operators. Gauss' and Stoke's theorem. Static electric fields and electrical potential, conductors and dielectrics. Capacitors and capacitance, electrostatic energy. Steady electric currents and Ohm's law. Continuity equation and Kirchoff's laws. Steady magnetic currents, vector potential, and Biot-Savart's law. Magnetization and magnetic circuits. Magnetic energy, force, and torque.
Textbook	David K. Cheng, <i>Field and Wave Electromagnetics</i> , Addison-Wesley Publications, ISBN 0-201-01239-1 .

Course name	Digital Electronics
Course code	ELE 321
Prerequisites	--
Required/Elective	R
Credit	(3-0) 3
Description	Large signal transistor models, TTL, MOS and CMOS logic gates. Inverters, input and output circuits. AND, OR, NAND, NOR and differential gates (XOR, XNOR): static and dynamic analysis. Regenerative circuits: astable, monostable multivibrators and Schmitt triggers circuits. Timers. Static and dynamic memories: RAM, ROM, EPROM, PLA and A/D and D/A converters. MUX, DEMUX circuits.
Textbook	1. T.A. Demassa ve Z. Ciccone, <i>Digital Integrated Circuits</i> , John Wiley & Sons, Inc., 1996, ISBN 0-471-10805-7 2. T.L. Floyd, <i>Digital Fundamentals</i> , Prentice Hall, Inc. 7. Edition. 3. R.J. Tocci, <i>Digital Systems, Principles and Applications</i> , Prentice - Hall, Inc., 4. Edition.

Course name	Digital Electronics Laboratory
Course code	ELE 321L
Prerequisites	--
Required/Elective	R
Credit	(0-2) 1
Description	<ul style="list-style-type: none"> • Transistor biasing and transistor based switching • Diode-Resistance logic gates (AND-OR, Level shifting diode AND, Level shifting diode OR) • RTL circuits and voltage transfer characteristics (Basic RTL inverter, RTL OR and RTL AND logic gates) • DTL circuits and voltage transfer characteristics • TTL circuits and voltage transfer characteristics (Basic TTL inverter and Totem-pole TTL NAND logic gates) • AND-OR-INVERTER circuits design • ECL circuits and voltage transfer characteristics • Monostable multivibrators • Astable multivibrators • Schmitt trigger circuits

Textbook	<ol style="list-style-type: none"> 1. T.A. Demassa ve Z. Ciccone, <i>Digital Integrated Circuits</i>, John Wiley & Sons, Inc., 1996, ISBN 0-471-10805-7 2. T.L. Floyd, <i>Digital Fundamentals</i>, Prentice Hall, Inc. 7. Edition. 3. R.J. Tocci, <i>Digital Systems, Principles and Applications</i>, Prentice – Hall, Inc., 4. Edition.
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Course Name	Electromagnetic Wave Theory
Course Code	ELE 331
Prerequisites	ELE 231
Required/Elective	R
Credit	(3-0) 3
Description	Faraday's law of magnetic induction and displacement current. Maxwell's equations. Electromagnetic boundary conditions, wave equations, and their solutions. Time harmonic electromagnetics and use of phasors. Plane electromagnetic waves in lossless and lossy media. Group velocity and dispersion. Flow of electromagnetic power and Poynting vector.
Textbook	David K. Cheng, <i>Field and Wave Electromagnetics</i> , Addison-Wesley Publications, ISBN 0-201-01239-1 .

Course Name	Signals and Systems
Course Code	ELE 371
Prerequisites	MAT 101, MAT 102
Required/Elective	R
Credit	(3-0) 3
Description	Continuous and discrete-time signals and systems. Feedback, memory, stability, time-invariance. Linear time-invariant systems described by differential or difference equations. Convolution. Fourier series and transform. Modulation. Sampling. Z-transform. Transfer function.
Textbook	<ol style="list-style-type: none"> 1. A.V. Oppenheim ve A.S. Willsky, <i>Signals and Systems</i>, Prentice Hall, 1997. 2. D.K. Lindner, <i>Signals and Systems</i>, Mc Graw Hill, 1999. 3. S. Haykin ve B. Van Veen, <i>Signals and Systems</i>, John Wiley & Sons; 2nd Ed., 2002, ISBN: 0471164747.

Course Name	Control Systems I
Course Code	ELE 301
Prerequisites	MAT 201, MAT 202
Required/Elective	R
Credit	(3-0)3
Description	Laplace Transform, Transfer Functions, Stability, Steady-State Error Analysis, Frequency Response Analysis, Root-Locus Technique, Design in State Space, controllability and observability, Pole Placement and Observer Design.
Textbook	<ol style="list-style-type: none"> 1. K. Ogata, <i>Modern Control Engineering</i>, Prentice Hall. 1997. 2. B.C. Kuo, <i>Automatic Control Systems</i>, Prentice Hall. 1995. 3. H. Özbay, <i>Introduction to Feedback Control Theory</i>, CRC Press, 1999, ISBN: 084931867X. 4. G.F. Franklin, J.D. Powell, A. Emami-Naeini, <i>Feedback Control of Dynamic Systems</i>, Prentice Hall, 4th Ed., 2002, ISBN: 0130323934.

Course Name	Control Systems I Laboratory
Course Code	ELE 301L
Prerequisites	MAT 201, MAT 202
Required/Elective	R
Credit	(0-2)1
Description	<ol style="list-style-type: none"> 1. Use of various sensors and digital acquisition of data 2. On-off control 3. P (Proportional) control and the effect of gain 4. Ziegler Nichols based PID design, load disturbance and steady state analysis, effect of D gain 5. Lag-lead compensator design
Textbook	Laboratory Manual

Course Name	Communication Systems I
Course Code	ELE 361
Prerequisites	--
Required/Elective	R
Credit	(3-0) 3
Description	Mathematical representation of information signals. Amplitude and phase modulation techniques: amplitude modulation, double side band, single side band, residual side band modulations, frequency modulation. Super heterodyne receivers. Phase lock loops, frequency division multiplexing, noise in FM and PM systems.
Textbook	<ol style="list-style-type: none"> 1. J.G. Proakis ve M. Salehi, <i>Communication Systems Engineering</i>, Prentice Hall, 2002, 2. Edition. 2. S. Haykin, <i>Communication Systems</i>, John Wiley & Sons, 2001, 4. Edition. 3. B.P. Lathi, <i>Modern Digital and Analog Communication Systems</i>, Oxford University Press, 1995, 2. Edition.

Course Name	Communication Systems I Laboratory
Course Code	ELE 361L
Prerequisites	--
Required/Elective	R
Credit	(0-2) 1
Description	<ul style="list-style-type: none"> • Voltage regulators • Measurement amplifiers • Audio frequency amplifier • Amplitude modulation • Phase modulation • Phase lock loop • Voltage controlled oscillator • Single sideband modulation and demodulation • Spectrum analysis of frequency modulation
Textbook	<ol style="list-style-type: none"> 1. J.G. Proakis ve M. Salehi, <i>Communication Systems Engineering</i>, Prentice Hall, 2002, 2. Edition. 2. S. Haykin, <i>Communication Systems</i>, John Wiley & Sons, 2001, 4. Edition. 3. B.P. Lathi, <i>Modern Digital and Analog Communication Systems</i>, Oxford University Press, 1995, 2. Edition.

Course Name	Digital Signal Processing
Course Code	ELE 372
Prerequisites	ELE 371
Required/Elective	R
Credit	(3-0) 3
Description	Discrete-time signals and systems. Sampling and reconstruction. Linear time-invariant systems. Z-transform. Forms of discrete-time systems. Fourier analysis of signals. Digital filter design techniques. Fast Fourier transform. Optimal filtering and linear prediction.
Textbook	1. A.V. Oppenheim ve R.W.Schafer, <i>Digital Signal Processing</i> , Prentice Hall, ISBN: 0132167719 2. J.G. Proakis ve D. Manolakis, <i>Digital Signal Processing: Principles, Algorithms and Applications</i> , 3rd Ed., 1995, ISBN: 0133737624.

Course Name	Microprocessors
Course Code	BİL 362
Prerequisites	BİL 264
Required/Elective	R
Credit	(3-0)3
Description	Introduction to Microprocessors. Addressing modes. Machine codes and assembly language programming. Subroutines, interrupts and basic input output. Serial and paralel communications.
Textbook	1. M.Rafiquazzaman, <i>Microprocessors and Microcomputer-Based System Design</i> , 2nd. Ed. CRC Press, 1995, ISBN 0-8493-4475-1 2. J.Crisp, <i>Introduction to Microprocessors & Microcontrollers</i> , 2nd. Ed., 2004, Newnes, ISBN: 0750659890 3. D.V. Hall, <i>Microprocessors and Interfacing: Programming and Hardware</i> , Glencoe McGraw-Hill, 2nd Ed., 1991, ISBN: 0070257426 4. W.A. Triebel, Avtar Singh, Avtar Singh, <i>The 8088 and 8086 Microprocessors: Programming Interfacing, Software, Hardware, and Applications</i> , 3rd Ed., Prentice Hall; 1999, ISBN:0130105600

Course Name	Microprocessors Laboratory
Course Code	BİL 362L
Prerequisites	BİL 264
Required/Elective	R
Credit	(0-2)1
Description	Assembly language programming. Interrupt programming. Programming input output devices.
Textbook	1. W. Triebel, A. Singh, <i>80X86 Microprocessor Experiments: Laboratory Manual</i> , Prentice Hall College Div; Lab Manual Ed., 1999, ISBN: 0133679136. 2. A.D. Wilcox, <i>68000 Microcomputer Experiments: Using the Motorola Educational Computer Board</i> , Prentice Hall, 1991, ISBN: 0138121818

Course Name	Senior Design Project I
Course Code	ELE 491
Prerequisites	-
Required/Elective	R
Credit	(1-4)3

Description	For this class, the students are involved in implementing a research project. The project scope consists of literature survey, problem formulation and a detailed design of a software engineering problem. At the end of the semester, the outcome of the research and design are presented to the project manager or instructor as requested.
Textbook	-

Course Name	Senior Design Project II
Course Code	ELE 492
Prerequisites	ELE 491
Required/Elective	R
Credit	(0-6)3
Description	This is a continuation of BIL 491. This time, the emphasis is on the development and implementation of the proposed design. The results are presented in a report and submitted to the Project manager. Also, a seminar will be held by the project team to present the implementation.
Textbook	-

ELECTIVE ELECTRICAL AND ELECTRONICS ENGINEERING COURSES

Course Name	Linear Systems
Course Code	ELE 401
Prerequisites	ELE 301
Required/Elective	E
Credit	(3-0)3
Description	Linear spaces, linear operators, range space and null space, eigenvectors, singular value decomposition, input, output and state, time varying and time invariant systems, discrete systems, linear system decompositions, observability, controllability, stability, detectability, stabilizability, reconstructability.
Textbook	1. P.J. Antsaklis and A.N. Michel, Linear Systems, McGraw-Hill Companies, 1997, ISBN: 0070414335 2. C.-T. Chen, Linear System Theory and Design, Oxford Series in Electrical and Computer Engineering, Oxford University Press; 3rd edition, 1998, ISBN: 0195117778 3. R.S. Strum and D.E. Kirk, Contemporary Linear Systems Using MATLAB, Thomson-Engineering, 1st Ed., 1999, ISBN: 0534371728.

Course Name	Control Systems II
Course Code	ELE 402
Prerequisites	ELE 301
Required/Elective	E
Credit	(3-0)3
Description	Compensator design in frequency domain, modeling in the state space, eigenvalues and eigenvectors, linear transformations, controllability and observability, pole placement, Lyapunov method, observer design, introduction to optimal control, design and analysis of discrete time systems.
Textbook	1. K. Ogata, Modern Control Engineering, Prentice Hall. 1997. 2. B. C. Kuo, Automatic Control Systems, Prentice Hall. 1995.

Course Name	Nonlinear Systems
Course Code	ELE 403
Prerequisites	ELE 301
Required/Elective	E
Credit	(3-0)3
Description	Nonlinear behavior, analysis in the phase space, Lyapunov stability analysis and definitions, describing function analysis, Lie algebra, feedback linearization, input/output linearization, input/state linearization, zero dynamics and internal stability, sliding mode control, nonlinear observers, applications in robotics and mechatronics.
Textbook	1. J.-J.E. Slotine and W. Li, Applied Nonlinear Control, ISBN: 0130408905. 2. H.K. Khalil, Nonlinear Systems, ASIN: 0132280248.

Course Name	Digital Control Systems
Course Code	ELE 404
Prerequisites	ELE 301
Required/Elective	E

Credit	(3-0)3
Description	Z-Transform, Discretization, Stability Analysis, Steady State Analysis, Root Locus, Design in Discrete Time, State Space and Structural Properties of DT Systems, Lyapunov Theory and Observer based Design.
Textbook	1. K. Ogata, Discrete Time Control Systems, ISBN: 0130342815 2. K. Sarioğlu, Digital Control Systems, in Turkish, Sistem Yayıncılık.

Course Name	Industrial Control Systems
Course Code	ELE 405
Prerequisites	ELE 301
Required/Elective	E
Credit	(3-0)3
Description	Programmable logic controllers (PLC), PID controller and its industrial aspects, microprocessor based control, instrumentation, process control, flow control.
Textbook	1. K.J. Aström and T. Hagglund, PID Controllers: Theory, Design and Tuning, International Society for Measurement and Con; 2. Edition 1995, ISBN: 1556175167. 2. M.J. Grimble, Industrial Control Systems Design, John Wiley & Sons, 1st Ed., 2001, ISBN: 0471492256. 3. A.B. Corripio, Tuning of Industrial Control Systems, Instrumentation Systems Inc., 1990, ISBN: 1556172532.

Course name	Robotics and Sensing
Course code	ELE 411
Prerequisites	ELE 301
Required/Elective	E
Credit	(3-0) 3
Description	Robotic manipulators, robot manipulator kinematics, manipulator trajectory planning, sensing systems, range sensing, sensing by touch, mobile robots, map building, trajectory planning and navigation, obstacle avoidance, target recognition, target tracking.
Textbook	1. J.J. Craig, <i>Introduction to Robotics: Mechanics and Control</i> , Prentice Hall, 3rd. Ed., 2003, ISBN: 0201543613. 2. S.B. Niku, <i>Introduction to Robotics, Analysis, Systems, Applications</i> , Prentice Hall, 2001. 3. L. Sciavicco ve B. Siciliano, <i>Modelling and Control of Robot Manipulators</i> , Springer, 2nd Ed., ISBN: 1852332212.

Course name	Mechatronic System Design
Course code	ELE 412
Prerequisites	ELE 301
Required/Elective	E
Credit	(3-0) 3
Description	Mechatronics as interdisciplinary design approach, design principles, mechanical design, electronic system design, software development for specific hardware, data collection and interface, hardware in the loop, modeling, control, logic, sensors and actuators, mechatronics instrumentation, intelligent systems, mini, micro and nano scale systems, industrial software and hardware examples.
Textbook	1. R.H. Bishop, <i>The Mechatronics Handbook</i> , CRC Press, ISBN: 0849300665

	2. D. Shetty ve R. Kolk, <i>Mechatronics System Design</i> , ISBN: 0534952852.
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Course name	Mechatronic System Design Laboratory
Course code	ELE 412L
Prerequisites	ELE 301
Required/Elective	E
Credit	(0-2) 1
Description	Actuators and sensors, computer based data collection, processing, evaluation and control, intelligent mechatronic systems.
Textbook	1. R.H. Bishop, <i>The Mechatronics Handbook</i> , CRC Press, ISBN: 0849300665 2. D. Shetty ve R. Kolk, <i>Mechatronics System Design</i> , ISBN: 0534952852.

Course name	Electrical Machinery Design
Course code	ELE 413
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	Asynchronous machine design: design fundamentals, determining size, chose of number ducts, windings, parameter calculations. Synchronous machine design: determining size, windings and parameter calculations Optimal design of synchronous and asynchronous machines.
Textbook	1. W.D. Stevenson, <i>Elements of Power System Analysis</i> , McGraw-Hill, 1982 ISBN: 0-07-061278-1 2. J.J. Grainger ve W.D. Stevenson, <i>Power System Analysis</i> , McGraw-Hill, 1994, ISBN: 0-07-061293-5

Course name	Fuzzy Logic
Course code	ELE 414
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	Crisp and fuzzy variables, membership functions and membership values, rule base, parametric membership functions, fuzzyfication and defuzzyfication methods, inference, combination of premises, rule activation level, function approximation, adaptive fuzzy systems, application areas of fuzzy systems, and analysis of application details.
Textbook	1. J.-S. R. Jang, C.-T. Sun ve E. Mizutani, <i>Neuro-Fuzzy and Soft-Computing</i> , Prentice Hall, 1996, ISBN: 0132610663. 2. L.X. Wang, <i>Adaptive Fuzzy Systems and Control: Design and Stability Analysis</i> , ASIN: 0130996319. 3. H.T. Nguyen ve E.A. Walker, <i>A First Course in Fuzzy Logic</i> , 2nd. Ed., CRC Press, 1999, ISBN: 0849316596. 4. T.Ross, <i>Fuzzy Logic with Engineering Applications</i> , John Wiley & Sons, 2nd Ed., 2004, ISBN: 0470860758.

Course name	Drive Systems
Course code	ELE 415
Prerequisites	--

Required/Elective	E
Credit	(3-2) 4
Description	Velocity control methods in DC motors and applications. Working in four quadrants. Asynchronous motor speed control methods and applications: voltage controlled speed control, frequency controlled speed control, speed control with constant field, rotor resistance speed control. Inverters and Pulse Width Modulation techniques. Working principles of step motors. Working principles of reluctance motors.
Textbook	1. R. Krishnan, <i>Electric Motor Drives</i> , Prentice Hall 2. N. Mohan, <i>Electric Drives: An Integrative Approach</i> , Univ. of Minnesota Pr. 3. T. Wildi, <i>Electrical Machines, Drives and Power Systems</i> , Prentice Hall.

Course name	Intelligent Systems
Course code	ELE 416
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	Intelligence and artificial intelligence (AI) concepts. AI approaches. AI components. AI techniques: Fuzzy Logic, Genetic Algorithms, Expert systems and Neural Networks (NN). Introduction to NN. Feedforward networks, learning algorithms. Industrial applications of NNs, fuzzy systems and control.
Textbook	1. J.-S. R. Jang, C.-T. Sun ve E. Mizutani, <i>Neuro-Fuzzy and Soft-Computing</i> , Prentice Hall, 1996, ISBN: 0132610663. 2. M.Ö. Efe ve O. Kaynak, <i>Yapay Sinir Ağları ve Uygulamaları</i> , Boğaziçi Üniversitesi Yayınları, 2004.

Course name	Semiconductor Device Technology
Course code	ELE 421
Prerequisites	ELE 221
Required/Elective	E
Credit	(3-0) 3
Description	Constructing semiconductor slices. Semiconductor insulator film. Photolithography. Doping materials and doping. Metalization, main connection and packaging. Integrated circuit elements and construction techniques. Commercial circuits integration. Future of semiconductor microtechnology.
Textbook	1. J. Allison, <i>Electronic Integrated Circuits</i> , McGraw-Hill. 2. D.V. Morgan ve K. Board, <i>An Introduction to Semiconductor Microtech-nology</i> , John Wiley & Sons. 3. A.S. Grove, <i>Physics and Technology of Semiconductor Devices</i> , John Wiley & Sons

Course name	VLSI Design
Course code	ELE 422
Prerequisites	ELE 221
Required/Elective	E
Credit	(3-0) 3
Description	Fast design techniques of very large scale circuits (VLSI). MOS technology and logic. Structural design and plotting rules. Circuit

	simulation, circuit design and plotting projects.
Textbook	1. S.H. Gerez, <i>Algorithms for VLSI Design Automation</i> , John Wiley & Sons, 198, ISBN: 0471984892. 2. C.Y. Chang ve S.M. Sze, <i>ULSI Technology</i> , McGraw-Hill, 1996, ISBN: 0070630623.

Course name	High Power Electronic Circuits
Course code	ELE 423
Prerequisites	ELE 221
Required/Elective	C
Credit	(3-0) 3
Description	Power regulators: descriptions and classifications. Power semiconductor switches and characteristics. Basic characteristics and operation of thyristors. Cooling. Mean output voltage of rectifiers. Rectifiers. Comutations. DC-DC converters: decreasing and increasing types. Inverters: voltage and current supplied inverters. Pulse Width Modulation techniques, applications.
Textbook	1. M. Rashid, <i>Power Electronics: Circuits, Devices and Applications</i> , Prentice Hall. 2. N. Mohan, T. Undeland, W.P. Robbins, <i>Power Electronics: Converters, Applications, and Design</i> , 3. P.T. Krein, <i>Elements of Power Electronics</i> , Oxford University Press

Course name	Circuit Synthesis
Course code	ELE 424
Prerequisites	ELE 201
Required/Elective	E
Credit	(3-0) 3
Description	Positive real functions and matrices, 1-gated LC circuit synthesis, reactance functions and implementations, 1-gated RC and RL circuits synthesis, Cauer transformations, RC type input impedance and admittance functions properties, 2-gated circuits synthesis, synthesis of LC circuit with resistance terminated, zero shifting method, active circuit synthesis, normalization, filter circuits and approximation problem, sensitivity problem.
Textbook	1. Fuat Anday, <i>Devre Sentezine Giriş</i> , İ.T.Ü. Yayınları. 2. A. Budak, <i>Passive and Active Network Analysis and Synthesis</i> , Waveland Press, 1991, ISBN: 0881336254.

Course name	Microwaves
Course code	ELE 431
Prerequisites	ELE 331
Required/Elective	E
Credit	(3-0) 3
Description	Review of electromagnetic theory, Maxwell's equations, plane waves and boundary conditions. Transmission lines and waveguides. Loss-free and low-loss transmission lines and steady state sinusoidal waves. TE, TM, and TEM waves. Rectangular and circular waveguides. Circuit theory for waveguiding systems, impedance transformation and matching.
Textbook	R. E. Collin, <i>Foundations of Microwave Engineering</i> , McGraw-Hill Editions

Course name	Antennas and Wave Propagation
Course code	ELE 432
Prerequisites	ELE 331
Required/Elective	E
Credit	(3-0) 3
Description	Fundamentals of electromagnetic radiation, antennas, and antenna impedance. Dipoles, arrays, long wire antennas, and aperture type antennas. Receiving antennas. Radiowave propagation, scattering, and diffraction.
Textbook	R. E. Collin, <i>Antennas and Radiowave propagation</i> , McGraw-Hill Editions

Course name	Biomedical Engineering
Course code	ELE 441
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	Basic principles of biomedical devices. Basic transducers and principles. Biopotential sources. ENG, EMG, ECG, ERG, EEG. Biopotential electrodes. Physiology and measurement of nervous, circulation and respiration systems. Biopotential amplifiers. Patient care and monitoring systems. Therapeutic and prosthetic devices.
Textbook	J.G. Webster, <i>Medical Instrumentation: Application and Design</i> .

Course name	Medical Imaging Systems
Course code	ELE 442
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	Generation and detection of X-rays, Imaging properties of X-rays, biological effects of ionized radiation. Conventional X-ray devices, principles of digital angiography and computed tomography. Basics of acoustic propagation, ultrasonic diagnosis methods. Radionuclide imaging, generation and detection of nuclear propagation, principles of gamma camera. Magnetic resonance imaging, generation and detection of MR signals, imaging techniques.
Textbook	1. İ. Karagöz ve O. Eroğul, <i>Tıbbi Görüntüleme Sistemleri</i> , 2. A. Macovski, <i>Medical Imaging Systems</i> .

Course name	Optics
Course code	ELE 451
Prerequisites	ELE 331, ELE 371
Required/Elective	E
Credit	(3-0) 3
Description	Ray optics, simple optical components, and matrix optics. Wave optics, monochromatic waves, and polychromatic light. The Gaussian beam, Hermite-Gaussian beams, and Laguerre-Gaussian beams. Fourier optics and diffraction of light. Holography. Electromagnetic optics and pulse propagation in dispersive media. Birefringence and crystal optics. Resonators. Statistical optics and coherent light.
Textbook	B. E. A. Saleh, M. C. Teich, <i>Fundamentals of Photonics</i> , John Wiley and Sons, Inc.

Course name	Photonics
Course code	ELE 452
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	Quantum states of light, definition of photon, and photon streams. Interaction of photons and atoms. Stimulated and spontaneous emission, light amplification. Laser amplifiers. Powersource and gain saturation in laser amplifiers. Theory of laser oscillation. Photons in semiconductors, semiconductor photon sources and detectors. Introduction to electro-optics, acousto-optics, and nonlinear optics.
Textbook	B. E. A. Saleh, M. C. Teich, <i>Fundamentals of Photonics</i> , John Wiley and Sons, Inc.

Course name	Optical Communications
Course code	ELE 453
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	Fiber-optics, step-index and graded index fibers, and attenuation and dispersion in fibers. Components of the optical fiber link. Modulation, multiplexing, and coupling. Coherent optical communications. System performance and receiver sensitivity.
Textbook	B. E. A. Saleh, M. C. Teich, <i>Fundamentals of Photonics</i> , John Wiley and Sons, Inc.

Course name	Communication Electronics
Course code	ELE 461
Prerequisites	ELE 222
Required/Elective	E
Credit	(3-0) 3
Description	Active and passive filters. RF amplifier design and analysis using Y-parameters. LC and crystal oscillators. PLL's and frequency generators. Design of linear and exponential modulators and demodulators.
Textbook	K.K. Clarke ve D.T. Hess, <i>Communication Circuits: Analysis and Design</i> .

Course name	Communication Systems II
Course code	ELE 462
Prerequisites	ELE 361
Required/Elective	E
Credit	(3-0) 3
Description	Pulse modulation. Sampling theorem. Pulswidth modulation. Pulse code modulation. Delta modulation. Time division multiplexing. Channel coding. Digital communication systems. Amplitude shift keying. Frequency shift keying. Phase shift keying. Introduction to probability theory. Statistical mean. Central limit theorem. Correlation.
Textbook	1. J.G. Proakis, M. Salehi, <i>Communication Systems Engineering</i> , Prentice Hall, 2002, 2. Edition.

	<p>2. S. Haykin, <i>Communication Systems</i>, John Wiley & Sons, 2001, 4. Edition.</p> <p>3. B.P. Lathi, <i>Modern Digital and Analog Communication Systems</i>, Oxford University Press, 1995, 2. Edition.</p>
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Course name	Communication Networks
Course code	ELE 463
Prerequisites	ELE 361
Required/Elective	E
Credit	(3-0) 3
Description	Telephony. Internet. Wireless networks. Architecture and protocols. Routing algorithms. Network design and management systems. Network simulation and performance analysis. Traffic measurement. Layered network architecture. Error control mechanisms. Packet switching. Circuit switching. Multiplexing methods. Network security.
Textbook	J. Walrand, <i>Communication Networks: A First Course</i> , 1991, ISBN: 0256088640.

Course name	Digital Communications
Course code	ELE 464
Prerequisites	ELE 361
Required/Elective	E
Credit	(3-0) 3
Description	Short revision of M-ASK, M-PSK, M-FSK, and M-QAM modulation techniques. Error detecting and correcting codes. Block and convolutional codes. Integral coding and modulation. Trellis code modulation. Code error relation for different modulations. Coding gain. Spread spectrum techniques. Direct sequence, frequency hopping and hybrid systems. Probability theory and a short review of random processes. Sum of random variables. Central limit theorem. Classification of lossy channels. Frequency selective attenuation. Fast and slow attenuation. Shadowing. BER and attenuation and shadowing. FDMA, TDMA, CDMA, ALOHA, CSMA, token ring. Attenuation and bandwidth.
Textbook	<p>1. J.G. Proakis, M. Salehi, <i>Communication Systems Engineering</i>, Prentice Hall, 2002, 2. Edition.</p> <p>2. S. Haykin, <i>Communication Systems</i>, John Wiley & Sons, 2001, 4. Edition.</p> <p>3. B.P. Lathi, <i>Modern Digital and analog Communication Systems</i>, Oxford University Press, 1995, 2. Edition.</p>

Course name	Radar and Sonar Systems
Course code	ELE 465
Prerequisites	ELE 371
Required/Elective	E
Credit	(3-0) 3
Description	Microwave propagation. Introduction to radar systems. Radar definition. Radar frequencies. Radar equation. Estimation of radar aperture. Classification of radars. Precision of radar measurements. Doppler measurements and tracking. Radar signals. Signal and noise separation. Information transfer using radar signals. Radar intersection. Propagation of radar waves. Radar antenna. Radar transmitters, receivers and antennas. Underwater acoustic propagation. Sonar transmitters and receivers. Detectors. Sequence

	processing. Detection and processing of radar and sonar signals.
Textbook	<ol style="list-style-type: none"> 1. M.I. Skolnik, <i>Introduction to Radar Systems</i>. 2. M.I. Skolnik, <i>Radar Handbook</i>. 3. B.R. Mahafza, <i>Radar Systems Analysis and Design Using MATLAB</i>. 4. P.Z. Peebles, <i>Radar Principles</i>.

Course name	Theory of Detection and Estimation
Course code	ELE 471
Prerequisites	ELE 371
Required/Elective	E
Credit	(3-0) 3
Description	Random parameters. Bias estimation. Minimum variance unbiased estimation. Cramer-Rao lower bound. Linear models. Linear unbiased estimation. Maximum likelihood estimation. Least squares method. Moments. Linear Bayesian estimation. Parameter estimation. Signal estimation.
Textbook	<ol style="list-style-type: none"> 1. S.M. Kay, <i>Fundamentals of Statistical Signal Processing Estimation Theory</i>. 2. H. Vincent Poor, <i>An Introduction to Signal Detection and Estimation</i>. 3. H.L. Van Trees, <i>Detection, Estimation, and Modulation Theory</i>.

Course name	Information Theory
Course code	ELE 472
Prerequisites	ELE 371
Required/Elective	E
Credit	(3-0) 3
Description	Definition of information, entropy, mutual information, measure of uncertainty, information sources and source coding, data compression, channels and channel capacity, noisy channels, performance limits of data communications.
Textbook	T.M. Cover ve C.A. Thomas, <i>Elements of Information Theory</i> , Wiley-Interscience 1991, ISBN: 0471062596.

Course name	Digital Image Processing
Course code	ELE 473
Prerequisites	ELE 372
Required/Elective	E
Credit	(3-0) 3
Description	Fundamentals of digital image processing. Image analysis. Edge detection. Grayscale image analysis. Binary image analysis. Pattern recognition and analysis. Analysis of point objects. Frequency domain analysis. Wavelet transform. Optical character recognition. Symbol recognition.
Textbook	<ol style="list-style-type: none"> 1. R.C. Gonzalez ve R.E. Woods, <i>Digital Image Processing</i>. 2. R.C. Gonzalez ve R.E. Woods, S.L. Eddins, <i>Digital Image Processing Using MATLAB</i>. 3. M.Seul, L. O’Gorman ve M.J. Sammon, <i>Practical Algorithms for Image Analysis Descriptions, Examples, and Code</i>. 4. J.R. Parker, <i>Algorithms for Image Processing and Computer Vision</i>.

Course name	Power System Analysis I
Course code	ELE 481

Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	TBA
Textbook	--

Course name	Power System Analysis II
Course code	ELE 482
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	TBA
Textbook	--

Course name	Isolation in Power Systems
Course code	ELE 483
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	TBA
Textbook	--

Course name	Power System Protection
Course code	ELE 484
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	TBA
Textbook	--

Course name	Energy Distribution I
Course code	ELE 485
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	TBA
Textbook	--

Course name	Energy Distribution II
Course code	ELE 486
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	TBA

Textbook	--
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Course name	Energy Transmission Lines
Course code	ELE 487
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	TBA
Textbook	--

Course name	Lighting Techniques
Course code	ELE 488
Prerequisites	--
Required/Elective	E
Credit	(3-0) 3
Description	TBA
Textbook	--

COURSES OFFERED TO OTHER DEPARTMENTS

Course name	Foundations of Electrical Engineering and Electronics
Course code	ELE 295
Prerequisites	-
Required/Elective	R
Credit	(2-0) 2
Description	Basic circuit theory. Analysis of DC circuits. Analysis of AC circuits. Semiconductor circuits. Digital electronics. Analog electronics. Instrumentation, communication, linear systems. Motors.
Textbook	<ol style="list-style-type: none"> 1. J.R. Cogdell, Foundations of Electrical Engineering, Prentice Hall, 1999, ISBN 0-13-092701-5. 2. R.L. Boylestad, L. Nashelsky, Electronic Devices and Circuit Theory, Prentice Hall, 1996, ISBN 0-13-375734-X. 3. J.W. Nilsson, Electric Circuits, Addison-Wesley Publishing Company, 1993, ISBN 0-201-58179-5. 4. H. Özyılmaz, Ü. Küçük, Elektronik Elemanlar ve Devre Teorisi, (Çeviri - R.L. Boylestad, L. Nashelsky, Electronic Devices and Circuit Theory), 2000, ISBN 975-11-0873-X.

Course name	Foundations of Electrical Engineering and Electronics Laboratory
Course code	ELE 295L
Prerequisites	-
Required/Elective	R
Credit	(0-2) 1
Description	Usage of measurement devices. Kirchhoff's voltage law. Kirchhoff's current law. Observing diode characteristics. Observing transistor characteristics. RL, RC, RLC circuits. Operational amplifiers and applications.
Textbook	<ol style="list-style-type: none"> 1. J.R. Cogdell, Foundations of Electrical Engineering, Prentice Hall, 1999, ISBN 0-13-092701-5. 2. R.L. Boylestad, L. Nashelsky, Electronic Devices and Circuit Theory, Prentice Hall, 1996, ISBN 0-13-375734-X. 3. J.W. Nilsson, Electric Circuits, Addison-Wesley Publishing Company, 1993, ISBN 0-201-58179-5. 4. H. Özyılmaz, Ü. Küçük, Elektronik Elemanlar ve Devre Teorisi, (Çeviri - R.L. Boylestad, L. Nashelsky, Electronic Devices and Circuit Theory), 2000, ISBN 975-11-0873-X.

Course name	Electronic Systems
Course code	ELE 296
Prerequisites	ELE 295
Required/Elective	R
Credit	(3-2) 4
Description	Introduction to digital electronics circuits. Diodes and bipolar junction transistors. Resistor-Transistor logic (RTL) circuits. Diode-Transistor logic (DTL) circuits. Transistor-Transistor logic (TTL) circuits. Operational amplifiers. Metal-oxide semiconductor field effect transistors digital circuits. NMOS logic gates. Semiconductor Read-Only Memories (ROM). Semiconductor static Random-Access Memories (RAM). Multivibrators.
Textbook	<ol style="list-style-type: none"> 1. Thomas A. DeMassa, Zack Ciccone, <i>Digital Integrated Circuits</i>, John Wiley & Sons, 1996.

	2. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, <i>Digital Integrated Circuits</i> , Prentice Hall, 2003.
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Course Name	Electronic Systems Laboratory
Course Code	ELE 296L
Prerequisites	ELE 295L
Required/Elective	R
Credit	(0-2) 1
Description	Diodes applications. Diode-resistor logic circuits. Resistor-transistor inverter circuits. Resistor-transistor noninverter circuits. Diode-transistor inverter circuits. Transistor-transistor inverter circuits. Operational amplifiers applications. NMOS NOR gate. NMOS NAND gate.
Textbook	<ol style="list-style-type: none"> 1. Thomas A. DeMassa, Zack Ciccone, <i>Digital Integrated Circuits</i>, John Wiley & Sons, 1996. 2. Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, <i>Digital Integrated Circuits</i>, Prentice Hall, 2003.