

## FACULTY OF ENGINEERING

Faculty of Engineering was established in 2012. The Faculty consists of Chemical Engineering, Civil Engineering, Computer Engineering, Electrical and Electronics Engineering, Environmental Engineering, Materials Science Engineering and Mechanical Engineering departments. The Faculty of Engineering is connected to Eskisehir Technical University, which was established with the Law No. 7141 published in the Official Gazette No. 30425 dated 18 May 2018. The Faculty of Engineering is located in the new and modern buildings of İki Eylül Campus. All the students attend one-year obligatory English Preparation School before four-year undergraduate programs. Most of the courses in undergraduate program are taught in English. Faculty of Engineering aims are giving high quality education to students to carry out professional work after graduation. All departments in the Faculty have modern computer facilities and research laboratories. Turkish Science and Research Council (TÜBİTAK), State Planning Office and University Research Foundation support various projects conducted in the departments of the Faculty. The Faculty of Engineering also conducts projects in collaboration with Local and Nation wide companies. There are also cooperative links with universities and research institutions in the U.S.A., Europe and Japan.

Dean	: Prof.Dr. Hanife APAYDIN ÖZKAN
Vice-Dean	: Dr. Lecturer Mehmet İnanç ONUR
Vice-Dean	: Assoc. Prof.Dr. Emir Zafer HOŞGÜN
Secretary to the Faculty	: Erhan ÜNSAL

### STAFF

#### Professors:

Emin AÇIKKALP, Elif AKBAY, Cemal AKSEL, Hanife APAYDIN ÖZKAN, Gürsoy ARSLAN, Nuray AT, Funda ATEŞ, Özgür AVŞAR, Feridun AY, Nezihe AYAS, Aydın AYBAR, Recep BAKIŞ, Müfide BANAR, Ümmühan BAŞARAN FİLİK, Ahmet BAYLAR, Berrin BOZAN, Hande ÇELEBİ, Arzu ÇİÇEK, Oğuz ÇOLAK, Atakan DOĞAN, Aydın DOĞAN, Tuncay DÖĞEROĞLU, Nihal ERGİNEL, Tansu FİLİK, Eftade Emine GAGA, Kadir GEDİK, Hasan Ferdi GERÇEL, Özgül GERÇEL, Ömer Nezihe GEREK, Serdar GÖNCÜ, Serkan GÜNAL, Altuğ İFTAR, Cihan KALELİ, Zehra KAMIŞLI ÖZTÜRK, Ferhat KARA, Refail KASIMBEYLİ, Onur KAYA, Nihan KOSKU PERKGÖZ, Semra KURAMA, Semra MALKOÇ, Ramis Mustafa ÖKSÜZOĞLU, Gökhan ÖZDEMİR, Mehmet Tankut ÖZGEN, Aysun ÖZKAN, Gürkan ÖZTÜRK, Cengiz ÖZZAİM, Abdullah Tuğrul SEYHAN, Ender SUVACI, Ünal ŞEN, Aynur ŞENSOY ŞORMAN, Ümran TEZCAN ÜN, Ahmet TUNCAN, Mustafa TUNCAN, Servet TURAN, Esin VAROL, Haluk YAPICIOĞLU, Yusuf YAVUZ

#### Associate Professors:

Sema AKYALÇIN, Levent AKYALÇIN, Mehmet ALEGÖZ, Nil ARAS, Ahmet ARSLAN, Erhan AYAS, Sinem BAŞKUT, Ali BOZER, Ahmet Ozan ÇELİK, Yasemin ÇELİK, Ali ÇELİK, Emre ÇİMEN, Gülçin DİNÇ YALÇIN, Elif Begüm ELÇİOĞLU, Burak EVİRGİN, Emin GERMEN, Yeşim GÜÇBİLMEZ, Zerrin GÜNKAYA, Emir Zafer HOŞGÜN, Fadime KARAER ÖZMEN, İrfan KAYA, Murat KILIÇ, Serkan KIVRAK, Mehmet KOÇ, Asım Anıl ÖNDER, Özlem ÖZDEN ÜZMEZ, Hakan Güray ŞENEL, Hakan ŞİRİN, Ali Arda ŞORMAN, Kıvanç TAŞKIN, Gökçen UYSAL, Tolga YASA, Sevcen YILMAZ GÜNDÜZ, Zehra YİĞİT AVDAN

#### Faculty Members:

İlgin ACAR, Müge ACAR, Şener AĞALAR, Oğuzkağan ALIÇ, Evren ARIÖZ, Ahmet AYDIN, Eren BALABAN, İlker BALCILAR, Burak BATMAZ, Zeynep BATMAZ, Suzan BİRAN AY, Fatma BİRİNCİ KAYAALP, Sema CANDEMİR, Bülent ÇİFTPINAR, Leman Esra DOLGUN, Emrah DÖLEKÇEKİÇ, Zeliha ERGÜL AYDIN, Hüseyin Ersin EROL, Özge EROL, Zeynep İdil ERZURUM ÇİÇEK, Emine Esra GEREK, Gökhan GÖKSEL, Mert GÜL, Çağla Gül GÜLDİKEN, Banu İÇMEN ERDEM, Selcan KAPLAN BERKAYA, Mutlu KARAŞOĞLU, Zühal KARTAL, Nergiz KASIMBEYLİ, Mehmet KILIÇARSLAN, Seval KINDEN, Volkan KİRİÇÇİ, Altan ONAT, Mehmet İnanç ONUR, Sadettin Eren ÖCAL, Derya ÖVER, İsmail Özgür ÖZER, Erdem ÖZYURT, Cahit PERKGÖZ, Hüseyin Boğaç POYRAZ, Özgür POYRAZ, Umut SAVACI, Gül İpek SELİMOĞLU, Hasan ŞAHİN, Burcu ŞİMŞEK UYGUN, Murat TAMER, Şura TOPTANCI, İrfan TÖRE, Onur TUNABOYU, Fatih TURAN, Semiha TÜRKAY, Can UYSAL, Burcu YILMAZEL, Ali YÜREKLİ, Ozan Can ZEHNİ, Abdulkadir ZİREK

#### Lecturers:

Orkun BAŞKAN, Pınar BİLGİN TENGİLİMOĞLU, Züliyet ÇELİKBİLEK, Esra FINDIK, Banu GÜNER, Bekir Tuna KAYAALP, Yalçın ÖZDEMİR, Muhsin YALÇIN

#### Research Assistants:

Zeynep AKTAŞ, Aslı ALTIPARMAK, Soner ALTUN, Perihan BEKDEMİR, Alp BİGALİ, Canberk BOLAT, Gürhan CEYLAN, Alattin ÇAKAN, Emrah DEMİR, Emin Talip DEMİRKIRAN, Harun Şenol DEMİROĞLU, Kamil Burak DERMENCİ, Enes İbrahim DÜDEN, Emine ERSEZER, Sevda ERYILMAZ, Şehnaz GENÇ, Hakkı Deniz GÜL, Kübra

GÜRCAN BAYRAK, Ertuğrul İŞLEK, Eren KAYA, Kübra KİBAR DOĞAN, Burcu KİREN, Levent KÖROĞLU, Handan KÜNKÜ, Ramazan MACİT, Merve MESTAN, Talha ORHAN, Kerim ÖRÜKLÜ, Nesil ÖZBAKAN ORHAN, Salih Çağrı ÖZER, Özlem Başak ÖZKAN KOLCUBAŞI, Mahmut ÖZTÜRK, Hatice Mine SAĞDIÇ ULUSOY, Mustafa Burak SAĞENER, Ali SOLAK, Gülseda ŞENEL, Naz ŞENGÜLER, Tansu TEMEL, Fikret YAMAN, Özen YELBAŞI, Kader YILDIRIM

## DEPARTMENT OF COMPUTER ENGINEERING (ENGLISH)

This programme intends to include all kinds of practical and theoretical aspects of the field of study and it aims to provide its graduates with technical and managerial skills in all aspects of Computer Engineering and Computer Sciences, required to pursue a career in the design, development, implementation, installation, operation, and maintenance of computer software and hardware systems, and to equip them with sufficient mathematical background necessary to follow advanced studies.

Department Head : Assoc. Prof.Dr. Mehmet KOÇ  
Deputy Department Head : Dr. Lecturer Zeynep BATMAZ  
Deputy Department Head : Dr. Lecturer Sema CANDEMİR

### PROGRAM

I.Semester				II.Semester			
BİM103 (Eng)	Computer Programming I	2+2	5.0	BİM108 (Eng)	Computer Programming II	2+2	6.0
BİM105 (Eng)	Introduction to Computer Engineering	2+0	2.0	BİM122 (Eng)	Discrete Computational Structures	3+0	5.0
FİZ105 (Eng)	Physics I	4+0	6.0	FİZ106 (Eng)	Physics II	4+0	6.0
FİZ107 (Eng)	Physics Laboratory I	0+2	1.5	FİZ108 (Eng)	Physics Laboratory II	0+2	1.5
KİM1005 (Eng)	General Chemistry	4+0	6.0	MAT1012 (Eng)	Calculus II	4+2	7.5
MAT1011 (Eng)	Calculus I	4+2	7.5	TÜR126	Turkish Language II	2+0	2.0
TÜR125	Turkish Language I	2+0	2.0	<i>Seçmeli Dersler</i>	--	2.0	----
			30.0				30.0
III.Semester				IV.Semester			
BİM2005 (Eng)	Computer Programming III	2+2	6.0	BİM2006 (Eng)	Computer Programming IV	2+2	5.5
BİM203 (Eng)	Logic Design	4+0	6.0	BİM2008 (Eng)	Formal Languages and Automata Theory	3+0	4.5
BİM209 (Eng)	Principles of Software Design and Development	3+0	6.0	BİM216 (Eng)	Database Management Systems	2+2	5.0
BİM213 (Eng)	Data Structures and Algorithms	2+2	5.5	BİM222 (Eng)	Internet Programming	3+0	4.5
MAT2021 (Eng)	Linear Algebra	3+1	4.5	İST252 (Eng)	Probability and Statistics	3+0	4.0
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0	MAT2004 (Eng)	Differential Equations and Numerical Methods	3+0	4.5
			30.0	TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
			30.0				30.0
V.Semester				VI.Semester			
BİM3005 (Eng)	Fundamentals of Software Engineering	3+0	4.5	BİM218 (Eng)	Operating Systems	2+2	4.5
BİM3007 (Eng)	Mathematical Tools for Computer Engineering	3+0	6.0	BİM304 (Eng)	Computer Algorithm Design	3+0	6.0
BİM303 (Eng)	Microcomputers	3+2	7.0	BİM308 (Eng)	Web Server Programming	3+0	4.5

BİM305 (Eng)	Computer Organization	3+0	5.0	BİM324 (Eng)	Computer Networks	2+2	4.5
	<i>Mesleki Seçmeli Dersler</i>	--	4.5	BİMSJ302 (Eng)	Computer Engineering Internship I	0+2	2.5
	<i>Seçmeli Dersler</i>	--	3.0		<i>Mesleki Seçmeli Dersler</i>	--	4.5
					<i>Seçmeli Dersler</i>	--	3.5
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			30.0				30.0

#### VII.Semester

BİM437 (Eng)	Computer Engineering Design	1+2	4.0
BİMSJ401 (Eng)	Computer Engineering Internship II	0+2	2.5
İSG401	Occupational Health and Safety I	2+0	2.0
	<i>Mesleki Seçmeli Dersler</i>	--	18.0
	<i>Seçmeli Dersler</i>	--	3.5
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			30.0

#### VIII.Semester

BİM444 (Eng)	Computer Engineering Applications	2+4	7.0
İSG402	Occupational Health and Safety II	2+0	2.0
	<i>Mesleki Seçmeli Dersler</i>	--	18.0
	<i>Seçmeli Dersler</i>	--	3.0
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			30.0

#### Elective Courses

ALM255 (Ger)	German I	3+0	4.0
ALM256 (Ger)	German II	3+0	4.0
ANT452	First Aid	1+2	4.0
ARK108	Archaeology	2+0	2.0
BEÖ155	Physical Education	2+0	2.0
BEÖ155 (Eng)	Physical Education	2+0	2.0
BEÖ176	Trekking	1+2	4.0
BİM411 (Eng)	Decision Support Systems	3+0	3.0
ESTÜ1001	Story Analysis On World Literature	3+0	3.0
ESTÜ1003	Yoga and Meditation	1+1	2.0
ESTÜ101	Introduction to University Life	0+1	2.0
ESTÜ102 (Eng)	Negotiation Techniques Class	2+0	3.0
ESTÜ103	Ceramic Design Processes	2+1	3.0
ESTÜ104	Academic and Life Skills	2+1	3.0
ESTÜ106	Proje Yönetimi	2+1	3.0
ESTÜ111	Volunteering Works	1+2	4.0
ESTÜ112	Cyber Security for Everyone	2+0	2.0
ESTÜ113	Design Thinking	3+0	3.0
ESTÜ114	Visual Thinking	3+0	3.0
ESTÜ115	Photographic Viewpoint	2+1	3.0
ESTÜ116	Computer Aided Design I	3+0	3.0
ESTÜ117	Computer Aided Design II	3+0	3.0
ESTÜ118	Visual Thinking with Concepts	3+0	3.0
ESTÜ119	Flute	3+1	3.0
ESTÜ120	Solfege	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
ESTÜ123	Gender Equality in Work Life	2+0	3.0
ESTÜ125	Philosophy of Science	3+0	3.0
ESTÜ127	Diction	1+2	3.0
ESTÜ129	Turkish as a Foreign Language I	2+0	2.0
ESTÜ130	Turkish as a Foreign Language II	2+0	2.0
ESTÜ131	Argentine Tango Dance	0+2	2.0
ESTÜ132	History of Political Thought	3+0	3.0
ESTÜ133	Disability and Awareness	3+0	3.0
ESTÜ2001	AI Literacy	2+0	2.0
ESTÜ201	Turkish Sign Language	3+0	3.0
ESTÜ203	Introduction to Sociology	3+0	3.0

ESTÜ204	Effective Reading and Writing Skills	3+0	4.0
ESTÜ206	Financial Literacy	3+0	3.0
ESTÜ207	General Psychology	2+0	4.0
ESTÜ210	Culture of Museum	2+0	2.0
ESTÜ301	Science Communication	2+0	3.0
ESTÜ307	Children Rights and Family Education	2+0	2.0
ESTÜ4001 (Eng)	Sustainable Building Design	3+0	3.0
ESTÜ401	Introduction to Professional Life	1+1	2.0
ESTÜ402	Coaching and Leadership	3+0	3.0
ESTÜ403	Basic Computer Utilization	3+0	4.0
FOT202	Photography	2+0	3.0
FRA255 (Fra)	French I	3+0	4.0
FRA256 (Fra)	French II	3+0	4.0
HUK458	Industrial Rights and Technological Development	3+0	3.0
İKT151 (Eng)	Economics	3+0	3.0
İKT356 (Eng)	Engineering Economics	3+0	4.5
İLT201	Interpersonal Communication	3+0	4.5
İLT201 (Eng)	Interpersonal Communication	3+0	4.5
İLT419	Body Language and Diction	2+0	5.0
İSN309 (Eng)	Mass Media	3+0	3.0
İSN409	Organizational Communication	3+0	4.5
İSP151 (Spa)	Spanish I	4+0	4.0
İSP152 (Spa)	Spanish II	4+0	4.0
İŞL101	Introduction to Business	3+0	4.5
İŞL101 (Eng)	Introduction to Business	3+0	4.5
İŞL102	Management and Organization	3+0	4.0
İŞL209	Business Management	2+0	2.0
İŞL301 (Eng)	Human Resources Management	3+0	4.0
İŞL301	Human Resources Management	3+0	4.0
İŞL321	Applied Entrepreneurship	3+1	5.0
İŞL406	Strategic Management	3+0	4.5
İŞL421	Entrepreneurship	2+0	3.0
İŞL475	Techno-Entrepreneurship	3+0	4.0
İTA255 (İta)	Italian I	3+0	4.0
İTA256 (İta)	Italian II	3+0	4.0
JAP301 (Jap)	Japanese I	4+0	4.0
JAP302 (Jap)	Japanese II	4+0	4.0
MFALM101 (Ger)	German for Engineering I	3+0	4.0
MFALM102 (Ger)	German for Engineering II	3+0	4.0
MFALM201 (Ger)	German for Engineering III	3+0	4.0
MFALM202 (Ger)	German for Engineering IV	3+0	4.0
MUH151	Introduction to Accounting	3+0	4.5
MUH151 (Eng)	Introduction to Accounting	3+0	4.5
MÜH402 (Eng)	Engineering Ethics	2+0	3.0
MÜH404 (Eng)	Innovation Management	3+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
NÜM301 (Eng)	Numerical Methods	3+0	3.5
ÖMB322	Ethics of Science and Research	2+0	3.0
PSİ102 (Eng)	Psychology	3+0	3.5
PZL302 (Eng)	Marketing Management	3+0	4.5
REK2522	Sports Aviation	1+1	4.0
RTV281	Digital Literacy	2+2	4.0
RUS255 (Rus)	Russian I	3+0	4.0
RUS256 (Rus)	Russian II	3+0	4.0
SAĞ102	First Aid	2+0	2.5
SNT155	History of Art	2+0	2.0
THU203	Community Services	0+2	3.0
TİY121	Introduction to Theatre	2+0	3.0
TİY152	Theatre	2+0	2.5
TİY308	Republic Era Turkish Theatre	2+0	3.0

#### Area Elective Courses

BlM309 (Eng)	Artificial Intelligence	3+0	4.5
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BiM405 (Eng)	Project Management	3+0	4.5
BiM423 (Eng)	Software Engineering	3+2	6.0
BiM439 (Eng)	Applications of Database Management Systems	3+0	4.5
BiM441 (Eng)	Introduction to Rough Sets Theory	3+0	4.5
BiM443 (Eng)	Blockchain and Cryptocurrency Technologies	3+0	4.5
BiM445 (Eng)	Enterprise IT Architecture	2+0	3.0
BiM446 (Eng)	Analysis of Algorithms	3+0	4.5
BiM447 (Eng)	Introduction to Deep Learning	3+0	4.5
BiM448 (Eng)	Computer Graphics	3+0	4.5
BiM449 (Eng)	Introduction to Game Programming	3+0	4.5
BiM450 (Eng)	Network Management	3+0	4.5
BiM451 (Eng)	Web Server Programming with MVC	3+0	4.5
BiM452 (Eng)	Multimedia Computing	3+0	4.5
BiM453 (Eng)	Introduction to Machine Learning	3+0	4.5
BiM454 (Eng)	Programming Language Concepts	3+0	4.5
BiM455 (Eng)	Introduction to Hardware Design	3+0	4.5
BiM456 (Eng)	Network Security Principles	3+0	4.5
BiM457 (Eng)	Embedded Programming Languages	3+0	4.5
BiM458 (Eng)	Simulation and Modeling	3+0	4.5
BiM459 (Eng)	Artificial Intelligence in Healthcare	3+0	4.5
BiM460 (Eng)	Software Modeling	3+0	4.5
BiM461 (Eng)	Introduction to Cloud Computing	3+0	4.5
BiM462 (Eng)	Parallel Systems	3+0	4.5
BiM463 (Eng)	Introduction to Natural Language Processing	3+0	4.5
BiM464 (Eng)	Human-Computer Interaction	3+0	4.5
BiM465 (Eng)	Introduction to Data Science	3+0	4.5
BiM466 (Eng)	Fuzzy Logic	3+0	4.5
BiM468 (Eng)	Computer Aided Design	3+0	4.5
BiM470 (Eng)	Neural Networks	3+0	4.5
BiM472 (Eng)	Image Processing	3+0	4.5
BiM474 (Eng)	Introduction to Cryptography	3+0	4.5
BiM476 (Eng)	Data Acquisition and Processing	3+0	4.5
BiM478 (Eng)	Management Information Systems	3+0	4.5
BiM480 (Eng)	Compiler Design	3+0	4.5
BiM482 (Eng)	Network Programming	3+0	4.5
BiM484 (Eng)	Distributed Systems	3+0	4.5
BiM485 (Eng)	Research in Computer Science I	3+0	4.5
BiM486 (Eng)	Research in Computer Science II	3+0	4.5
BiM488 (Eng)	Introduction to Pattern Recognition	3+0	4.5
BiM490 (Eng)	Introduction to Information Retrieval	3+0	4.5
BiM492 (Eng)	Design Patterns	3+0	4.5
BiM493 (Eng)	Mobile Programming I	3+0	4.5
BiM494 (Eng)	Mobile Programming II	3+0	4.5
BiM496 (Eng)	Computer Vision	3+0	4.5
BiM498 (Eng)	Embedded Software Design	3+0	4.5
EEM305 (Eng)	Signals and Systems	3+0	4.5
EEM334 (Eng)	Digital Systems II	3+0	5.0
MÜH302 (Eng)	Interdisciplinary Applications	1+2	4.5

## SOFTWARE AND OPTIMIZATION MINOR PROGRAM

### DEPARTMENT OF ENVIRONMENTAL ENGINEERING (30% ENGLISH)

Environmental engineers address environmental challenges that impact both public health and the environment. They leverage their technical expertise to formulate methodologies and technologies aimed at the purification and safeguarding of air, water, and soil quality. Moreover, environmental engineers are actively engaged in tackling contemporary global issues, including the societal and ecological consequences of climate change. Additionally, they focus on ongoing matters such as sustainability and the circular economy. Environmental engineers excel in optimizing natural resource utilization, facilitating the development of renewable energy resources, and enhancing the efficiency of existing materials. The Department of Environmental Engineering, a pioneering division of Anadolu University's Faculty of Engineering and Architecture, commenced its undergraduate and

graduate (master's and doctorate) programs during the 1994-1995 academic year. Following the enactment of legislation published in Official Gazette No. 7141 on May 18, 2018, the Faculty of Engineering at Anadolu University was autonomously established and incorporated into the newly founded Eskişehir Technical University. The department is staffed by 11 Professors, 4 Associate Professors, 5 Assistant Professors, 1 Lecturer Dr., and 3 Research Assistants. It holds a 5-year accreditation from MÜDEK, covering the period from 2022 to 2025, and has been bestowed the EUR-ACE label.

Department Head : Prof.Dr. Aysun ÖZKAN  
Deputy Department Head : Dr. Lecturer İlker BALÇILAR  
Deputy Department Head : Assoc. Prof.Dr. Alp ÖZDEMİR

## PROGRAM

I.Semester				II.Semester			
ÇEV203	Introduction to Environmental Engineering	2+0	2.5	ÇEV1006	Ecology	2+0	2.0
ÇEV209 (Eng)	Technical English I	3+0	2.5	FİZ106	Physics II	4+0	6.0
FİZ105	Physics I	4+0	6.0	FİZ108	Physics Laboratory II	0+2	1.5
FİZ107	Physics Laboratory I	0+2	1.5	KİM1002 (Eng)	General Chemistry II	4+0	6.0
KİM1001 (Eng)	General Chemistry I	4+0	6.0	KİM1010 (Eng)	General Chemistry Laboratory	0+2	1.5
MAT1011	Calculus I	4+2	7.5	MAT1012	Calculus II	4+2	7.5
TÜR125	Turkish Language I	2+0	2.0	TÜR126	Turkish Language II	2+0	2.0
	<i>Seçmeli Dersler</i>	--	2.0		<i>Seçmeli Dersler</i>	--	3.5
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30.0				30.0			

III.Semester				IV.Semester			
BİY353	Environmental Microbiology	3+0	3.0	ÇEV2006 (Eng)	Environmental Chemistry Laboratory	0+3	3.0
BİY357 (Eng)	Environmental Microbiology Lab.	0+3	2.5	ÇEV206 (Eng)	Environmental Chemistry II	3+0	4.5
ÇEV210 (Eng)	Technical English II	2+0	2.0	İKT356 (Eng)	Engineering Economics	3+0	4.5
ÇEV213	Environmental Chemistry I	3+0	3.0	İST2001	Engineering Statistics	3+0	4.0
ÇEV216	Sustainability, Innovation and Project Management in Environmental Engineering	1+1	2.5	MAT2023	Linear Algebra and Numerical Methods	2+2	4.5
MAT2011	Differential Equation	3+1	4.5	MEK215 (Eng)	Statics and Strength of Materials	3+0	4.5
MLZ203 (Eng)	Materials Science	3+0	3.0	TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0		<i>Mesleki Seçmeli Dersler</i>	--	3.0
	<i>Seçmeli Dersler</i>	--	7.5				
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30.0				30.0			

V.Semester				VI.Semester			
ÇEV305 (Eng)	Unit Operations and Processes I	4+0	4.0	ÇEV312	Water Supply and Sewerage	3+0	3.0
ÇEV310	Water and Soil Pollution	3+0	3.0	ÇEV324 (Eng)	Unit Operations and Processes II	4+0	4.0
ÇEV316 (Eng)	Air Pollution	3+0	3.5	ÇEV342 (Eng)	Unit Operations And Processes Laboratory	0+3	4.0
İNŞ308 (Eng)	Hydrology	3+0	4.5	ÇEV344	Solid Waste Management	3+1	4.0
MEK315	Fluid Mechanics	3+2	5.0	ÇEV427 (Eng)	Air Pollution Control	3+0	3.5
	<i>Mesleki Seçmeli Dersler</i>	--	10.0	TER403	Thermodynamics	3+0	3.5

				Mesleki Seçmeli Dersler	--	8.0
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				30.0		30.0
<b>VII.Semester</b>				<b>VIII.Semester</b>		
ÇEV442	Hazardous Waste Management	3+0	3.0	ÇEV438	Environmental Management	3+2 5.0
ÇEV445 (Eng)	Environmental Modeling	3+0	4.5	ÇEV450	Graduation Project in Environmental Engineering II	2+4 5.5
ÇEV447 (Eng)	Wastewater Engineering	3+0	4.0	ÇEVSJ402	Environmental Engineering Internship II	0+2 2.5
ÇEV449	Graduation Project in Environmental Engineering I	1+2	3.0	İSG402	Occupational Health and Safety II	2+0 2.0
ÇEVSJ401	Environmental Engineering Internship I	0+2	2.5			
İSG401	Occupational Health and Safety I	2+0	2.0	Mesleki Seçmeli Dersler	--	15.0
Mesleki Seçmeli Dersler						
				-----		-----
				30.0		30.0
<b>Elective Courses</b>						
ALM255 (Ger)	German I				3+0	4.0
ALM256 (Ger)	German II				3+0	4.0
ANT452	First Aid				1+2	4.0
ARK108	Archaeology				2+0	2.0
BEÖ155	Physical Education				2+0	2.0
BEÖ176	Trekking				1+2	4.0
ÇEV319	Scientific Reading and Writing Skills				2+0	3.0
ESTÜ1001	Story Analysis On World Literature				3+0	3.0
ESTÜ1003	Yoga and Meditation				1+1	2.0
ESTÜ101	Introduction to University Life				0+1	2.0
ESTÜ103	Ceramic Design Processes				2+1	3.0
ESTÜ104	Academic and Life Skills				2+1	3.0
ESTÜ106	Proje Yönetimi				2+1	3.0
ESTÜ111	Volunteering Works				1+2	4.0
ESTÜ112	Cyber Security for Everyone				2+0	2.0
ESTÜ113	Design Thinking				3+0	3.0
ESTÜ114	Visual Thinking				3+0	3.0
ESTÜ115	Photographic Viewpoint				2+1	3.0
ESTÜ116	Computer Aided Design I				3+0	3.0
ESTÜ117	Computer Aided Design II				3+0	3.0
ESTÜ118	Visual Thinking with Concepts				3+0	3.0
ESTÜ119	Flute				3+1	3.0
ESTÜ120	Solfege				3+1	3.0
ESTÜ121	Piano				3+1	3.0
ESTÜ122	Guitar				3+1	3.0
ESTÜ123	Gender Equality in Work Life				2+0	3.0
ESTÜ125	Philosophy of Science				3+0	3.0
ESTÜ127	Diction				1+2	3.0
ESTÜ131	Argentine Tango Dance				0+2	2.0
ESTÜ132	History of Political Thought				3+0	3.0
ESTÜ133	Disability and Awareness				3+0	3.0
ESTÜ2001	AI Literacy				2+0	2.0
ESTÜ201	Turkish Sign Language				3+0	3.0
ESTÜ203	Introduction to Sociology				3+0	3.0
ESTÜ206	Financial Literacy				3+0	3.0
ESTÜ207	General Psychology				2+0	4.0
ESTÜ210	Culture of Museum				2+0	2.0
ESTÜ301	Science Communication				2+0	3.0

ESTÜ307	Children Rights and Family Education	2+0	2.0
ESTÜ4001 (Eng)	Sustainable Building Design	3+0	3.0
ESTÜ401	Introduction to Professional Life	1+1	2.0
ESTÜ403	Basic Computer Utilization	3+0	4.0
ESTÜ405	Computer Programming	3+0	5.0
FEL102	Introduction to Philosophy	2+0	2.5
FEL401	Philosophy of Science	2+0	2.5
FOT202	Photography	2+0	3.0
FRA255 (Fra)	French I	3+0	4.0
FRA256 (Fra)	French II	3+0	4.0
HUK252	Labor Law	2+0	2.5
HUK458	Industrial Rights and Technological Development	3+0	3.0
İLT201	Interpersonal Communication	3+0	4.5
İLT370	New Approaches in Management	3+0	6.5
İLT419	Body Language and Diction	2+0	5.0
İSN309	Mass Media	3+0	3.0
İŞL101	Introduction to Business	3+0	4.5
İŞL102	Management and Organization	3+0	4.0
İŞL209	Business Management	2+0	2.0
İŞL321	Applied Entrepreneurship	3+1	5.0
İŞL406	Strategic Management	3+0	4.5
İŞL421	Entrepreneurship	2+0	3.0
İŞL454 (Eng)	Management of Technology	3+0	4.5
İŞL475	Techno-Entrepreneurship	3+0	4.0
İTA255 (İta)	Italian I	3+0	4.0
İTA256 (İta)	Italian II	3+0	4.0
JAP301 (Jap)	Japanese I	4+0	4.0
JAP302 (Jap)	Japanese II	4+0	4.0
KÜL451 (Eng)	History of Science and Engineering	3+0	4.5
MFALM101 (Ger)	German for Engineering I	3+0	4.0
MFALM102 (Ger)	German for Engineering II	3+0	4.0
MFALM201 (Ger)	German for Engineering III	3+0	4.0
MFALM202 (Ger)	German for Engineering IV	3+0	4.0
MUH151	Introduction to Accounting	3+0	4.5
MÜH402	Engineering Ethics	2+0	3.0
MÜH404	Innovation Management	3+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
ÖMB322	Ethics of Science and Research	2+0	3.0
PSİ102	Psychology	3+0	3.5
PZL302	Marketing Management	3+0	4.5
REK2522	Sports Aviation	1+1	4.0
RUS255 (Rus)	Russian I	3+0	4.0
RUS256 (Rus)	Russian II	3+0	4.0
SNT155	History of Art	2+0	2.0
SOS153	Sociology	3+0	3.5
SOS154	Man and Sociology	2+0	3.0
TAR201	History of Science	2+0	2.5
THU203	Community Services	0+2	3.0
TİY121	Introduction to Theatre	2+0	3.0
TİY152	Theatre	2+0	2.5
TİY308	Republic Era Turkish Theatre	2+0	3.0
TRS127	Technical Drawing	2+2	4.5
TÜR120	Turkish Sign Language	3+0	3.0

#### Area Elective Courses

ÇEV323	Bioremediation Technologies	2+0	3.0
ÇEV325	Information Technologies in Environmental Engineering	2+0	3.0
ÇEV327	Green and Sustainable Agriculture	2+0	3.0
ÇEV335	Disinfection of Water and Wastewater	1+1	3.0
ÇEV340	Applied of Environmental Statistics Analysis	2+0	3.0
ÇEV346	Environmental Problems Resulting from Energy Production	2+0	3.0
ÇEV348 (Eng)	Instrumental Analysis in Environmental Studies	2+0	3.0
ÇEV352	Environmental Health	2+0	3.0



ÇEV354	Environmental Footprints	2+0	3.0
ÇEV356	Reuse of Wastewater for the Sustainability of Water Resources	2+0	3.0
ÇEV358	Global Climate Change	2+0	3.0
ÇEV360	Corporate Sustainability Management	2+0	3.0
ÇEV362	Environment Economy	2+0	3.0
ÇEV398	Environmental Auditing	2+0	3.0
ÇEV431	Water Treatment Project	1+2	4.0
ÇEV432	Wastewater Treatment Project	1+2	4.0
ÇEV444	Solid Waste Management Project	1+2	4.0
ÇEV448 (Eng)	Coastal Zone Management	2+0	3.0
ÇEV4501	Environmental Sociology	2+0	3.0
ÇEV466	Ecological Planning and Ecotechnology	2+0	3.0
ÇEV468	Watershed Management	2+0	3.0
ÇEV473	Water Quality Assessment	2+0	3.0
ÇEV477	Remote Sensing and GIS Applications in Environmental Sciences	2+0	3.0
ÇEV479	Green Engineering Design and Sustainability	2+0	3.0
ÇEV481	Sludge Treatment and Disposal	2+0	3.0
ÇEV482	Air Pollution Laboratory	1+2	3.0
ÇEV483	Environmental Toxicology	1+1	3.0
ÇEV484	Small-scale Wastewater Treatment Systems	2+0	3.0
ÇEV485 (Eng)	Environmental Exposure Assessment	2+0	3.0
ÇEV487	Water and wastewater treatment using membrane systems and processes	2+0	3.0
ÇEV491	Noise Pollution and Control	2+0	3.0
ÇEV492	Air Quality Management Project	1+2	4.0
ÇEV493	Legislation Approach For Environmental Solutions	2+0	3.0
ÇEV495	Air Pollution Meteorology and Atmospheric Dispersion	2+0	3.0
ÇEV496	Microbiological Treatment Methods	2+0	3.0
ÇEV497	Industrial Wastewater Treatment	2+0	3.0
ÇEV498	Health-Care Waste Management	2+0	3.0
ÇEV499	Advanced Treatment of Water and Wastewater	2+0	3.0
MTH456	Future Literacy and Foresight Analysis	3+0	5.0
MÜH302	Interdisciplinary Applications	1+2	4.5

## SUSTAINABILITY AND CLIMATE CHANGE MINOR PROGRAM

### DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING (ENGLISH)

ABOUT THE DEPARTMENT Department of Electrical and Electronics Engineering was first established in 1980 and then became a part of the Faculty of Engineering and Architecture of Anadolu University in 1982. However, when this faculty became a part of the newly established Osmangazi University in August 1993, a new Faculty of Engineering and Architecture and, as a part of this new faculty, a new Department of Electrical and Electronics Engineering were established at Anadolu University. Presently there are 4 professors, 4 associate professors, and 5 assistant professors, adding up to thirteen full-time faculty members accompanied by 13 associates working with the department. Furthermore, some faculty members from other departments in our university and from other universities also work as adjunct faculty members in our department. The undergraduate program (leading to the B.S. degree) in our department has started in the 1997-1998 academic year. Currently there are about 380 undergraduates studying in the department including the 62 students in the English preparatory classes. The language of the instruction in the undergraduate program is English. Graduate education (leading to M.S. and Ph.D. degrees) with specializations in systems and control theory, digital systems, power electronics, and signal and image processing and recognition, computer networks and architecture is being offered since the 1994-95 academic year.

Department Head : Prof.Dr. Nuray AT  
Deputy Department Head : Dr. Lecturer Abdulkadir ZİREK  
Deputy Department Head : Dr. Lecturer Burak BATMAZ

### PROGRAM

#### I.Semester

#### II.Semester

BİM122 (Eng)	Discrete Computational Structures	3+0	5.0	EEM102 (Eng)	Introduction to Electrical Engineering	4+2	7.5
FİZ105 (Eng)	Physics I	4+0	6.0	EEM104 (Eng)	Professional Aspects of Electrical & Electronics Engineering	2+0	3.0
FİZ107 (Eng)	Physics Laboratory I	0+2	1.5	FİZ106 (Eng)	Physics II	4+0	6.0
KİM1005 (Eng)	General Chemistry	4+0	6.0	FİZ108 (Eng)	Physics Laboratory II	0+2	1.5
MAT1011 (Eng)	Calculus I	4+2	7.5	MAT1012 (Eng)	Calculus II	4+2	7.5
TÜR125	Turkish Language I	2+0	2.0	MAT2021 (Eng)	Linear Algebra	3+1	4.5
	<i>Seçmeli Dersler</i>	--	2.0				
			-----				-----
			30.0				30.0

### III.Semester

BİL200 (Eng)	Computer Programming	2+2	6.0
EEM206 (Eng)	Electrical Circuits Laboratory	1+2	3.0
EEM209 (Eng)	Circuit Analysis	4+1	7.5
MAT2011 (Eng)	Differential Equation	3+1	4.5
MAT2093 (Eng)	Engineering Mathematics	4+0	6.0
	<i>Seçmeli Dersler</i>	--	3.0
			-----
			30.0

### IV.Semester

EEM208 (Eng)	Electromagnetic Fields and Waves	4+0	6.0
EEM210 (Eng)	Fundamentals of Semiconductor Device	3+0	5.0
EEM232 (Eng)	Digital Systems I	4+0	6.0
EEM238 (Eng)	Digital Systems Laboratory	0+2	2.0
İST2044 (Eng)	Engineering Probability	3+1	5.0
TÜR126	Turkish Language II	2+0	2.0
	<i>Seçmeli Dersler</i>	--	4.0
			-----
			30.0

### V.Semester

EEM301 (Eng)	Signals and Systems	4+0	6.0
EEM311 (Eng)	Principles of Energy Conversion	3+2	6.0
EEM321 (Eng)	Electronics I	3+0	5.0
EEM328 (Eng)	Electronics Laboratory	1+2	3.0
İKT151 (Eng)	Economics	3+0	3.0
İSG401	Occupational Health and Safety I	2+0	2.0
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0
	<i>Seçmeli Dersler</i>	--	3.0
			-----
			30.0

### VI.Semester

EEM308 (Eng)	Introduction to Communications	3+2	7.0
EEM336 (Eng)	Microprocessors I	3+2	7.0
EEM342 (Eng)	Fundamentals of Control Systems	3+2	7.0
İSG402	Occupational Health and Safety II	2+0	2.0
TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
	<i>Seçmeli Dersler</i>	--	5.0
			-----
			30.0

### VII.Semester

EEM413 (Eng)	Electrical and Electronics Engineering Design Project I	1+5	4.5
EEM415 (Eng)	Engineering Design and Research	2+0	3.0
EEMSJ401 (Eng)	Electrical and Electronics Engineering Internship I	0+2	2.5

### VIII.Semester

EEM414 (Eng)	Electrical and Electronics Engineering Design Project II	1+5	4.5
EEMSJ402 (Eng)	Electrical and Electronics Engineering Internship II	0+2	2.5
	<i>Mesleki Seçmeli Dersler</i>	--	20.0

<i>Mesleki Seçmeli Dersler</i>	--	15.0	<i>Seçmeli Dersler</i>	--	3.0
<i>Seçmeli Dersler</i>	--	5.0			
		----			----
		30.0			30.0

### Elective Courses

ALM255 (Ger)	German I	3+0	4.0
ALM256 (Ger)	German II	3+0	4.0
ANT452	First Aid	1+2	4.0
ARK108	Archaeology	2+0	2.0
BEÖ155	Physical Education	2+0	2.0
BEÖ155 (Eng)	Physical Education	2+0	2.0
BEÖ176	Trekking	1+2	4.0
ESTÜ1001	Story Analysis On World Literature	3+0	3.0
ESTÜ1003	Yoga and Meditation	1+1	2.0
ESTÜ101	Introduction to University Life	0+1	2.0
ESTÜ102 (Eng)	Negotiation Techniques Class	2+0	3.0
ESTÜ103	Ceramic Design Processes	2+1	3.0
ESTÜ104	Academic and Life Skills	2+1	3.0
ESTÜ106	Proje Yönetimi	2+1	3.0
ESTÜ111	Volunteering Works	1+2	4.0
ESTÜ112	Cyber Security for Everyone	2+0	2.0
ESTÜ113	Design Thinking	3+0	3.0
ESTÜ114	Visual Thinking	3+0	3.0
ESTÜ115	Photographic Viewpoint	2+1	3.0
ESTÜ116	Computer Aided Design I	3+0	3.0
ESTÜ117	Computer Aided Design II	3+0	3.0
ESTÜ118	Visual Thinking with Concepts	3+0	3.0
ESTÜ119	Flute	3+1	3.0
ESTÜ120	Solfege	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
ESTÜ123	Gender Equality in Work Life	2+0	3.0
ESTÜ125	Philosophy of Science	3+0	3.0
ESTÜ127	Diction	1+2	3.0
ESTÜ129	Turkish as a Foreign Language I	2+0	2.0
ESTÜ130	Turkish as a Foreign Language II	2+0	2.0
ESTÜ131	Argentine Tango Dance	0+2	2.0
ESTÜ133	Disability and Awareness	3+0	3.0
ESTÜ2001	AI Literacy	2+0	2.0
ESTÜ201	Turkish Sign Language	3+0	3.0
ESTÜ203	Introduction to Sociology	3+0	3.0
ESTÜ204	Effective Reading and Writing Skills	3+0	4.0
ESTÜ206	Financial Literacy	3+0	3.0
ESTÜ207	General Psychology	2+0	4.0
ESTÜ210	Culture of Museum	2+0	2.0
ESTÜ301	Science Communication	2+0	3.0
ESTÜ307	Children Rights and Family Education	2+0	2.0
ESTÜ4001 (Eng)	Sustainable Building Design	3+0	3.0
ESTÜ401	Introduction to Professional Life	1+1	2.0
ESTÜ402	Coaching and Leadership	3+0	3.0
ESTÜ403	Basic Computer Utilization	3+0	4.0
FEL102	Introduction to Philosophy	2+0	2.5
FEL401	Philosophy of Science	2+0	2.5
FOT202	Photography	2+0	3.0
FRA255 (Fra)	French I	3+0	4.0
FRA256 (Fra)	French II	3+0	4.0
HUK458	Industrial Rights and Technological Development	3+0	3.0
İLT201	Interpersonal Communication	3+0	4.5
İLT419	Body Language and Diction	2+0	5.0
İSN309	Mass Media	3+0	3.0
İSN409	Organizational Communication	3+0	4.5

iSP151 (Spa)	Spanish I	4+0	4.0
iSP152 (Spa)	Spanish II	4+0	4.0
iŞL101 (Eng)	Introduction to Business	3+0	4.5
iŞL102	Management and Organization	3+0	4.0
iŞL201	Business Organization	3+0	4.0
iŞL209	Business Management	2+0	2.0
iŞL301	Human Resources Management	3+0	4.0
iŞL321	Applied Entrepreneurship	3+1	5.0
iŞL406	Strategic Management	3+0	4.5
iŞL421	Entrepreneurship	2+0	3.0
iŞL454	Management of Technology	3+0	4.5
iŞL475	Techno-Entrepreneurship	3+0	4.0
iTA255 (İta)	Italian I	3+0	4.0
iTA256 (İta)	Italian II	3+0	4.0
JAP301 (Jap)	Japanese I	4+0	4.0
JAP302 (Jap)	Japanese II	4+0	4.0
KÜL451	History of Science and Engineering	3+0	4.5
MFALM101 (Ger)	German for Engineering I	3+0	4.0
MFALM102 (Ger)	German for Engineering II	3+0	4.0
MFALM201 (Ger)	German for Engineering III	3+0	4.0
MFALM202 (Ger)	German for Engineering IV	3+0	4.0
MUH151	Introduction to Accounting	3+0	4.5
MÜH402	Engineering Ethics	2+0	3.0
MÜH404	Innovation Management	3+0	3.0
MÜZ101	Evolution of Music	2+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
ÖMB322	Ethics of Science and Research	2+0	3.0
PSİ102	Psychology	3+0	3.5
PSİ301	Industrial Psychology	3+0	4.5
PZL302	Marketing Management	3+0	4.5
REK2522	Sports Aviation	1+1	4.0
RTV281	Digital Literacy	2+2	4.0
RUS255 (Rus)	Russian I	3+0	4.0
RUS256 (Rus)	Russian II	3+0	4.0
SAĞ102	First Aid	2+0	2.5
SAN155	Hall Dances	0+2	2.0
SNT155	History of Art	2+0	2.0
SOS153	Sociology	3+0	3.5
SOS154	Man and Sociology	2+0	3.0
SOS155	Folkdance	2+0	2.0
TAR201	History of Science	2+0	2.5
THU203	Community Services	0+2	3.0
TİY121	Introduction to Theatre	2+0	3.0
TİY152	Theatre	2+0	2.5
TİY308	Republic Era Turkish Theatre	2+0	3.0

#### Area Elective Courses

EEM403 (Eng)	Fundamentals of Optoelectronics and Nanophotonics	3+0	5.0
EEM407 (Eng)	Digital VLSI Design	2+2	5.0
EEM409 (Eng)	Random Signals	3+0	5.0
EEM416 (Eng)	Introduction to GNU/Linux Operating Systems	2+2	5.0
EEM417 (Eng)	Engineering Computations	3+1	5.0
EEM418 (Eng)	Introduction to Digital Integrated Circuits	3+0	5.0
EEM444 (Eng)	Object Oriented Design	3+0	5.0
EEM446 (Eng)	Cryptographic Hardware Design	3+0	5.0
EEM447 (Eng)	Research in Digital Systems I	1+4	5.0
EEM448 (Eng)	Research in Digital Systems II	1+4	5.0
EEM449 (Eng)	Embedded System Design	2+2	5.0
EEM450 (Eng)	Introduction to System Identification	3+0	5.0
EEM4501 (Eng)	Analog Electronics	3+0	5.0
EEM4503 (Eng)	Digital Systems Design with VHDL and FPGA	3+2	5.0
EEM451 (Eng)	Industrial Control Systems	1+4	5.0
EEM452 (Eng)	Introduction to Robotics	3+0	5.0
EEM453 (Eng)	Research in Control and System Theory I	1+4	5.0

EEM454 (Eng)	Research in Control and System Theory II	1+4	5.0
EEM455 (Eng)	Research in Power Systems I	1+4	5.0
EEM456 (Eng)	Research in Power Systems II	1+4	5.0
EEM457 (Eng)	Research in Signal Processing I	1+4	5.0
EEM458 (Eng)	Research in Signal Processing II	1+4	5.0
EEM459 (Eng)	Research in Electronics I	1+4	5.0
EEM460 (Eng)	Research in Electronics II	1+4	5.0
EEM461 (Eng)	Research in Telecommunications I	1+4	5.0
EEM462 (Eng)	Research in Telecommunications II	1+4	5.0
EEM463 (Eng)	Introduction to Image Processing	3+0	5.0
EEM464 (Eng)	System-on-Chip Design	2+2	5.0
EEM465 (Eng)	Fundamentals of Data Communications	3+0	5.0
EEM466 (Eng)	High Voltage Techniques	3+0	5.0
EEM467 (Eng)	Digital Communications	3+0	5.0
EEM468 (Eng)	Advanced Communication Techniques	3+0	5.0
EEM469 (Eng)	Communication Electronics	3+0	5.0
EEM470 (Eng)	Microwaves and Antennas	3+0	5.0
EEM471 (Eng)	Electrical Machinery I	2+2	5.0
EEM472 (Eng)	Electrical Machinery II	2+2	5.0
EEM473 (Eng)	Power Systems Analysis I	3+0	5.0
EEM475 (Eng)	Power Electronics I	3+0	5.0
EEM476 (Eng)	Power Electronics II	2+2	5.0
EEM477 (Eng)	Digital Signal Processing	3+0	5.0
EEM478 (Eng)	Digital Signal Processing Hardware	1+4	5.0
EEM479 (Eng)	Electrical Installation Systems	2+2	5.0
EEM480 (Eng)	Algorithms and Complexity	3+0	5.0
EEM481 (Eng)	Solid State Electronics	3+0	5.0
EEM482 (Eng)	Fundamentals of Data Networks	3+0	5.0
EEM483 (Eng)	Power Systems Analysis II	2+2	5.0
EEM484 (Eng)	Integrated Circuit Design	3+0	5.0
EEM485 (Eng)	Digital Electronic Circuits	3+0	5.0
EEM486 (Eng)	Computer Architecture	3+0	5.0
EEM489 (Eng)	Microprocessors II	2+2	5.0
EEM490 (Eng)	Nonlinear Systems	3+0	5.0
EEM491 (Eng)	Linear Control Systems	3+0	5.0
EEM493 (Eng)	Digital Control Systems	3+0	5.0
EEM494 (Eng)	Control Systems Laboratory	1+4	5.0
EEM495 (Eng)	Network Synthesis	3+0	5.0
EEM496 (Eng)	Communications Systems Laboratory	1+4	5.0
EEM497 (Eng)	Communication Systems I	3+0	5.0
EEM498 (Eng)	Communication Systems II	3+0	5.0

## **AUTONOMOUS VEHICLES TECHNOLOGY MINOR PROGRAM**

### **DEPARTMENT OF INDUSTRIAL ENGINEERING (30% ENGLISH)**

This program aims to train Industrial Engineers who can solve industrial engineering problems using scientific methods with a system approach, analyze, design and improve production, service and socio-economic systems, create a career plan for business life, can renew himself/herself with the consciousness of life-long learning, carry out academic studies to produce universal knowledge. This program includes all theoretical and practical approaches of the field and aims to provide students with necessary skills for analyzing and evaluating systems for production through analysis and experimental methods, supply chain, and quality and human-machine. It also provides opportunities for students to gain system approach to increase the effectiveness and productivity of integrated systems including design, planning, control, human resources, equipment and energy.

Department Head : Prof.Dr. Nihal ERGİNEL  
Deputy Department Head : Assoc. Prof.Dr. Gülçin DİNÇ YALÇIN  
Deputy Department Head : Assoc. Prof.Dr. Mehmet ALEGÖZ

### **PROGRAM**

I.Semester				II.Semester			
ENM102 (Eng)	Introduction to Industrial Engineering	2+0	3.0	ENM104 (Eng)	Introduction to Computation and Programming for Industrial Engineering	2+2	4.5
FİZ105	Physics I	4+0	6.0	FİZ106	Physics II	4+0	6.0
FİZ107	Physics Laboratory I	0+2	1.5	FİZ108	Physics Laboratory II	0+2	1.5
KİM1005	General Chemistry	4+0	6.0	İKT151	Economics	3+0	3.0
KİM1010	General Chemistry Laboratory	0+2	1.5	MAT1012	Calculus II	4+2	7.5
MAT1011	Calculus I	4+2	7.5	MAT2023 (Eng)	Linear Algebra and Numerical Methods	2+2	4.5
TRS127	Technical Drawing	2+2	4.5	<i>Seçmeli Dersler</i>		--	3.0
			----				----
			30.0				30.0
III.Semester				IV.Semester			
BİY243 (Eng)	General and Molecular Biology	3+0	4.0	ENM2006	Manufacturing Technologies and Materials Science	3+0	3.0
ENM203 (Eng)	Linear Programming	2+2	5.5	ENM212 (Eng)	Integer Programming and Network Models	2+2	6.0
ENM207 (Eng)	Advanced Programming	2+2	4.5	ENM407 (Eng)	Systems Analysis	3+0	5.0
MAT2011	Differential Equation	3+1	4.5	İSG401	Occupational Health and Safety I	2+0	2.0
MEK215 (Eng)	Statics and Strength of Materials	3+0	4.5	İST244	Engineering Probability	3+0	5.0
MUH210	General and Cost Accounting	3+0	3.0	İŞL116 (Eng)	Fundamentals of Business	3+0	3.0
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0	TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
TÜR125	Turkish Language I	2+0	2.0	TÜR126	Turkish Language II	2+0	2.0
			----	<i>Seçmeli Dersler</i>		--	2.0
			30.0				----
							30.0
V.Semester				VI.Semester			
BİL409 (Eng)	Decision Support Systems	3+0	6.0	ENM307 (Eng)	Simulation	2+2	6.0
ENM301	Work Study	3+0	4.0	ENM310	Experiment Design and Regression Analysis	3+0	4.5
ENM317	Engineering Statistics	3+0	4.5	ENM320 (Eng)	Production and Operations Planning II	3+0	5.0
ENM319 (Eng)	Production and Operations Planning I	3+0	5.0	ENM426 (Eng)	Ergonomics	3+0	4.5
İKT356 (Eng)	Engineering Economics	3+0	4.5	İSG402	Occupational Health and Safety II	2+0	2.0
	<i>Mesleki Seçmeli Dersler</i>	--	4.0	<i>Mesleki Seçmeli Dersler</i>		--	8.0
	<i>Seçmeli Dersler</i>	--	2.0				----
			30.0				30.0
VII.Semester				VIII.Semester			
ENM435	Engineering Seminars I	0+2	1.5	ENM458	Industrial Engineering Graduation Project II	2+3	5.5
ENM457	Industrial Engineering Graduation Project I	2+2	4.5	ENMSJ402	Industrial Engineering Internship II	0+2	2.5
ENMSJ401	Industrial Engineering Internship I	0+2	2.5	<i>Mesleki Seçmeli Dersler</i>		--	22.0

HUK252	Labor Law	2+0	2.5		
	<i>Mesleki Seçmeli Dersler</i>	--	16.0		
	<i>Seçmeli Dersler</i>	--	3.0		
			-----		-----
			30.0		30.0

#### Elective Courses

ALM255 (Ger)	German I		3+0	4.0
ALM256 (Ger)	German II		3+0	4.0
ANT452	First Aid		1+2	4.0
ARK108	Archaeology		2+0	2.0
BEÖ155	Physical Education		2+0	2.0
BEÖ176	Trekking		1+2	4.0
ESTÜ1001	Story Analysis On World Literature		3+0	3.0
ESTÜ1003	Yoga and Meditation		1+1	2.0
ESTÜ101	Introduction to University Life		0+1	2.0
ESTÜ102 (Eng)	Negotiation Techniques Class		2+0	3.0
ESTÜ103	Ceramic Design Processes		2+1	3.0
ESTÜ104	Academic and Life Skills		2+1	3.0
ESTÜ106	Proje Yönetimi		2+1	3.0
ESTÜ111	Volunteering Works		1+2	4.0
ESTÜ112	Cyber Security for Everyone		2+0	2.0
ESTÜ113	Design Thinking		3+0	3.0
ESTÜ114	Visual Thinking		3+0	3.0
ESTÜ115	Photographic Viewpoint		2+1	3.0
ESTÜ116	Computer Aided Design I		3+0	3.0
ESTÜ117	Computer Aided Design II		3+0	3.0
ESTÜ118	Visual Thinking with Concepts		3+0	3.0
ESTÜ119	Flute		3+1	3.0
ESTÜ120	Solfege		3+1	3.0
ESTÜ121	Piano		3+1	3.0
ESTÜ122	Guitar		3+1	3.0
ESTÜ123	Gender Equality in Work Life		2+0	3.0
ESTÜ125	Philosophy of Science		3+0	3.0
ESTÜ127	Diction		1+2	3.0
ESTÜ129	Turkish as a Foreign Language I		2+0	2.0
ESTÜ130	Turkish as a Foreign Language II		2+0	2.0
ESTÜ131	Argentine Tango Dance		0+2	2.0
ESTÜ132	History of Political Thought		3+0	3.0
ESTÜ133	Disability and Awareness		3+0	3.0
ESTÜ2001	AI Literacy		2+0	2.0
ESTÜ201	Turkish Sign Language		3+0	3.0
ESTÜ203	Introduction to Sociology		3+0	3.0
ESTÜ204	Effective Reading and Writing Skills		3+0	4.0
ESTÜ206	Financial Literacy		3+0	3.0
ESTÜ207	General Psychology		2+0	4.0
ESTÜ210	Culture of Museum		2+0	2.0
ESTÜ301	Science Communication		2+0	3.0
ESTÜ307	Children Rights and Family Education		2+0	2.0
ESTÜ4001 (Eng)	Sustainable Building Design		3+0	3.0
ESTÜ401	Introduction to Professional Life		1+1	2.0
ESTÜ402	Coaching and Leadership		3+0	3.0
ESTÜ403	Basic Computer Utilization		3+0	4.0
ESTÜ405	Computer Programming		3+0	5.0
FOT202	Photography		2+0	3.0
FRA255 (Fra)	French I		3+0	4.0
FRA256 (Fra)	French II		3+0	4.0
İLT201	Interpersonal Communication		3+0	4.5
İLT419	Body Language and Diction		2+0	5.0
İSN409	Organizational Communication		3+0	4.5
İSP151 (Spa)	Spanish I		4+0	4.0
İSP152 (Spa)	Spanish II		4+0	4.0

işL101	Introduction to Business	3+0	4.5
işL102	Management and Organization	3+0	4.0
işL209	Business Management	2+0	2.0
işL321	Applied Entrepreneurship	3+1	5.0
işL406	Strategic Management	3+0	4.5
işL421	Entrepreneurship	2+0	3.0
İTA255 (İta)	Italian I	3+0	4.0
İTA256 (İta)	Italian II	3+0	4.0
JAP301 (Jap)	Japanese I	4+0	4.0
JAP302 (Jap)	Japanese II	4+0	4.0
MFALM101 (Ger)	German for Engineering I	3+0	4.0
MFALM102 (Ger)	German for Engineering II	3+0	4.0
MFALM201 (Ger)	German for Engineering III	3+0	4.0
MFALM202 (Ger)	German for Engineering IV	3+0	4.0
MUH151	Introduction to Accounting	3+0	4.5
MÜH402	Engineering Ethics	2+0	3.0
MÜH404	Innovation Management	3+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ155	Turkish Folk Music	2+0	2.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
ÖMB322	Ethics of Science and Research	2+0	3.0
PSİ102	Psychology	3+0	3.5
REK2522	Sports Aviation	1+1	4.0
RTV281	Digital Literacy	2+2	4.0
RUS255 (Rus)	Russian I	3+0	4.0
RUS256 (Rus)	Russian II	3+0	4.0
SAĞ102	First Aid	2+0	2.5
SAN155	Hall Dances	0+2	2.0
SNT155	History of Art	2+0	2.0
SOS155	Folkdance	2+0	2.0
THU203	Community Services	0+2	3.0
TİY121	Introduction to Theatre	2+0	3.0
TİY152	Theatre	2+0	2.5
TİY308	Republic Era Turkish Theatre	2+0	3.0

#### Area Elective Courses

ARY202	Research Techniques	3+0	5.0
BİM211 (Eng)	Visual Programming	2+2	6.0
BİM213 (Eng)	Data Structures and Algorithms	2+2	5.5
BİM222 (Eng)	Internet Programming	3+0	4.5
BİM312 (Eng)	Database Management Systems	3+0	6.0
BİM445 (Eng)	Enterprise IT Architecture	2+0	3.0
BİM466 (Eng)	Fuzzy Logic	3+0	4.5
BİM470 (Eng)	Neural Networks	3+0	4.5
BİM478 (Eng)	Management Information Systems	3+0	4.5
EEM480 (Eng)	Algorithms and Complexity	3+0	5.0
ENM304 (Eng)	Investment Planning and Analysis	4+0	6.0
ENM306 (Eng)	Stochastic Models	3+0	4.5
ENM309	Industrial Information Systems	3+0	6.0
ENM312	Manufacturing Systems Analysis	3+0	5.0
ENM313	Mathematical Programming Models in Engineering	3+0	4.5
ENM314 (Eng)	Investment Analysis	3+0	5.0
ENM315 (Eng)	Nonlinear Programming	2+2	6.0
ENM316 (Eng)	Statistical Forecasting and Time Series	2+1	5.0
ENM321	Industrial Case Studies	3+0	5.0
ENM323 (Eng)	Energy Systems Planning	2+1	5.0
ENM325 (Eng)	Theory and Algorithms in Nonlinear Programming	2+1	5.0
ENM326 (Eng)	Network Optimization and Algorithms	3+0	5.0
ENM411 (Eng)	Facilities Planning	3+0	4.5
ENM411	Facility Planning	3+0	4.5
ENM413 (Eng)	Planning and Scheduling in Manufacturing and Service Systems	3+0	4.0
ENM413	Planning and Scheduling in Manufacturing and Service Systems	3+0	4.0
ENM415	Design, Creativity and Innovation	3+0	4.5
ENM419 (Eng)	Sustainable Systems Engineering	3+0	5.0
ENM420	Service Systems	3+0	4.5



ENM421	Introduction to Data Science	2+1	4.5
ENM423 (Eng)	Queuing Models	3+0	5.0
ENM425 (Eng)	Scheduling	3+0	5.0
ENM429	Quality Engineering Methods for Product and Process Design	3+0	5.0
ENM430	Cognitive Ergonomics	3+0	4.5
ENM431	Advanced Production Systems	3+0	4.5
ENM432	Lean Thinking and Lean Manufacturing Management	3+0	4.5
ENM437 (Eng)	Structural Equation Modeling	3+0	4.5
ENM440 (Eng)	Introduction to Data Mining	3+0	4.5
ENM442 (Eng)	Decision Analysis	3+0	4.5
ENM444	Supply Chain Modeling And Analysis	3+0	4.5
ENM446	Enterprise Resource Planning	3+0	4.5
ENM448 (Eng)	Project Planning and Management	3+0	6.0
ENM450 (Eng)	Introduction to Metaheuristic Optimization	3+0	6.0
ENM452 (Eng)	Introduction to Multiobjective Optimization	3+0	5.0
ENM454 (Eng)	Risk Assessment and Hazard Analysis Techniques	3+0	4.5
ENM456	Futures Thinking and Technology Foresight	2+0	3.0
FIN415 (Eng)	Financial Markets and Institutions	3+0	4.5
IST237	Programming With MATLAB	4+0	4.0
IST401	Multivariate Statistics I	3+0	4.5
IST402	Multivariate Statistics II	3+0	4.0
IST411 (Eng)	Time Series Analysis	4+0	5.0
IST411	Time Series Analysis	4+0	5.0
IST415	Reliability Analysis	3+0	5.0
İŞL301	Human Resources Management	3+0	4.0
İŞL323 (Eng)	Human Resources Management	3+0	5.0
İŞL412	Strategic Management	2+0	3.0
İŞL454 (Eng)	Management of Technology	3+0	4.5
İŞL454	Management of Technology	3+0	4.5
İŞL475	Techno-Entrepreneurship	3+0	4.0
LOJ401 (Eng)	Logistics Management and Models	3+0	6.0
LOJ401	Logistics Management and Models	3+0	6.0
MAT226	Introduction to Graph Theory	3+0	5.0
MAT410	Game Theory	3+0	5.0
MTH456	Future Literacy and Foresight Analysis	3+0	5.0
MTH458	Lean Manufacturing Strategies and Applications in Industry	3+0	5.0
MÜH302	Interdisciplinary Applications	1+2	4.5
MÜH302 (Eng)	Interdisciplinary Applications	1+2	4.5
PZL302	Marketing Management	3+0	4.5
PZL310 (Eng)	Marketing Management	3+0	5.0
PZL452 (Eng)	Revenue Management and Pricing	3+0	6.0
TKY302	Quality Control	3+0	4.5
TKY405	Total Quality Management	3+0	4.5

## ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING MINOR PROGRAM

### DEPARTMENT OF INDUSTRIAL ENGINEERING (ENGLISH)

Nowadays, technical improvement takes an important role in progressing country. It is important to efficiency use together machine, man and money with ergonomic circumstance. Industrial Engineering aims optimum yield by planning resource and effectiveness. Industrial engineering is concerned with the design, improvement, and installation of integrated systems of people, materials, and equipment; drawing upon specialized knowledge and skill in the mathematics, physical, and social sciences together with the principles and methods of engineering analysis and design, to specify, predict and evaluate the results to be obtained from such systems. Areas like Enterprises Resource Planning, ISO 9001 Quality Management System, fizibilite analysis are related to Industrial Engineering. Anadolu University, Industrial Engineering Department was established in 2002. One professor, three assistant professors, three teaching assistants, six research assistants and two visiting teaching assistants are working in the department. The decisions related with the department are made by the department council which is composed of all faculty members of the department. The research projects are supported with Anadolu University Scientific Research Project Commission. The capacity of the department is 40 students per year for undergraduate program. Students must attend English preparatory class before beginning their four-year Industrial Engineering education. Advanced computer facilities are offered to the students. They can manage production planning, inventory control, work force planning,

Günümüzde teknolojik gelişme ülke kalkınmasında önemli bir rol oynamaktadır. Bu teknolojik gelişmede makine, insan ve para yönetiminin yanı sıra, bu üç faktörün birlikte en verimli ve ergonomik koşullarda kullanılması da büyük önem taşımaktadır. Endüstri Mühendisliği, makine, insan ve para kaynaklarını etkin ve verimli bir şekilde planlayarak optimum çıktıyı elde etmeyi amaçlar. Endüstri Mühendisliği insan, makine ve ekipmanın bütünleşik sistemlerinin tasarımı, gelişmesi ve kurulmasıyla ilgilenir; bu sistemlerden elde edilen sonuçları belirtmek, değerlendirmek, için mühendislik analiz ve tasarım yöntemleriyle birlikte matematik, fizik ve sosyal bilimlerde uzmanlık gösterir. Bütünleşik kaynak planlaması ISO 9001 Kalite Yönetim Sistemleri fizibilite analizleri, gibi konular Endüstri Mühendislerinin ilgilendiği alanlardır. Anadolu Üniversitesi Endüstri Mühendisliği Bölümü 2002 yılında kurulmuştur. 2 Profösör, 2 Doçent, 7 Yardımcı Doçent, 11 Araştırma Görevlisi bulunmaktadır. 2013-2014 Öğretim Yılı'nda 62 öğrenci alınmıştır. Öğrenciler dört yıllık Endüstri Mühendisliği eğitimine başlamadan önce İngilizce hazırlık sınıfı okumak veya İngilizce yeterlilik sınavından geçmek zorundadırlar. Öğrencilere gelişmiş bilgisayar laboratuvar olanakları sunulmaktadır. Bilgisayar laboratuvarları genel amaçlı olmanın yanı sıra Endüstri Mühendisliğine özel yazılımları içeren laboratuvarlar da mevcuttur. Endüstri Mühendisliği'ne özel laboratuvarları da, üretim planlaması, hat dengeleme ve iş gücü planlaması konularını içeren Üretim Modülü, malzeme tedarikini ve stok kontrolünü içeren Malzeme Yönetim Modülü, Satış Dağıtım Modülü, İnsan Kaynakları Modülü, Mali İşler ve Mali Muhasebe Modülü olan SAP R/3 programı, ARENA, MINITAB, SPSS, LINDO, LINGO vb. pek çok yazılımları öğrencilerin kullanabilmesi mümkündür.

Department Head : Prof.Dr. Nihal ERGİNEL  
Deputy Department Head :

The Civil Engineering Department was established in 1998. The department is located at İki Eylül Campus and occupies a covered area of 5000 m<sup>2</sup>. 8 Professors, 3 Associate Professors, 7 Assistant Professors, 1 Instructor and 8 Research Assistants are currently working in the department. The department is governed by one department head and two deputy heads. One of the deputy heads takes care of technical activities of the department while the other deputy head assists the head in academic activities in the department. The primary education philosophy of the Department has been to provide a sound professional training which has been consistent with the current scientific and technological state of the art background supported by practice through laboratory applications in Civil Engineering discipline. The aim of the department is to educate the students by providing a broad knowledge in theory and in practice; equipping them with the skills to design and do research; and teaching them the importance of human rights. The instruction is supported by experimental applications and computer programs in laboratories (structural mechanics, construction materials, transportation, soil mechanics and hydraulics). Civil engineering department has agreements with various universities from Europe under the LLP/Erasmus program.

Department Head : Prof.Dr. Aynur ŞENSOY ŞORMAN  
Deputy Department Head : Dr. Lecturer Onur TUNABOYU  
Deputy Department Head : Prof.Dr. Özgür AVŞAR

I.Semester				II.Semester			
FİZ105	Physics I	4+0	6.0	FİZ106	Physics II	4+0	6.0
FİZ107	Physics Laboratory I	0+2	1.5	FİZ108	Physics Laboratory II	0+2	1.5
İNG250 (Eng)	Reading and Speaking in English	2+0	2.0	İNG360 (Eng)	English for Business	2+0	2.0
İNŞ101	Introduction to Civil Engineering	2+0	3.5	İNŞ118	Computer Applications in Civil Engineering	2+2	3.5
KİM1005	General Chemistry	4+0	6.0	İSG401	Occupational Health and Safety I	2+0	2.0
KİM1010	General Chemistry Laboratory	0+2	1.5	MAT1012	Calculus II	4+2	7.5
MAT1011	Calculus I	4+2	7.5	TRS110	Technical Drawing in Civil Engineering	2+2	3.5
TÜR125	Turkish Language I	2+0	2.0	TÜR126	Turkish Language II	2+0	2.0
					<i>Seçmeli Dersler</i>	--	2.0
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			30.0				30.0

#### IV.Semester

İNŞ239	Law and Ethics in Civil Engineering	3+0	3.0	İKT356 (Eng)	Engineering Economics	3+0	4.5
İNŞ241 (Eng)	Materials Science in Civil Engineering	3+0	4.5	İNŞ240 (Eng)	Hydrology	3+0	5.0
İNŞ246 (Eng)	Computer Programming in Civil Engineering	1+2	3.0	MEK206 (Eng)	Dynamics	3+0	4.0
İST2001	Engineering Statistics	3+0	4.0	MEK212 (Eng)	Strength of Materials I	3+2	6.0
MAT2011	Differential Equation	3+1	4.5	MLZ204	Materials of Construction	3+2	5.0
MAT2023	Linear Algebra and Numerical Methods	2+2	4.5	TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
MEK201 (Eng)	Statics	3+0	4.5		<i>Seçmeli Dersler</i>	--	3.5
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0				
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			30.0				30.0

#### V.Semester

İNŞ307 (Eng)	Structural Analysis I	3+2	6.0
İNŞ311 (Eng)	Transportation Engineering I	3+2	6.0
İNŞ315 (Eng)	Soil Mechanics I	3+0	4.5
İNŞ317 (Eng)	Soil Mechanics Laboratory	0+2	1.5
İNŞSJ301	Civil Engineering Internship I	0+2	2.5
İSG402	Occupational Health and Safety II	2+0	2.0
MEK307 (Eng)	Fluid Mechanics	3+0	4.5
	<i>Seçmeli Dersler</i>	--	3.0
			----
			30.0

#### VI.Semester

İNŞ302	Reinforced Concrete I	3+2	6.0
İNŞ312 (Eng)	Construction Engineering and Management	3+0	4.5
İNŞ320 (Eng)	Steel Structures	3+0	4.5
İNŞ322 (Eng)	Hydraulics	3+2	6.0
İNŞ342	Foundation Engineering I	3+0	4.5
İNŞSJ302	Civil Engineering Internship II	0+2	2.5
	<i>Seçmeli Dersler</i>	--	2.0
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			30.0

#### VII.Semester

İNŞ415	Special Topics in Civil Engineering	2+2	3.0
İNŞ417	Design Project	2+2	3.5
	<i>Mesleki Seçmeli Dersler</i>	--	23.5
			----
			30.0

#### VIII.Semester

İNŞ414	Applications of Design in Civil Engineering	2+4	4.0
	<i>Mesleki Seçmeli Dersler</i>	--	26.0
			----
			30.0

#### Foreign Language Courses

ESTÜ130	Turkish as a Foreign Language II	2+0	2.0
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#### Elective Courses

ALM255 (Ger)	German I	3+0	4.0
ALM256 (Ger)	German II	3+0	4.0
ANT452	First Aid	1+2	4.0
ARK108	Archaeology	2+0	2.0
BEÖ155	Physical Education	2+0	2.0
BEÖ176	Trekking	1+2	4.0
ESTÜ1001	Story Analysis On World Literature	3+0	3.0
ESTÜ1003	Yoga and Meditation	1+1	2.0
ESTÜ101	Introduction to University Life	0+1	2.0
ESTÜ102 (Eng)	Negotiation Techniques Class	2+0	3.0
ESTÜ103	Ceramic Design Processes	2+1	3.0
ESTÜ104	Academic and Life Skills	2+1	3.0

ESTÜ106	Proje Yönetimi	2+1	3.0
ESTÜ111	Volunteering Works	1+2	4.0
ESTÜ112	Cyber Security for Everyone	2+0	2.0
ESTÜ113	Design Thinking	3+0	3.0
ESTÜ114	Visual Thinking	3+0	3.0
ESTÜ115	Photographic Viewpoint	2+1	3.0
ESTÜ116	Computer Aided Design I	3+0	3.0
ESTÜ117	Computer Aided Design II	3+0	3.0
ESTÜ118	Visual Thinking with Concepts	3+0	3.0
ESTÜ119	Flute	3+1	3.0
ESTÜ120	Solfege	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
ESTÜ123	Gender Equality in Work Life	2+0	3.0
ESTÜ125	Philosophy of Science	3+0	3.0
ESTÜ127	Diction	1+2	3.0
ESTÜ129	Turkish as a Foreign Language I	2+0	2.0
ESTÜ131	Argentine Tango Dance	0+2	2.0
ESTÜ132	History of Political Thought	3+0	3.0
ESTÜ133	Disability and Awareness	3+0	3.0
ESTÜ2001	AI Literacy	2+0	2.0
ESTÜ201	Turkish Sign Language	3+0	3.0
ESTÜ203	Introduction to Sociology	3+0	3.0
ESTÜ204	Effective Reading and Writing Skills	3+0	4.0
ESTÜ206	Financial Literacy	3+0	3.0
ESTÜ207	General Psychology	2+0	4.0
ESTÜ210	Culture of Museum	2+0	2.0
ESTÜ301	Science Communication	2+0	3.0
ESTÜ307	Children Rights and Family Education	2+0	2.0
ESTÜ4001 (Eng)	Sustainable Building Design	3+0	3.0
ESTÜ401	Introduction to Professional Life	1+1	2.0
ESTÜ402	Coaching and Leadership	3+0	3.0
ESTÜ403	Basic Computer Utilization	3+0	4.0
ESTÜ405	Computer Programming	3+0	5.0
FOT202	Photography	2+0	3.0
FRA255 (Fra)	French I	3+0	4.0
FRA256 (Fra)	French II	3+0	4.0
HUK252	Labor Law	2+0	2.5
HUK458	Industrial Rights and Technological Development	3+0	3.0
İKT151	Economics	3+0	3.0
İLT201	Interpersonal Communication	3+0	4.5
İLT201 (Eng)	Interpersonal Communication	3+0	4.5
İLT419	Body Language and Diction	2+0	5.0
İSN309	Mass Media	3+0	3.0
İSN409	Organizational Communication	3+0	4.5
İSP151 (Spa)	Spanish I	4+0	4.0
İSP152 (Spa)	Spanish II	4+0	4.0
İŞL101	Introduction to Business	3+0	4.5
İŞL101 (Eng)	Introduction to Business	3+0	4.5
İŞL102	Management and Organization	3+0	4.0
İŞL209	Business Management	2+0	2.0
İŞL301	Human Resources Management	3+0	4.0
İŞL321	Applied Entrepreneurship	3+1	5.0
İŞL406	Strategic Management	3+0	4.5
İŞL421	Entrepreneurship	2+0	3.0
İŞL454 (Eng)	Management of Technology	3+0	4.5
İŞL475	Techno-Entrepreneurship	3+0	4.0
İTA255 (İta)	Italian I	3+0	4.0
İTA256 (İta)	Italian II	3+0	4.0
JAP301 (Jap)	Japanese I	4+0	4.0
JAP302 (Jap)	Japanese II	4+0	4.0
KÜL451 (Eng)	History of Science and Engineering	3+0	4.5
MFALM101 (Ger)	German for Engineering I	3+0	4.0
MFALM102 (Ger)	German for Engineering II	3+0	4.0

MFALM201 (Ger)	German for Engineering III	3+0	4.0
MFALM202 (Ger)	German for Engineering IV	3+0	4.0
MUH151	Introduction to Accounting	3+0	4.5
MÜH402 (Eng)	Engineering Ethics	2+0	3.0
MÜH404 (Eng)	Innovation Management	3+0	3.0
MÜZ101	Evolution of Music	2+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
ÖMB322	Ethics of Science and Research	2+0	3.0
PSİ102	Psychology	3+0	3.5
REK2522	Sports Aviation	1+1	4.0
RTV281	Digital Literacy	2+2	4.0
RUS255 (Rus)	Russian I	3+0	4.0
RUS256 (Rus)	Russian II	3+0	4.0
SAĞ102	First Aid	2+0	2.5
SNT155	History of Art	2+0	2.0
SOS154	Man and Sociology	2+0	3.0
THU203	Community Services	0+2	3.0
TİY121	Introduction to Theatre	2+0	3.0
TİY152	Theatre	2+0	2.5
TİY308	Republic Era Turkish Theatre	2+0	3.0

#### Area Elective Courses

İNŞ310	Water Supply and Sewerage	3+2	4.5
İNŞ314 (Eng)	Structural Analysis II	3+0	4.5
İNŞ401	Reinforced Concrete Project	3+0	4.5
İNŞ407	Reinforced Concrete II	3+0	4.5
İNŞ409	Pavement Design	3+0	4.5
İNŞ411	Transportation Engineering II	3+0	4.5
İNŞ4502 (Eng)	Transportation Data Collection and Analysis	3+0	4.5
İNŞ4504	Surveying	2+1	4.5
İNŞ451 (Eng)	Geographic Information Systems (GIS) Applications in Hydrology and Hydraulics	2+2	4.5
İNŞ452 (Eng)	Computer Applications in Hydrology and Hydraulics	2+2	4.5
İNŞ453	Railway Engineering	3+0	4.5
İNŞ454	Earthquake Analysis of Structures	3+0	4.5
İNŞ455	Highway Design	2+2	4.5
İNŞ456	Ground Water Hydrology	3+0	4.5
İNŞ457	Construction Cost Design	2+2	4.5
İNŞ458	Testing of Concrete	3+0	4.5
İNŞ459	Geotechnical Design	2+2	4.5
İNŞ460	Admixture for Concrete	3+0	4.5
İNŞ461	Structural Design for Reinforced Concrete Buildings	2+2	4.5
İNŞ462	Properties of Fresh and Hardened Concrete	3+0	4.5
İNŞ463	Hydraulic Design	2+2	4.5
İNŞ464	Concrete Durability	3+0	4.5
İNŞ465 (Eng)	Steel Structural Design	2+2	4.5
İNŞ467 (Eng)	Construction Equipments	3+0	4.5
İNŞ468	Computer-Based Project Management	3+0	4.5
İNŞ469 (Eng)	Renewable Energy with Water, Wind and Wave Power	3+0	4.5
İNŞ470 (Eng)	Concrete Technology	3+0	4.5
İNŞ471 (Eng)	Numerical Modeling in Hydrology and Hydraulics	2+2	4.5
İNŞ472 (Eng)	Introduction Traffic Engineering	3+0	4.5
İNŞ473	Timber Structures	3+0	4.5
İNŞ474	Tunnels	3+0	4.5
İNŞ475	Multi-Story Steel Structure Design	3+0	4.5
İNŞ476	Project Planning with Primavera and MS Project	3+0	4.5
İNŞ478	Construction Cost Analysis and Estimating	3+0	4.5
İNŞ480	Concrete Making Materials	3+0	4.5
İNŞ481 (Eng)	Soil Mechanics II	3+0	4.5
İNŞ482 (Eng)	Ground Improvement	3+0	4.5
İNŞ483	Retaining Structures	3+0	4.5
İNŞ484	Foundation Engineering II	3+0	4.5
İNŞ485	Irrigation and Drainage	3+0	4.5

İNŞ486	Introduction to Soil Dynamics	3+0	4.5
İNŞ487	Water Structures	3+0	4.5
İNŞ488	Environmental Geotechnology	3+0	4.5
İNŞ489 (Eng)	Open Channel Hydraulics	3+0	4.5
İNŞ490	Coastal and Port Engineering	3+0	4.5
İNŞ492 (Eng)	Water Resources Engineering	3+0	4.5
İNŞ494	Civil Engineering Construction	3+0	4.5
İNŞ495	Highway Pavements	3+0	4.5
İNŞ496 (Eng)	Construction Planning and Management	3+0	4.5
İNŞ498 (Eng)	Introduction to Structural Dynamics	3+0	4.5
JEO201	Engineering Geology	3+0	4.5
MEK403 (Eng)	Strength of Materials II	3+0	4.5
MTH456	Future Literacy and Foresight Analysis	3+0	5.0
MÜH302	Interdisciplinary Applications	1+2	4.5

## DEPARTMENT OF CIVIL ENGINEERING (ENGLISH)

Civil Engineers from history left us the Maya and Egyptian Pyramids, the Gothic Cathedrals, the Great Wall of China, and quite literally, the physical as well as the technological foundation upon which many of our modern structure are built. The scope of the construction industry today is immense: from suburban homes to 100 story skyscraper, from sidewalk to dams and tunnels for irrigation and hydroelectric power; from recreational marinas to complete harbors and even structures in the deep open sea; from bycle shops to aircrafts factories; from smart houses to bridges; thermal power plants, petroleum refineries, and mining developments; highways and rapid train systems that not only span physical spaces, but bring people together in the social, political and economic endovers. The Department was established in 1998 as Civil Engineering Department. The department is located at the İki Eylül Campus and occupies a covered area of 5000 m2. 4 Professors,4 Associate Professors, 6 Assistant Professors and 11 Research Assistants currently working in the department. The decisions related with the department are made by the department council which is composed of all faculty members of the department. The department is governed by one chairman and two deputy chairmen. One of the deputy chairmen takes care of technical activities of the department while the other deputy chairman assists chairman in academic activities in the department.

Department Head	: Prof.Dr. Aynur ŞENSOY ŞORMAN
Deputy Department Head	: Dr. Lecturer Onur TUNABOYU
Deputy Department Head	: Prof.Dr. Özgür AVŞAR

## DEPARTMENT OF CHEMICAL ENGINEERING (30% ENGLISH)

Chemical Engineering Department intends to include all kinds of practical and the theoretical aspects of the field of study and it aims to equip students with skills including the design and application of chemical processes required for large-scale manufacturing, laboratory applications, solution development for industrial, technological and environmental problems as well as knowledge about the process of converting raw materials or chemicals into more useful or valuable forms. The chemical engineering has its origins in oil refining and petrochemical production, moreover the skills of chemical engineering are now applied in a wide range of other industries, such as food and beverage, pharmaceuticals, paper, plastics, water purification, electricity generation, metals, textiles, fertilizer, cement, semi-conductors, perfumes and fragrances, cosmetics and detergents, paint, fertilizer and cement. The department was established in 1968. The department carried out its education at Eskisehir Osmangazi University, due to the partition of Anadolu Universty in 1993. After a 4-year break, it restarted its education as a new department at Anadolu Universty İki Eylül Campus in 1997. In Chemical Engineering Department, there are 6 Professors, 5 Associate Professor, 5 Assistant Professors and 6 Research Assistants responsible for carrying out the research and teaching duties of the department. Annual student quota of the department is 72 students, and the language of instruction is 30% English.

Department Head	: Prof.Dr. Elif AKBAY
Deputy Department Head	: Dr. Lecturer Çağla Gül GÜLDİKEN
Deputy Department Head	: Dr. Lecturer Murat TAMER

## PROGRAM

I.Semester				II.Semester			
FİZ105	Physics I	4+0	6.0	FİZ106	Physics II	4+0	6.0
FİZ107	Physics Laboratory I	0+2	1.5	FİZ108	Physics Laboratory II	0+2	1.5
KİM1001	General Chemistry I	4+0	6.0	KİM1002	General Chemistry II	4+0	6.0
(Eng)				(Eng)			
KMH105	Technical English	2+0	2.0	KİM1010	General Chemistry Laboratory	0+2	1.5
(Eng)				(Eng)			

MAT1011	Calculus I	4+2	7.5	KMH108 (Eng)	Introduction to Chemical Engineering	2+0	2.5
TÜR125	Turkish Language I <i>Seçmeli Dersler</i>	2+0 --	2.0 5.0	MAT1012 TÜR126	Calculus II Turkish Language II <i>Seçmeli Dersler</i>	4+2 2+0 --	7.5 2.0 3.0
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			30.0				30.0
<b>III.Semester</b>				<b>IV.Semester</b>			
KİM208	Organic Chemistry	3+0	4.0	İST2001	Engineering Statistics	3+0	4.0
KİM211	Analytical Chemistry	3+0	3.0	KİM226	Physical Chemistry	3+0	4.0
KMH213 (Eng)	Chemical Process Calculations	3+2	6.0	KİM231	Physical Chemistry Laboratory	0+3	1.5
MAT2011	Differential Equation	3+1	4.5	KMH2006 (Eng)	Computer Programming in Chemical Engineering	2+2	4.0
MLZ203	Materials Science	3+0	3.0	MAT2023	Linear Algebra and Numerical Methods	2+2	4.5
TAR165	Atatürk's Principles and History of Turkish Revolution I <i>Seçmeli Dersler</i>	2+0 --	2.0 7.5	MEK317	Fluid Mechanics	4+0	5.0
			----	TAR166	Atatürk's Principles and History of Turkish Revolution II <i>Mesleki Seçmeli Dersler</i>	2+0 --	2.0 5.0
			30.0				----
							30.0
<b>V.Semester</b>				<b>VI.Semester</b>			
İKT356 (Eng)	Engineering Economics	3+0	4.5	İSG401	Occupational Health and Safety I	2+0	2.0
KİMSJ301	Chemical Engineering Laboratory Internship	0+2	2.5	KMH303 (Eng)	Mathematical Modeling in Chemical Engineering	4+0	5.0
KMH310	Heat Transfer	4+0	5.0	KMH308	Mass Transfer	4+0	5.0
KMH314 (Eng)	Chemical Reaction Engineering I	4+0	5.0	KMH318	Chemical Engineering Thermodynamics II	3+0	4.0
KMH317	Chemical Engineering Thermodynamics I <i>Mesleki Seçmeli Dersler</i>	3+0 --	4.0 4.5	KMH425 (Eng)	Chemical Reaction Engineering II <i>Mesleki Seçmeli Dersler</i>	4+0 --	5.0 9.0
	<i>Seçmeli Dersler</i>	--	4.5				----
			30.0				30.0
<b>VII.Semester</b>				<b>VIII.Semester</b>			
KİMSJ401	Chemical Engineering Plant Internship	0+2	2.5	İSG402	Occupational Health and Safety II	2+0	2.0
KMH415 (Eng)	Process Dynamics and Control	4+0	5.0	KMH406 (Eng)	Separation Processes	3+0	4.0
KMH429	Special Topics in Chemical Engineering	1+2	2.0	KMH432 (Eng)	Chemical Engineering Design II	4+0	6.0
KMH431 (Eng)	Chemical Engineering Design I	4+0	6.0	KMH434	Chemical Engineering Applications	2+4	5.0
KMH435 (Eng)	Chemical Engineering Laboratory I <i>Mesleki Seçmeli Dersler</i>	0+4 --	3.0 11.5	KMH436 (Eng)	Chemical Engineering Laboratory II <i>Mesleki Seçmeli Dersler</i>	0+4 --	3.0 10.0
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			30.0				30.0
<b>Elective Courses</b>							
ALM255 (Ger)	German I					3+0	4.0

ALM256 (Ger)	German II	3+0	4.0
ANT452	First Aid	1+2	4.0
ARK108	Archaeology	2+0	2.0
BEÖ155	Physical Education	2+0	2.0
ESTÜ1001	Story Analysis On World Literature	3+0	3.0
ESTÜ1003	Yoga and Meditation	1+1	2.0
ESTÜ101	Introduction to University Life	0+1	2.0
ESTÜ102 (Eng)	Negotiation Techniques Class	2+0	3.0
ESTÜ103	Ceramic Design Processes	2+1	3.0
ESTÜ104	Academic and Life Skills	2+1	3.0
ESTÜ105	Big Data Analysis with SQL	2+2	4.5
ESTÜ106	Proje Yönetimi	2+1	3.0
ESTÜ111	Volunteering Works	1+2	4.0
ESTÜ112	Cyber Security for Everyone	2+0	2.0
ESTÜ113	Design Thinking	3+0	3.0
ESTÜ114	Visual Thinking	3+0	3.0
ESTÜ115	Photographic Viewpoint	2+1	3.0
ESTÜ116	Computer Aided Design I	3+0	3.0
ESTÜ117	Computer Aided Design II	3+0	3.0
ESTÜ118	Visual Thinking with Concepts	3+0	3.0
ESTÜ119	Flute	3+1	3.0
ESTÜ120	Solfege	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
ESTÜ123	Gender Equality in Work Life	2+0	3.0
ESTÜ125	Philosophy of Science	3+0	3.0
ESTÜ127	Diction	1+2	3.0
ESTÜ129	Turkish as a Foreign Language I	2+0	2.0
ESTÜ130	Turkish as a Foreign Language II	2+0	2.0
ESTÜ131	Argentine Tango Dance	0+2	2.0
ESTÜ132	History of Political Thought	3+0	3.0
ESTÜ133	Disability and Awareness	3+0	3.0
ESTÜ2001	AI Literacy	2+0	2.0
ESTÜ201	Turkish Sign Language	3+0	3.0
ESTÜ203	Introduction to Sociology	3+0	3.0
ESTÜ204	Effective Reading and Writing Skills	3+0	4.0
ESTÜ206	Financial Literacy	3+0	3.0
ESTÜ207	General Psychology	2+0	4.0
ESTÜ210	Culture of Museum	2+0	2.0
ESTÜ301	Science Communication	2+0	3.0
ESTÜ307	Children Rights and Family Education	2+0	2.0
ESTÜ4001 (Eng)	Sustainable Building Design	3+0	3.0
ESTÜ401	Introduction to Professional Life	1+1	2.0
ESTÜ402	Coaching and Leadership	3+0	3.0
ESTÜ403	Basic Computer Utilization	3+0	4.0
ESTÜ405	Computer Programming	3+0	5.0
FOT202	Photography	2+0	3.0
FRA255 (Fra)	French I	3+0	4.0
FRA256 (Fra)	French II	3+0	4.0
HUK252	Labor Law	2+0	2.5
HUK458	Industrial Rights and Technological Development	3+0	3.0
İKT427	Industrial Economics	2+0	3.0
İLT419	Body Language and Diction	2+0	5.0
İSN309	Mass Media	3+0	3.0
İSN409	Organizational Communication	3+0	4.5
İSP151 (Spa)	Spanish I	4+0	4.0
İSP152 (Spa)	Spanish II	4+0	4.0
İŞL101	Introduction to Business	3+0	4.5
İŞL101 (Eng)	Introduction to Business	3+0	4.5
İŞL102	Management and Organization	3+0	4.0
İŞL201 (Eng)	Business Organization	3+0	4.0
İŞL209	Business Management	2+0	2.0
İŞL301	Human Resources Management	3+0	4.0
İŞL321	Applied Entrepreneurship	3+1	5.0



işL406	Strategic Management	3+0	4.5
işL421	Entrepreneurship	2+0	3.0
işL454 (Eng)	Management of Technology	3+0	4.5
işL475	Techno-Entrepreneurship	3+0	4.0
iTA255 (İta)	Italian I	3+0	4.0
iTA256 (İta)	Italian II	3+0	4.0
JAP301 (Jap)	Japanese I	4+0	4.0
JAP302 (Jap)	Japanese II	4+0	4.0
KMH439	Catalytic Materials	3+0	4.0
KÜL451 (Eng)	History of Science and Engineering	3+0	4.5
MFALM101 (Ger)	German for Engineering I	3+0	4.0
MFALM102 (Ger)	German for Engineering II	3+0	4.0
MFALM201 (Ger)	German for Engineering III	3+0	4.0
MFALM202 (Ger)	German for Engineering IV	3+0	4.0
MUH151	Introduction to Accounting	3+0	4.5
MÜH402 (Eng)	Engineering Ethics	2+0	3.0
MÜH404 (Eng)	Innovation Management	3+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
ÖMB322	Ethics of Science and Research	2+0	3.0
PSİ102	Psychology	3+0	3.5
PZL211 (Eng)	Principles of Marketing	3+0	5.0
PZL302	Marketing Management	3+0	4.5
REK2522	Sports Aviation	1+1	4.0
RTV281	Digital Literacy	2+2	4.0
RUS255 (Rus)	Russian I	3+0	4.0
RUS256 (Rus)	Russian II	3+0	4.0
SAĞ102	First Aid	2+0	2.5
SNT155	History of Art	2+0	2.0
SOS154	Man and Sociology	2+0	3.0
THU203	Community Services	0+2	3.0
TİY121	Introduction to Theatre	2+0	3.0
TİY152	Theatre	2+0	2.5
TİY308	Republic Era Turkish Theatre	2+0	3.0

#### Area Elective Courses

KİM282	Organic Chemistry Laboratory	0+3	3.0
KİM457	Chemical Technologies I	3+0	4.0
KİM458	Chemical Technologies II	3+0	4.0
KMH210	Instrumental Analysis	3+0	4.0
KMH212	Computer Applications in Chemical Engineering	3+0	4.0
KMH2501	Introduction to Engineering Calculations	2+0	3.0
KMH307	Experimental Design Techniques	3+0	4.0
KMH313	Biorefinery Processes	3+0	4.0
KMH316 (Eng)	Biotechnology	3+0	4.0
KMH319	Fundamentals of Polymer Chemistry	3+0	4.0
KMH320	Paint Technology	3+0	4.0
KMH323	Biochemical Engineering Fundamentals	3+0	4.0
KMH326	Introduction to Pharmaceutical Technology	3+0	4.0
KMH3501	Materials for Biomedical Applications	3+0	4.0
KMH3502	Rubber Technology	3+0	4.0
KMH3503	Electrochemical Power Sources	3+0	4.0
KMH351	Sugar Technology	3+0	4.0
KMH352	Water Technology	3+0	4.0
KMH353	Air Pollution Removal Equipments	3+0	4.0
KMH354	Boron Technology	3+0	4.0
KMH355	Food Chemistry	3+0	4.0
KMH356	Bubble Column Technology	3+0	4.0
KMH357	Electrochemistry	3+0	4.0
KMH358	Measurement and Control in Chemical Processes	3+0	4.0
KMH360 (Eng)	Carbon Materials	3+0	4.0
KMH407	Fuel and Energy Technologies	3+0	4.0
KMH409	Oil Technology	3+0	4.0
KMH410	Coal Technologies	3+0	4.0
KMH411	Polymer Technology	3+0	4.0

KMH412	Petroleum Refinery Engineering	3+0	4.0
KMH433	Industrial Equipments in Chemical Engineering	3+0	4.0
KMH437 (Eng)	Alcohol Based Fuels	3+0	4.0
KMH438 (Eng)	Computer Aided Design in Chemical Engineering	3+0	4.0
KMH440 (Eng)	Polymer Materials Science	3+0	4.0
KMH441 (Eng)	Catalysis	3+0	4.0
KMH442 (Eng)	Textile Chemical Processing	3+0	4.0
KMH4502	Chemical Process Safety	3+0	4.0
KMH4504	Green Chemical Engineering	3+0	4.0
KMH451	Phase Equilibrium	3+0	4.0
KMH452	Food Processing	3+0	4.0
KMH453	Operations of Solid Particles	3+0	4.0
KMH454	Heat Transfer Equipments	3+0	4.0
KMH455	Food Additives	3+0	4.0
KMH456	Occupational Health and Safety	3+0	4.0
KMH457 (Eng)	Transport Phenomena	3+0	4.0
KMH458	Chemical Process Optimization	3+0	4.0
KMH459 (Eng)	Geopolymer Production and Applications	3+0	4.0
KMH460	Membrane Separation Processes	3+0	4.0
KMH462 (Eng)	Membrane Science and Technology	3+0	4.0
KMH464	Chemical Admixtures for Concrete Production	3+0	4.0
MTH456	Future Literacy and Foresight Analysis	3+0	5.0
MÜH302	Interdisciplinary Applications	1+2	4.5
MÜH302 (Eng)	Interdisciplinary Applications	1+2	4.5
TRS127	Technical Drawing	2+2	4.5

## SUSTAINABLE CLEAN ENERGY MINOR PROGRAM

### DEPARTMENT OF CHEMICAL ENGINEERING (ENGLISH)

Chemical Engineering involves in the design, construction and operation of processes which convert raw materials into useful products by changing their chemical or physical state. The discipline of chemical engineering has its origins in oil refining and petrochemical production, moreover the skills of a chemical engineer are now applied in a wide range of other industries, such as food and baverage, pharmaceuticals, paper, plastics, water purification, electricity generation, metals, textiles, fertelizer, cement, semi-conductors, perfumes and fragrances, cosmetics and detergents,paint,fertilizer and cement.% 100 of education language is English.

Department Head :  
Deputy Department Head :

### DEPARTMENT OF MECHANICAL ENGINEERING (30% ENGLISH)

Eskisehir Technical University Mechanical Engineering Program objective is to cover all kind of practical and theoretical aspects of mechanical engineering. It also targets to enhance knowledge of the students in all fields of mechanical engineering mainly focusing design, manufacture and operate of machines that are used in industries and daily life of society and fundamental principles of physics, chemistry, mathematics and engineering that is required by performance optimization. The engineers that are graduated from the program have fundamental knowledge of engineering subjects like mechanics, dynamics, material science, design, computer aided design and modelling (CAD/CAM), control and automation, thermodynamics, fluid mechanics, heat transfer. Moreover, it program's motivation that the graduate engineers have the ability to apply their engineering knowledge for practical problems by performing analysis and synthesis in their professional career and daily life.

Department Head : Prof.Dr. Emin AÇIKKALP  
Deputy Department Head : Dr. Lecturer Fatih TURAN  
Deputy Department Head : Dr. Lecturer Erdem ÖZYURT

### PROGRAM

I.Semester				II.Semester			
FİZ105	Physics I	4+0	6.0	FİZ106	Physics II	4+0	6.0

FİZ107	Physics Laboratory I	0+2	1.5	FİZ108	Physics Laboratory II	0+2	1.5
İSG401	Occupational Health and Safety I	2+0	2.0	İSG402	Occupational Health and Safety II	2+0	2.0
KİM1005	General Chemistry	4+0	6.0	MAT1012	Calculus II	4+2	7.5
MAT1011	Calculus I	4+2	7.5	MKM102 (Eng)	Introduction to Mechanical Engineering	3+0	4.0
MKM101	Technical Drawing for Mechanical Engineers	2+2	3.0	MKM104	Computer Aided Engineering Technical Drawing	2+2	5.0
MKM103 (Eng)	Technical English for Mechanical Engineers	2+0	2.0	TÜR126	Turkish Language II	2+0	2.0
TÜR125	Turkish Language I	2+0	2.0	<i>Seçmeli Dersler</i>		--	2.0
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			30.0				30.0

### III.Semester

BİL200 (Eng)	Computer Programming	2+2	6.0
İKT356 (Eng)	Engineering Economics	3+0	4.5
İST2001	Engineering Statistics	3+0	4.0
MAT2011	Differential Equation	3+1	4.5
MEK217 (Eng)	Engineering Mechanics: Statics	3+0	5.0
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0
TER207 (Eng)	Thermodynamics I	3+0	4.0
			----
			30.0

### IV.Semester

EEM214 (Eng)	Electrical Engineering for Mechanical Engineers	3+0	3.5
MAT2023	Linear Algebra and Numerical Methods	2+2	4.5
MEK216 (Eng)	Engineering Mechanics: Dynamics	3+0	4.0
MEK311 (Eng)	Strength of Materials	4+0	5.5
MLZ232 (Eng)	Introduction to Materials Science	3+0	3.5
TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
TER208 (Eng)	Thermodynamics II	3+0	5.0
<i>Seçmeli Dersler</i>		--	2.0
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			30.0

### V.Semester

MEK323 (Eng)	Fundamentals of Fluid Mechanics	4+0	6.0
MKM301 (Eng)	Theory of Machines	3+0	5.0
MKM302 (Eng)	Machine Design I	4+0	6.0
MKM309	Introduction to Finite Element Analysis	3+0	5.0
	<i>Mesleki Seçmeli Dersler</i>	--	5.0
	<i>Seçmeli Dersler</i>	--	3.0
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			30.0

### VI.Semester

EEM310 (Eng)	Control Systems	3+0	5.0
MKM3006 (Eng)	Experimental Engineering I	1+2	3.0
MKM303 (Eng)	Heat Transfer	4+0	6.0
MKM304 (Eng)	Manufacturing Techniques	2+2	4.0
MKM401 (Eng)	Machine Design II	4+0	6.0
	<i>Mesleki Seçmeli Dersler</i>	--	3.0
	<i>Seçmeli Dersler</i>	--	3.0
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			30.0

### VII.Semester

MAKSJ401	Mechanical Engineering Internship I	0+2	2.5
MKM4007 (Eng)	Experimental Engineering II	1+2	3.0
MKM403	Mechanical Engineering Design I	2+2	4.5
	<i>Mesleki Seçmeli Dersler</i>	--	13.0
	<i>Seçmeli Dersler</i>	--	7.0

### VIII.Semester

MAKSJ402	Mechanical Engineering Internship II	0+2	2.5
MKM404	Mechanical Engineering Design II	2+4	5.5
	<i>Mesleki Seçmeli Dersler</i>	--	19.0
	<i>Seçmeli Dersler</i>	--	3.0

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30.0

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30.0

### Elective Courses

ANT452	First Aid	1+2	4.0
BEÖ155	Physical Education	2+0	2.0
BEÖ176	Trekking	1+2	4.0
ESTÜ1001	Story Analysis On World Literature	3+0	3.0
ESTÜ1003	Yoga and Meditation	1+1	2.0
ESTÜ101	Introduction to University Life	0+1	2.0
ESTÜ102 (Eng)	Negotiation Techniques Class	2+0	3.0
ESTÜ103	Ceramic Design Processes	2+1	3.0
ESTÜ104	Academic and Life Skills	2+1	3.0
ESTÜ106	Proje Yönetimi	2+1	3.0
ESTÜ111	Volunteering Works	1+2	4.0
ESTÜ112	Cyber Security for Everyone	2+0	2.0
ESTÜ113	Design Thinking	3+0	3.0
ESTÜ114	Visual Thinking	3+0	3.0
ESTÜ115	Photographic Viewpoint	2+1	3.0
ESTÜ116	Computer Aided Design I	3+0	3.0
ESTÜ117	Computer Aided Design II	3+0	3.0
ESTÜ118	Visual Thinking with Concepts	3+0	3.0
ESTÜ119	Flute	3+1	3.0
ESTÜ120	Solfege	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
ESTÜ123	Gender Equality in Work Life	2+0	3.0
ESTÜ125	Philosophy of Science	3+0	3.0
ESTÜ127	Diction	1+2	3.0
ESTÜ129	Turkish as a Foreign Language I	2+0	2.0
ESTÜ130	Turkish as a Foreign Language II	2+0	2.0
ESTÜ131	Argentine Tango Dance	0+2	2.0
ESTÜ132	History of Political Thought	3+0	3.0
ESTÜ133	Disability and Awareness	3+0	3.0
ESTÜ2001	AI Literacy	2+0	2.0
ESTÜ201	Turkish Sign Language	3+0	3.0
ESTÜ203	Introduction to Sociology	3+0	3.0
ESTÜ204	Effective Reading and Writing Skills	3+0	4.0
ESTÜ206	Financial Literacy	3+0	3.0
ESTÜ207	General Psychology	2+0	4.0
ESTÜ210	Culture of Museum	2+0	2.0
ESTÜ301	Science Communication	2+0	3.0
ESTÜ4001 (Eng)	Sustainable Building Design	3+0	3.0
ESTÜ401	Introduction to Professional Life	1+1	2.0
ESTÜ402	Coaching and Leadership	3+0	3.0
ESTÜ403	Basic Computer Utilization	3+0	4.0
ESTÜ405	Computer Programming	3+0	5.0
FOT202	Photography	2+0	3.0
FRA255 (Fra)	French I	3+0	4.0
FRA256 (Fra)	French II	3+0	4.0
HUK252	Labor Law	2+0	2.5
HUK458	Industrial Rights and Technological Development	3+0	3.0
İKT209 (Eng)	Money and Banking	3+0	5.0
İLT201	Interpersonal Communication	3+0	4.5
İLT419	Body Language and Diction	2+0	5.0
İSN309	Mass Media	3+0	3.0
İSN409	Organizational Communication	3+0	4.5
İSP151 (Spa)	Spanish I	4+0	4.0
İSP152 (Spa)	Spanish II	4+0	4.0
İŞL101	Introduction to Business	3+0	4.5
İŞL101 (Eng)	Introduction to Business	3+0	4.5
İŞL102	Management and Organization	3+0	4.0
İŞL103 (Eng)	Business Management	3+0	3.5

işL201 (Eng)	Business Organization	3+0	4.0
işL209	Business Management	2+0	2.0
işL301	Human Resources Management	3+0	4.0
işL302 (Eng)	Production Management and Systems	3+0	4.5
işL321	Applied Entrepreneurship	3+1	5.0
işL406	Strategic Management	3+0	4.5
işL421	Entrepreneurship	2+0	3.0
işL454 (Eng)	Management of Technology	3+0	4.5
işL475	Techno-Entrepreneurship	3+0	4.0
İTA255 (İta)	Italian I	3+0	4.0
İTA256 (İta)	Italian II	3+0	4.0
JAP301 (Jap)	Japanese I	4+0	4.0
JAP302 (Jap)	Japanese II	4+0	4.0
MFALM101 (Ger)	German for Engineering I	3+0	4.0
MFALM102 (Ger)	German for Engineering II	3+0	4.0
MFALM201 (Ger)	German for Engineering III	3+0	4.0
MFALM202 (Ger)	German for Engineering IV	3+0	4.0
MUH151	Introduction to Accounting	3+0	4.5
MÜH402 (Eng)	Engineering Ethics	2+0	3.0
MÜH404 (Eng)	Innovation Management	3+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
ÖMB322	Ethics of Science and Research	2+0	3.0
PSİ102	Psychology	3+0	3.5
PZL211 (Eng)	Principles of Marketing	3+0	5.0
PZL302	Marketing Management	3+0	4.5
REK2522	Sports Aviation	1+1	4.0
RTV281	Digital Literacy	2+2	4.0
RUS255 (Rus)	Russian I	3+0	4.0
RUS256 (Rus)	Russian II	3+0	4.0
SAĞ102	First Aid	2+0	2.5
SNT155	History of Art	2+0	2.0
SOS154	Man and Sociology	2+0	3.0
THU203	Community Services	0+2	3.0
TİY121	Introduction to Theatre	2+0	3.0
TİY152	Theatre	2+0	2.5
TİY308	Republic Era Turkish Theatre	2+0	3.0
TOP102	Surveying	2+2	4.5

#### Area Elective Courses

EEM311 (Eng)	Principles of Energy Conversion	3+2	6.0
EEM471 (Eng)	Electrical Machinery I	2+2	5.0
EEM472 (Eng)	Electrical Machinery II	2+2	5.0
EEM490 (Eng)	Nonlinear Systems	3+0	5.0
EEM491 (Eng)	Linear Control Systems	3+0	5.0
EEM493 (Eng)	Digital Control Systems	3+0	5.0
EEM494 (Eng)	Control Systems Laboratory	1+4	5.0
İNŞ453	Railway Engineering	3+0	4.5
İNŞ467 (Eng)	Construction Equipments	3+0	4.5
İNŞ469 (Eng)	Renewable Energy with Water, Wind and Wave Power	3+0	4.5
MEK404 (Eng)	Applied Fluid Mechanics	2+2	5.0
MEK405 (Eng)	Applied Strength of Materials	3+0	5.0
MEK406 (Eng)	Mechanical Vibrations	3+0	5.0
MEK439 (Eng)	Thermal System Design	2+2	5.0
MKM220	Problem Solving Methods	3+0	4.5
MKM222	Technical Report Writing and Presentation Skills in Engineering	3+0	4.5
MKM307	Engineering Materials for Mechanical Engineers	3+0	5.0
MKM330	MATLAB Programming for Engineers	1+2	5.0
MKM339 (Eng)	Introduction to Finite Element Method	2+2	5.0
MKM405	Machining and Machine Tools	3+0	5.0
MKM406	Reliability in Machine Design	3+0	5.0
MKM407	Maintenance in Mechanical Engineering	3+0	5.0
MKM408	Non-destructive Testing Methods	3+0	5.0
MKM409	Shape Memory Alloys	3+0	5.0
MKM410	Aircraft Engine Design	3+0	5.0

MKM411	System Engineering Fundamentals	3+0	5.0
MKM412	Internal Combustion Engines	3+0	5.0
MKM413	Engineering Applications of Finite Element Analysis	3+0	5.0
MKM414	Refrigeration Systems	3+0	5.0
MKM416	Theory of Elasticity	3+0	5.0
MKM417	Nonconventional Manufacturing Techniques	3+0	5.0
MKM418	Materials Handling Techniques	3+0	5.0
MKM419	Mechanics of Materials II	3+0	5.0
MKM420	Manufacturing Quality	3+0	5.0
MKM421	Energy Management and Efficiency	3+0	5.0
MKM422 (Eng)	Micro/ Nanoscale Fabrication and Characterization	3+0	5.0
MKM423	Welding Technologies	3+0	5.0
MKM424	Advanced Driver Assistance Systems	3+0	5.0
MKM426	Analysis and Evaluation of Cogeneration Systems	3+0	5.0
MKM427	Introduction to Composite Materials	3+0	5.0
MKM428	Computational Fluid Dynamics	3+0	5.0
MKM429	Vehicle Simulation	3+0	5.0
MKM432	Hydraulics and Pneumatic	3+0	5.0
MKM437 (Eng)	Engineering Materials	3+0	5.0
MKM440	Introduction to Computer Aided Manufacturing	3+0	5.0
MKM440 (Eng)	Introduction to Computer Aided Manufacturing	2+2	5.0
MKM4501 (Eng)	Three-Dimensional Kinematics and Kinetics of Rigid Bodies	3+0	5.0
MLZ307 (Eng)	Phase Diagrams	3+0	4.5
MLZ314 (Eng)	Transport Phenomena in Materials Processing	4+0	6.0
MLZ318 (Eng)	Metallic Materials	4+0	4.0
MLZ413 (Eng)	Powder Metallurgy	3+0	4.0
MLZ431 (Eng)	Alloys	3+0	4.0
MLZ433 (Eng)	Thin Film Technology	3+0	4.0
MLZ434 (Eng)	Aviation Materials	3+0	4.0
MLZ444 (Eng)	Welding Technologies	3+0	4.0
MLZ445 (Eng)	Phase Transformations in Metals and Alloys	3+0	4.0
MLZ450 (Eng)	Computational Materials Science	3+0	4.0
MLZ454 (Eng)	Smart Materials	3+0	4.0
MLZ456 (Eng)	Physical Properties of Nanomaterials	3+0	4.0
MTH456	Future Literacy and Foresight Analysis	3+0	5.0
MTH458	Lean Manufacturing Strategies and Applications in Industry	3+0	5.0
MTR301	Introduction to Mechatronics	3+0	5.0
MTR401 (Eng)	Mechatronics	2+2	5.0

## MECHATRONICS MINOR PROGRAM

## ENGINE TECHNOLOGIES MINOR PROGRAM

## DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING (ENGLISH)

This programme intends to include all kinds of practical and theoretical aspects of the field of study and it aims to train students to be skilled in all aspects of Materials Science and Engineering with emphasis on physics, chemistry, mathematics and engineering principles required for designing the microstructure, processing, characteristics and performance of all types of materials.

Department Head : Prof.Dr. Aydın DOĞAN  
Deputy Department Head : Dr. Lecturer Mert GÜL  
Deputy Department Head : Dr. Lecturer Hüseyin Boğaç POYRAZ

### PROGRAM

#### I.Semester

#### II.Semester

FİZ105 (Eng)	Physics I	4+0	6.0	FİZ106 (Eng)	Physics II	4+0	6.0
FİZ107 (Eng)	Physics Laboratory I	0+2	1.5	FİZ108 (Eng)	Physics Laboratory II	0+2	1.5
KİM1001 (Eng)	General Chemistry I	4+0	6.0	KİM1002 (Eng)	General Chemistry II	4+0	6.0
MAT1011 (Eng)	Calculus I	4+2	7.5	KİM1010 (Eng)	General Chemistry Laboratory	0+2	1.5
MLZ109 (Eng)	Materials World	2+0	2.5	MAT1012 (Eng)	Calculus II	4+2	7.5
TRS127 (Eng)	Technical Drawing	2+2	4.5	MLZ114 (Eng)	Structure of Materials	2+0	2.5
TÜR125	Turkish Language I	2+0	2.0	MLZ116 (Eng)	Freshman Project	1+0	1.0
				TÜR126	Turkish Language II	2+0	2.0
					<i>Seçmeli Dersler</i>	--	2.0
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			30.0				30.0

### III.Semester

iST2001 (Eng)	Engineering Statistics	3+0	4.0
MAT2011 (Eng)	Differential Equation	3+1	4.5
MAT2023 (Eng)	Linear Algebra and Numerical Methods	2+2	4.5
MEK215 (Eng)	Statics and Strength of Materials	3+0	4.5
MLZ221 (Eng)	Physical Properties of Materials	2+0	2.5
MLZ223 (Eng)	Polymer Chemistry (	2+0	3.0
MLZ225 (Eng)	Raw Metaterials and Unit Operations	2+0	2.0
MLZ229 (Eng)	Materials Characterization Techniques I	2+0	3.0
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0
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			30.0

### IV.Semester

BİL814 (Eng)	Computing and Programming	2+2	4.0
ETK208 (Eng)	Engineering Ethics	1+0	2.0
İSG401	Occupational Health and Safety I	2+0	2.0
MLZ216 (Eng)	Mechanical Behaviour of Materials I	2+0	3.0
MLZ218 (Eng)	Ceramic Processing	2+0	3.0
MLZ222 (Eng)	Materials Characterization Techniques Laboratory	0+2	3.0
MLZ230 (Eng)	Materials Characterization Techniques II	2+0	3.5
MLZ231 (Eng)	Materials Thermodynamics I	2+1	4.5
TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
	<i>Seçmeli Dersler</i>	--	3.0
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			30.0

### V.Semester

MLZ315 (Eng)	Electrochemistry	1+0	2.0
MLZ329 (Eng)	Materials Thermodynamics II	2+1	4.5
MLZ331 (Eng)	Materials Processing Laboratory I	0+2	2.0
MLZ333 (Eng)	Phase Diagrams	2+0	3.0
MLZ335 (Eng)	Metallic Materials I	2+0	3.0
MLZ337 (Eng)	Transport Phenomena in Materials Processing I	2+0	3.0
MLZ339 (Eng)	Non-Crystalline Materials	2+0	3.0
MLZSJ301 (Eng)	Materials Science and Engineering Internship I	0+2	2.5
	<i>Mesleki Seçmeli Dersler</i>	--	6.0
	<i>Seçmeli Dersler</i>	--	1.0
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			30.0

### VI.Semester

İLT328 (Eng)	Communication Skills	1+0	1.0
MLZ326 (Eng)	Project Management	1+0	2.0
MLZ328 (Eng)	Materials and Energy Balance	2+0	3.0
MLZ336 (Eng)	Metallic Materials II	2+0	3.0
MLZ338 (Eng)	Transport Phenomena in Materials Processing II	2+0	3.0
	<i>Mesleki Seçmeli Dersler</i>	--	12.0
	<i>Seçmeli Dersler</i>	--	6.0
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			30.0

VII.Semester				VIII.Semester			
iSG402	Occupational Health and Safety II	2+0	2.0	MLZ460 (Eng)	Materials Selection and Design	2+2	4.0
MLZ447 (Eng)	Materials Processing Laboratory II	0+2	3.0	MLZ462 (Eng)	Applications in Materials Engineering	2+0	3.5
MLZ449 (Eng)	Innovation and Entrepreneurship	1+0	1.0	MLZ464 (Eng)	Project Practice for Material Science and Engineering	2+4	5.0
MLZ457 (Eng)	Manufacturing with Materials	2+0	3.0	MLZSJ402 (Eng)	Materials Science and Engineering Internship II	0+2	2.5
MLZ459 (Eng)	Degradation of Engineering Materials	2+0	3.0		<i>Mesleki Seçmeli Dersler</i>	--	12.0
MLZ463 (Eng)	Project Preparation for Material Science and Engineering	1+2	3.0		<i>Seçmeli Dersler</i>	--	3.0
	<i>Mesleki Seçmeli Dersler</i>	--	15.0				
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			30.0				30.0

#### Elective Courses

ALM255 (Ger)	German I	3+0	4.0
ALM256 (Ger)	German II	3+0	4.0
ANT452	First Aid	1+2	4.0
ARK108	Archaeology	2+0	2.0
BEÖ155	Physical Education	2+0	2.0
BEÖ155 (Eng)	Physical Education	2+0	2.0
BEÖ176	Trekking	1+2	4.0
ÇEV462	Computer Aided Engineering Design	3+0	4.5
ESTÜ1001	Story Analysis On World Literature	3+0	3.0
ESTÜ1003	Yoga and Meditation	1+1	2.0
ESTÜ101	Introduction to University Life	0+1	2.0
ESTÜ102 (Eng)	Negotiation Techniques Class	2+0	3.0
ESTÜ103	Ceramic Design Processes	2+1	3.0
ESTÜ104 (Eng)	Academic and Life Skills	2+1	3.0
ESTÜ106	Proje Yönetimi	2+1	3.0
ESTÜ111	Volunteering Works	1+2	4.0
ESTÜ112	Cyber Security for Everyone	2+0	2.0
ESTÜ113	Design Thinking	3+0	3.0
ESTÜ114	Visual Thinking	3+0	3.0
ESTÜ115	Photographic Viewpoint	2+1	3.0
ESTÜ116	Computer Aided Design I	3+0	3.0
ESTÜ117	Computer Aided Design II	3+0	3.0
ESTÜ118	Visual Thinking with Concepts	3+0	3.0
ESTÜ119	Flute	3+1	3.0
ESTÜ120	Solfège	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
ESTÜ123	Gender Equality in Work Life	2+0	3.0
ESTÜ125	Philosophy of Science	3+0	3.0
ESTÜ127	Diction	1+2	3.0
ESTÜ129	Turkish as a Foreign Language I	2+0	2.0
ESTÜ130	Turkish as a Foreign Language II	2+0	2.0
ESTÜ131	Argentine Tango Dance	0+2	2.0
ESTÜ132	History of Political Thought	3+0	3.0
ESTÜ133	Disability and Awareness	3+0	3.0
ESTÜ2001	AI Literacy	2+0	2.0
ESTÜ203	Introduction to Sociology	3+0	3.0
ESTÜ204	Effective Reading and Writing Skills	3+0	4.0
ESTÜ206	Financial Literacy	3+0	3.0
ESTÜ207	General Psychology	2+0	4.0
ESTÜ210	Culture of Museum	2+0	2.0
ESTÜ301	Science Communication	2+0	3.0
ESTÜ307	Children Rights and Family Education	2+0	2.0



ESTÜ401	Introduction to Professional Life	1+1	2.0
ESTÜ402	Coaching and Leadership	3+0	3.0
ESTÜ403	Basic Computer Utilization	3+0	4.0
ESTÜ405	Computer Programming	3+0	5.0
FOT202	Photography	2+0	3.0
FRA255 (Fra)	French I	3+0	4.0
FRA256 (Fra)	French II	3+0	4.0
HUK252	Labor Law	2+0	2.5
HUK458	Industrial Rights and Technological Development	3+0	3.0
İKT209 (Eng)	Money and Banking	3+0	5.0
İLT201	Interpersonal Communication	3+0	4.5
İLT419	Body Language and Diction	2+0	5.0
İSN309	Mass Media	3+0	3.0
İSN409	Organizational Communication	3+0	4.5
İSP151 (Spa)	Spanish I	4+0	4.0
İSP152 (Spa)	Spanish II	4+0	4.0
İŞL101	Introduction to Business	3+0	4.5
İŞL101 (Eng)	Introduction to Business	3+0	4.5
İŞL102	Management and Organization	3+0	4.0
İŞL103 (Eng)	Business Management	3+0	3.5
İŞL201 (Eng)	Business Organization	3+0	4.0
İŞL209	Business Management	2+0	2.0
İŞL301	Human Resources Management	3+0	4.0
İŞL302 (Eng)	Production Management and Systems	3+0	4.5
İŞL321	Applied Entrepreneurship	3+1	5.0
İŞL406	Strategic Management	3+0	4.5
İŞL421	Entrepreneurship	2+0	3.0
İŞL454 (Eng)	Management of Technology	3+0	4.5
İŞL475	Techno-Entrepreneurship	3+0	4.0
İTA255 (İta)	Italian I	3+0	4.0
İTA256 (İta)	Italian II	3+0	4.0
JAP301 (Jap)	Japanese I	4+0	4.0
JAP302 (Jap)	Japanese II	4+0	4.0
MFALM101 (Ger)	German for Engineering I	3+0	4.0
MFALM102 (Ger)	German for Engineering II	3+0	4.0
MFALM201 (Ger)	German for Engineering III	3+0	4.0
MFALM202 (Ger)	German for Engineering IV	3+0	4.0
MUH151	Introduction to Accounting	3+0	4.5
MÜH402 (Eng)	Engineering Ethics	2+0	3.0
MÜH404 (Eng)	Innovation Management	3+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
ÖMB322	Ethics of Science and Research	2+0	3.0
PSİ102	Psychology	3+0	3.5
PZL211 (Eng)	Principles of Marketing	3+0	5.0
PZL302	Marketing Management	3+0	4.5
REK2522	Sports Aviation	1+1	4.0
RTV281	Digital Literacy	2+2	4.0
RUS255 (Rus)	Russian I	3+0	4.0
RUS256 (Rus)	Russian II	3+0	4.0
SAĞ102	First Aid	2+0	2.5
SNT155	History of Art	2+0	2.0
SOS154	Man and Sociology	2+0	3.0
THU203	Community Services	0+2	3.0
TİY121	Introduction to Theatre	2+0	3.0
TİY152	Theatre	2+0	2.5
TİY308	Republic Era Turkish Theatre	2+0	3.0
TOP102	Surveying	2+2	4.5

#### Area Elective Courses

İKT151 (Eng)	Economics	3+0	3.0
İKT356 (Eng)	Engineering Economics	3+0	4.5
MLZ208 (Eng)	Electrical, Magnetic and Optical Properties of Materials	2+0	3.0
MLZ327 (Eng)	Mechanical Behaviour of Materials II	2+0	3.0

MLZ330 (Eng)	Silicate Ceramics	2+0	3.0
MLZ332 (Eng)	Processing of Polymers	2+0	3.0
MLZ334 (Eng)	Fundamentals of Semiconductors	2+0	3.0
MLZ342 (Eng)	Whitewares	2+0	3.0
MLZ354 (Eng)	Spectroscopic Analysis of Materials	2+0	3.0
MLZ453 (Eng)	Advanced Materials and Composites	2+0	3.0
MLZ455 (Eng)	Heat Treatment	2+0	3.0
MLZ461 (Eng)	Glass Technology	2+0	3.0
MLZ465 (Eng)	Machining Technology of Metals	2+0	3.0
MLZ466 (Eng)	Enamels	2+0	3.0
MLZ467 (Eng)	Particle Size Control Mechanism	2+0	3.0
MLZ468 (Eng)	Rubber and Rubber Technology	2+0	3.0
MLZ470 (Eng)	Cement and Concrete	2+0	3.0
MLZ471 (Eng)	Nanomaterials and Nanotechnology	2+0	3.0
MLZ472 (Eng)	Biomaterials	2+0	3.0
MLZ473 (Eng)	Carbon Nanomaterials	2+0	3.0
MLZ474 (Eng)	Aviation Materials	2+0	3.0
MLZ475 (Eng)	Polymer Matrix Composites	2+0	3.0
MLZ476 (Eng)	Engineering Materials for Armour Applications	2+0	3.0
MLZ477 (Eng)	Microscopy in Practice	2+0	3.0
MLZ478 (Eng)	Mathematical Relations in Powder Processing	2+0	3.0
MLZ479 (Eng)	Electroceramic Materials	2+0	3.0
MLZ480 (Eng)	Tile and Brick	2+0	3.0
MLZ482 (Eng)	Refractories	2+0	3.0
MLZ484 (Eng)	Glass Ceramics	2+0	3.0
MLZ486 (Eng)	Strengthening Mechanisms in Materials	2+0	3.0
MLZ488 (Eng)	Technical Glasses	2+0	3.0
MLZ492 (Eng)	Materials in Cosmetic Science	2+0	3.0
MLZ494 (Eng)	Data Analysis and Optimization in Materials Science	2+0	3.0
TKY411 (Eng)	Quality Control	2+0	3.0

## AERONAUTICAL ENGINEERING PR. (ENGLISH)

This programme intends to include all kinds of practical and theoretical aspects of the field of study and it aims to provide its graduates with technical and managerial skills in all aspects of Aeronautical Engineering, required to pursue a career in the design, development, implementation, installation, operation, and maintenance systems, and to equip them with sufficient background necessary to follow advanced studies.

Department Head :  
Deputy Department Head :

### PROGRAM

I.Semester				II.Semester			
FİZ105 (Eng)	Physics I	4+0	6.0	FİZ106 (Eng)	Physics II	4+0	6.0
FİZ107 (Eng)	Physics Laboratory I	0+2	1.5	FİZ108 (Eng)	Physics Laboratory II	0+2	1.5
İSG401	Occupational Health and Safety I	2+0	2.0	İSG402	Occupational Health and Safety II	2+0	2.0
KİM1005 (Eng)	General Chemistry	4+0	6.0	MAT1012 (Eng)	Calculus II	4+2	7.5
MAT1011 (Eng)	Calculus I	4+2	7.5	MKM104 (Eng)	Computer Aided Engineering Technical Drawing	2+2	5.0
TÜR125	Turkish Language I	2+0	2.0	TÜR126	Turkish Language II	2+0	2.0
UZY101 (Eng)	Introduction to Aerospace and Ethics	2+0	3.0	UCK102 (Eng)	Theory of Flight	3+0	4.0
	<i>Seçmeli Dersler</i>	--	2.0		<i>Seçmeli Dersler</i>	--	2.0
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			30.0				30.0
III.Semester				IV.Semester			
BİL200 (Eng)	Computer Programming	2+2	6.0	MAT2023 (Eng)	Linear Algebra and Numerical Methods	2+2	4.5

İST2001 (Eng)	Engineering Statistics	3+0	4.0	MEK216 (Eng)	Engineering Mechanics: Dynamics	3+0	4.0
MAT2011 (Eng)	Differential Equation	3+1	4.5	MLZ216 (Eng)	Mechanical Behaviour of Materials I	2+0	3.0
MEK217 (Eng)	Engineering Mechanics: Statics	3+0	5.0	MLZ232 (Eng)	Introduction to Materials Science	3+0	3.5
MEK323 (Eng)	Fundamentals of Fluid Mechanics	4+0	6.0	TAR166	Atatürk's Principles and History of Turkish Revolution II	2+0	2.0
TAR165	Atatürk's Principles and History of Turkish Revolution I	2+0	2.0	UCK202 (Eng)	Circuits, Signals and Systems	3+0	4.5
	<i>Seçmeli Dersler</i>	--	2.5	UZY202 (Eng)	Thermodynamics	3+0	4.5
					<i>Seçmeli Dersler</i>	--	4.0
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			30.0				30.0

V.Semester				VI.Semester			
İKT356 (Eng)	Engineering Economics	3+0	4.5	MEK406 (Eng)	Mechanical Vibrations	3+0	5.0
MLZ453 (Eng)	Advanced Materials and Composites	2+0	3.0	MKM303 (Eng)	Heat Transfer	4+0	6.0
UCK3005 (Eng)	Aerodynamics I	3+0	4.5	UCK3006 (Eng)	Aerodynamics II	3+0	4.5
UCK301 (Eng)	Flight Mechanics	3+0	5.0	UCK3008 (Eng)	Introduction to Helicopter Aerodynamics and Design	2+0	3.0
UZY301 (Eng)	Aerospace Structures	3+0	5.0	UCK3010 (Eng)	Aeronautical Engineering Design	3+0	4.5
UZY302 (Eng)	Propulsion Systems	3+0	4.0	UZY310 (Eng)	Flight Stability and Control	3+0	4.5
	<i>Seçmeli Dersler</i>	--	4.0		<i>Seçmeli Dersler</i>	--	2.5
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			30.0				30.0

VII.Semester				VIII.Semester			
EEM415 (Eng)	Engineering Design and Research	2+0	3.0	UCK402 (Eng)	Aeronautical Engineering Design Project II	1+5	4.5
UCK401 (Eng)	Aeronautical Engineering Design Project I	2+2	4.5	UCKSJ402 (Eng)	Aeronautical Engineering Internship II	0+2	2.5
UCKSJ401 (Eng)	Aeronautical Engineering Internship I	0+2	2.5		<i>Mesleki Seçmeli Dersler</i>	--	20.0
	<i>Mesleki Seçmeli Dersler</i>	--	20.0		<i>Seçmeli Dersler</i>	--	3.0
			----				----
			30.0				30.0

#### Elective Courses

ALM255 (Ger)	German I	3+0	4.0
ALM256 (Ger)	German II	3+0	4.0
ANT452	First Aid	1+2	4.0
ARK108	Archaeology	2+0	2.0
BEÖ155	Physical Education	2+0	2.0
BEÖ155 (Eng)	Physical Education	2+0	2.0
BEÖ176	Trekking	1+2	4.0
ESTÜ1001	Story Analysis On World Literature	3+0	3.0
ESTÜ1003	Yoga and Meditation	1+1	2.0
ESTÜ101	Introduction to University Life	0+1	2.0
ESTÜ102 (Eng)	Negotiation Techniques Class	2+0	3.0
ESTÜ103	Ceramic Design Processes	2+1	3.0
ESTÜ104	Academic and Life Skills	2+1	3.0
ESTÜ106	Proje Yönetimi	2+1	3.0

ESTÜ111	Volunteering Works	1+2	4.0
ESTÜ112	Cyber Security for Everyone	2+0	2.0
ESTÜ113	Design Thinking	3+0	3.0
ESTÜ114	Visual Thinking	3+0	3.0
ESTÜ115	Photographic Viewpoint	2+1	3.0
ESTÜ116	Computer Aided Design I	3+0	3.0
ESTÜ117	Computer Aided Design II	3+0	3.0
ESTÜ118	Visual Thinking with Concepts	3+0	3.0
ESTÜ119	Flute	3+1	3.0
ESTÜ120	Solfege	3+1	3.0
ESTÜ121	Piano	3+1	3.0
ESTÜ122	Guitar	3+1	3.0
ESTÜ123	Gender Equality in Work Life	2+0	3.0
ESTÜ125	Philosophy of Science	3+0	3.0
ESTÜ127	Diction	1+2	3.0
ESTÜ129	Turkish as a Foreign Language I	2+0	2.0
ESTÜ130	Turkish as a Foreign Language II	2+0	2.0
ESTÜ131	Argentine Tango Dance	0+2	2.0
ESTÜ132	History of Political Thought	3+0	3.0
ESTÜ133	Disability and Awareness	3+0	3.0
ESTÜ2001	AI Literacy	2+0	2.0
ESTÜ201	Turkish Sign Language	3+0	3.0
ESTÜ203	Introduction to Sociology	3+0	3.0
ESTÜ204	Effective Reading and Writing Skills	3+0	4.0
ESTÜ206	Financial Literacy	3+0	3.0
ESTÜ207	General Psychology	2+0	4.0
ESTÜ210	Culture of Museum	2+0	2.0
ESTÜ301	Science Communication	2+0	3.0
ESTÜ307	Children Rights and Family Education	2+0	2.0
ESTÜ4001 (Eng)	Sustainable Building Design	3+0	3.0
ESTÜ401	Introduction to Professional Life	1+1	2.0
ESTÜ402	Coaching and Leadership	3+0	3.0
ESTÜ403	Basic Computer Utilization	3+0	4.0
ESTÜ405	Computer Programming	3+0	5.0
FOT202	Photography	2+0	3.0
FRA255 (Fra)	French I	3+0	4.0
FRA256 (Fra)	French II	3+0	4.0
HUK252	Labor Law	2+0	2.5
HUK458	Industrial Rights and Technological Development	3+0	3.0
İKT151 (Eng)	Economics	3+0	3.0
İLT201	Interpersonal Communication	3+0	4.5
İLT201 (Eng)	Interpersonal Communication	3+0	4.5
İLT419	Body Language and Diction	2+0	5.0
İSN309	Mass Media	3+0	3.0
İSN409	Organizational Communication	3+0	4.5
İSP151 (Spa)	Spanish I	4+0	4.0
İSP152 (Spa)	Spanish II	4+0	4.0
İŞL101	Introduction to Business	3+0	4.5
İŞL101 (Eng)	Introduction to Business	3+0	4.5
İŞL102	Management and Organization	3+0	4.0
İŞL209	Business Management	2+0	2.0
İŞL301	Human Resources Management	3+0	4.0
İŞL321	Applied Entrepreneurship	3+1	5.0
İŞL406	Strategic Management	3+0	4.5
İŞL421	Entrepreneurship	2+0	3.0
İŞL454 (Eng)	Management of Technology	3+0	4.5
İŞL475	Techno-Entrepreneurship	3+0	4.0
İTA255 (İta)	Italian I	3+0	4.0
İTA256 (İta)	Italian II	3+0	4.0
JAP301 (Jap)	Japanese I	4+0	4.0
JAP302 (Jap)	Japanese II	4+0	4.0
KÜL451 (Eng)	History of Science and Engineering	3+0	4.5
MFALM101 (Ger)	German for Engineering I	3+0	4.0
MFALM102 (Ger)	German for Engineering II	3+0	4.0

MFALM201 (Ger)	German for Engineering III	3+0	4.0
MFALM202 (Ger)	German for Engineering IV	3+0	4.0
MUH151	Introduction to Accounting	3+0	4.5
MÜH402 (Eng)	Engineering Ethics	2+0	3.0
MÜH404 (Eng)	Innovation Management	3+0	3.0
MÜZ101	Evolution of Music	2+0	3.0
MÜZ151	Short History of Music	2+0	3.0
MÜZ157	Traditional Turkish Art Music	2+0	2.0
ÖMB322	Ethics of Science and Research	2+0	3.0
PSİ102	Psychology	3+0	3.5
REK2522	Sports Aviation	1+1	4.0
RTV281	Digital Literacy	2+2	4.0
RUS255 (Rus)	Russian I	3+0	4.0
RUS256 (Rus)	Russian II	3+0	4.0
SAĞ102	First Aid	2+0	2.5
SNT155	History of Art	2+0	2.0
SOS154	Man and Sociology	2+0	3.0
THU203	Community Services	0+2	3.0
TİY121	Introduction to Theatre	2+0	3.0
TİY152	Theatre	2+0	2.5
TİY308	Republic Era Turkish Theatre	2+0	3.0

#### Area Elective Courses

BİL409 (Eng)	Decision Support Systems	3+0	6.0
EEM493 (Eng)	Digital Control Systems	3+0	5.0
ENM203 (Eng)	Linear Programming	2+2	5.5
ENM304 (Eng)	Investment Planning and Analysis	4+0	6.0
ENM306 (Eng)	Stochastic Models	3+0	4.5
ENM419 (Eng)	Sustainable Systems Engineering	3+0	5.0
ENM442 (Eng)	Decision Analysis	3+0	4.5
İST244 (Eng)	Engineering Probability	3+0	5.0
LOJ401 (Eng)	Logistics Management and Models	3+0	6.0
MKM304 (Eng)	Manufacturing Techniques	2+2	4.0
MKM413 (Eng)	Engineering Applications of Finite Element Analysis	3+0	5.0
MKM416 (Eng)	Theory of Elasticity	3+0	5.0
MLZ221 (Eng)	Physical Properties of Materials	2+0	2.5
MLZ229 (Eng)	Materials Characterization Techniques I	2+0	3.0
MLZ230 (Eng)	Materials Characterization Techniques II	2+0	3.5
MLZ327 (Eng)	Mechanical Behaviour of Materials II	2+0	3.0
MLZ329 (Eng)	Materials Thermodynamics II	2+1	4.5
MLZ474 (Eng)	Aviation Materials	2+0	3.0
MLZ475 (Eng)	Polymer Matrix Composites	2+0	3.0
MLZ486 (Eng)	Strengthening Mechanisms in Materials	2+0	3.0
MÜH302 (Eng)	Interdisciplinary Applications	1+2	4.5
UCK403 (Eng)	Professional Practice	0+25	20.0

### COURSE CONTENTS

#### ALM255 (Ger) German I 3+0 4.0

Greeting Friends; Asking for Someone's Health; Asking for Directions; Asking Where People are From; Making Requests; Asking for Prices; asking for Prices; Asking for Different Kinds of Food and Drink; Formal Sentences Used in Restaurants and Formal Places; Asking For and Telling People about Preferences; Likes and Dislikes; Asking for the Amount of Something and Telling the Amount of Something; Structures Used in Telephone Conversations; Using Appropriate Grammar Forms for the Given Situations.

#### ALM256 (Ger) German II 3+0 4.0

Modal verbs: Können, Müssen, Wollen, Dürfen, Sollen, Mögen; Tenses: Simple Present Tense, Future Tense; Nouns and Types of Nouns; Articles; Singular and Plural Forms: Words that are used as Singular or Plural only, Plural Form of the Indefinite Article; Cases of a Noun: Uninflected Case, Accusative, Dative, Possessive Cases; Exercises about these Grammar Points.

#### ANT452 First Aid 1+2 4.0

Functioning Of The Human Metabolism And Systems: Disruptions occurring in the system, Things to do in the event of illness, Things to do in case of an accident or injury, First Aid Principles: The importance of first aid, Personal

responsibilities related to first aid, Legal responsibilities related to first aid, Priorities in first aid, Awareness on first aid, Equipment used in first aid, First aid and time, Lifesaving, Human responsibilities in first aid, Proper first aid intervention, Preparation for expert team after first aid.

**ARK108 Archaeology 2+0 2.0**

Definition; Social, cultural and historical role of archaeology; Domain of Archaeology; Age of the World; Production of the Earliest Stone Tools; Scientific Disciplines Revenant to Archaeological Studies; Brief History of Archaeological Excavations; Historical Classification and History of Anatolia: Prehistoric Ages, Historical Ages, Archaeological sites of Anatolia, Archaeological excavations in Anatolia; Archaeological Activities of University.

**ARY202 Research Techniques 3+0 5.0**

Science: Definition of science, Scientific research, Technical approaches in scientific research; Research: Stages of a research, Types of research, Data collection techniques in research; Question: Definition of question, Types of question, Question forms in research, Preparation of the forms using computers; Analysis of the results: Evaluation of question forms using computer, Statistical analysis of the research results, Computer output of research results; Report writing; An Application of Research Planning.

**BEÖ155 Physical Education 2+0 2.0**

Definition of Physical Education and Sports; Aims, Disadvantages of Inactive Life; Various Activities for Physical Education; Recreation; Human Physiology; First Aid; Sports Branches: Definition, Rules and Application; Keep Fit Programs. Definition of Physical Education and Sports; Aims, Disadvantages of Inactive Life; Various Activities for Physical Education; Recreation; Human Physiology; First Aid; Sports Branches: Definition, Rules and Application; Keep Fit Programs.

**BEÖ155 (Eng) Physical Education 2+0 2.0**

Definition of Physical Education and Sports; Aims, Disadvantages of Inactive Life; Various Activities for Physical Education; Recreation; Human Physiology; First Aid; Sports Branches: Definition, Rules and Application; Keep Fit Programs. Definition of Physical Education and Sports; Aims, Disadvantages of Inactive Life; Various Activities for Physical Education; Recreation; Human Physiology; First Aid; Sports Branches: Definition, Rules and Application; Keep Fit Programs.

**BEÖ176 Trekking 1+2 4.0**

The Definition of Trekking; The Essentials which Must Be Done Before Trekking, At The Time of Trekking, After Trekking; Trekking Equipments; Backpack and Essential Equipments in Backpack; The Characteristics of Clothes; The Characteristics of Shoes; Sleeping Bags: Their kinds and characteristics; The Characteristics of Mats; Tents: Their kinds and characteristics; The Methods of Direction Determination: Scrip, GPS, Pole star, Sun, Watch; The Problems According to Weather Conditions in Trekking.

**BiL200 (Eng) Computer Programming 2+2 6.0**

Procedural and Functional Programming Concepts; C Programming Environment and Compilers; Basic C Commands and Variables; Algorithm Flow; Logic Expressions; Functions; Arrays and Pointers; Function I/O Interfaces; Files; Memory Allocation and Data Structures; Advanced Topics. Procedural and Functional Programming Concepts; C Programming Environment and Compilers; Basic C Commands and Variables; Algorithm Flow; Logic Expressions; Functions; Arrays and Pointers; Function I/O Interfaces; Files; Memory Allocation and Data Structures; Advanced Topics.

**BiL409 (Eng) Decision Support Systems 3+0 6.0**

Rational Decision Making and Appropriate Data Support; Components of Decision Support Systems (DSS): Data, Information, Databases, Dbms, Knowledgebase, Data Warehouses, Rulebase/Modelbase; Expert Systems Mechanism and Certainty Factors, System Dynamics and Simulation, Group DSS, Executive Information Systems, User-Interface Components; Designing, Implementation and Evaluation of DSS. Rational Decision Making and Appropriate Data Support; Components of Decision Support Systems (DSS): Data, Information, Databases, Dbms, Knowledgebase, Data Warehouses, Rulebase/Modelbase; Expert Systems Mechanism and Certainty Factors, System Dynamics and Simulation, Group DSS, Executive Information Systems, User-Interface Components; Designing, Implementation and Evaluation of DSS.

**BiL814 (Eng) Computing and Programming 2+2 4.0**

Introduction to Computers: Fundamentals of Algorithms, Pseudocode and Flowcharts; Basic Elements of Programming; Branching programs, String and Input, Iteration; Some Simple Numerical Programs; Functions; Scoping and Abstraction; Structured Types; Tuples, Lists and Mutability, Functions as Objects, Dictionaries; Algorithm Design and Numerical Solutions of Some Materials Science and Engineering Problems.

**BiM103 (Eng) Computer Programming I 2+2 5.0**

Software, Hardware, Operating Systems; Number Systems: Decimal, binary, octal and hexadecimal numbers; Algorithms; Flowcharts; Program Coding and Introduction to Programming with Java: Primitive data types and operations, Selection statements and looping constructs; Basic Input / Output Operations: Reading from Keyboard; Printing to Screen; Methods; Arrays.

**BiM105 (Eng) Introduction to Computer Engineering 2+0 2.0**

Introduction to Computers: General structure of computers, Software, Hardware; Introduction to Computer Hardware; Data and Storage; Introduction to Computer Software; General Overview of Programming Concepts; Introduction to Operating Systems; Introduction to Artificial Intelligence: Machine learning, Computer vision, Image processing; Introduction to Data Science; Introduction to Internet and Computer Networks; Introduction to Databases; Introduction to Computing Theory and Algorithm Analysis.

**BiM108 (Eng) Computer Programming II 2+2 6.0**

Objects and Classes: Defining classes and objects, Accessing objects via reference variables; Thinking in Objects: Immutable objects and classes, Class abstraction and encapsulation; OOP Concepts: Inheritance, Superclasses and subclasses, Encapsulation, Polymorphism, Dynamic binding, Abstract classes, Interfaces, Multiple inheritance, Inner classes, Anonymous inner classes; Exception Handling Concepts: Exception types, Finally clause, Rethrowing exceptions, Defining custom exception classes, Assertions; I/O Programming: Stream oriented I/O, Text I/O, Binary I/O, Random access files.

**BiM122 (Eng) Discrete Computational Structures 3+0 5.0**

Fundamentals of Logic; Set Theory and Mathematical Logic; Methods of Proof; Mathematical Induction; Relations; Functions; Cardinality and Countability; The Duality Principles; Homomorphism and Isomorphism; Boolean Algebras; Graph Theory; Trees; Matrix Representations; Introduction to Algebraic Structures; Lattices; Groups: Semigroups, Monoids; Finite State Machines and Languages. Fundamentals of Logic; Set Theory and Mathematical Logic; Methods of Proof; Mathematical Induction; Relations; Functions; Cardinality and Countability; The Duality Principles; Homomorphism and Isomorphism; Boolean Algebras; Graph Theory; Trees; Matrix Representations; Introduction to Algebraic Structures; Lattices; Groups: Semigroups, Monoids; Finite State Machines and Languages.

**BiM2005 (Eng) Computer Programming III 2+2 6.0**

Environment Variables and Command Line Tools; Version Control and Build Automation; Data Structures; Generic Programming Features; Annotations; Functional Programming Features; File Operations; Software Testing; Data Processing with Streams; Concurrent Programming Features; Database Connectivity; Frontend Development.

**BiM2006 (Eng) Computer Programming IV 2+2 5.5**

Introduction to Prompt Engineering: Definitions, Application Areas; Introduction to Large Language Models: Transformer architecture, Tokenization, Context window; Role of Prompts in AI Interaction: Open-ended prompts, Closed prompts, Role definition; Prompt Writing for Code Generation: Template creation, Function generation, Error control; AI-Assisted Documentation and Code Explanation: Inline comments, API documentation generation; Debugging and Error Resolution: Identifying code errors, Analyzing incorrect outputs, Step-by-step repair prompts; Test Writing with AI: Unit test generation, Scenario-based testing; Code Refactoring and Optimization: Code simplification, Performance improvement suggestions; Multi-file and Contextual Prompting: Providing context, Maintaining consistency across files; Prompt Chaining and Tool Integration: Multi-step prompting; Ethics and Security in AI-Assisted Coding: Copyright, Hallucination risk, Data privacy.

**BiM2008 (Eng) Formal Languages and Automata Theory 3+0 4.5**

Finite Automata; Nondeterminism; Regular Languages and their Properties; Regular Expressions; the Pumping Lemma for Regular Languages; Context-free Grammars and Languages; Different Forms of Grammars; Pushdown Automata; Non-context-free Languages; Turing Machines and their Properties.

**BiM203 (Eng) Logic Design 4+0 6.0**

Digital Systems and Information: Number systems, Arithmetic operations, Base conversions; Gate Circuits and Boolean Equations: Binary logic and gates, Boolean algebra, Standard forms; Circuit Optimization: Cost criteria, Karnaugh maps; Implementation Technology and Logic Design: Design procedure, Mapping; Combinational Functions: Encoder, Decoder, Multiplexer; Arithmetic Functions: Addition, Subtraction, Multiplication, Division, Signed numbers; Storage Elements: Latches, Flip-flops; Sequential Circuit Analysis: State tables, State diagrams, Mealy and Moore models; Sequential Circuit Design; Counters and Registers. Digital Systems and Information: Number systems, Arithmetic operations, Base conversions; Gate Circuits and Boolean Equations: Binary logic and gates, Boolean algebra, Standard forms; Circuit Optimization: Cost criteria, Karnaugh maps; Implementation Technology and Logic Design: Design procedure, Mapping; Combinational Functions: Encoder, Decoder, Multiplexer; Arithmetic Functions: Addition, Subtraction, Multiplication, Division, Signed numbers; Storage Elements: Latches, Flip-flops; Sequential Circuit Analysis: State tables, State diagrams, Mealy and Moore models; Sequential Circuit Design; Counters and Registers.

**BiM209 (Eng) Principles of Software Design and Development 3+0 6.0**

Object-Oriented Programming Concepts; Object-Oriented Design Principles; Needs Analysis; Functionality Analysis; Textual Analysis; Domain Analysis; Commonality Analysis; Concepts of High Cohesion and Loose Coupling; UML Diagrams; Class Diagrams; Use-Case Diagrams; Software Architecture; Test-Driven Development; Feature-Driven Development; Writing Test Scenarios; Defensive Programming.

**BiM211 (Eng) Visual Programming 2+2 6.0**

Basic Structure and Environment of Visual Programming; Basic Tools of Visual Basic Environment; Project: Characteristics and Help System; Form Design; Controls; Menus; Events and Methods; Data Types; Arrays; Functions; Subroutines and Modules; String and Character Operations; Sample Programs with Different Features; Use of Multiple Forms; Use of Files; Sample Programs on Files; Use of Databases; Sample Applications on Databases. Basic Structure and Environment of Visual Programming; Basic Tools of Visual Basic Environment; Project: Characteristics and Help System; Form Design; Controls; Menus; Events and Methods; Data Types; Arrays; Functions; Subroutines and Modules; String and Character Operations; Sample Programs with Different Features; Use of Multiple Forms; Use of Files; Sample Programs on Files; Use of Databases; Sample Applications on Databases.

**BiM213 (Eng) Data Structures and Algorithms 2+2 5.5**

Introduction; Classification of Data Structures; Primitive Data Structures; Arrays and Strings; Abstract Data Types; Data Representation; Formula Based and Linked Representation; Stacks; Recursion; Queues; Linked Lists; Circular Linked Lists; Double Linked Lists; Trees; Binary Trees; Traversal Functions on Binary Trees; Representing Lists as Binary Trees; Search Algorithms; Tree Searching; AVL Trees and Searching; Red-Black Trees; B-Trees; Multiway Search Trees. Introduction; Classification of Data Structures; Primitive Data Structures; Arrays and Strings; Abstract Data Types; Data Representation; Formula Based and Linked Representation; Stacks; Recursion; Queues; Linked Lists; Circular Linked Lists; Double Linked Lists; Trees; Binary Trees; Traversal Functions on Binary Trees; Representing Lists as Binary Trees; Search Algorithms; Tree Searching; AVL Trees and Searching; Red-Black Trees; B-Trees; Multiway Search Trees.

**BiM216 (Eng) Database Management Systems 2+2 5.0**

Basic Database Concepts and Definitions: Data, Database, Database management systems, Data model; Database Architecture: External level, Conceptual level, and Internal level; Data Independence; The Relational Model of Data; Database Design Process; The Entity-Relationship (E/R) Model; Relational Schema; Schema Refinement: Functional dependency, Normalization, and Normal forms; Structured Query Language (SQL): Data definition, Data manipulation, and Query language; Relational Algebra; Relational Calculus; Query Optimization; Physical Schema: Storage, and File organization; Transactions; Operational Requirements: Security, Integrity, Accuracy, Concurrency, Performance.

**BiM218 (Eng) Operating Systems 2+2 4.5**

Operating System Structures: Operating system services, System calls; Processes: Process concept, Interprocess communication; Threads: Multicore programming, Multithreading models, Thread libraries; Process Synchronization: Critical-section problem, Semaphores, Classical problems of synchronization; CPU Scheduling: Scheduling criteria, Scheduling algorithms; Deadlocks; Main Memory: Contiguous memory allocation, Segmentation, Paging; Virtual Memory; Mass Storage Structure; File Systems; I/O Systems: I/O hardware, Application I/O interface, Kernel I/O subsystem.

**BiM222 (Eng) Internet Programming 3+0 4.5**

Introduction to Hyper Text Markup Language (HTML 4); Cascading Style Sheets (CSS); Javascript ? Introduction; Javascript - Control Structures; Javascript ? Functions; Javascript ? Arrays; Javascript ? Objects; Dynamic HTML; DHTML - Object Model and Collections; DHTML - Event Model; Introduction to XML; Creating Markup with XML; XML - Document Type Definition (DTD) and Schemas; XML - Document Object Model; XML Path Language; XSL: Extensible Stylesheet Language Transformations (XSLT). Introduction to Hyper Text Markup Language (HTML 4); Cascading Style Sheets (CSS); Javascript ? Introduction; Javascript - Control Structures; Javascript ? Functions; Javascript ? Arrays; Javascript ? Objects; Dynamic HTML; DHTML - Object Model and Collections; DHTML - Event Model; Introduction to XML; Creating Markup with XML; XML - Document Type Definition (DTD) and Schemas; XML - Document Object Model; XML Path Language; XSL: Extensible Stylesheet Language Transformations (XSLT).

**BiM3005 (Eng) Fundamentals of Software Engineering 3+0 4.5**

Software Processes: Software Design, Software Implementation, Software Testing, Software Maintenance; Software Reuse; Project Management; Software Engineering Ethics

**BiM3007 (Eng) Mathematical Tools for Computer Engineering 3+0 6.0**

Vectors and Matrices; Properties and Transformations of Matrices; Matrix Factorizations; Multivariable Functions and Approximation; Matrix Based Differentiation Methods; Optimization: Lagrange multipliers; Fundamentals of Signals and Systems; Frequency Domain Analysis; Difference Equations and Time Domain Solution Methods; Z Transform: Discrete time system analysis in the transform domain; Convolution and Correlation: Filtering applications.



**BiM303 (Eng) Microcomputers****3+2 7.0**

Introduction to Microcomputers: Microprocessor, Memory, I/O, Buses; Programming Structure and Software Development Flow: Low and high level programming languages, Software development tools; Architecture of Microprocessor: Basic instruction cycle, Registers; Addressing Modes: Data addressing, Program memory addressing, Stack memory addressing; Instructions: Instruction format, Data movement instructions, Arithmetic and logic instructions, Program control instructions; Memory Interface: Memory connections, Memory types, Error correction; I/O Interface: Isolated I/O, Memory mapped I/O, Handshaking, Serial and parallel communication; Interrupts: Polling and interrupt, Types of interrupts; Microprocessor Performance; Floating Point Arithmetic.

**BiM304 (Eng) Computer Algorithm Design****3+0 6.0**

Introduction; The Role of Algorithms in Computing; Algorithms as a Technology; Sorting; Analysis of Sorting Algorithms; Heap Sort and Quick Sort; Algorithm Performance Analysis; Space Complexity; Time Complexity; Asymptotic Notations: , and notations; Arrays and Matrices; C++ Classes: Array1D, Array2D, Matrix; Stack and Queue Manipulation Algorithms; Trees; Binary Trees; Abstract Data Type for Trees; Tree Traversal Algorithms; Graphs; Graph Search Methods; Algorithm Design Techniques; The Greedy Method; 0/1 Knapsack Problem; Divide and Conquer Method; Merge Sort; Branch and Bound Method; Traveling Salesperson Problem.

**BiM305 (Eng) Computer Organization****3+0 5.0**

Performance: Measuring performance, Performance metrics, SPEC benchmarks, Comparing and summarizing performance; MIPS Instruction Set Architecture; Arithmetic for Computers: ALU design, Integer multiplication and division, Floating point operations; The Processor: Single cycle datapath design, Controller design for a single cycle datapath, Multicycle datapath design, Controller design for a multicycle datapath; Pipelining: A pipelined datapath and its control, Data hazards and forwarding, Data hazards and stalls, Branch hazards; Caches: Basics of caches, Measuring and improving cache performance.

**BiM308 (Eng) Web Server Programming****3+0 4.5**

Web-Based and Client-Based Programming; Publishing Web Pages; Comparison of HTML Pages and ASP Pages; IIS and Management of Web Sites; Web-Based Programming Languages and Tools; .NET Framework; Common Language Runtime (CLR); ASP.NET v2.0: Building a web application, Performing data access, Form input controls, Master pages, Storing user profiles, Caching for performance, Internationalizing, User controls, Session and application variables; Web Services: XML, SOAP protocol, Web services returning various data types. Web-Based and Client-Based Programming; Publishing Web Pages; Comparison of HTML Pages and ASP Pages; IIS and Management of Web Sites; Web-Based Programming Languages and Tools; .NET Framework; Common Language Runtime (CLR); ASP.NET v2.0: Building a web application, Performing data access, Form input controls, Master pages, Storing user profiles, Caching for performance, Internationalizing, User controls, Session and application variables; Web Services: XML, SOAP protocol, Web services returning various data types.

**BiM309 (Eng) Artificial Intelligence****3+0 4.5**

Introduction to Artificial Intelligence; Intelligent Agents; Solving Problems by Searching; Search Strategies; Constraint Satisfaction Problems; State Space Search; Data-Driven and Goal-Driven Search; Heuristic Search; Informed Search Methods; Agent Based on Logical Reasoning in Building a Knowledge Base; Inference in First-Order Logic; Uncertainty; Probabilistic Reasoning Systems; Machine Learning; Inductive Learning; Decision Trees; Knowledge in Learning. Introduction to Artificial Intelligence; Intelligent Agents; Solving Problems by Searching; Search Strategies; Constraint Satisfaction Problems; State Space Search; Data-Driven and Goal-Driven Search; Heuristic Search; Informed Search Methods; Agent Based on Logical Reasoning in Building a Knowledge Base; Inference in First-Order Logic; Uncertainty; Probabilistic Reasoning Systems; Machine Learning; Inductive Learning; Decision Trees; Knowledge in Learning.

**BiM312 (Eng) Database Management Systems****3+0 6.0**

Database; Database Management Systems; Basic Concepts and Definitions; Database Architecture: External level, Conceptual level and Internal level; Schemas; Data Independence; Data Models: Entity-Relationship model, Hierarchical model, Network model, Relational model; Dependencies between Attributes; Normal Forms; Design Criteria; Hierarchical Database Systems; Network Database Systems; Relational Database Systems; Data Definition; Data Manipulation; Query Languages; Relational Algebra Operators; Relational Calculus; Examples of Relational Query Languages: SQL, QUEL, QBE; Operational Requirements: Security, Integrity, Accuracy, Concurrency, Performance.

**BiM324 (Eng) Computer Networks****2+2 4.5**

Essentials of ISO Reference Model: Logic of multi-layered network; Fundamentals of Physical Layer: Bit-Rate, Baud-Rate, Modulation, Encoding; Fundamentals of Data Link Layer: Encapsulation, Framing, CDMA/CD; Network Layer Protocols: IPv4 and IPv6, Forwarding, Routing, Multicasting; Transport Layer Protocols: UDP, TCP, SCTP, Flow control, Congestion control, Reliable packet delivery techniques; Application Layer Protocols: HTTP, FTP, SMTP, P2P file sharing protocols.

**BiM405 (Eng) Project Management****3+0 4.5**

Fundamental Concepts; Planning and Supervision Needs; Steps of a Project; Feasibility Studies; Cost-effect Analysis; Writing a Project Report; Budget Planning; Forming a Project Team; Project Management Techniques; Charts: PERT, CPM, Gantt; Writing a Project Proposal and Report. Fundamental Concepts; Planning and Supervision Needs; Steps of a Project; Feasibility Studies; Cost-effect Analysis; Writing a Project Report; Budget Planning; Forming a Project Team; Project Management Techniques; Charts: PERT, CPM, Gantt; Writing a Project Proposal and Report.

**BiM411 (Eng) Decision Support Systems 3+0 3.0**

Rational Decision Making and Appropriate Data Support; Components of Decision Support Systems (DSS): Data, Information, Databases, Database management systems, Knowledgebase, Data Warehouses, Rulebase/Modelbase; Expert Systems Mechanism and Certainty Factors; System Dynamics and Simulation; Group DSS; Executive Information Systems; User-Interface Components; Designing of DSS; Implementation of DSS; Evaluation of DSS. Rational Decision Making and Appropriate Data Support; Components of Decision Support Systems (DSS): Data, Information, Databases, Database management systems, Knowledgebase, Data Warehouses, Rulebase/Modelbase; Expert Systems Mechanism and Certainty Factors; System Dynamics and Simulation; Group DSS; Executive Information Systems; User-Interface Components; Designing of DSS; Implementation of DSS; Evaluation of DSS.

**BiM423 (Eng) Software Engineering 3+2 6.0**

System Theory; Characteristics and Problems of Large Software Projects; Software Development Life Cycle; Software Development Models; Software Standards; Planning and Management of a Software Project; Software Requirements; Software Design; Software Implementation and Coding; Software Testing; Software Installation; Software Maintenance; Software Documentation; Software Quality Assurance and Management; Overview of CASE Technologies.

**BiM437 (Eng) Computer Engineering Design 1+2 4.0**

Applications of Programming languages, Management information systems, software engineering, parallel and distributed systems, project management, algorithm analysis and design, neural networks, signals and systems, and Microprocessors concepts to everyday life problems using a design and implementation based project .Seminars on contemporary software and their applications. Applications of Programming languages, Management information systems, software engineering, parallel and distributed systems, project management, algorithm analysis and design, neural networks, signals and systems, and Microprocessors concepts to everyday life problems using a design and implementation based project .Seminars on contemporary software and their applications.

**BiM439 (Eng) Applications of Database Management Systems 3+0 4.5**

Triggers and Active Databases; Physical Data Organization and Indexing; Transactions; Concurrency Control; Recovery Protocols; Query Processing and Optimization; Database Tuning; Object Databases; Network Storage Systems; Web-based Database Applications; Security and Authorization Models; Data Mining and Data Warehouse. Triggers and Active Databases; Physical Data Organization and Indexing; Transactions; Concurrency Control; Recovery Protocols; Query Processing and Optimization; Database Tuning; Object Databases; Network Storage Systems; Web-based Database Applications; Security and Authorization Models; Data Mining and Data Warehouse.

**BiM441 (Eng) Introduction to Rough Sets Theory 3+0 4.5**

The Concept of Rough Sets; Knowledge Systems; Data Gathering and Digitization; Discernibility Set Approach; Core & Reduction and Reduction Algebra; Decision Rules and Synthesis; Discernibility Matrix and Functions; Decision-based Discernibility Matrix; Decision-based Discernibility Functions; Reduction Algorithms; Solution of Real State Problems by Using Rough Sets. The Concept of Rough Sets; Knowledge Systems; Data Gathering and Digitization; Discernibility Set Approach; Core & Reduction and Reduction Algebra; Decision Rules and Synthesis; Discernibility Matrix and Functions; Decision-based Discernibility Matrix; Decision-based Discernibility Functions; Reduction Algorithms; Solution of Real State Problems by Using Rough Sets.

**BiM443 (Eng) Blockchain and Cryptocurrency Technologies 3+0 4.5**

Cryptography and Cryptocurrencies: History of cryptocurrencies; Bitcoin's Consensus Mechanism: Centralization vs. decentralization, Distributed consensus; The blockchain; Bitcoin Applications and Security: Storing Bitcoins, Transaction fees; Bitcoin Mining: Strategies; Alternative Mining Puzzles: Proof of useful work; Bitcoin and Anonymity: Anonymity basics, Decentralized mixing; Altcoins: Interaction between Bitcoin and Altcoins; Ethereum; Programming Smart Contracts on Ethereum: Solidity language; Scalability: Off-chain channels; The Real World: Smart property, Public randomness; The Future of Bitcoin.

**BiM444 (Eng) Computer Engineering Applications 2+4 7.0**

Selections from Current Computer Engineering Topics Such As: Programming languages, Management information systems, Software engineering, Parallel and Distributed systems, Project management, Analysis of algorithms, Neural networks, Signals and systems, Microprocessors. Selections from Current Computer Engineering Topics Such As: Programming languages, Management information systems, Software engineering, Parallel and Distributed systems, Project management, Analysis of algorithms, Neural networks, Signals and systems, Microprocessors.

**BiM445 (Eng) Enterprise IT Architecture****3+0 3.0**

What is enterprise software architecture? What are the types of architecture? What are the technological solutions for architecture? What are the next generation technology stacks used in architectural solutions? Programming languages (web development technology stack JavaScript, CSS, HTML, etc., server layer node.js, java, etc., databases - document base and relational), ready-made application patterns and development frameworks. What is reusability and how is it provided? Design according to reusability principles, ready libraries, DevOps tools, SCM tools. Project management approaches to increase production efficiency and PaaS application development options.

**BiM446 (Eng) Analysis of Algorithms****3+0 4.5**

Algorithm Analysis Techniques: Big-O, Omega, Theta asymptotic notations; Sorting and Searching Algorithms; Selection; Binary and Binomial Heaps; Greedy Algorithms; Dynamic Programming: 0-1 knapsack problem, Chain matrix multiplication, Longest common subsequence; Graphs and Graph Algorithms: BFS, DFS, Topological sort, Shortest path algorithms, Minimum spanning tree algorithms; NP-Completeness: Definition, Cook's theorem, Reductions; Approximation Algorithms. Algorithm Analysis Techniques: Big-O, Omega, Theta asymptotic notations; Sorting and Searching Algorithms; Selection; Binary and Binomial Heaps; Greedy Algorithms; Dynamic Programming: 0-1 knapsack problem, Chain matrix multiplication, Longest common subsequence; Graphs and Graph Algorithms: BFS, DFS, Topological sort, Shortest path algorithms, Minimum spanning tree algorithms; NP-Completeness: Definition, Cook's theorem, Reductions; Approximation Algorithms.

**BiM447 (Eng) Introduction to Deep Learning****3+0 4.5**

Perceptron: Perceptron learning algorithm; Activation Functions; Gradient Descent Algorithm; Feed Forward Neural Networks; Backpropagation Method: Batch learning, Mini batch learning, Stochastic learning; Deep Neural Networks; Deep Convolutional Neural Networks: Convolution layer, Pooling layer, Two dimensional and three dimensional convolutional neural networks; Recurrent Neural Networks: Long short term memory; Autoencoders; Overfitting; Regularization; Normalization.

**BiM448 (Eng) Computer Graphics****3+0 4.5**

Hardware and Software Components of Graphic Systems; Output and Filled-data Primitives; 2d and 3d Geometric Transformations; Two Dimensional Viewing: Viewing pipeline, Clipping, Windowing; Three Dimensional Viewing: Viewing pipeline, Viewing parameters, Projections, Viewing transformations, Clipping; Visible Surface Detection; Introduction to Illumination Models and Surface Rendering. Hardware and Software Components of Graphic Systems; Output and Filled-data Primitives; 2d and 3d Geometric Transformations; Two Dimensional Viewing: Viewing pipeline, Clipping, Windowing; Three Dimensional Viewing: Viewing pipeline, Viewing parameters, Projections, Viewing transformations, Clipping; Visible Surface Detection; Introduction to Illumination Models and Surface Rendering.

**BiM449 (Eng) Introduction to Game Programming****3+0 4.5**

Introduction to Game Programming: Differences between game programming and graphical programming, Game time and real time; Linear Algebra for Game Programming: Object, camera, and real world coordinate systems; Two-Dimensional Game Programming; Three Dimensional Game Programming: Light models, Perspective transformations; Input, Sound, and Physics for the Game; Using Artificial Intelligence in Game Programming; Graphical User Interfaces; Scripting Languages and Data Formats; Networked Games.

**BiM450 (Eng) Network Management****3+0 4.5**

Historical Process of Network Management; Network Management Infrastructure and Architecture; ISO Network Management Architecture and Models: Performance management, Configuration management, End-user account management, Error management, Security management, SNMP; VLANs and their management; Router, Firewall, NAT and ALG setup and management. Historical Process of Network Management; Network Management Infrastructure and Architecture; ISO Network Management Architecture and Models: Performance management, Configuration management, End-user account management, Error management, Security management, SNMP; VLANs and their management; Router, Firewall, NAT and ALG setup and management.

**BiM451 (Eng) Web Server Programming with MVC****3+0 4.5**

The Model-View-Controller (MVC) Design Pattern; Creating an MVC Web Application; Adding a Controller: Understanding actions, Mapping routes; Adding a View: The ViewBag object, Layout pages, Razor syntax, Linking to an action; Adding a Model: Working with an OR/M software, Create, Read, Update and Delete (CRUD) operations, GET and POST methods, Partial views, Creating custom display controls, Searching and filtering; Adding Validation; Security; Authentication and Authorization; Internationalization and Globalization.

**BiM452 (Eng) Multimedia Computing****3+0 4.5**

Multimedia Structures and Literature; Characteristics of Information Flow; Multimedia Entities: Voice, Video, Graphics, Text; Image and Graphics: Image processing; Video and Animation: Television, Computerized animation; Information encoding; Compression: Coding standards, Entropy; Video Encoding: JPEG, MPEG, DVI; Optic Storage: Video disks, Compaq disks, VCD, DVD; Multimedia Operating Systems: Multimedia storage, Retrieval, Transmission, Synchronization

techniques, Future of multimedia. Multimedia Structures and Literature; Characteristics of Information Flow; Multimedia Entities: Voice, Video, Graphics, Text; Image and Graphics: Image processing; Video and Animation: Television, Computerized animation; Information encoding; Compression: Coding standards, Entropy; Video Encoding: JPEG, MPEG, DVI; Optic Storage: Video disks, Compaq disks, VCD, DVD; Multimedia Operating Systems: Multimedia storage, Retrieval, Transmission, Synchronization techniques, Future of multimedia.

#### **BiM453 (Eng) Introduction to Machine Learning 3+0 4.5**

Introduction to Learning Algorithms; Linear Regression with One Variable; Linear Regression with Multiple Variables; Supervised Learning Algorithms and Classification; Regression and Classification with Neural Networks Models; Decision Tree Learning; Naive Bayes Classifier and Bayesian Networks; Genetic Algorithms; Support Vector Machines for Classification Problems; Hidden Markov Models; Unsupervised Learning Algorithms.

#### **BiM454 (Eng) Programming Language Concepts 3+0 4.5**

Introduction; Evolution of Programming Languages; Syntax and Semantics of Programming Languages; Formal Methods for Description of Programming Languages; Lexical and Syntactic Analysis; The Parsing Problem; Names; Bindings; Type Checking and Its Scope; Data Types; Expressions and Assignment Statements; Control Structures; Subprogram Mechanism; Abstract Data Types; Design Issues and Examples; Object Oriented Programming; Concurrency Levels; Exception Handling; Functional and Logical Programming Languages. Introduction; Evolution of Programming Languages; Syntax and Semantics of Programming Languages; Formal Methods for Description of Programming Languages; Lexical and Syntactic Analysis; The Parsing Problem; Names; Bindings; Type Checking and Its Scope; Data Types; Expressions and Assignment Statements; Control Structures; Subprogram Mechanism; Abstract Data Types; Design Issues and Examples; Object Oriented Programming; Concurrency Levels; Exception Handling; Functional and Logical Programming Languages.

#### **BiM455 (Eng) Introduction to Hardware Design 3+0 4.5**

Combinatorial Review; Sequential Review; Verilog: Language, Syntax, Tools, Simulation, Integrated Circuits & PLDs; Packaging Circuit Boards; Interconnection and Signal Integrity; Processor Basics: Embedded computer organization, ALU, Instructions & Data; Memory Organization: Memory interface; Cache memory; I/O Interfacing; I/O Devices; I/O Controllers; Parallel Busses; Serial transmission; I/O Software; Accelerators: General concepts; Case Study: Video edge detection, Verifying an accelerator; Design Methodology.

#### **BiM456 (Eng) Network Security Principles 3+0 4.5**

Introduction to Network Security; Main Problems in Network Security; Terminology; Active and Passive Attacks; Encryption Methods; Overview of Authentication Systems; One-Way and Mutual Authentication Techniques; Message Integrity Techniques: MD-5, SHA-1, Digital signatures; Network Security Standards: Secure-E-mail (PGP), S-MIME, SSL, TLS, IPsec; Strong Password Protocols; Digital Cash; DoS Attacks, Distributed DoS Attacks. Introduction to Network Security; Main Problems in Network Security; Terminology; Active and Passive Attacks; Encryption Methods; Overview of Authentication Systems; One-Way and Mutual Authentication Techniques; Message Integrity Techniques: MD-5, SHA-1, Digital signatures; Network Security Standards: Secure-E-mail (PGP), S-MIME, SSL, TLS, IPsec; Strong Password Protocols; Digital Cash; DoS Attacks, Distributed DoS Attacks.

#### **BiM457 (Eng) Embedded Programming Languages 3+0 4.5**

Introduction to Embedded Programming Languages; Compiling and Debugging Linux Applications; Introduction to Linux; Linux Kernel; Essential Commands and Tools in Linux; Handling Errors and Exceptions; Bash & Perl Programming; Python Programming; Embedded C Programming; Device Driver Concept; Timing in Linux; Interrupt Handling; Using DMA; Linux File System Concept; Linux and Real Time.

#### **BiM458 (Eng) Simulation and Modeling 3+0 4.5**

System Theory; Decision Making and Modeling; Simulation Methodologies and Science; Simulation Models; Continuous and Discrete Time Simulation; Selection of Input Probability Distributions; Random Number Generation; Data Analysis of a System Output; Statistical Comparison of Similar Systems; Modeling on Virtual Environment; Virtual Modeling Software; Development of Models by Using Lab View; Sample Model Development with Lab View. System Theory; Decision Making and Modeling; Simulation Methodologies and Science; Simulation Models; Continuous and Discrete Time Simulation; Selection of Input Probability Distributions; Random Number Generation; Data Analysis of a System Output; Statistical Comparison of Similar Systems; Modeling on Virtual Environment; Virtual Modeling Software; Development of Models by Using Lab View; Sample Model Development with Lab View.

#### **BiM459 (Eng) Artificial Intelligence in Healthcare 3+0 4.5**

Digital Transformation in Healthcare; Medical Data Analysis; Computational Model Development in Healthcare Problems and Tools: Tensorflow, Keras, Pytorch, Anaconda, NumPy, ScikitLearn, OpenCV; Computational Model Development Stages; Clinical problem definition, Data curation, Data annotation, Model development, Model evaluation; Deep Learning Techniques in Medical Data Analysis; Medical Data: Imaging data, Text data, Reports, Demographics, Data privacy; Medical Data Analysis Applications: Medical image segmentation, Clinical object detection and tracking, Lesion detection and classification, Prognosis.

**BiM460 (Eng)      Software Modeling      3+0    4.5**

Software Development Methods; Advantages of Object Oriented Programming; Integrated Software Development Processes; Using Models in Software Development; Unified Modeling Language (UML); Requirements Analysis and Use Cases; Activity and Sequence Diagrams; Class Diagrams; Deployment Diagrams; Object Oriented Analysis and Modeling; Object Oriented Design and Modeling; Design Patterns. Software Modeling Applications by Using Software Development Tools. Software Development Methods; Advantages of Object Oriented Programming; Integrated Software Development Processes; Using Models in Software Development; Unified Modeling Language (UML); Requirements Analysis and Use Cases; Activity and Sequence Diagrams; Class Diagrams; Deployment Diagrams; Object Oriented Analysis and Modeling; Object Oriented Design and Modeling; Design Patterns. Software Modeling Applications by Using Software Development Tools.

**BiM461 (Eng)      Introduction to Cloud Computing      3+0    4.5**

Cloud Concepts Overview: Advantages of the cloud, Introduction to cloud services; Cloud Economics and Billing: Fundamentals of pricing, Total cost of ownership, Billing and cost management; Global Infrastructure; Cloud Security: Shared responsibility model, Securing accounts, Securing data; Networking and Content Delivery: Networking basics, Virtual private cloud; Compute Services; Storage Services; Databases Services; Cloud Architecture; Auto Scaling and Monitoring.

**BiM462 (Eng)      Parallel Systems      3+0    4.5**

Parallel Applications: Weather forecasting; Speedup and Amdahl's Law; Parallel Algorithm Design Techniques: Domain decomposition, Recursive decomposition; Message Passing Computation and Message Passing Interface; Pipelined Computations: Sorting; Synchronous Computation and Barriers; Shared Memory Computation; Distributed Shared Memory; SIMD and Vector Processors; Overview of Parallel Architectures; Interconnection Networks: Bus, Mesh, Hypercube; Cache Consistency Protocols. Parallel Applications: Weather forecasting; Speedup and Amdahl's Law; Parallel Algorithm Design Techniques: Domain decomposition, Recursive decomposition; Message Passing Computation and Message Passing Interface; Pipelined Computations: Sorting; Synchronous Computation and Barriers; Shared Memory Computation; Distributed Shared Memory; SIMD and Vector Processors; Overview of Parallel Architectures; Interconnection Networks: Bus, Mesh, Hypercube; Cache Consistency Protocols.

**BiM463 (Eng)      Introduction to Natural Language Processing      3+0    4.5**

Basic Text Processing: Tokenization; Morphological Analysis: Stemming, Lemmatization, Stopwords; N-gram Language Models; Text Classification; Lexical Semantics; Word Embeddings; Word Classes and Part-of-Speech Tagging; Named-entity Recognition; Hidden Markov Models; Syntactic Analysis; Semantic Parsing; Statistical Parsing; Natural Language Processing Applications with Deep Learning.

**BiM464 (Eng)      Human-Computer Interaction      3+0    4.5**

Human Factors in Software Development; Use of Database Systems; Design of Interactive Systems.; Science Bases: Theories, Models, Usability studies, Controlled experimentation; Software Engineering with User Interface Development Environments; Programming and command languages, Menus, Forms, Direct manipulation; Graphical User Interfaces; Computer-Supported Cooperative Work; Information Search and Visualization; Input/Output Devices; Display Design. Human Factors in Software Development; Use of Database Systems; Design of Interactive Systems.; Science Bases: Theories, Models, Usability studies, Controlled experimentation; Software Engineering with User Interface Development Environments; Programming and command languages, Menus, Forms, Direct manipulation; Graphical User Interfaces; Computer-Supported Cooperative Work; Information Search and Visualization; Input/Output Devices; Display Design.

**BiM465 (Eng)      Introduction to Data Science      3+0    4.5**

Fundamentals of Data Science; Project Life Cycle in Data Science; Statistical Analysis in Data Science; Data Collection and Processing; Feature Engineering: Feature extraction, Feature selection, Feature transformation, Dimension reduction; Data Modeling; Data Visualization; Clustering; Regression Analysis; Classification; Big Data Analysis; Business Intelligence and Data Warehouse; Data Science Applications with Deep Learning.

**BiM466 (Eng)      Fuzzy Logic      3+0    4.5**

Fuzzy Sets and Basic Operations on Fuzzy Sets; Fuzzy Relation and Extension Principle; Linguistic Variables; Fuzzy Logic and Approximate Reasoning; Fuzzy Rule Base; Fuzzy Inference Engine; Fuzzifiers and Defuzzifiers; Fuzzy Systems as Nonlinear Mappings; Design of Fuzzy Systems from Input-Output Data; Table Look-Up Scheme; Gradient Descent Training; Fuzzy Clustering, Neuro-Fuzzy (ANFIS). Fuzzy Sets and Basic Operations on Fuzzy Sets; Fuzzy Relation and Extension Principle; Linguistic Variables; Fuzzy Logic and Approximate Reasoning; Fuzzy Rule Base; Fuzzy Inference Engine; Fuzzifiers and Defuzzifiers; Fuzzy Systems as Nonlinear Mappings; Design of Fuzzy Systems from Input-Output Data; Table Look-Up Scheme; Gradient Descent Training; Fuzzy Clustering, Neuro-Fuzzy (ANFIS).

**BiM468 (Eng)      Computer Aided Design      3+0    4.5**

Use of Computers in Designing; Current Computer-Aided Design Software: Features, Applications; The Use of Computer Aided Design Software with Other Software; CAD; Production of Sample Designs Using CAD; Hardware Requirements for CAD; Menu / Command Structure; Initial Drawing Set-Ups and Prototype Drawings. Use of Computers in Designing; Current Computer-Aided Design Software: Features, Applications; The Use of Computer Aided Design Software with Other Software; CAD; Production of Sample Designs Using CAD; Hardware Requirements for CAD; Menu / Command Structure; Initial Drawing Set-Ups and Prototype Drawings.

**BiM470 (Eng) Neural Networks 3+0 4.5**

Fundamentals of Neural Networks: Neuron model, Neural network structures; Bayes Rules; Fuzzy Sets; Discriminate Analysis; Learning Rules and Tasks; Perception Methods; Single Layer Feedforward Networks; Multilayer Feedforward Networks; Least Mean Square Algorithm; Error Back-Propagation; Radial Basis Function Networks; Associative Memory: Analysis, Design; Functional Link Networks; Pattern Recognition; Relations on Neural Network Methods; Support Vector Machines; Self Organizing Maps. Fundamentals of Neural Networks: Neuron model, Neural network structures; Bayes Rules; Fuzzy Sets; Discriminate Analysis; Learning Rules and Tasks; Perception Methods; Single Layer Feedforward Networks; Multilayer Feedforward Networks; Least Mean Square Algorithm; Error Back-Propagation; Radial Basis Function Networks; Associative Memory: Analysis, Design; Functional Link Networks; Pattern Recognition; Relations on Neural Network Methods; Support Vector Machines; Self Organizing Maps.

**BiM472 (Eng) Image Processing 3+0 4.5**

Fundamentals of Digital Image Processing: Visual perception, Image sensing, Image sampling and quantization, Basic relationships between pixels; Image Enhancement in Spatial Domain: Gray level transformations, Histogram processing, Spatial filtering for smoothing and sharpening; Image Enhancement in Frequency Domain: Fourier transform, Frequency-domain filters for smoothing and sharpening, Homomorphic filtering; Image Restoration; Color Image Processing; Wavelets and Multiresolution Processing; Image Compression; Morphological Image Processing. Fundamentals of Digital Image Processing: Visual perception, Image sensing, Image sampling and quantization, Basic relationships between pixels; Image Enhancement in Spatial Domain: Gray level transformations, Histogram processing, Spatial filtering for smoothing and sharpening; Image Enhancement in Frequency Domain: Fourier transform, Frequency-domain filters for smoothing and sharpening, Homomorphic filtering; Image Restoration; Color Image Processing; Wavelets and Multiresolution Processing; Image Compression; Morphological Image Processing.

**BiM474 (Eng) Introduction to Cryptography 3+0 4.5**

Introduction to Cryptography and Encryption Algorithms; Private Key Encryption Algorithms: Data encryption standard, Triple data encryption standard, Advanced encryption standard; Public Key Cryptography; Public Key Encryption Algorithms: RSA, Diffie-Hellman, ElGamal, Public-Private key generation techniques; Conventional Encryption Techniques: Caesar cipher; The Uses of Encryption: Cryptographic hash functions, Key exchange, Certificates. Introduction to Cryptography and Encryption Algorithms; Private Key Encryption Algorithms: Data encryption standard, Triple data encryption standard, Advanced encryption standard; Public Key Cryptography; Public Key Encryption Algorithms: RSA, Diffie-Hellman, ElGamal, Public-Private key generation techniques; Conventional Encryption Techniques: Caesar cipher; The Uses of Encryption: Cryptographic hash functions, Key exchange, Certificates.

**BiM476 (Eng) Data Acquisition and Processing 3+0 4.5**

Use of Computers in Data Acquisition; Sensors and Interfaces; Sampling; Noise; Filtering; Computer Measurements; Parallel Input/Output; Interrupt Systems; Timers; Parallel and Serial Data Paths and Transmission; Using Direct Memory Access (DMA) for External Data Communication; Data Transfer; Basic Control Techniques; Real-Time Input Handling Techniques; Knowledge Discovery Process. Use of Computers in Data Acquisition; Sensors and Interfaces; Sampling; Noise; Filtering; Computer Measurements; Parallel Input/Output; Interrupt Systems; Timers; Parallel and Serial Data Paths and Transmission; Using Direct Memory Access (DMA) for External Data Communication; Data Transfer; Basic Control Techniques; Real-Time Input Handling Techniques; Knowledge Discovery Process.

**BiM478 (Eng) Management Information Systems 3+0 4.5**

An Overview of Management Information Systems (MIS); MIS as a Tool for Organization Development; Conceptual Fundamentals: Information; System; Planning; Control; Concepts of Organization and Management; Human as Information Processors; Decision-Making Processes; Methods of Selecting an Alternative; Structure of a Management Information System; MIS Support at Operational, Planning, Control, Decision Making, and Management Levels; Determination of Information Requirements; Development; Implementation; and Management of Information System Resources. An Overview of Management Information Systems (MIS); MIS as a Tool for Organization Development; Conceptual Fundamentals: Information; System; Planning; Control; Concepts of Organization and Management; Human as Information Processors; Decision-Making Processes; Methods of Selecting an Alternative; Structure of a Management Information System; MIS Support at Operational, Planning, Control, Decision Making, and Management Levels; Determination of Information Requirements; Development; Implementation; and Management of Information System Resources.

**BiM480 (Eng) Compiler Design 3+0 4.5**

Development of the Logical Design of a Compiler: Lexical analyzer, Parser, Semantic analyzer, Code generator, Code optimizer, Error recovery routines; Analysis of Formal Algorithms for Each Component; Description of Overall Compiler

Construction Techniques; Code Analysis and Optimization Techniques. Development of the Logical Design of a Compiler: Lexical analyzer, Parser, Semantic analyzer, Code generator, Code optimizer, Error recovery routines; Analysis of Formal Algorithms for Each Component; Description of Overall Compiler Construction Techniques; Code Analysis and Optimization Techniques.

#### **BiM482 (Eng) Network Programming**

**3+0 4.5**

TCP/IP Stack Overview and Socket Layer; UDP socket programming; POSIX I/O Models: Blocking, Non-blocking, signal driven and asynchronous I/O; Select/Poll System Calls; Multi-Threaded Server Design Techniques; TCP Socket Programming Techniques: Line-driven Protocol Design and Implementation Techniques; Socket Options; Broadcasting and Multicasting Applications. TCP/IP Stack Overview and Socket Layer; UDP socket programming; POSIX I/O Models: Blocking, Non-blocking, signal driven and asynchronous I/O; Select/Poll System Calls; Multi-Threaded Server Design Techniques; TCP Socket Programming Techniques: Line-driven Protocol Design and Implementation Techniques; Socket Options; Broadcasting and Multicasting Applications.

#### **BiM484 (Eng) Distributed Systems**

**3+0 4.5**

Distributed System Architectures; Goals: Transparency, Scalability, Fault tolerance, Replication; Remote Procedure Calls and Remote Object Invocation; Naming: X.500; Synchronization: Clock synchronization; Mutual Exclusion; Consistency and Replication Techniques; Fault Tolerance; Distributed Object Systems: DCOM, CORBA; Distributed File Systems: NFS, AFS, XFS, CODA, Network attached storage devices (NASD). Distributed System Architectures; Goals: Transparency, Scalability, Fault tolerance, Replication; Remote Procedure Calls and Remote Object Invocation; Naming: X.500; Synchronization: Clock synchronization; Mutual Exclusion; Consistency and Replication Techniques; Fault Tolerance; Distributed Object Systems: DCOM, CORBA; Distributed File Systems: NFS, AFS, XFS, CODA, Network attached storage devices (NASD).

#### **BiM485 (Eng) Research in Computer Science I**

**3+0 4.5**

Preparing students for research in Computer Science; Participating in academic research under advisement; Research in Computer Networks: Peer-to-Peer Networks, Overlay Networks, Quality of Service Protocols, Sensor Networks, Voice over IP Protocols; Research in Information Retrieval: Information Extraction, Text Classification, Clustering; Learning in High Dimensional Spaces; Research in Data Mining: Data pre-processing, Association Rule Mining, Classification, Clustering, Prediction, Collaborative Filtering; Research in Artificial Intelligence and Fuzzy Systems; Expert Systems; Approximate Reasoning; Fuzzy Logic; Fuzzy Reasoning; Fuzzy Inference Systems; Function Approximation; Time Series Prediction. Preparing students for research in Computer Science; Participating in academic research under advisement; Research in Computer Networks: Peer-to-Peer Networks, Overlay Networks, Quality of Service Protocols, Sensor Networks, Voice over IP Protocols; Research in Information Retrieval: Information Extraction, Text Classification, Clustering; Learning in High Dimensional Spaces; Research in Data Mining: Data pre-processing, Association Rule Mining, Classification, Clustering, Prediction, Collaborative Filtering; Research in Artificial Intelligence and Fuzzy Systems; Expert Systems; Approximate Reasoning; Fuzzy Logic; Fuzzy Reasoning; Fuzzy Inference Systems; Function Approximation; Time Series Prediction.

#### **BiM486 (Eng) Research in Computer Science II**

**3+0 4.5**

Preparing students for research in Computer Science; Participating in academic research under advisement; Research in Parallel and Distributed Systems: Storage Architectures and File Systems; Grid Computing; Agent-based Computing; Research in Natural Language Processing: Turkish Text Analysis, Morphological Analysis; Search and Ranking Algorithms; Learning Approaches to Ranking; Research In Data Mining with Privacy: Privacy, Distributed Data-based Data Mining Tasks with Privacy, Privacy-preserving Data Mining, Privacy-preserving Collaborative Filtering; Research in Neural Networks: Multi-layer Perception, Recurrent Neural Networks, Fuzzy Neural Networks, Wavelet Neural Networks; Function Learning. Preparing students for research in Computer Science; Participating in academic research under advisement; Research in Parallel and Distributed Systems: Storage Architectures and File Systems; Grid Computing; Agent-based Computing; Research in Natural Language Processing: Turkish Text Analysis, Morphological Analysis; Search and Ranking Algorithms; Learning Approaches to Ranking; Research In Data Mining with Privacy: Privacy, Distributed Data-based Data Mining Tasks with Privacy, Privacy-preserving Data Mining, Privacy-preserving Collaborative Filtering; Research in Neural Networks: Multi-layer Perception, Recurrent Neural Networks, Fuzzy Neural Networks, Wavelet Neural Networks; Function Learning.

#### **BiM488 (Eng) Introduction to Pattern Recognition**

**3+0 4.5**

Components of Pattern Recognition System: Pattern, Feature Extraction, Classification; Probability and Linear Algebra; Bayes based Classifiers: Bayes Classifier, Naïve Bayes Classifier, Minimum Distance Classifiers; Linear Classifiers: Linear Discriminant Analysis, Perceptron Algorithm; Nonlinear Classifiers: Decision Trees; Analysis of Classification Performance; Text Recognition; Speech Recognition; Image Recognition. Components of Pattern Recognition System: Pattern, Feature Extraction, Classification; Probability and Linear Algebra; Bayes based Classifiers: Bayes Classifier, Naïve Bayes Classifier, Minimum Distance Classifiers; Linear Classifiers: Linear Discriminant Analysis, Perceptron Algorithm; Nonlinear Classifiers: Decision Trees; Analysis of Classification Performance; Text Recognition; Speech Recognition; Image Recognition.

**BiM490 (Eng) Introduction to Information Retrieval 3+0 4.5**

Boolean Retrieval; Term Vocabulary; Posting Lists; Index Construction; Index Compression; Scoring; Term Weighting; Vector Space Model; Evaluation in Information Retrieval; Relevance Feedback; Query Expansion; XML Retrieval; Language Models; Text Classification; Clustering; Web Search. Boolean Retrieval; Term Vocabulary; Posting Lists; Index Construction; Index Compression; Scoring; Term Weighting; Vector Space Model; Evaluation in Information Retrieval; Relevance Feedback; Query Expansion; XML Retrieval; Language Models; Text Classification; Clustering; Web Search.

**BiM492 (Eng) Design Patterns 3+0 4.5**

Essential Elements of Design Patterns: Pattern Name, Problem, Solution, Consequences; Object-Oriented Design Principles: Polymorphism, Abstraction, Classes, Encapsulation; Observer Pattern; Template Method Pattern; Factory Pattern; Singleton Pattern; Iterator Pattern; Composite Pattern; Facade Pattern; State and Strategy Patterns, Functors and Command Patterns; Proxy Pattern; Adapter Pattern; Decorator Pattern; Chain of Responsibility Pattern. Essential Elements of Design Patterns: Pattern Name, Problem, Solution, Consequences; Object-Oriented Design Principles: Polymorphism, Abstraction, Classes, Encapsulation; Observer Pattern; Template Method Pattern; Factory Pattern; Singleton Pattern; Iterator Pattern; Composite Pattern; Facade Pattern; State and Strategy Patterns, Functors and Command Patterns; Proxy Pattern; Adapter Pattern; Decorator Pattern; Chain of Responsibility Pattern.

**BiM493 (Eng) Mobile Programming I 3+0 4.5**

Mobile Computing; Mobile computing platforms, Smart devices, Mobile development environments, Android Overview; Android Environment SDK; Environment Emulator and Applications Life Cycle; User Interfaces; XML Layouts; Selection Widgets; Date-Time Tabs; Hard and Soft Keyboard; Fonts; Menus; The WebKit Browser; Intents; Inter-Process Communication Using Bundles; Multi-Threading.

**BiM494 (Eng) Mobile Programming II 3+0 4.5**

External Resources; Location Based Services; Working with MapViews; Services and Broadcast Receivers; Notifications and Intent Filters; Telephony and SMS; Sensors; Touch and Gestures; SQL Databases; Bluetooth Communication; Network Connectivity and WiFi.

**BiM496 (Eng) Computer Vision 3+0 4.5**

Image Formation and Image Sensing; Binary Images: Geometrical properties, Topological properties; Regions and Image Segmentation; Image Processing: Edge detection, Contour extraction, Color; Motion Field and Optical Flow; Stereo Correspondance; Three-dimensional Image Analysis: Shape from shading, Reconstruction from projections; Pattern Classification and Object Recognition; Tracking.

**BiM498 (Eng) Embedded Software Design 3+0 4.5**

Introduction to Embedded Systems: What is an embedded system? Real-time embedded systems, Embedded system design examples, Development environment, The C language; Compiling & Debugging: Compile process, Cross-compilers, Debug monitors, Remote debuggers, Emulators; Hardware Fundamentals & Peripherals: Control and status registers, Device driver philosophy, GPIO's, Serial Port, Ethernet, USB; Interrupts: Overview, Priorities, ISR; Embedded Linux: Operating system fundamentals, Kernel architecture, Boot sequence, System initialization, The Scheduler, System programming, Process management, Synchronization.

**BiMSJ302 Computer Engineering Internship I 0+2 2.5 (Eng)**

Professional Work in a Business Environment; Professional Knowledge, Skills, Attitudes and Behaviors; Recognition of Business Areas And Industry; Adapting to Business Life; Gaining Work Experience; Learning the Applications in Institutions/Organizations; Growing Up in a Real Production and Service Environment; Applying Learned Knowledge and Skills; Recognizing, Analyzing, Modeling and Solving Complex Systems and Real Life Problems; Report Writing.

**BiMSJ401 Computer Engineering Internship II 0+2 2.5 (Eng)**

Professional Work in a Business Environment; Professional Knowledge, Skills, Attitudes and Behaviors; Recognition of Business Areas And Industry; Adapting to Business Life; Gaining Work Experience; Learning the Applications in Institutions/Organizations; Growing Up in a Real Production and Service Environment; Applying Learned Knowledge and Skills; Recognizing, Analyzing, Modeling and Solving Complex Systems and Real Life Problems; Report Writing.

**BiY243 (Eng) General and Molecular Biology 3+0 4.0**

Introduction to biology and history; Organic and inorganic molecules in the cell structure; Proteins, Carbohydrates, Lipids and Nucleic Acids; DNA, chromosomes and RNA structure; Protein synthesis and functions; Cell types and structures: Prokaryotic and eukaryotic cell structures; Cell energy metabolism; Catalyst substances in cells- Enzymes; Communication types and signal transmission in cells; Cell cycle and control mechanisms; Programmed cell death, importance in cells and



organisms and cancer; Cancer cells and normal cell structures and the differences; an overview of biological nanometer-sized materials, their usage and cytotoxicity studies.

**BiY353 Environmental Microbiology 3+0 3.0**  
Description of Microorganisms: Bacteria, Blue-green algae, Viruses, Fungi; Environmental Needs; Growth: Growth of microorganisms, Monod kinetics, Quantitative measures; Microbiological Control: Physical and chemical methods, Chemotherapeutics; Applied Microbiology: Natural water, Drinking water, Wastewater, Microbiological pollution, Treatment; Microorganisms in Air and Investigation Methods; Industrial Microbiology: Fermentation, Biosynthesis; Use of Microorganisms: Food, Biogas, Metal leaching, Production of petroleum.

**BiY357 (Eng) Environmental Microbiology Lab. 0+3 2.5**  
Presentation of Material and Equipment that are Used in Microbiological Investigations; Sterilization and Disinfection; Various Media and Preparation Methods; Preparation Techniques for Microorganisms; Coloring and Examination Methodology of Microorganisms; Size Measurements of Microorganisms; Determination of Microorganism Numbers (Enumeration); Examples of Microorganisms in Water, Air and Soil; Presentation of Microorganisms that are Used in Biological Treatment.

**ÇEV1006 Ecology 2+0 2.0**  
Introduction: Basic Rules and Concepts in Ecology; Individual Ecology; Abiotic Factors and Their Effects on Organisms Edaphic Factors, Biotic Factors, Biological Relations; Population Ecology, Structural Features of Population, Population Dynamics; Ecology of Species Communities, Community and Its Features, Succession; Ecosystem and Its Features; Matter Cycles in Ecosystems; Major Ecosystems of the World; Ecological Problems of Humanity, Protection of Nature and Biodiversity; Ecological Economics and Applied Ecology.

**ÇEV2006 (Eng) Environmental Chemistry Laboratory 0+3 3.0**  
General information: Laboratory safety rules, devices and instruments used in the laboratory; Sampling, analysis methods and measurement uncertainty; Gravimetric analysis: Determination of solid material; Volumetric analysis: Determination of acidity, alkalinity, hardness; Spectroscopic analysis: Determination of total Kjeldahl nitrogen, determination of phosphorus, Instrumental analysis: Determination of heavy metal concentration in solid samples; Determination of oil-grease, Determination of organic matter: Chemical oxygen demand, biochemical oxygen demand; Breakpoint chlorination.

**ÇEV203 Introduction to Environmental Engineering 2+0 2.5**  
Scope, Definition and Historical Development of Environmental Engineering; Overview of Environmental Engineering and Education; Fundamental Concepts; Introduction to Various Forms of Water, Air and Soil Pollution; Pollutants and Their Characteristics; Introduction to Water and Wastewater Treatment; Overview of Air Pollution and Control; Solid Wastes: Disposal and Reuse; Overview of Global Environmental Problems; Technical, Economic and Organizational Considerations of Environmental Quality.

**ÇEV206 (Eng) Environmental Chemistry II 3+0 4.5**  
Carbonate Chemistry in Natural Water and Wastewater; Nitrogen Species in Water and Wastewater: Ammonification, Nitrification, Denitrification, Nitrogen Fixation; Phosphorus and Detergents; Chemical Oxygen Demand, Biochemical Oxygen Demand and Its Kinetics; Natural and Synthetic Organics in Water and Wastewater; Colloidal Chemistry and Colloids: Formation and species, Charge acquisition, Destabilization and aggregation; Introduction to Atmospheric Chemistry; Important Anthropogenic Air Pollutants.

**ÇEV209 (Eng) Technical English I 3+0 2.5**  
Technical Vocabulary for Environmental Sciences and Environmental Engineering; Readings of Selected Passages from Environmental Engineering Literature; Translation of Passages Related to Topics in Environmental Sciences and Engineering from English to Turkish.

**ÇEV210 (Eng) Technical English II 2+0 2.0**  
Translation of Passages Related to Topics in Environmental Sciences and Engineering from Turkish into English; Explanation of Words and Terms Used Frequently in Environmental Sciences and Engineering and Their Use in Sentences; Use of Visual Materials in Class With Active Participation of Students; Short Presentations in English Based on Visual Materials and Selected Passages From Literature; Technical Report Writing.

**ÇEV213 Environmental Chemistry I 3+0 3.0**  
Description of Environmental Chemistry: Formation, availability, and distribution of elements on earth.; Organic and Inorganic Compounds in Environmental Engineering and Their Nomenclature; Concentration Units and Stoichiometric Calculations; Analysis Techniques, Calculation of Ion Intensity; Oxygen Solubility: Henry's law, Equalization of reactions, Rates of reactions, Equilibrium; Preparation of Solutions, Acids and Bases; Acids with Single and Multiple Protons and Calculations of pH; Analysis Techniques in Environmental Engineering; Introduction to laboratory methods and essential

principles, Solubility in chemical treatment, Buffer solutions, Hardness, Ion exchange and resins, Chemistry of sulphur, Chemistry of nitrogen, Acidity, Alkalinity, Chemistry of chlorine and disinfection.

**ÇEV216 Sustainability, Innovation and Project Management in Environmental Engineering 1+1 2.5**

Concepts; Sustainability; Evolution from Environmental Protection into Sustainability; Sustainable Environmental Engineering; Design Principles in Sustainable Environmental Engineering; Measuring Sustainability; Green Engineering and Practices; Innovation: Entrepreneurship and Start-up Organization; Innovative Approaches in Sustainable Environmental Engineering; Life Cycle Cost and Benefit Analysis; Project Management; Scientific Research Process; Project Writing Process; Sustainability, Innovation and Risk Management in Projects; Sample Project Application.

**ÇEV305 (Eng) Unit Operations and Processes I 4+0 4.0**

Mass and Energy Balances; Flow Models and Reactors: Batch and continuous flow reactors, Completely-mixed reactors, Plug-flow reactors; Water and Wastewater Treatment Plants; Unit Operations and Processes in Water and Wastewater Treatment; Screening; Grit Removal; Flow Equalization; Neutralization; Coagulation and Flocculation; Sedimentation; Filtration; Flotation; Adsorption; Ion Exchange; Membrane Processes; Ammonia Removal.

**ÇEV310 Water and Soil Pollution 3+0 3.0**

General Definitions in Water and Soil Pollution; Characterization of Water Environment: Water environments (streams, lakes, oceans and groundwaters), Water quality; Water Pollution: Types and sources of pollutants, Organic pollution and eutrophication, Inorganic pollution, Pathogens, Metals and toxic materials; Characterization of Soil Environment; Soil Pollution: Pollutant sources, Fate of pollutants, Transport of pollutants; Agriculture and Erosion: Agricultural pollutants and their effects, Effects of erosion on water and soil quality, Erosion control; Water and Soil Quality Criteria and Standards: Legal aspects of water and soil pollution control. General Definitions in Water and Soil Pollution; Characterization of Water Environment: Water environments (streams, lakes, oceans and groundwaters), Water quality; Water Pollution: Types and sources of pollutants, Organic pollution and eutrophication, Inorganic pollution, Pathogens, Metals and toxic materials; Characterization of Soil Environment; Soil Pollution: Pollutant sources, Fate of pollutants, Transport of pollutants; Agriculture and Erosion: Agricultural pollutants and their effects, Effects of erosion on water and soil quality, Erosion control; Water and Soil Quality Criteria and Standards: Legal aspects of water and soil pollution control.

**ÇEV312 Water Supply and Sewerage 3+0 3.0**

Water Quantity: Factors affecting water use, Fluctuations; Population Forecasts and Design Flows; Quality of Water Resources; Relation of Water Quality to Environmental Health; Water Collection and Distribution; Pipes and Pipe Networks: Components, Design, Use, Maintenance; Pipe Networks and Water Quality; Wastewater Quantities: Factors affecting wastewater flows, Fluctuations in flows, Infiltration and inflow, Fluctuations; Stormwater: Quantity and Quality; Sewer Design Flows; Sewer Network: Appurtenances, Design, Construction, Maintenance; Use of Computer Programs in Pipe and Open Channel Network Design.

**ÇEV316 (Eng) Air Pollution 3+0 3.5**

Basic Definitions and Concepts Related to Air Pollution and Control; Air Quality Management; Sources of Air Pollutants; Effects of Air Pollutants: Effects to living and non-living things; Indoor Air Pollution Models; Laws Related to Air Quality Control; Characterization and Monitoring of Air Pollution; Dispersion and Transportation of Pollutants: Horizontal and vertical dispersion of pollutants in the atmosphere and air pollution models. Basic Definitions and Concepts Related to Air Pollution and Control; Air Quality Management; Sources of Air Pollutants; Effects of Air Pollutants: Effects to living and non-living things; Indoor Air Pollution Models; Laws Related to Air Quality Control; Characterization and Monitoring of Air Pollution; Dispersion and Transportation of Pollutants: Horizontal and vertical dispersion of pollutants in the atmosphere and air pollution models.

**ÇEV319 Scientific Reading and Writing Skills 2+0 3.0**

Scientific Concepts: Academic titles, MSc, PhD; Scientific Products: Article, Proceedings, Poster, Thesis, CV; Scientific Research Process; Time Management in Research Process; Academic Databases and Usage; Academic Ethics and Plagiarism; Report Writing Process; Thesis Writing Process; Project Writing Process; Presentation Preparation Techniques; Scientific Programs; Sample Application for TUBITAK Undergraduate Student Project.

**ÇEV323 Bioremediation Technologies 2+0 3.0**

Concept of Bioremediation: Definition, Subjects, Characteristics; Bioremediation Techniques: In-situ, Ex-situ, Bioreactor, Natural reduction; Bioremediation Types: Bacterial remediation, Fungal remediation, Phytoremediation; Pollutants with Bioremediation: Heavy and light metals, Petroleum, Dyestuffs, Pesticides, Polycyclic aromatic hydrocarbons, Xenobiotic compounds, Chlorinated and nitro compounds; Bioremediation Strategies; Genetically modified microorganisms, Genetically modified plants, Nanoparticle use; Limitations in bioremediation.

**ÇEV324 (Eng) Unit Operations and Processes II 4+0 4.0**

Biochemical Treatment Methods, Biochemical Kinetics; Biological Processes: Activated sludge processes and kinetic equations, Oxygen requirement, Nitrification, Activated sludge coefficients, Rate constants and coefficients in continuous-flow biological reactors; Oxygen Transfer and Mixing; Trickling Filters and Rotary Biological Contactors; Stabilization Ponds and Aerated Lagoons; Anaerobic Digestion, Aerobic Digestion; Natural Treatment Systems: Soil Based Systems, Aquatic Systems; Other Unit Operations and Processes: Water treatment, Wastewater treatment; Disinfection: Disinfectants, Disinfection kinetics

**ÇEV325 Information Technologies in Environmental Engineering 2+0 3.0**

Information Technologies: General informations about informatics; Information technologies in Turkey; Environmental Data Management: Data capture, Data storage, Data analysis and decision support, Information Technologies at Air Quality Modeling and Measurements; Information Technologies at Solid Waste Management and Hazardous Waste Management; Information Technologies at Water Quality Monitoring and Measurements; Information Technologies in Practice; Information technologies at environmental impacts assessments, National environmental database system practices, Remote sensing practices, GIS practices, Other industrial practices.

**ÇEV327 Green and Sustainable Agriculture 2+0 3.0**

What is Environment: Ecosystem and its features; The reasons for the emergence of environmental problems; Agriculture methods; sustainable, organic, traditional agriculture; Agricultural environmental policies in Turkey; Chemical fertilizers: Nitrogen and phosphorus fertilizers; Pollutant sources: Soil and water pollution; Agriculture and gas emissions; Agricultural mechanization and its environmental effects; Environmental effects of industrial livestock methods; Agriculture and erosion; Pesticide pollution: Behavior of pesticides in the environment; Heavy metal accumulation; Incorrect irrigation; Green agriculture; European Green Deal; Other agricultural applications.

**ÇEV335 Disinfection of Water and Wastewater 1+1 3.0**

Pathogens in Water and Biofilms: Biofilm Formation, Factors Affecting Biofilm Formation, Resistance to Disinfection, Risk and Infectivity of Biofilm Associated Pathogens; Pathogen Control in Drinking Water: Pathogen Detection Methods, Pathogen Control, Disinfection Kinetics; Waterborne diseases; Legislation and Related Requirements; Disinfection Processes and Applications: Free and Residual Chlorine, Chlorine Dioxide, Ozone, UV, Filtration, Metal Ions, Oxidants, Electrochemical Processes, Photocatalysis; Ct Concept: Water Safety Plans, Disinfection By-Products; Disinfection Equipment: Commercial Systems, Monitoring, Verification and Maintenance.

**ÇEV340 Applied of Environmental Statistics Analysis 2+0 3.0**

Introduction to Environmental Statistics and Its Importance; Sample Collection: Sampling process; Frequency Analysis; The Distribution of Sampling: Normal distribution, Log-normal distribution; Inferential Statistics and Hypothesis Testing: Test of Z, Test of T, Test of F; Analysis of Variance; Graphical Data Analysis: The use of the scatterplot in environmental data analysis, Standard addition and internal standard methods; Multivariate Data Analysis: Regression and correlation; Introduction to Minitab Statistical Program; Design of Experiments: Factorial experimental designs, Taguchi experimental design.

**ÇEV342 (Eng) Unit Operations And Processes Laboratory 0+3 4.0**

Laboratory General Rules; Laboratory Safety; Coagulation: Coagulants and their amounts, Jar test; flocculation; Precipitation Test; Filtration; Dimensional analysis, Determination of particle density, Calculation of filtration coefficient; Adsorption: The theory of adsorption, determination of Freundlich and Langmuir isotherms; Ion Exchange. Aeration; Determination of absorption coefficient and oxygenation capacity; Anaerobic Treatment; Aerobic Treatment: Investigation of continuous aerobic reactor; Flotation; Removal of suspended solids and oils; Permeability and fluidization tests; Determination of porosity.

**ÇEV344 Solid Waste Management 3+1 4.0**

Municipal Solid Waste Management: Composition of the solid wastes, Physical, chemical and biological properties; Decision Making Techniques; Collection of Solid Wastes: Analysis of collection systems, Optimization of collection routes; Integrated Solid Waste Management; Engineering Principles: Minimization, Reuse, Recycling, Composting, Biogas, Thermal conversion Technologies, Landfilling.

**ÇEV346 Environmental Problems Resulting from Energy Production 2+0 3.0**

Introduction: Energy systems, Transportation and delivery of energy, Efficiency and economics of energy; Electricity Production and Consumption in Turkey; Energy Policy in the European Union and Turkey: Environmental policy in energy production; Air Pollution Resulting from Energy Production: Thermal power plants and their environmental impacts, Environmental disasters in the past; Alternative Energy Sources and Their Environmental Impacts: Hydrogen, Wind, Biomass, Geothermal, Solar, Nuclear, Hydroelectric, Ocean, Wave, Ocean thermal and Tidal energy.

**ÇEV348 (Eng) Instrumental Analysis in Environmental Studies 2+0 3.0**

**ÇEV352                      Environmental Health                      2+0    3.0**

Concept of Environmental Health: Definition, Characteristics; The Relationship between Environment and Health: Personal environment, Biological environment, Social, cultural and economic environment; Environment epidemiology: Environmental exposure, Toxic exposure, Environmental burden of disease; Risk assessment: Biomarkers, Risk perception, Risk management and communication; Environment and Human: Drinking and usage water, Air, Soil, Agriculture, Solid wastes; Urban, Environment and Health: Hospital environmental health, School environmental health, Tourism, Sports, Visual pollution, Noise, Illumination; Environmental Legislation in European Union and Turkey.

**ÇEV354                      Environmental Footprints                      2+0    3.0**

Footprint Family; Ecological Footprint; Calculation of Ecological Footprint; Environmental Footprint; Carbon Footprint; Direct and Indirect Carbon Footprint; Water Footprint; Green-Blue-Gray Water Footprint; Virtual Water Footprint; Energy Footprint; Emission Footprint; Nitrogen Footprint; Land Footprint; Biodiversity Footprint; Food Waste Footprint; Corporate Footprints, Product Footprints, Global Footprints Management Strategies; Footprints Calculation Methodology, Input-Output Analysis, Climate Change and Footprints, Footprint Reduction Strategies; Global Footprint Network activity

**ÇEV356                      Reuse of Wastewater for the Sustainability of Water Resources                      2+0    3.0**

Introduction: Importance of wastewater reuse for sustainable use of water resources; Wastewater Reclamation and Reuse Planning; Community Health and Environmental Effects; Importance of Wastewater Reuse for the Future; Wastewater Reuse Application Areas: Urban reuse, Industrial reuse, Land irrigation and agricultural reuse; Groundwater Supply; Treatment Technologies for Reuse; Distribution and Storage of Reclaimed Water; Case Studies.

**ÇEV358                      Global Climate Change                      2+0    3.0**

Structure of the Atmosphere: Layers of the atmosphere, Energy balance of the Earth; Fundamentals of Climate Change: Components of climate, Effects of natural sources on climate, Greenhouse gases and effects, Global warming; Historical Change of Climate; Effects of Climate Change: Sea level rise, Temperature increases, Effects on Biodiversity; Modeling of Climate Change; Climate Change and Sustainable Development: Sustainable use and protection of resources; International and National Battle with Climate Change: UN climate change framework agreement, Paris agreement, Kyoto protocol, Montreal protocol, Turkey's greenhouse gas inventory.

**ÇEV360                      Corporate Sustainability Management                      2+0    3.0**

Sustainable Development, Environmental, Economic and Social Dimensions; United Nations Sustainable Development Goals; Corporate Sustainability and Responsibilities; Climate Policies in Turkey and World; European Green Deal and Corporate Perspectives ; Circular Economy and Resource Efficiency: Zero Waste Principles; Corporate Governance for Sustainability; Sustainability Reports, Corporate Sustainability Indexes; Measurement of Corporate Sustainability Performance: Performance evaluation frameworks, Indicators and methods used in performance measurement.

**ÇEV362                      Environment Economy                      2+0    3.0**

Environment and Economy: Conceptual framework, Environmental assets and property issue; Economic and Political Approaches to Natural Resources and Environmental Problems in the Historical Development Process: Macroeconomic approach in environmental economics, Environmental policy and management; Solution Alternatives to Environmental Problems: Legal and market-based solutions; Microeconomic Analysis of Environmental Pollution: Sustainable development indicators and indices, Pollution economics and economic approaches to pollution control, Classification of resources in economy; Principles of Utilizing Natural Resources and Economic Development; European Union Environmental Policy.

**ÇEV398                      Environmental Auditing                      2+0    3.0**

Environmental Auditing and Consultancy Relation; Environmental Auditing and Purpose; Types of Environmental Auditing; Audit Procedure: Preparation, Site visit, Evaluation and reporting; Quality Management in Auditing; Exemplary Audit or Consultancy Practices on Sectoral Basis; Legal Regulations for Auditing; Environmental Monitoring: Planning of the program, Air / Water / Soil monitoring, Waste monitoring, Noise monitoring.

**ÇEV427 (Eng)            Air Pollution Control                      3+0    3.5**

Air Pollution Control Strategies: Dilution in atmosphere, Process modifications; Resource Recovery; Secondary Control Techniques; Air Pollution Control Methods; Gas and Particle Removal Systems Used at Stationary Emission Sources: Design of particle holders, Absorption, Adsorption, Incineration, Condensation; Sulphur Oxides; Control of Nitrogen Oxides and Volatile Organic Compounds; Air Pollution Control at Combustion and Non-combustion Sources; Control of Motor Vehicle Emissions; Air Pollution Control Applications in Some Industrial Facilities; Economic Analysis of Control Technologies.

**ÇEV431                      Water Treatment Project                      1+2    4.0**

Project Planning: Site selection; Evaluation of Present and Future Conditions; Population Projections; Water Quantity: Fluctuations in water demand; Water quality; Water Supply: Ground and surface waters; Conveyance of Water and Connections; Selection of Units in a WTP Based on Water Characteristics; Design of WTP: Intake structures, Aeration and rapid mixing structures, Flocculation chambers, Sedimentation basins, Filtration beds, Disinfections units and others.

**ÇEV432 Wastewater Treatment Project 1+2 4.0**

Project Planning: Site selection, Work plans; Effluent Limits; Evaluation of Present and Future Conditions; Wastewater Parameters to be Considered in Design; Alternative Evaluation: Treatment, Land application, Disposal; Economics: Selection of units in a WWTP based on wastewater characteristics; Design of a WWTP: Screens, Grit chambers, Primary sedimentation, Biological treatment, Disinfections, Sludge thickeners, Anaerobic treatment and others; Personnel Hygiene and Safety.

**ÇEV438 Environmental Management 3+2 5.0**

Main Shareholders and Criteria in Decision - making on Environmental Issues; Anthropocentric and Biocentric Approaches; Design of Environmental Regulations; Economic Valuation and Allocation of Environmental Resources; Public Involvement and Resolution of Disputes; Environmental Impact Assessment (EIA) Procedures: Command and control, Pollution discharge fee, Tradable permits; Air and Water Quality Management; Integrated Waste Management; Biological, Cultural and Socioeconomic Impacts of Projects; Environmental Risk Assessment; Strategic Environmental Assessment; Involvement of Geographical Information Systems in EIA Applications.

**ÇEV442 Hazardous Waste Management 3+0 3.0**

Fundamentals of Hazardous Waste Management: General definitions, Preparation of MSDS forms, National and international legislation, Fate and transport of contaminants; Toxicology and Risk Management: Toxic effects of hazardous wastes, Dose-response relationships; Pollution Prevention Practices: Management strategies, Life cycle analysis, Volume reduction, Toxicity reduction, Recycling processes; Treatment and Disposal Methods: Physico-chemical processes, Biological methods, Stabilization and solidification, Thermal methods, Landfilling; Case Studies on Industrial Waste Treatment.

**ÇEV444 Solid Waste Management Project 1+2 4.0**

Principles of Municipal and Industrial Solid Waste Management Design: Waste amount, Composition and sources, Collection system, treatment/ disposal processes; National Legislation: Legal restrictions on selection and design of solid waste management system; Open Ended Design Problems: Software Application in Process Design; Collection Design; Material Recovery Facility Design; Recycling System Design; Composting Process Design; Incineration Plant Design; Landfill Design; Economic Analysis: Material and Energy Recovery; Investment; Operating costs; Industrial Solid Waste Management: Waste Minimization; Recovery.

**ÇEV445 (Eng) Environmental Modeling 3+0 4.5**

Mathematical Modeling in Environmental Sciences and Engineering; A General Overview of Model Development Process: Calibration and verification processes; Well-Mixed Systems: Steady and unsteady state conditions; Numerical Methods in the Modeling of Well-Mixed Systems; General Principles in Stream Modeling; Modeling of Streams: Wasteload Allocation; Streeter-Phelps Model: Aerobic and anaerobic conditions; Regression Models and Applications; Uncertainty Analysis: Perturbation. First order error analysis, Monte Carlo simulation; Widely Used Models: Watershed models (HSPF), Stream models (QUAL2EU), Ecological models, Climate models. Mathematical Modeling in Environmental Sciences and Engineering; A General Overview of Model Development Process: Calibration and verification processes; Well-Mixed Systems: Steady and unsteady state conditions; Numerical Methods in the Modeling of Well-Mixed Systems; General Principles in Stream Modeling; Modeling of Streams: Wasteload Allocation; Streeter-Phelps Model: Aerobic and anaerobic conditions; Regression Models and Applications; Uncertainty Analysis: Perturbation. First order error analysis, Monte Carlo simulation; Widely Used Models: Watershed models (HSPF), Stream models (QUAL2EU), Ecological models, Climate models.

**ÇEV447 (Eng) Wastewater Engineering 3+0 4.0**

Quantities and Characteristics of Wastewater: Physical, inorganic, nonmetallic, organic and biological characteristics; Screening, grit removal, sedimentation and flotation in wastewater treatment plants and their operational problems; Coagulation, flocculation and disinfection processes in wastewater treatment plants and their operational problems; Biological Wastewater Treatment: Suspended and fixed growth systems; Suspended growth process design and operational problems; Fixed growth process design and operational problems; Nutrient Removal: Nitrogen removal, Phosphorus removal, removal of nitrogen and phosphorus together; Anaerobic removal in wastewater treatment and its operational problems; Sludge treatment processes. Quantities and Characteristics of Wastewater: Physical, inorganic, nonmetallic, organic and biological characteristics; Screening, grit removal, sedimentation and flotation in wastewater treatment plants and their operational problems; Coagulation, flocculation and disinfection processes in wastewater treatment plants and their operational problems; Biological Wastewater Treatment: Suspended and fixed growth systems; Suspended growth process design and operational problems; Fixed growth process design and operational problems; Nutrient Removal: Nitrogen removal, Phosphorus removal, removal of nitrogen and phosphorus together; Anaerobic removal in wastewater treatment and its operational problems; Sludge treatment processes.

**ÇEV448 (Eng) Coastal Zone Management 2+0 3.0**

Characterization and Properties of Coastal Environments; Coastal Plains, Lagoons, Beaches; Ecological and Economic Importance of Coastal Areas; Coastal Features; Coastal Wave Climate: Cross shore and oblique waves, Near-shore currents; Coastal Erosion and its Effects; Precautions to Hinder Coastal Erosion; Pollutant Sources and Pollutant Types in the Coastal Environment ; Prevention of Coastal Pollution; Protection of Coastal Habitats. Characterization and Properties of Coastal Environments; Coastal Plains, Lagoons, Beaches; Ecological and Economic Importance of Coastal Areas; Coastal Features; Coastal Wave Climate: Cross shore and oblique waves, Near-shore currents; Coastal Erosion and its Effects; Precautions to Hinder Coastal Erosion; Pollutant Sources and Pollutant Types in the Coastal Environment ; Prevention of Coastal Pollution; Protection of Coastal Habitats.

**ÇEV449 Graduation Project in Environmental Engineering I 1+2 3.0**

Preliminary Research on the Topic Chosen under the Guidance of an Advisor; A Broad Literature Survey about the Topic; Preliminary Studies for Setting-up Laboratory Experiments; Design of Experimental Set-ups; Acquisition of Data for Theoretical and/or Modeling Studies; Determination of the Steps of the Study; Reporting the Results.

**ÇEV450 Graduation Project in Environmental Engineering II 2+4 5.5**

Theoretical and/or Experimental Works Related to the Chosen Topic under the Guidance of an Advisor; Reporting the Results; Presentation of the Results as a Poster; Oral Presentation before a committee.

**ÇEV4501 Environmental Sociology 2+0 3.0**

Taguchi Approach for Product and Process Design: System design, Robust parameter design, Tolerance design; Fractional Factorial Designs; Orthogonal Array Experiments; Quality Loss Function; Signal-to-Noise Ratio; Crossed Array Design; Response Surface Methodology; Experimental Designs Used in Modeling Response Surfaces; Combined Array Design and Response Model Approach; Dual Response Optimization.

**ÇEV462 Computer Aided Engineering Design 3+0 4.5**

Two Dimensional Drawing for Engineers; Descriptions of the GUI (Graphical User Interface) and Hardware of the Software (AutoCAD), the Interaction with Other Softwares; The Logic of the AutoCAD; Pull Down Menu Commands for Two Dimensional Drawing (2D): File (New, Open, Save etc.), Format (Layer, Text Style, Dimension Style, Point Style etc.), Tools (Attributes, Drafting Settings etc.), View (Zoom, Pan, Toolbars etc.) and Draw (Line, Arc, Hatch, Block etc.), Modify (Erase, Move, Offset, Array, Divide, Trim, Chamfer etc.) and Insert (Block, Raster Image), Dimension (Linear, Align, Radius, Leader etc.) Pull Down Menus; Object Snap (OSNAP), Object Selection Methods.

**ÇEV466 Ecological Planning and Ecotechnology 2+0 3.0**

Deformations of Balance in Ecosystems; Problem of Energy; Impacts of Increasing Population, Urbanization and Industrialization on Nature; Protection of Biodiversity and Natural Areas; Agricultural Problems; Nutritional Problems; Impacts of Polluting Sources to Biotic and Abiotic Environment; Environmental Planning; Environmental Health; Assessment of Alternative Environmental Projects; Investigations of Scientific and Ethic Problems for a Good Environment in the Future.

**ÇEV468 Watershed Management 2+0 3.0**

Introduction: Concepts of watershed management, Current issues in water management, Characteristics of effective watershed management; Watershed Inventory: Physical features and landforms, Climate, Soil characteristics, Streamflow, Groundwater, Water quality, Land use; Developing Management Options: Identifying the sources, Types of options, Constraints and criteria; Simple Assessment Methods; Detailed Assessment Methods.

**ÇEV473 Water Quality Assessment 2+0 3.0**

Sources and Characteristics of Water Pollutants; Characterization of Water Environments; Planning Water Quality Monitoring Programs; Site Selection and Determination of Monitoring Frequency; Selection of Monitoring Parameters; Sampling Methods: Discharge measurement, Sampling physical, chemical and biological parameters; Analysis Methods; Analysis; Reduction of Continuously Monitored Data; Trend Analysis of Water Quality Constituents; Analysis of Completed Monitoring Programs.

**ÇEV477 Remote Sensing and GIS Applications in Environmental Sciences 2+0 3.0**

What is Remote Sensing?; Satellites Used; Project Management in Remote Sensing; Image processing and enhancement techniques in Remote Sensing; Classification; Using Remote Sensing in Environmental Science; Introduction to GRASS program: Sample Application; What is Geographic Information Systems (GIS)?; Elements of Geographic Information Systems; Raster GIS and Vector GIS; Use of Geographic Information Systems in Environmental Science, Introduction to QGIS; Sample Application.

- ÇEV479 Green Engineering Design and Sustainability 2+0 3.0**  
Green Engineering and Sustainability Principles: Green chemistry, Sustainable development goals, climate change, European Union Green Deal, Recycling, Upcycling; Cleaner Production and Pollution Prevention; Life Cycle Analysis; Carbon Footprint, Eco-Labels, Environmental Product Declarations; Industrial Symbiosis; Green Certification Systems: LEED, BREEAM etc.; Case Studies.
- ÇEV481 Sludge Treatment and Disposal 2+0 3.0**  
Principals of Sludge Management: Definitions and sludge sources, national and international legislation, physical, chemical and biological properties of sludge, main contaminants in sludge; Sludge Treatment and Disposal Methods: Sludge stabilization, sludge thickening, dewatering, conditioning, pathogen removal from sludge; Final Disposal Methods, Thermal methods, landfilling, land disposal.
- ÇEV482 Air Pollution Laboratory 1+2 3.0**  
Sampling, Analysis and Evaluation Techniques in Air Pollution Monitoring; Sampling Techniques in Ambient Air; SO<sub>2</sub>-PM Measurement; NO<sub>2</sub> Measurement; Automatic Measurement Systems (CO, NO<sub>x</sub>, O<sub>3</sub>): Operation principles, Calibration, Operation of the air quality monitoring station; Sampling of Atmospheric Constituents with Denuder and Their Secondary Analysis; Sampling and Analysis of Particles at Different Sizes; Measurement of Meteorological Parameters; Sampling and Analysis of Organic Compounds; Isokinetic Sampling of Flue Gas; Orsat Analysis; Indoor Sampling with Personal Samplers and Analysis of the Constituents; Evaluation of the Data and Report Writing.
- ÇEV483 Environmental Toxicology 1+1 3.0**  
Concept of Environmental Toxicology: Definition of Environmental Toxicology, Properties of Toxic Chemicals, Distribution, Transport, Storage, Transformation and Effects on Toxicity of Water, Air and Soil Ecosystems and Effects on Livings; Pollutants in the Development of Ecotoxicology; Existing Legal Regulations on Toxic Chemicals; Toxicity Tests: Toxicity Measurement Methods, Accuracy of Toxicity Tests, Limitations, Advantages, Areas of Use; Toxicity Parameters: Endpoint, Dose Response Relationship, Effective Dose - Effective Concentration; Monitoring of Toxic Compounds and Determination of Synergic Toxicity; Hazard and Risk Assessment in Environmental Toxicology.
- ÇEV484 Small-scale Wastewater Treatment Systems 2+0 3.0**  
Introduction to Decentralized Wastewater Management Systems and Their Management; Constituents in Wastewater; Introduction to Process Analysis and Design; Wastewater Pretreatment Operations and Processes; Alternative Wastewater Collection Systems; Biological Treatment and Nutrient Removal; Lagoon Treatment Systems; Wetlands and Aquatic Treatment Systems; Land Treatment Systems; Packed-Bed Filters; Effluent Disposal for Decentralized Systems; Biosolids and Septage Management.
- ÇEV485 (Eng) Environmental Exposure Assessment 2+0 3.0**  
Introduction to the assessment of exposure due to the environmental epidemiology; Concepts of exposure, Sizing of the exposure, Ways and paths of exposure; Methods for exposure assessment: Direct methods, Indirect methods; Methods for the assessment and determination of exposure: Survey application regarding the exposure situation; Exposure measurements; Environmental data monitoring; Exposure modelling; Environmental modelling, Stochastic exposure modelling; Case studies regarding environmental exposure assessment.
- ÇEV487 Water and wastewater treatment using membrane systems and processes 2+0 3.0**
- ÇEV491 Noise Pollution and Control 2+0 3.0**  
Basic Phonetics and Acoustic Parameters; Sound Power Level and Pressure Calculations; Noise Concept and Its Impact on Human Health; Noise Indicators; Propagation of Sound in Open Space; Indoor Sound Spreading; Noise Measurement Methods: Use of measuring equipment and devices, Determination of measurement points, Determination of correct measurement conditions; Determination of Noise Level; Society's Response to Noise; Noise Control; Quiet Areas; Legal Regulations for Noise and Control.
- ÇEV492 Air Quality Management Project 1+2 4.0**  
Urban and industrial air quality management: Preparation of emission inventories; Preparation of clean air plans and solutions of open-ended problems related to energy saving and pollution reduction strategies at industrial plants; Choice of the best against alternatives regarding criteria like cost, applicability, etc.
- ÇEV493 Legislation Approach For Environmental Solutions 2+0 3.0**  
Regulation Reading Method; Waste Management Regulation; Packaging Waste Control Regulation; Zero Waste Regulation, Waste Oil Control Regulation; Waste Battery and Accumulator Control Regulation; Ozone Layer Regulation on Thinning Substances; Mining Wastes Regulation; Regulation on Regular Landfilling of Wastes; Regulation on Control of Medical

Wastes; Regulation on Control of Waste Electronic Equipment; Excavation Soil Construction and Demolition Waste Control Regulation; Regulation on the Monitoring of Greenhouse Gas Emissions; Industrial Air Pollution Regulation; Soil Pollution Control Regulation.

**ÇEV495                      Air Pollution Meteorology and Atmospheric Dispersion                      2+0    3.0**

Fundamental Meteorological Knowledge; Vertical Stratification in the Atmosphere; Troposphere Meteorology and Air Pollution; Atmospheric Stability Classification; Micrometeorology: Mixing height, Wind-height relationship, Boundary layer, Meteorological measurements; Atmospheric Diffusion Theories; Calculations Related to Atmospheric Diffusion: Gaussian dispersion equation, Plume rise; Atmospheric Chemical Transport Models; Frequently Used Models: Meteorological models, Chemical models, Statistical models.

**ÇEV496                      Microbiological Treatment Methods                      2+0    3.0**

Introduction to Biological Treatment: Basic Features, Advantages and disadvantages; Fundamentals of Microbiological Treatment: Definition of microbiological metabolism, Nutrient requirement in microorganism growth, Carbon and energy sources, Nutrient and trace element requirement, Effect of environmental conditions on biological reaction, Growth kinetics of microorganisms; The Role of Macro and Microorganisms in Biological Treatment; Biological Processes Used in Wastewater Treatment; Biological Processes Used in Air Pollution Control; Biological Processes Used in Solid Waste Treatment; By-products of Biological Treatment and Application Areas: Application examples.

**ÇEV497                      Industrial Wastewater Treatment                      2+0    3.0**

Fundamentals of Industrial Wastewater Treatment; Basic Industries and Wastewaters; Textile Industry Wastewater and Treatment; Pesticide Industries and Wastewaters; Refinery Wastes and Treatment; Treatment of Pulp and Paper Mill Wastes; Treatment of Pharmaceutical Industry Wastes, Characterization and Treatment of Pharmaceutical Industry Waste, Waste Recovery and Control; Operational Problems.

**ÇEV498                      Health-Care Waste Management                      2+0    3.0**

Definition and Characterization Waste Resulted from Health-Care Facilities: Health-care wastes, Hazardous wastes, Radioactive wastes, municipal solid wastes; Health-Care Waste Management System Creation in Health-Care Facilities; Environmental impacts of health-care wastes; Legislative of Health-Care Wastes; Health-Care Waste Management: Segregation, Collection, Transportation and Temporary storage; Health-Care Waste Treatment and Disposal Methods: Steam treatment, Microwave treatment, Dry-heat treatment, Chemical treatment, Incineration; Management of Liquid Health-Care Wastes; Cost of Health-Care Wastes Management: Cost elements and cost analysis.

**ÇEV499                      Advanced Treatment of Water and Wastewater                      2+0    3.0**

Ultrasound: Cavitation, Source of ultrasound effect, Parameters affecting cavitation, Environmental applications of ultrasound; The Role of Adsorption in Water Treatment; Factors Affecting Adsorption; Equilibrium in Adsorption; Adsorbents: Activated carbon production and properties; Fixed Bed Adsorbents; What is Ion Exchange; Equilibrium in Ion Exchange; Materials Used in Ion Exchange; Ion Exchange Columns.

**ÇEVSJ401                      Environmental Engineering Internship I                      0+2    2.5**

Professional Work in a Business Environment; Professional Knowledge, Skills, Attitudes and Behaviors; Recognition of Business Areas And Industry; Adapting to Business Life; Gaining Work Experience; Learning the Applications in Institutions/Organizations; Growing Up in a Real Production and Service Environment; Applying Learned Knowledge and Skills; Recognizing, Analyzing, Modeling and Solving Complex Systems and Real Life Problems; Report Writing.

**ÇEVSJ402                      Environmental Engineering Internship II                      0+2    2.5**

Professional Work in a Business Environment; Professional Knowledge, Skills, Attitudes and Behaviors; Recognition of Business Areas And Industry; Adapting to Business Life; Gaining Work Experience; Learning the Applications in Institutions/Organizations; Growing Up in a Real Production and Service Environment; Applying Learned Knowledge and Skills; Recognizing, Analyzing, Modeling and Solving Complex Systems and Real Life Problems; Report Writing.

**EEM102 (Eng)                      Introduction to Electrical Engineering                      4+2    7.5**

Electrical Engineering Profession; Electrical Charge, Current, Potential, Energy and Power; Resistance and Ohm's Law; DC Voltage, Current and Power Measurements: DC voltmeter, Ammeter, Ohmmeter and Wattmeter; Oscilloscopes; Linear Circuit Elements; Kirchoff's Laws; Loop and Node Analysis; Superposition; Thevenin and Norton Equivalent Circuits; Alternating Current Circuits; Sinusoidal Input Function; Phasor Concept; Steady-state Response to Sinusoidal Input; Average Power; Complex Power; Mutual Inductance and Transformers; AC Measurements; AC Power Calculations and Measurements; Polyphase Circuits; Semi-conductors: Diodes and transistors, Basic electronic circuits; Fields of Electrical Engineering.

**EEM104 (Eng)                      Professional Aspects of Electrical & Electronics Engineering                      2+0    3.0**



Elektrik-Elektronik Mühendisliği Bölüm Tanıtımı, Mühendislik mesleği, Mühendislik etiğinin toplumsal önemi, Mühendislik uygulamalarının evrensel ve toplumsal boyutlarda etkileri, Teknolojik gelişmeler, Yaşam boyu öğrenmenin gerekliliği, Girişimcilik.

**EEM206 (Eng) Electrical Circuits Laboratory**

**1+2 3.0**

Short Circuit, Open Circuit, Serial and Parallel Connections; Power Calculation; Voltmeter Loading; Thevenin's Theorem; Computer Aided Circuit Analysis; RL and RC Circuits; Resonance Circuits; Unit Step and Pulse Response of Linear Circuits; OPAMP Circuits; Active Filters; Unit Step and Pulse Response of Non-Linear Circuits; Frequency Response of RL, RC, RLC and OPAMP Circuits. Short Circuit, Open Circuit, Serial and Parallel Connections; Power Calculation; Voltmeter Loading; Thevenin's Theorem; Computer Aided Circuit Analysis; RL and RC Circuits; Resonance Circuits; Unit Step and Pulse Response of Linear Circuits; OPAMP Circuits; Active Filters; Unit Step and Pulse Response of Non-Linear Circuits; Frequency Response of RL, RC, RLC and OPAMP Circuits.

**EEM208 (Eng) Electromagnetic Fields and Waves**

**4+0 6.0**

Vector Analysis; Electrostatic and Magnetostatic Fields; Ampere's Law; Magnetic Circuits; Vector Magnetic Potential; Quasi-static Electromagnetic Fields; Dielectric and Magnetic Materials; Faraday's Law; Electromagnetic Energy and Forces; Electromotive Force and Potential; Boundary-Value Problems; Maxwell Equations; Wave Propagation; Plane Waves; Reflection; Refraction; Polarization; Radiation. Vector Analysis; Electrostatic and Magnetostatic Fields; Ampere's Law; Magnetic Circuits; Magnetic Potential Vector; Quasi-static Electromagnetic Fields; Dielectric and Magnetic Materials; Faraday's Law; Electromagnetic Energy and Forces; Electromotive Force and Potential; Boundary-Value Problems; Maxwell Equations; Wave Propagation; Plane Waves; Reflection; Refraction; Polarization; Radiation.

**EEM209 (Eng) Circuit Analysis**

**4+1 7.5**

Transient Response: RL and RC circuits, Natural and forced response, Unit step response; RLC circuits; Complex Frequency; Frequency Response; Filters: Low-pass filters, Band-pass filters, High-pass filters, Quality factor; Bode Plots: Drawing Amplitude and Phase Graphs; Operational Amplifiers; Two-Port Circuits; Fourier Series; Fourier Transform and its Applications in Circuit Analysis; Application of Laplace Transform in Circuit Analysis.

**EEM210 (Eng) Fundamentals of Semiconductor Device**

**3+0 5.0**

Wave-Particle Duality: Blackbody radiation, Photoelectric Effect, X-Ray diffraction, Compton Effect, de Broglie Waves; Uncertainty Principle, Bohr Model of the Atom, Energy Levels and Spectra, Atomic Excitation, The Laser; Introduction to Quantum Mechanics: Schrödinger Equation, Particle in a Box, Finite Potential Well, Tunneling Effect, Harmonic Oscillator; Semiconductor Materials: Crystal Structure, Energy Bands, Density of States; Conduction mechanism: Carrier Concentration, Donors and Acceptors, Mobility, Resistivity; Hall Effect, Carrier Diffusion, Generation and Recombination Processes; P-N Junction, Current-Voltage Characteristics; Bipolar Devices: The Transistor Action, Modes of Operation, Frequency Response; Unipolar Devices: Metal-Semiconductor Contacts, JFET, MESFET, MOS Diode, MOSFET; Modern Fabrication and Experimental Techniques.

**EEM214 (Eng) Electrical Engineering for Mechanical Engineers**

**3+0 3.5**

Principles and Components of Electrical Circuits; Variables of Circuit Elements and Measuring Devices; Kirchhoff's Laws; Circuit Analysis Techniques; Nodal Analysis; Electronic Analog and Digital Systems; Three-phased Circuits; Digital and Analog Building Blocks; Elements of Power Electronics and Circuits; Electric Machines; Transformers, Synchronous and asynchronous machines, Direct current machines.

**EEM232 (Eng) Digital Systems I**

**4+0 6.0**

Number Systems; Logic Gates; Designing Binary Systems using Gates; Boolean Algebra; Karnaugh Maps; Combinational Circuit Analysis and Design; Hardware Description Language (HDL); Basic MSI (Middle scale integrated) Devices: Decoder, Encoder, Multiplexer, Demultiplexer, Binary adder (Half adder, full adder); Binary Arithmetic; Sequential Logic Concept and Design: Latch and flip-flop, State diagrams and state tables, Sequential circuits with D flip-flops, J-K flip-flops and R-S flip-flops; Registers and Counters; Memory and Programmable Logic Devices: Static/dynamic RAM modules.

**EEM238 (Eng) Digital Systems Laboratory**

**0+2 2.0**

Introduction to Logic Gates (Basic Boolean algebra with gates); Timing Consideration of a Gate; Voltage Transfer Characteristics; Fan-out, Fan-in Concepts; Implementation of a Problem with Sum of Products and Product of Sums; Combinational Circuit Design with MSI Devices; 4-bit Adder/Subtractor Circuitry Design; Synchronous Sequential Logic Design Experiment (Counter design); Data Bus and Register Transfer Experiment; Memory Experiment.

**EEM301 (Eng) Signals and Systems**

**4+0 6.0**

Discrete and Continuous Time Signals; Causality; Static / Dynamic, Discrete / Continuous Time, Linear / Non-linear, Time Varying / Invariant Systems; Laplace, Z, Fourier and Discrete Fourier Transforms; Modeling and Responses of Linear and Time Invariant Discrete and Continuous Time Systems; Differential Equations and Difference Equations; State Variables and State Equations; Impulse Response; Convolution; Transfer Functions; Realization of Transfer Functions; Computer Simulations; Fourier Analysis of Discrete and Continuous Time Systems; Sampling and Reconstructing.

**EEM305 (Eng) Signals and Systems 3+0 4.5**

Discrete and Continuous Time Signals; Causality; Static / Dynamic, Discrete / Continuous Time, Linear / Non-linear, Time Varying / Invariant Systems; Laplace, Z, Fourier and Discrete Fourier Transforms; Modeling and Responses of Linear and Time Invariant Discrete and Continuous Time Systems; Differential Equations and Difference Equations; State Variables and State Equations; Impulse Response; Convolution; Transfer Functions; Realization of Transfer Functions; Computer Simulations; Fourier Analysis of Discrete and Continuous Time Systems; Sampling and Reconstructing.

**EEM308 (Eng) Introduction to Communications 3+2 7.0**

Fourier Series, Fourier transforms; Power, Energy, Autocorrelation function, Power spectral density; Sampling; Hilbert Transforms, Lowpass representations of bandpass signals and systems; DSB-SC, DSB, SSB, VSB Amplitude Modulation, Amplitude modulators and demodulators; PLL; Angle Modulation: Frequency modulation (FM) and phase modulation (PM); Spectral Characteristics of Angle-Modulated Signals, Effective bandwidth, Carson's rule; Angle Modulators and Demodulators, Random processes: WSS processes, Gaussian and white processes, Noise equivalent bandwidth, Bandpass processes; Effect of Noise on Analog Communication Systems; Pre-Emphasis and De-Emphasis Filtering.

**EEM310 (Eng) Control Systems 3+0 5.0**

Introduction: Definition and classification of systems, Control Systems; Input-output Modeling of Linear Time-Invariant (LTI) Systems; Solution to the State Equations of LTI Systems; Modeling Electromechanical systems; Discrete-time Equivalents of Continuous-time Systems; Stability; Feedback Control Design for Stability; Steady-state Errors; Transient Response of LTI Systems; The Root-Locus Method; Introduction to Discrete-time Systems; Sampled-Data Systems.

**EEM311 (Eng) Principles of Energy Conversion 3+2 6.0**

Electromagnetic Circuits; Properties of Ferromagnetic Materials; Single-phase Transformers; Three-phase Transformers; Per Unit System; Principles of Electromagnetic Energy Conversion; Analysis of Singly or Multiply Excited Linear Systems; Analysis of Singly or Multiply Excited Rotational Systems; DC Machines: Generators, Motors, and Speed control. Electromagnetic Circuits; Properties of Ferromagnetic Materials; Single-phase Transformers; Three-phase Transformers; Per Unit System; Principles of Electromagnetic Energy Conversion; Analysis of Singly or Multiply Excited Linear Systems; Analysis of Singly or Multiply Excited Rotational Systems; DC Machines: Generators, Motors, and Speed control.

**EEM321 (Eng) Electronics I 3+0 5.0**

Diodes; Diode Applications; Zener Diodes; BJT Transistors; Common Emitter, Common Collector, Common Base Connections; Field Effect Transistors (FET); DC Analysis of Transistors; Thermal Effect and Stability Analysis; BJT Equivalent Circuits; FET Equivalent Circuits; Small Signal Analysis; Low Frequency Amplifiers; Frequency Response of Amplifiers; Input-Output Impedances. Diodes; Diode Applications; Zener Diodes; BJT Transistors; Common Emitter, Common Collector, Common Base Connections; Field Effect Transistors (FET); DC Analysis of Transistors; Thermal Effect and Stability Analysis; BJT Equivalent Circuits; FET Equivalent Circuits; Low Signal Analysis; Low Frequency Amplifiers; Frequency Response of Amplifiers; Input-Output Impedances.

**EEM328 (Eng) Electronics Laboratory 1+2 3.0**

Diode Characteristics; Examination of Various Diode Circuits; BJT Characteristics; Examination of Various BJT Circuits; FET characteristics; Examination of various FET circuits; Common Emitter / Source, Common Collector/Drain, Common Base/Gate Amplifiers; Frequency Response of Amplifiers; Differential Amplifiers; OPAMP Circuits; Design and Applications of Amplifiers with OPAMP.

**EEM334 (Eng) Digital Systems II 3+0 5.0**

Asynchronous Sequential Logic; Register Transfer Language and its Related Hardware Design; Design of a Basic Computer Datapath and its Connection to Register Bank; Sequencing of Register Transfer Operations; ASM (Algorithmic State Machine) Approach and Design Fundamentals; Designing Single Clock Cycle and Multiple Clock Cycle Computer; Instruction Set Architecture Concept: Addressing modes, Architectures, Instruction Types; Comparing Two Different CPU Designs: CISC and RISC; CISC and RISC Design Fundamentals.

**EEM336 (Eng) Microprocessors I 3+2 7.0**

8 Bit Microcontrollers; Command Subsets and Machine Language; Index Modes; Program Structure and Design; Advanced Programming in Assembler Language (Indexing; Arithmetic Operations; Bit and Byte Manipulation; Stacks; Subroutines; Loops); Fundamentals of the Design of Systems with Microprocessors; Memory Decoding; Data/Address/Control Buses; Input / Output Hardware; Interrupt Logic; Parallel Input / Output Interfaces; A/D and D/A Operations; Serial Communication Interfaces; Interrupt Hardware; Real Time Clock; Program Timer; Error Recovery Operations with COP Timers.

**EEM342 (Eng) Fundamentals of Control Systems 3+2 7.0**

Analysis of Discrete- and Continuous-time Control Systems Using Transfer Functions and State Variables; Stability; Transient Response; System Types and Steady State Errors; P, PI, PD, and PID Controls; Root Locus; Discrete- and Continuous-time Controller Design Using Root Locus; Hybrid Systems and Computer Controlled Analogue Systems; Discrete-time Controller Design for Continuous-time Systems.

**EEM403 (Eng) Fundamentals of Optoelectronics and Nanophotonics 3+0 5.0**

Wave Optics: Maxwell's wave equation, Fresnel's equations, Light waves in a homogeneous medium, Total internal reflection, Interference and optical resonators; Dielectric Waveguides and Optical Fibers: Planar slab and rectangular waveguides, Dispersion in waveguides, Optical fibers; Semiconductor Devices: Direct and indirect bandgap semiconductors, Pn junction, Light emitting diodes and lasers, Photovoltaic devices, Photodetectors; Photonic Crystals: One- and two- dimensional periodic nanostructures, Principles of nanoplasmonics. Wave Optics: Maxwell's wave equation, Fresnel's equations, Light waves in a homogeneous medium, Total internal reflection, Interference and optical resonators; Dielectric Waveguides and Optical Fibers: Planar slab and rectangular waveguides, Dispersion in waveguides, Optical fibers; Semiconductor Devices: Direct and indirect bandgap semiconductors, Pn junction, Light emitting diodes and lasers, Photovoltaic devices, Photodetectors; Photonic Crystals: One- and two- dimensional periodic nanostructures, Principles of nanoplasmonics.

**EEM407 (Eng) Digital VLSI Design 2+2 5.0**

Introduction: MOS transistor theory, Circuit design, Simple CMOS gates; CMOS Processing Technology: Manufacturing steps, Design rules; Standard CMOS Circuits: Standard circuit synthesis, Circuit design using Euler method; VLSI CAD Tools: Introduction to VLSI CAD tools, Circuit drawing and analysis using Magic, Circuit simulation; Circuit Characterization: Analytical delay estimation methods, Transistor sizing, Logical effort method; Complex Circuit Design: Combinatorial circuit design, Sequential circuit design, Circuit timing, Interconnections, I/O structures; System Design: Design strategies, Standard cell designs, Library- based circuit synthesis. Introduction: MOS transistor theory, Circuit design, Simple CMOS gates; CMOS Processing Technology: Manufacturing steps, Design rules; Standard CMOS Circuits: Standard circuit synthesis, Circuit design using Euler method; VLSI CAD Tools: Introduction to VLSI CAD tools, Circuit drawing and analysis using Magic, Circuit simulation; Circuit Characterization: Analytical delay estimation methods, Transistor sizing, Logical effort method; Complex Circuit Design: Combinatorial circuit design, Sequential circuit design, Circuit timing, Interconnections, I/O structures; System Design: Design strategies, Standard cell designs, Library- based circuit synthesis.

**EEM409 (Eng) Random Signals 3+0 5.0**

Correlation of Signals; Energy and Power Spectral Densities; Hilbert Transform; Principles of Modulation; Stochastic Processes: Characterization, Correlation functions, Stationarity, Ergodicity, Auto-correlation sequence, Power spectral density; Transmission of Random Signals Through Linear Systems; Special Stochastic Processes; Gaussian Processes; White Gaussian Noise; Band-limited Random Processes and Their Properties; Examples in Communications and Other Fields. Correlation of Signals; Energy and Power Spectral Densities; Hilbert Transform; Principles of Modulation; Stochastic Processes: Characterization, Correlation functions, Stationarity, Ergodicity, Auto-correlation sequence, Power spectral density; Transmission of Random Signals Through Linear Systems; Special Stochastic Processes; Gaussian Processes; White Gaussian Noise; Band-limited Random Processes and Their Properties; Examples in Communications and Other Fields.

**EEM413 (Eng) Electrical and Electronics Engineering Design Project I 1+5 4.5**

Engineering Design Methodology; Problem Statement Involving Feedback Control Systems, Digital Signal Processing, Software and Systems, Digital System Design, VLSI Design, Robotics and Computer Vision, Electronic Circuits, Microelectronic Processing, Optoelectronics, Microwave Circuits and Power Systems; The Specification of the Requirements; Concept Generation and Evaluation; The Functional Design and Test; Grouping and Team Work; Effective Communication in a Teamwork Environment; Capstone Project Proposal Presentation and Proposal Writing.

**EEM414 (Eng) Electrical and Electronics Engineering Design Project II 1+5 4.5**

Embodiment of the Design Process Involving Feedback Control Systems, Digital Signal Processing, Software and Systems, Digital System Design, VLSI Design, Robotics and Computer Vision, Electronic Circuits, Microelectronic Processing, Optoelectronics, Microwave Circuits, Power Systems; Incorporation of Realistic Engineering Constraints; Cost Estimation and Manufacturability; Completion of a Team Project; Final Report Writing; Presentation.

**EEM415 (Eng) Engineering Design and Research 2+0 3.0**

Engineering Design Process: Elements of the design process; Project Selection and Needs Identification: Engineering design projects, Project feasibility and selection criteria, Needs identification, The research survey, Needs and objectives statements; The Requirements Specification: The requirements setting process, Engineering requirements; Concept Generation and Evaluation: Creativity; Teams and Teamwork: Definition of team, Models of team development, Characteristics of real teams; Project Management: Network diagrams, Gantt charts, Cost estimation; Oral Presentations: Evaluation criterias of presentations.

- EEM416 (Eng) Introduction to GNU/Linux Operating Systems** **2+2 5.0**  
History of Linux and GNU project; Linux Kernel basics, Linux distributions, graphical desktop environments, file systems, BASH shell programming, GNU utilities, process management and Linux scheduler, Linux boot process, systemd, init, LKM, eBPF, control groups, namespaces, Linux network system, disk and storage management, security of Linux systems, hardening Linux system security, SELinux, AppArmor, SSH, firewall yönetimi, basic system administration.
- EEM417 (Eng) Engineering Computations** **3+1 5.0**  
Application of numerical analysis and optimization methods, A brief overview of Matlab, Solution of Equations of a Single Variable, Curve fitting (Approximation), interpolation, regression methods and application with Matlab, Numerical differentiation and its applications, Numerical integration and its applications, Ordinary differential equations - numerical solution methods to initial value problems, Ordinary differential equations - numerical solution methods to boundary value problems, Introduction to linear programming and Simplex Method, Introduction to unconstrained nonlinear programming, Modern optimization methods - Genetic Algorithms, Simulated Annealing and Particle Swarm Optimization
- EEM418 (Eng) Introduction to Digital Integrated Circuits** **3+0 5.0**  
Manufacturing Process: Manufacturing and Packaging of Integrated Circuits; CMOS Logic-Gate Circuits: Switch-Level Transistor, The CMOS Inverter, General Structure of CMOS Logic, The Two-Input NOR Gate, The Two-Input NAND Gate, A Complex Gate, CMOS Layout Designs; Digital Logic Inverters: The Voltage-Transfer Characteristic (VTC), Noise Margins, Inverter Implementation; Dynamic Operation of the CMOS: Inverter, the Propagation Delay, the Equivalent Load Capacitance; Transistor Sizing: Transistor Sizing in CMOS Logic Gates, Driving a Large Capacitance; Power Dissipation: Sources of Power, Dissipation, Power-Delay and Energy-Delay Products; Digital IC Technologies: Logic-Circuit Families, Design Methodologies, Logic-Circuit Families.
- EEM444 (Eng) Object Oriented Design** **3+0 5.0**  
Introduction: Preprocessing commands, Basic structures; Object Oriented Model: Objects and classes, Fields and methods, Enumerations; Memory Control: Constructors and destructors, New and delete operators; Object Oriented Concepts: Information hiding, Encapsulation, Inheritance, Polymorphism, Operator overloading, Exception handling, try - catch blocks; OO Paradigms: Templates, Iterators, Vectors; Method Types: Virtual functions, Inline functions, Function overriding, Function pointers; Advanced Topics: Multithreading, Controlling critical sections, Semaphores, Atomic operations.
- EEM446 (Eng) Cryptographic Hardware Design** **3+0 5.0**  
Introduction to Cryptography: Symmetric-key cryptography, Public-key cryptography, Cryptographic hash functions; Computer-Aided Cryptographic Engineering; Digital System Design: Combinational and sequential logic design, Hardware description languages (HDLs), Reconfigurable logic devices, Design of computer systems and components; Metrics for Security in Embedded Systems; Cryptographic Hardware Architectures: Basic building blocks for cryptographic hardware, Hardware design for block ciphers, stream ciphers, and asymmetric cryptography, Design examples, High-performance and efficient design of cryptographic primitives.
- EEM447 (Eng) Research in Digital Systems I** **1+4 5.0**  
Network protocols; Optimization of network protocols; Developing network applications; System-on-chip fundamentals; System-on-chip hardware design; System-on-chip software design; Embedded system hardware design; Embedded system software design; Application development on real time operating systems; Mobile software applications; Low power RF system design; Hardware applications on FPGA. Network protocols; Optimization of network protocols; Developing network applications; System-on-chip fundamentals; System-on-chip hardware design; System-on-chip software design; Embedded system hardware design; Application development on real time operating systems; Mobile software applications; Low power RF system design.
- EEM448 (Eng) Research in Digital Systems II** **1+4 5.0**  
Network protocols; Optimization of network protocols; Developing network applications; System-on-chip fundamentals; System-on-chip hardware design; System-on-chip software design; Embedded system hardware design; Embedded system software design; Application development on real time operating systems; Mobile software applications; Low power RF system design; Hardware applications on FPGA.
- EEM449 (Eng) Embedded System Design** **2+2 5.0**  
Embedded systems, development cycle of embedded systems, design requirements of embedded systems; ARM architecture and programming; interface design, ADC/DAC; timers, interrupts; ARM microcontroller system design, oscillators, reset circuits, DC-DC conversion; PCB design, line driver design, memory interfacing; communication, inter chip communication, network programming, TCP/IP communication, Ethernet; RF communication, RF interface circuits; real-time operating systems, real-time programming, multithreaded programming, process synchronization; graphical user interface, Qt programming.
- EEM450 (Eng) Introduction to System Identification** **3+0 5.0**

<b>EEM4501</b> <b>(Eng)</b>	<b>Analog Electronics</b>	<b>3+0</b>	<b>5.0</b>
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<b>EEM4503</b> <b>(Eng)</b>	<b>Digital Systems Design with VHDL and FPGA</b>	<b>3+2</b>	<b>5.0</b>
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<b>EEM451 (Eng)</b>	<b>Industrial Control Systems</b>	<b>1+4</b>	<b>5.0</b>
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<b>EEM452 (Eng)</b>	<b>Introduction to Robotics</b>	<b>3+0</b>	<b>5.0</b>
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<b>EEM453 (Eng)</b>	<b>Research in Control and System Theory I</b>	<b>1+4</b>	<b>5.0</b>
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<b>EEM454 (Eng)</b>	<b>Research in Control and System Theory II</b>	<b>1+4</b>	<b>5.0</b>
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<b>EEM455 (Eng)</b>	<b>Research in Power Systems I</b>	<b>1+4</b>	<b>5.0</b>
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<b>EEM456 (Eng)</b>	<b>Research in Power Systems II</b>	<b>1+4</b>	<b>5.0</b>
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<b>EEM457 (Eng)</b>	<b>Research in Signal Processing I</b>	<b>1+4</b>	<b>5.0</b>
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Introduction to Advanced Signal Processing Techniques; Introduction to Signal Detection and Parameter Estimation Methods: Classical Approach; Bayesian Approach; Modern Signal Modelling Techniques; Spectrum Estimation:	174	310
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Nonparametric Methods, Parametric Methods; Spread Spectrum Communications; Introduction to Array Signal Processing; Direction of Arrival Estimation Techniques and Systems; Signal Localization; Introduction to Radar Signal Processing.

**EEM458 (Eng) Research in Signal Processing II 1+4 5.0**

An elective course offered by the related faculty for individual research and development progress of the student: Problem Definition; Signal Modelling; Defining the Problem Solution with Signal Processing Techniques; Simulation Studies; Performance Comparison; Interpretation of the Results; Design and Implementation; Verification of the Results; Fine Tuning; Testing the Designed System; Reporting Final Results.

**EEM459 (Eng) Research in Electronics I 1+4 5.0**

Solid State Semiconductor Material Properties: Optoelectronic; Thermoelectrical; Optical and Similar Characteristics; Solid State Semiconductor Material Applications; Thin Film Growth Methods; Thin Film Characterization Methods; Micro and Nanofabrication Techniques of Devices; Theoretical and Applied Optoelectronics; Characterization and Measurement Techniques of Optoelectronic Devices; Optoelectronic Device (Lasers, Solar Cells, etc.) Operation Principles.

**EEM460 (Eng) Research in Electronics II 1+4 5.0**

Solid State Semiconductor Material Properties: Optoelectronic; Thermoelectrical; Optical and Similar Characteristics; Thin Film Growth Methods; Thin Film Characterization Methods; Micro and Nanofabrication Techniques of Devices; Theoretical and Applied Optoelectronics; Characterization and Measurement Techniques of Optoelectronic Devices; Optoelectronic Device (Lasers, Solar Cells, etc.) Operation Principles.

**EEM461 (Eng) Research in Telecommunications I 1+4 5.0**

Applications of Analog and Digital Modulation Techniques; Implementation of Amplitude Modulation; Angle modulation; Pulse Amplitude Modulation; Phase Shift Keying; Quadrature Amplitude Modulation; Frequency Shift Keying and Realization of Other Modulation Variants; Source Coding Applications; Implementation of Huffman Codes and Lempel-Ziv Codes; Channel Coding Applications; Linear Block Codes; Implementation of Convolutional Codes; Mobile Communications Applications; Radar Systems; Satellite Communications.

**EEM462 (Eng) Research in Telecommunications II 1+4 5.0**

Applications of Analog and Digital Modulation Techniques; Implementation of Amplitude Modulation; Angle modulation; Pulse Amplitude Modulation; Phase Shift Keying; Quadrature Amplitude Modulation; Frequency Shift Keying and Realization of Other Modulation Variants; Source Coding Applications; Implementation of Huffman Codes and Lempel-Ziv Codes; Channel Coding Applications; Linear Block Codes; Implementation of Convolutional Codes; Mobile Communications Applications; Radar Systems; Satellite Communications.

**EEM463 (Eng) Introduction to Image Processing 3+0 5.0**

2D Signals and systems; Digital images: Color, stereo and video images, Sampling and quantization of images; Binary images: Image binarization, Morphological operations; Image transforms; Linear and nonlinear filters; Spatial and frequency domain image enhancement; Image restoration; Image segmentation; Image coding and compression: Lossy and lossless compression; Image processing applications: Security and surveillance, Medical image processing.

**EEM464 (Eng) System-on-Chip Design 2+2 5.0**

System-on-Chip principles: Design methodologies, Design tools, Design flow, Design Reuse; HW/SW Co-design: Hardware acceleration, Interface design, Intellectual property (IP) block design, IP integration, Resource sharing, Pipelining in the design; Verification of System-on-chip: Testing; Zynq System: Processing system, Programmable logic, Interconnection networks, ARM AMBA AXI protocols; High-level-synthesis (HLS), Data types, Interface specification, Algorithm synthesis, Designing with Vivado HLS, IP generation; Operating Systems on Zynq; Designing a SoC with a soft-processor MicroBlaze.

**EEM465 (Eng) Fundamentals of Data Communications 3+0 5.0**

Probability and random variables; Measures of information: entropy, mutual information; The asymptotic equipartition property; Data Compression, Kraft inequality; Optimal Codes: Huffman codes; Universal compression, Lempel-Ziv coding; Algebraic concepts; Linear block codes; Cyclic codes; BCH and Reed-Solomon codes; Linear convolutional codes; Properties of convolutional codes; Applications. Probability and random variables; Measures of information: entropy, mutual information; The asymptotic equipartition property; Data Compression, Kraft inequality; Optimal Codes: Huffman codes; Universal compression, Lempel-Ziv coding; Algebraic concepts; Linear block codes; Cyclic codes; BCH and Reed-Solomon codes; Linear convolutional codes; Properties of convolutional codes; Applications.

**EEM466 (Eng) High Voltage Techniques 3+0 5.0**

Introduction; Electric Field; Insulators; Estimation and Control of Electric Stress; Surge Voltages; Conduction and Electrical Breakdown in Gases; Conduction and Electrical Breakdown in Liquids; Conduction and Electrical Breakdown in Solids; Applications of Insulating Materials; Generation of High Voltages and Currents; Measurement of High Voltages and Currents; Electrostatic Fields and Field Stress Control; Non-Destructive Insulation Test Techniques; Overvoltages, Testing Procedures and Insulation Coordination; Design and Testing of External Insulation.

#### **EEM467 (Eng) Digital Communications**

**3+0 5.0**

Signals, power of signals, FT, concepts of modulation, multiplexing (time, frequency and code), networks, allocation of frequency spectrum, noise analysis; Geometric representation of signals, BER analysis, MF detection; ISI, raised cosine spectrum, trellis diagrams, channel equalization; Channel capacity and coding, block codes, cyclic codes and convolutional codes. Signals, power of signals, FT, concepts of modulation, multiplexing (time, frequency and code), networks, allocation of frequency spectrum, noise analysis; Geometric representation of signals, BER analysis, MF detection; ISI, raised cosine spectrum, trellis diagrams, channel equalization; Channel capacity and coding, block codes, cyclic codes and convolutional codes.

#### **EEM468 (Eng) Advanced Communication Techniques**

**3+0 5.0**

Optical Communications; Ray Theory; Mod Propagation; Attenuation and Dispersion in Fibres; Inter Symbol Interference (ISI) and Doppler Effect in Wireless Communication; Channel Equalization; Coding; Block Codes; Cyclic Codes and Convolutional Codes; Trellis Diagrams; Spread Spectrum Techniques; Pseudo-Noise (PN) Sequences and Their Generations; Code Division Multiple Access (CDMA) Communication Protocol; Multipath Fading. Optical Communications; Ray Theory; Mod Propagation; Attenuation and Dispersion in Fibres; Inter Symbol Interference (ISI) and Doppler Effect in Wireless Communication; Channel Equalization; Coding; Block Codes; Cyclic Codes and Convolutional Codes; Trellis Diagrams; Spread Spectrum Techniques; Pseudo-Noise (PN) Sequences and Their Generations; Code Division Multiple Access (CDMA) Communication Protocol; Multipath Fading.

#### **EEM469 (Eng) Communication Electronics**

**3+0 5.0**

Analysis of Transmission Lines; Smith Chart; Impedance Matching of Distributed and Lumped Element Circuits; Distributed Resonator Circuits; Two Port Scattering Parameter Analysis; Filter Design by Insertion Loss Method; S-Parameters and RF Amplifiers; Oscillator Design; PLL and Frequency Synthesizers; Noise and Linearity Problems in Communication Systems; Receivers and Modulators; Detectors and Mixers. Analysis of Transmission Lines; Smith Chart; Impedance Matching of Distributed and Lumped Element Circuits; Distributed Resonator Circuits; Two Port Scattering Parameter Analysis; Filter Design by Insertion Loss Method; S-Parameters and RF Amplifiers; Oscillator Design; PLL and Frequency Synthesizers; Noise and Linearity Problems in Communication Systems; Receivers and Modulators; Detectors and Mixers.

#### **EEM470 (Eng) Microwaves and Antennas**

**3+0 5.0**

Electromagnetic Plane Waves; Antenna Parameters; Antenna Radiation Pattern; Antenna Gain; Antenna Efficiency and Impedance; Transmission Line Analysis; Antenna Effective Aperture; Friis Transmission Equations; Antenna Radiation Fields; Radiation Integrals and Auxiliary Potential Functions; Wire and Dipol Antennas; Short and Half Wave Dipol Antennas; Monopole Antennas; Monopole Antennas Above an Infinite Ground Plane; Loop Antennas; Antenna Arrays; Waveguides TEM, TE, and TM Mods; Parallel Plate Waveguide; Analysis of Waveguides with a Rectangular or Circular Cross-Section. Electromagnetic Plane Waves; Antenna Parameters; Antenna Radiation Pattern; Antenna Gain; Antenna Efficiency and Impedance; Transmission Line Analysis; Antenna Effective Aperture; Friis Transmission Equations; Antenna Radiation Fields; Radiation Integrals and Auxiliary Potential Functions; Wire and Dipol Antennas; Short and Half Wave Dipol Antennas; Monopole Antennas; Monopole Antennas Above an Infinite Ground Plane; Loop Antennas; Antenna Arrays; Waveguides TEM, TE, and TM Mods; Parallel Plate Waveguide; Analysis of Waveguides with a Rectangular or Circular Cross-Section.

#### **EEM471 (Eng) Electrical Machinery I**

**2+2 5.0**

DC Machines with Commutator; Structural Properties; Operational Concepts; Circuit Models of DC Machines; Series, Shunt and Compound Machines; Structural Properties; Rotating Field Theory; Circuit Models of Synchronous Machines; Generator and Motor Operation Cases; Asynchronous Machines; Structural Properties; Circuit Models of Asynchronous Machines; Performance Calculations; Speed Control Techniques and Motor Characteristics. DC Machines with Commutator: Structural Properties; Operational Concepts; Circuit Models of DC Machines; Series, Shunt and Compound Machines; Structural Properties; Rotating Field Theory; Circuit Models of Synchronous Machines; Generator and Motor Operation Cases; Asynchronous Machines; Structural Properties; Circuit Models of Asynchronous Machines; Performance Calculations; Speed Control Techniques and Motor Characteristics.

#### **EEM472 (Eng) Electrical Machinery II**

**2+2 5.0**

Operational Characteristics and Applications of Stepping Motors; Operation and Control of Linear Asynchronous Motors; Motors Used in Rail-way Traction Systems; Single-phase Machines; Capacitor-type Machines; Shaded Pole Machines; Permanent Magnet DC Machines and Speed Control; Starting Properties of Asynchronous Machines; Machines Used for Special Applications; Reluctance and Synchros; Linear Motors. Operational Characteristics and Applications of Step Motors; Operation and Control of Linear Asynchronous Motors; Motors Used in Rail-way Systems; Single-phase Machines;

Capacitor-type Machines; Shaded Pole Machines; Permanent Magnet DC Machines and Speed Control; Starting Properties of Asynchronous Machines; Machines Used for Special Applications; Reluctance and Synchros; Linear Motors.

**EEM473 (Eng) Power Systems Analysis I 3+0 5.0**

Basic Theorems Used in Power Systems; Phasors; Complex Power; Symmetrical Components; Sequence Networks of Load and Rotating Machine Systems; Power Transformers; Transmission-Line Parameters; Differences of Transmission-Line Parameters due to Line Structure; Steady-State Analysis of Transmission-Lines, Equivalent pi Circuit, Maximum Power Flow, Reactive Compensation Techniques. Basic Theorems Used in Power Systems; Phasors; Complex Power; Symmetrical Components; Sequence Networks of Load and Rotating Machine Systems; Power Transformers; Transmission-Line Parameters; Differences of Transmission-Line Parameters due to Line Structure; Steady-State Analysis of Transmission-Lines, Equivalent Pi Circuit, Maximum Power Flow, Reactive Compensation Techniques.

**EEM475 (Eng) Power Electronics I 3+0 5.0**

Uncontrolled Diode Rectifiers; Phase-Controlled Rectifier and Inverter Circuits; Single-Phase and Three-Phase Inverters; DC Switched Converter and Inverter Circuits; Buck, Boost and Full-Bridge DC Converters; DC-AC Switched Inverters; Resonance Converters; Basic Resonance and Load Resonance Converters; Direct Current Power Supplies; Computer Models of Power Electronics Circuits. Uncontrolled Diode Rectifiers; Phase-Controlled Rectifier and Inverter Circuits; Single-Phase and Three-Phase Inverters; DC Switched Converter and Inverter Circuits; Buck, Boost and Full-Bridge DC Converters; DC-AC Switched Inverters; Resonance Converters; Basic Resonance and Load Resonance Converters; DC Power Supplies; Computer Models of Power Electronics Circuits.

**EEM476 (Eng) Power Electronics II 2+2 5.0**

Direct and Alternative Current Motor Driver Systems; Equivalent Circuits; Permanent Magnet DC Servo-Drivers; Asynchronous Motor Drivers; Pulse Width Modulation with Variable Frequency and Square Wave Drivers; Industrial Applications of Power Electronics; Analysis of Current Harmonics; Harmonics Reduction Method; Direct Current Transmission-Lines; Snubber Circuits; SCR Circuits; Special Topics on Industrial Applications. Direct and Alternative Current Motor Driver Systems; Equivalent Circuits; Permanent Magnet DC Servo-Drivers; Asynchronous Motor Drivers; Pulse Width Modulation with Variable Frequency and Square Wave Drivers; Industrial Applications of Power Electronics; Analysis of Current Harmonics; Harmonics Reduction Method; Direct Current Transmission-Lines; Snubber Circuits; SCR Circuits; Special Topics in Industrial Applications.

**EEM477 (Eng) Digital Signal Processing 3+0 5.0**

Discrete Time Systems and Signals; Periodically Sampling, Reconstruction; Changing Sampling Frequency; Z-Transform; Inverse Z-Transform; Linear Time-Invariant Systems; Frequency Response; Systems Described by Difference Equations; Discrete System Functions; Zeros and Poles; Minimum Phase Systems; Graphical Representations of Difference Equations; FIR and IIR Systems; Lattice Structure; Filter Design Methods; Fast Fourier Transform. Discrete Time Systems and Signals; Periodical Sampling, Reconstruction; Changing Sampling Frequency; Z-Transform; Inverse Z-Transform; Linear Time-Invariant Systems; Frequency Response; Systems Described by Difference Equations; Discrete System Functions; Zeros and Poles; Minimum Phase Systems; Graphical Representations of Difference Equations; FIR and IIR Systems; Lattice Structure; Filter Design Methods; Fast Fourier Transform.

**EEM478 (Eng) Digital Signal Processing Hardware 1+4 5.0**

Digital Signal Processors (DSP); Fix Point Processors; Introduction to Texas Instruments TMS3205x Fix Point Processors; Memory Organization; ALU; Interrupts; Serial Ports; Direct Memory Access; C5x Programming; Fixed Point Code Optimisation; Introduction to Floating Point DSP Processors; T1 TMS320C3x Systems; ALU; Interrupts; Serial Ports; DMA; Sampling; Floating Point Programming and Optimisation. Digital Signal Processors (DSP); Fix Point Processors; Introduction to Texas Instruments TMS3205x Fix Point Processors; Memory Organization; ALU; Interrupts; Serial Ports; Direct Memory Access; C5x Programming; Fixed Point Code Optimisation; Introduction to Floating Point DSP Processors; T1 TMS320C3x Systems; ALU; Interrupts; Serial Ports; DMA; Sampling; Floating Point Programming and Optimisation.

**EEM479 (Eng) Electrical Installation Systems 2+2 5.0**

Rules and Standards of Electrical Installation Engineering; Safety of Electrical Installations; Motor, Heating and Illumination Load Connections; Calculations of Supplied Power and Maximum kVA Ratings; Illumination and Load Distribution Factors; Illumination Calculations; Protection Methods Against Short Circuit and Extremely High Voltages; Power Factor Compensation Methods; Schedules and Energy Measurement; Grounding Methods; Distribution Panels; Determination of Conductor Size; Calculation of Voltage Drop; Sample Installation Projects and Project Applications. Rules and Standards in Electrical Installation Engineering; Safety of Electrical Installations; Motor, Heating and Illumination Load Connections; Calculations of Supplied Power and Maximum kVA Ratings; Illumination and Load Distribution Factors; Illumination Calculations; Protection Methods Against Short Circuit and Extremely High Voltages; Power Factor Compensation Methods; Schedules and Energy Measurement; Grounding Methods; Distribution Panels; Determination of Conductor Size; Calculation of Voltage Drop; Sample Installation Projects and Project Applications.

**EEM480 (Eng) Algorithms and Complexity 3+0 5.0**



Mathematical Preliminaries to Define Complexity: Orders of magnitude, Recurrence relations, Time complexity, Space complexity; Recursive Algorithms; Abstract Data Types; Object Orienting Programming Preliminaries; Stacks and Queues; Analyzing of Sorting and Searching Algorithms; Trees: Binary trees search trees, Analysis of Insertion into trees and deletion from trees; Priority queues; Analysis of Hash Tables. Mathematical Preliminaries to Define Complexity: Orders of magnitude, Recurrence relations, Time complexity, Space complexity; Recursive Algorithms; Abstract Data Types; Object Orienting Programming Preliminaries; Stacks and Queues; Analyzing of Sorting and Searching Algorithms; Trees: Binary trees search trees, Analysis of Insertion into trees and deletion from trees; Priority queues; Analysis of Hash Tables.

#### **EEM481 (Eng) Solid State Electronics**

**3+0 5.0**

Semiconductors; Physical Properties of Semiconductors; Atomic Structure of Semiconductors; Energy Bands; Carrier Concentrations; PN-junction Elements; One Pole Elements; Double Pole Elements; Diodes; Bi-junction Transistors (BJT); Field Effect Transistors (FET); Fundamentals of Integrated Circuits; Integrated Circuits Design; Fundamentals of Production of Integrated Circuits. Semiconductors; Physical Properties of Semiconductors; Atomic Structure of Semiconductors; Energy Bands; Carrier Concentrations; PN-junction Elements; One Pole Elements; Double Pole Elements; Diodes; Bi-junction Transistors (BJT); Field Effect Transistors (FET); Fundamentals of Integrated Circuits; Integrated Circuits Design; Fundamentals of Integrated Circuits Production .

#### **EEM482 (Eng) Fundamentals of Data Networks**

**3+0 5.0**

Fundamentals of ISO Reference Model: Layered Structure in Networking; Physical Layer Fundamentals: Bit-rate, Baud-rate; Electrical Data Transfer Methods; Multiplexing; Data Link Layer Fundamentals: Basic protocols, Sliding window protocol and data transfer protocols, Fundamentals of rate-based control and algorithms, Examples of protocols; Network Layer Fundamentals: Datagram and virtual circuits; Routing Algorithms and Efficiency; Fundamentals of TCP/IP: Protocol layers, Packet addressing, Applications of TCP/IP; Socket Interface; Telnet; Ftp; E-mail. Fundamentals of ISO Reference Model: Layered Structure in Networking; Physical Layer Fundamentals: Bit-rate, Baud-rate; Electrical Data Transfer Methods; Multiplexing; Data Link Layer Fundamentals: Basic protocols, Sliding window protocol and data transfer protocols, Fundamentals of rate-based control and algorithms, Examples of protocols; Network Layer Fundamentals: Datagram and virtual circuits; Routing Algorithms and Efficiency; Fundamentals of TCP/IP: Protocol layers, Packet addressing, Applications of TCP/IP; Socket Interface; Telnet; Ftp; E-mail.

#### **EEM483 (Eng) Power Systems Analysis II**

**2+2 5.0**

Power Flow Calculations; Jacobi, Gauss and Newton-Raphson Solution Techniques; Symmetrical and Asymmetrical Short Circuits; Power Systems Controls ; General- Voltage Control; Load -Frequency Control; Transient Operation and Stability of Transmission Lines; Lossy and Lossless Lines; Multiconductor Lines; Insulation Coordination; Transient Model of Synchronous Machine. Power Flow Calculations; Jacobi, Gauss and Newton-Raphson Solution Techniques; Symmetrical and Asymmetrical Short Circuits; Power Systems Controls ; General- Voltage Control; Load -Frequency Control; Transient Operation and Stability of Transmission Lines; Lossy and Lossless Lines; Multiconductor Lines; Insulation Coordination; Transient Model of Synchronous Machine.

#### **EEM484 (Eng) Integrated Circuit Design**

**3+0 5.0**

Fundamentals of Design of Integrated Circuits; Design Techniques of Large Scale Integrated Circuits (LSI); Design Techniques of Very Large Scale Integrated Circuits (VLSI); Bi-Polar Integrated Circuits; MOS Technology and Logic; PMOS, NMOS and CMOS Technologies and Utilization of These Technologies in Integrated Circuits; Structural Design; Design Rules; Placement Methods; Computer Aided Integrated Circuit Design; Simulation of Integrated Circuits; Timing. Fundamentals Design of Integrated Circuits of ; Design Techniques of Large Scale Integrated Circuits (LSI); Design Techniques of Very Large Scale Integrated Circuits (VLSI); Bi-Polar Integrated Circuits; MOS Technology and Logic; PMOS, NMOS and CMOS Technologies and Utilization of These Technologies in Integrated Circuits; Structural Design; Design Rules; Placement Methods; Computer Aided Integrated Circuit Design; Simulation of Integrated Circuits; Timing.

#### **EEM485 (Eng) Digital Electronic Circuits**

**3+0 5.0**

Large Signal Transistor Models; TTL Logic Gates; MOS Logic Gates; CMOS Logic Gates; Inverters; Input and Output Circuits; NAND Gate; NOR Gate; Stability Analysis; Flip-Flops; Astable Multivibrators; Monostable Multivibrators; Bistable Multivibrators; Schmitt Triggers; Memories: RAM, ROM, EPROM, EEPROM; Analogue-Digital and Digital-Analogue Converters. Large Signal Transistor Models; TTL Logic Gates; MOS Logic Gates; CMOS Logic Gates; Inverters; Input and Output Circuits; NAND Gate; NOR Gate; Stability Analysis; Flip-Flops; Astable Multivibrators; Monostable Multivibrators; Bistable Multivibrators; Schmitt Triggers; Memories: RAM, ROM, EPROM, EEPROM; Analogue-Digital and Digital-Analogue Converters.

#### **EEM486 (Eng) Computer Architecture**

**3+0 5.0**

Performance: Measuring performance, Performance metrics, SPEC benchmarks, Comparing and summarizing performance; MIPS Instruction Set Architecture; Arithmetic for Computers: ALU design, Integer multiplication and division, Floating point operations; The Processor: Single cycle datapath design, Controller design for a single cycle datapath, Multicycle datapath design, Controller design for a multicycle datapath; Pipelining: A pipelined datapath and its control, Data hazards and forwarding, Data hazards and stalls, Branch hazards; Caches: Basics of caches, Measuring and improving cache performance. Performance: Measuring performance, Performance metrics, SPEC benchmarks, Comparing and summarizing

performance; MIPS Instruction Set Architecture; Arithmetic for Computers: ALU design, Integer multiplication and division, Floating point operations; The Processor: Single cycle datapath design, Controller design for a single cycle datapath, Multicycle datapath design, Controller design for a multicycle datapath; Pipelining: A pipelined datapath and its control, Data hazards and forwarding, Data hazards and stalls, Branch hazards; Caches: Basics of caches, Measuring and improving cache performance.

**EEM489 (Eng) Microprocessors II 2+2 5.0**

32 Bits Microprocessors; Motorola 68K Series; Command Subsets; Index Modes; 32 Bits Programming; 68K Hardware Elements; Data Buses; Address, Data and Control Buses; Interrupt Definition; Address Analysis; Direct Memory Access; Serial Communication; Digital to Analogue Conversion; Parallel Ports; Arithmetic Operations; Microprocessor Buses VME; General Microprocessor System Design.

**EEM490 (Eng) Nonlinear Systems 3+0 5.0**

Phase Plane Analysis: Constructing phase portraits, Phase plane analysis of nonlinear systems, Existence of limit cycles; Fundamentals of Lyapunov Theory: Equilibrium points, Concepts of stability, Linearization and local stability, Lyapunov's direct method, System analysis based on Lyapunov's direct method; Advanced Stability Theory: Concepts of stability for non-autonomous systems, Lyapunov analysis of non-autonomous systems, Instability theorems, Existence of Lyapunov functions, Positive linear systems and the passivity formalism, Absolute stability; Describing Function Analysis. Phase Plane Analysis: Constructing phase portraits, Phase plane analysis of nonlinear systems, Existence of limit cycles; Fundamentals of Lyapunov Theory: Equilibrium points, Concepts of stability, Linearization and local stability, Lyapunov's direct method, System analysis based on Lyapunov's direct method; Advanced Stability Theory: Concepts of stability for non-autonomous systems, Lyapunov analysis of non-autonomous systems, Instability theorems, Existence of Lyapunov functions, Positive linear systems and the passivity formalism, Absolute stability; Describing Function Analysis.

**EEM491 (Eng) Linear Control Systems 3+0 5.0**

Frequency Response of Linear Systems; Nyquist Criteria; Stability Margins; Lead and Lag Compensator Design; Sensitivity Analysis and Robust Control; Response of Linear Time - Varying Systems; Controllability and Observability; Controllable and Observable Modes; Stabilizability and Detectability; Kalman's Decomposition; Pole Placement by State Feedback; Observers; Pole Placement by Dynamic Output Feedback; Disturbance Rejection and Asymptotic Reference Signal Tracking; Servomechanism Problem. Frequency Response of Linear Systems; Nyquist Criteria; Stability Margins; Lead and Lag Compensator Design; Sensitivity Analysis and Robust Control; Response of Linear Time - Varying Systems; Controllability and Observability; Controllable and Observable Modes; Stabilizability and Detectability; Kalman's Decomposition; Pole Placement by State Feedback; Observers; Pole Placement by Dynamic Output Feedback; Disturbance Rejection and Asymptotic Reference Signal Tracking; Servomechanism Problem.

**EEM493 (Eng) Digital Control Systems 3+0 5.0**

Sampling and Reconstruction; Digital-Analog and Analog-Digital Conversions; Data Sampling Systems; Effect of Sampling Frequency on System Response and Choice of Sampling Frequency; Transient Response of Discrete Time Systems; Steady-State Response of Discrete Time Systems; Frequency Response of Discrete Time Systems; Multi-Rate Sampled Data Systems; Quantization Errors; Pole Placement; Observers; Performance Criteria; Optimal Control; Design of Dynamic Controllers. Sampling and Reconstruction; Digital-Analog and Analog-Digital Conversions; Data Sampling Systems; Effect of Sampling Frequency on System Response and Choice of Sampling Frequency; Transient Response of Discrete Time Systems; Steady-State Response of Discrete Time Systems; Frequency Response of Discrete Time Systems; Multi-Rate Sampled Data Systems; Quantization Errors; Pole Placement; Observers; Performance Criteria; Optimal Control; Design of Dynamic Controllers.

**EEM494 (Eng) Control Systems Laboratory 1+4 5.0**

Industrial Control Applications; Control System Design and Implementation for Examples of Industrial Systems; Analog Controller Design and Implementation for Linear and Non-Linear Systems; Digital Implementation of Analog Controllers; Digital Controller Design for Analog Systems; Choice of Sampling Frequency; Effect of Quantization Errors on System Performance; Utilization of Microprocessors and Programmable Logic Controllers in Control Applications. Industrial Control Applications; Control System Design and Implementation for sample Industrial Systems; Analog Controller Design and Implementation for Linear and Non-Linear Systems; Digital Implementation of Analog Controllers; Digital Controller Design for Analog Systems; Choice of Sampling Frequency; Effect of Quantization Errors on System Performance; Utilization of Microprocessors and Programmable Logic Controllers in Control Applications.

**EEM495 (Eng) Network Synthesis 3+0 5.0**

System Function; Impulse Response of RC, RL, RLC and LC Circuits; Frequency Response of RC, RL, RLC and LC Circuits; Synthesis of RC Circuits; Synthesis of RL Circuits; Synthesis of RLC Circuits; Synthesis of LC Circuits; Ladder Circuits; Filters; Bandwidth and Quality Factor; Design and Realization of Low-Pass Filters; Design and Realization of Band-Pass Filters; Design and Realization of Band-Stop Filters; Computer Aided Circuit Synthesis. System Function; Impulse Response of RC, RL, RLC and LC Circuits; Frequency Response of RC, RL, RLC and LC Circuits; Synthesis of RC Circuits; Synthesis of RL Circuits; Synthesis of RLC Circuits; Synthesis of LC Circuits; Ladder Circuits; Filters;

Bandwidth and Quality Factor; Design and Realization of Low-Pass Filters; Design and Realization of Band-Pass Filters; Design and Realization of Band-Stop Filters; Computer Aided Circuit Synthesis.

**EEM496 (Eng) Communications Systems Laboratory 1+4 5.0**

AM Modulation, DSB Modulation, SSB Modulation; Noise in AM Systems; Frequency Modulation; Transmitters - Receivers; FM Stereo Systems; Noise in FM Systems; PSK and FSK Modulation; Digital Communication Subsystems: Sampling, Quantization and Reconstruction; PCM and PWM Systems; Noise in Digital Systems; Coding; Troubleshooting. AM Modulation, DSB Modulation, SSB Modulation; Noise in AM Systems; Frequency Modulation; Transmitters - Receivers; FM Stereo Systems; Noise in FM Systems; PSK and FSK Modulation; Digital Communication Subsystems: Sampling, Quantization and Reconstruction; PCM and PWM Systems; Noise in Digital Systems; Coding; Troubleshooting.

**EEM497 (Eng) Communication Systems I 3+0 5.0**

Development of Analog and Digital Systems; Signals; Noise and Spectra; Fourier Transform; Random Processes; Power Spectral Density; Correlation Functions; Input and Output Relations in Linear Systems; Signal-to-Noise Ratio; Amplitude Modulation; Double Side Band Transmitter (DSB); Single Side Band Transmitter (SSB); Phase (PM) and Frequency Modulation (FM); Bilateral Phase-Shift Keying (BPSK); PSK; Frequency-Shift Keying (FSK), Frequency Division Multiplexing and FM. Development of Analog and Digital Systems; Signals; Noise and Spectra; Fourier Transform; Random Processes; Power Spectral Density; Correlation Functions; Input and Output Relations in Linear Systems; Signal-to-Noise Ratio; Amplitude Modulation; Double Side Band Transmitter (DSB); Single Side Band Transmitter (SSB); Phase (PM) and Frequency Modulation (FM); Bilateral Phase-Shift Keying (BPSK); PSK; Frequency-Shift Keying (FSK), Frequency Division Multiplexing and FM.

**EEM498 (Eng) Communication Systems II 3+0 5.0**

Historical Development of Digital Systems; Sampling Theorem; Binary Coding; Pulse-Amplitude Modulation; Pulse-Code Modulation; Sampling, Quantization, u-Law and A-Law of Coding Processes; Line Coding; Inter-Symbol Interference (ISI); Delta Modulation; Time-Division Multiplexing (TDM); Pulse-Width Modulation (PWM); Noise Effects on Digital Systems; Error Rate of Binary-Signals. Historical Development of Digital Systems; Sampling Theorem; Binary Coding; Pulse-Amplitude Modulation; Pulse-Code Modulation; Sampling, Quantization, u-Law and A-Law of Coding Processes; Line Coding; Inter-Symbol Interference (ISI); Delta Modulation; Time-Division Multiplexing (TDM); Pulse-Width Modulation (PWM); Noise Effects on Digital Systems; Error Rate of Binary-Signals.

**EEMSJ401 Electrical and Electronics Engineering Internship I 0+2 2.5 (Eng)**

Gaining Work Experience; Adapting to Industrial And Business Life; Experiencing a Real Production and/or Service Environment; Observing Professional Skills, Attitudes and Behaviors; Learning Electrical and Electronics Applications in Institutions/Organizations; Understanding and Recognizing How Theoretical Knowledge is Applied to Real Life Engineering Problems in an Industrial And Business Environment; Report Writing.

**EEMSJ402 Electrical and Electronics Engineering Internship II 0+2 2.5 (Eng)**

Gaining Work Experience; Adapting to Industrial And Business Life; Experiencing a Real Production and/or Service Environment; Observing Professional Skills, Attitudes and Behaviors; Learning Electrical and Electronics Applications in Institutions/Organizations; Understanding and Recognizing How Theoretical Knowledge is Applied to Real Life Engineering Problems in an Industrial And Business Environment; Report Writing.

**ENM102 (Eng) Introduction to Industrial Engineering 2+0 3.0**

Engineering: Industrial engineering, Definitions of task and progress, Topics in Industrial Engineering: Manpower, Capital, Technology Relations, Mutual interaction, Goods and Service Production, Company, Company types, Industrial company; Productivity: Productivity management, Labor study, Time study, Labor evaluation, Labor and Wage; Statistics; Quality and Quality Control; Ergonomics; Facility Planning; Operation Research; use computers in Industrial Engineering.

**ENM104 (Eng) Introduction to Computation and Programming for Industrial Engineering 2+2 4.5**

Introduction to Computer: History of computers, Components of computers; Fundamentals of Algorithms; Pseudocode and Flowcharts; Basic Elements of Programming; Branching Programs; String and Input; Iteration; Some Simple Numerical Programs; Functions, Scoping and abstraction; Structured Types: Tuples, Lists; Algorithm Design and Numerical Solutions of Some Industrial Engineering Problems.

**ENM2006 Manufacturing Technologies and Materials Science 3+0 3.0**

Production Parameters; Material Selection for Manufacturing; Mechanical, Chemical, and Physical Properties in Material Selection; Determination and Importance of Atomic and Crystal Structures in Materials, and Metallurgical Structure in Manufacturing Methods According to Criteria; Solidification, Plastic Deformation, Welding, Casting, Machining Methods,

Glass and Ceramic Production; Powder Metallurgy and Heat Treatment Processes; Other Special Manufacturing Technologies; High-Tech Materials and Production Methods; Introduction to Manufacturing Systems; The Importance of Production Methods in the Selection of Manufacturing Systems.

**ENM203 (Eng) Linear Programming 2+2 5.5**

Methodology of Operations Research; Assumptions of Linear Programming; Modeling with Linear Programming; Graphical Solution; Simplex Algorithm; Big M Method; Two-Phase Simplex Algorithm; Revised Simplex Algorithm; Duality: Primal- dual relationship, Dual simplex algorithm; Sensitivity Analysis; Solution of Linear Decision Models with Computer Software. Methodology of Operations Research; Assumptions of Linear Programming; Modeling with Linear Programming; Graphical Solution; Simplex Algorithm; Big M Method; Two-Phase Simplex Algorithm; Revised Simplex Algorithm; Duality: Primal- dual relationship, Dual simplex algorithm; Sensitivity Analysis; Solution of Linear Decision Models with Computer Software.

**ENM207 (Eng) Advanced Programming 2+2 4.5**

Review of the basic programming concepts; Stack Implementation; Multidimensional lists; Classes and Data Abstractions; Inheritance; Polymorphism; Sort algorithms; Search algorithms; NumPy module; SciPy module.

**ENM212 (Eng) Integer Programming and Network Models 2+2 6.0**

Transportation Models: Transportation table; Assignment Models; Hungarian Algorithm; Network Models; Shortest Path Problem; Minimum Spanning Tree Problem; Maximum Flow Problem; Critical Path Problem; Dynamic Programming; Integer Programming; 0-1 Integer and Mixed Integer Programming; Branch and Bound Algorithm; Branch and Cut Approach; Solution of 0-1 Integer Programming Problems with Computer Software. Transportation Models: Transportation table; Assignment Models; Hungarian Algorithm; Network Models; Shortest Path Problem; Minimum Spanning Tree Problem; Maximum Flow Problem; Critical Path Problem; Dynamic Programming; Integer Programming; 0-1 Integer and Mixed Integer Programming; Branch and Bound Algorithm; Branch and Cut Approach; Solution of 0-1 Integer Programming Problems with Computer Software.

**ENM301 Work Study 3+0 4.0**

Historical Development of Work Study; The importance of ergonomics in work study; concepts in Work study and method study; Work flow diagram, steps of work division and measurement; Determining standard time; Fatigue factor; Synthetic times (MTM, WF, MTA etc.), chronometer method; Applications of method study and work measurement.

**ENM304 (Eng) Investment Planning and Analysis 4+0 6.0**

Investment Concepts in Types of investments; Preparation of investment projects; Evaluation of Investment Projects: Static, Dynamic and multi-criteria evaluation methods; Feasibility; Cost-Benefit Analysis; Optimum Investment Planning; Investments of Establishments and Individuals; Measurement of risk and gain; Stock and money exchange; Investment evaluation process and techniques; Comparison of investment alternatives; Portfolio Theory and its applications.

**ENM306 (Eng) Stochastic Models 3+0 4.5**

Definition of Stochastic Processes; Markov Chain; Chapman-Kolmogorov Equations; Transition Matrices; Classification of States of Markov Chain; Queuing Theory; Exponential Distribution; Birth and Death Process; Queuing Models Involving Exponential Distribution; Queuing Models Involving Nonexponential Distribution; Analytical Solution Methods of Queuing Models; Priority Discipline Queuing Models; Queuing Networks; Queuing Systems. Definition of Stochastic Processes; Markov Chain; Chapman-Kolmogorov Equations; Transition Matrices; Classification of States of Markov Chain; Queuing Theory; Exponential Distribution; Birth and Death Process; Queuing Models Involving Exponential Distribution; Queuing Models Involving Nonexponential Distribution; Analytical Solution Methods of Queuing Models; Priority Discipline Queuing Models; Queuing Networks; Queuing Systems.

**ENM307 (Eng) Simulation 2+2 6.0**

Methodology of Simulation; Simulation Models; Monte Carlo Simulation, Discrete and continuous time simulation; Selection of input probability distribution, Production of random numbers; Data analysis of a system output; Statistical comparison of similar systems. Model events; Introduction to simulation languages; Usage and application of SIMAN and ARENA.

**ENM309 Industrial Information Systems 3+0 6.0**

Database; Introduction to Access Database: Commands, Properties, Table Properties, Construction of Tables, Data Processing; Access Programming, Combining Industrial Engineering Applications with database; Functional Structure Design Specification Methods: IDEF0 Method; Information Structure and Logical Database Design: IDEFIX Method, Design and Modeling Information Systems; Automated Data Collection Systems (SCADA, Barcode etc.) Integration of Information Systems with database used for production and control.

**ENM310 Experiment Design and Regression Analysis 3+0 4.5**

Experiment Design and Analysis: Variance analysis with one factor, two factors, several factors; Hypothesis Tests for Significance of the Model; Model Adequacy Test; Comparisons Among Treatment Means; Simple and Multiple Linear Regression Analysis: Estimation of model parameters by least square methods and by matrix; Estimation of Standard Error; Hypothesis Tests for Significance of Regression; Hypothesis Tests for Significance of Regression Parameters; Residual Analysis; Polynomial Regression Models; Correlation; The Coefficient of Determination; Selection of Variables in Multiple Regression: Forward selection, Backward elimination, Stepwise selection; 2k factorial design and analysis.

**ENM312                      Manufacturing Systems Analysis                      3+0    5.0**

Introduction and Basic Concepts; Evaluation of Manufacturing Systems: Overall system performance, Evaluation criteria in manufacturing, Modeling and simulation of manufacturing systems, Analysis of production lines, Assembling and line balancing; Design of Manufacturing Systems; Computer Integrated Manufacturing Systems: NC, CNC and DNC systems; Parts Programming; Introduction to CAD/CAM Systems: Computer aided quality (CAQ) systems, Robots and analysis of robotics; Operation of Systems; Trends in Manufacturing Systems: Modern manufacturing technologies, Principles of group technology and cellular manufacturing, Factory of the future.

**ENM313                      Mathematical Programming Models in Engineering                      3+0    4.5**

Introduction to Linear Programming: Problem statement, Basic definitions, Linear programming, Problem in standard form, Basic solutions, Sensitivities, Duality; Understanding the Set of all Feasible Solutions; Convex Sets: Linear spaces, Polyhedral convex cones, Polytopes, Polyhedra; Bounded and Unbounded LPP: Models and GAMS package, Transportation problem, Production scheduling problem, Diet problem, Network flow problem, Portfolio problem, The 0-1 knapsack problem, Academy problem and school timetable problem, Identifying relevant symptoms, Models of discrete location.

**ENM314 (Eng)            Investment Analysis                      3+0    5.0**

Understanding powerful relationships between risk, return, and price. Intuitively explore the baseline fundamental law of Financial Analysis. Calculating stock returns for dividend and non-dividend paying stocks, manually. Estimating expected returns using the mean method. Estimating expected returns using state contingent weighted probabilities. Estimating expected returns using Asset Pricing Models including the Capital Asset Pricing Model. Estimating the total risk, market risk of a stock. Estimating the return of a multi-asset portfolio. Measuring the risk of a multi-asset portfolio. Exploring Diversification, Optimisation Risk reduction by diversification.

**ENM315 (Eng)            Nonlinear Programming                      2+2    6.0**

Nonlinear Programming; Convex Function; Concave Function; Convex Set; One-Variable Unconstrained Models; Bisection Method; Newton Method; Multivariable Unconstrained Optimization; Gradient Search Method; Multivariable Constrained Optimization; Karush-Kuhn-Tucker Conditions; Convex Programming; Frank-Wolfe Algorithm; Sequential Unconstrained Minimization Technique (SUMT). Nonlinear Programming; Convex Function; Concave Function; Convex Set; One-Variable Unconstrained Models; Bisection Method; Newton Method; Multivariable Unconstrained Optimization; Gradient Search Method; Multivariable Constrained Optimization; Karush-Kuhn-Tucker Conditions; Convex Programming; Frank-Wolfe Algorithm; Sequential Unconstrained Minimization Technique (SUMT).

**ENM316 (Eng)            Statistical Forecasting and Time Series                      2+1    5.0**

Analysis of Time Series Data, Components and Visualization, Correlation and Autocorrelation, Analysis of Prediction Errors, Moving Averages, Exponential Smoothing, Holt Method, Winters Method, Autoregressive Models, Regression, Machine Learning Models

**ENM317                      Engineering Statistics                      3+0    4.5**

Data: Classified Data; Mean; Distribution Measurements; Sampling: Sampling error, Sampling distribution, t Distribution, F Distribution, Chi-Square test; Statistical Estimation: Estimation of population parameter, Point estimation, Confidence interval estimation; Hypothesis Testing: Hypothesis tests for means, proportions and variances, Hypothesis testing for small and large samples; Nonparametric Statistical Testing: Sign test, Sign test for large samples, Sign test for paired observation, Wilcoxon sign ranking test; Goodness of Fit: Test of Chi-Square, Kolmogorov-Smirnov test, Independence test, Homogeneity test.

**ENM319 (Eng)            Production and Operations Planning I                      3+0    5.0**

Common Concepts and Basic Definitions of Production and Operations Management; Forecasting: Qualitative forecasting techniques, Quantitative forecasting techniques, Forecasting errors; Sales and Operations Planning: Aggregate planning of capacity, Workforce planning; Service Operations Management; Push and Pull Production Control Systems: Lot sizing, Material requirements planning, Explosion calculus, Just in time production systems.

**ENM320 (Eng)            Production and Operations Planning II                      3+0    5.0**

Basic Concepts of Inventory Control; Inventory Control Subject to Known Demand: Economic order quantity model, Extensions of economic order quantity model, Quantity discount models; Inventory Control Subject to Uncertain Demand:

Newsvendor model, (Q, R) model, Service levels; Supply Chain Management; Operations Scheduling: First come first served, Shortest processing time, Earliest due date, Critical ratio scheduling; Project Scheduling: CPM model, PERT model.

**ENM321 Industrial Case Studies 3+0 5.0**

Interview; Case Questions; Case Analysis; Graph Analysis; Case Analysis Tools; Effective Use of Graphs; Case Analysis Frameworks; Data Interpretation; Effective Use of Graphs; SWOT Analysis; Fishbone; 5P; 7S; Ivy Case System; Business World; Real-life Problems; Industrial Case; Communication; Presentation; Data Visualization; Data Analysis; Critical Thinking; Brainstorming; Strategic Thinking; Analytical Thinking; Cause and Effect Relationship; Storytelling with Data.

**ENM323 (Eng) Energy Systems Planning 2+1 5.0**

Historical trends in energy supply and demand; renewable energy sources and related technologies. Global climate change, security, reliability and economic issues in energy operations and planning issues. Energy demand and supply forecasting, energy transportation and storage. Smart grid and generation expansion decisions. Problem solving techniques and methods applied in the pursuit of decision making in energy systems.

**ENM325 (Eng) Theory and Algorithms in Nonlinear Programming 2+1 5.0**

Nonlinear Programming Problems and Examples of Mathematical Model; Convex Set; Convex Function; Concave Function; One Variable Unconstraint Optimization Problems, Mathematical Models and Algorithms: Bisection Method, Newton Method; Multi Variable Unconstraint Optimization Problems, Mathematical Models and Algorithms: Gradient Search Method, Multi Variable Newton Method; Multi Variable Constraint Problems, Mathematical Models and Algorithms: Karush-Kuhn-Tucker Conditions, Frank-Wolfe Algorithms, The Sequential Unconstrained Minimization Technique (SUMT).

**ENM326 (Eng) Network Optimization and Algorithms 3+0 5.0**

Basic Concepts About Network Models; Shortest Path Problem and Its Applications; Algorithms for The Shortest Path Problem; Maximum Flow Problem and Algorithms; Max Flow-Min Cut Theorem and Ford Fulkerson Algorithm; Minimum Cost Network Flow Problem and Algorithms; Assignment and Matching Problems; Minimum Spanning Tree Problem; Project Management; Network Simplex Algorithm.

**ENM407 (Eng) Systems Analysis 3+0 5.0**

Introduction to Systems; System Engineering; Design of Conceptual Systems: Needs Analysis; Feasibility Analysis; Functional Analysis; Synthesis And Evaluation; System Specification; Preparing For System Design: Functional analysis of sub systems, Design parameters; Detailed System Design and Development: Detailed design needs, Combining system elements, Design engineering activities, Detail design equipment, Documentation of design and development of a prototype; Testing The Systems And Evaluation; System Analysis Tools; Alternatives And Models of Decision-Making; Or Economical Evaluation Models, Optimization of Design And Operations

**ENM411 Facility Planning 3+0 4.5**

Facility Location Selection; Numerical Analysis of Facility Location Problem; Analysis of Models; Facility Location Projects, Project Management Techniques; Design of Layout; Required Knowledge And Analysis; Activity Grouping And Department Designation. Material; Handling System; Determining Equipment, Manpower and Area Requirements; Computer Aided Facility Planning.

**ENM411 (Eng) Facilities Planning 3+0 4.5**

Facility Location Selection; Numerical Analysis of Facility Location Problem; Analysis of Models; Facility Location Projects, Project Management Techniques; Design of Layout; Required Knowledge And Analysis; Activity Grouping And Department Designation. Material; Handling System; Determining Equipment, Manpower and Area Requirements; Computer Aided Facility Planning.

**ENM413 Planning and Scheduling in Manufacturing and Service Systems 3+0 4.0**

Introduction to Scheduling; Manufacturing models and service models; Exact Optimization Methods and Heuristic Solution Techniques; Project Planning and Scheduling; Machine Scheduling and Job Shop Scheduling; Economic Lot Scheduling; Scheduling and Timetabling in Sports; Timetabling in Educational Systems; Planning, Scheduling and Timetabling in Transportation; Workforce Scheduling.

**ENM413 (Eng) Planning and Scheduling in Manufacturing and Service Systems 3+0 4.0**

Introduction to Scheduling; Manufacturing models and service models; Exact Optimization Methods and Heuristic Solution Techniques; Project Planning and Scheduling; Machine Scheduling and Job Shop Scheduling; Economic Lot Scheduling; Scheduling and Timetabling in Sports; Timetabling in Educational Systems; Planning, Scheduling and Timetabling in Transportation; Workforce Scheduling.

**ENM415 Design, Creativity and Innovation 3+0 4.5**

Industrial design basic concepts; Design theories and methods: practical solutions, solve the problem; Design of product; Creativity; Innovation: conversion to the profitable product/ service, relationship of marketing; Creativity Methods; converting the creativity opinion to the innovation; Intellectual Property: patent, register of design; Entrepreneurship: job scheduling, government aid, challenges and risks; Management of the innovation.

**ENM419 (Eng) Sustainable Systems Engineering 3+0 5.0**

Definition, History and Basic Concepts of Sustainability; Life Cycle Assessment; Carbon Footprinting; Carbon Regulations and Carbon Pricing; Waste Management and Waste Regulations; Green Inventory Management and Facility Location; Closed-Loop Supply Chains; Corporate Social Responsibility; Responsible Sourcing, Case Studies Related to Sustainability Initiatives in Industries.

**ENM420 Service Systems 3+0 4.5**

Definition of Service Systems; Fundamental Components; Properties of Service Systems; Operation Characteristics in Service Systems; Queue models; Quality in Service; Customer Fidelity; Performance Criterion in Service Systems.

**ENM421 Introduction to Data Science 2+1 4.5**

Introduction: What is data science? Applications of Python Libraries in Data Science: Data manipulation, Data analysis, Data visualization and interpretation; Data Collection from Different Sources, Cleaning and Preprocessing; Types of Machine Learning: Regression, Classification, Clustering and Python applications; Text Processing Applications; Recommendation Systems Applications; Image Processing Applications.

**ENM423 (Eng) Queuing Models 3+0 5.0**

Introduction to queuing systems and understanding the basic features of queuing systems. Examination of the characteristics of queuing systems, Examination of single or multi-service queuing models. (M/M/1, M/M/c, G/M/c, M/G/1). Performing equilibrium analysis. Ensuring optimal control of queues. Examination of queuing networks. Applications of queuing theory in production and computer systems. Introduction to queuing systems and understanding the basic features of queuing systems. Examination of the characteristics of queuing systems, Examination of single or multi-service queuing models. (M/M/1, M/M/c, G/M/c, M/G/1). Performing equilibrium analysis. Ensuring optimal control of queues. Examination of queuing networks. Applications of queuing theory in production and computer systems.

**ENM425 (Eng) Scheduling 3+0 5.0**

Introduction to Scheduling; Scheduling Problems in Manufacturing and Service Systems; Performance Measures in Scheduling Problems; Single Machine Scheduling Problems and Solution Methods; Job Shop Scheduling Problems and Solution Methods; Heuristic Solution Approaches; Workforce Scheduling Problems; Exam Scheduling Problems; Sports Scheduling Problems; Transportation Scheduling Problems.

**ENM426 (Eng) Ergonomics 3+0 4.5**

Concept of Ergonomics; Human Body: Movement systems, Nervous systems, Perceptive organs, Energy needs; Practical Anthropometrics; Environment at the Work Place: Temperature, Humidity, Air Activities, Lighting, Noise, Vibration; Relation Between Ergonomics And Work Study; Components of Human-Machine Systems; Principles of Ergonomics At Work; Engineering Anthropometrics; Role of Ergonomics On Quality And Productivity; Energy Needed During work.

**ENM429 Quality Engineering Methods for Product and Process Design 3+0 5.0**

Taguchi Approach for Product and Process Design: System design, Robust parameter design, Tolerance design; Fractional Factorial Designs; Orthogonal Array Experiments; Quality Loss Function; Signal-to-Noise Ratio; Crossed Array Design; Response Surface Methodology; Experimental Designs Used in Modeling Response Surfaces; Combined Array Design and Response Model Approach; Dual Response Optimization.

**ENM430 Cognitive Ergonomics 3+0 4.5**

Introduction to human factors; Human Information Processing; Visual and Auditory Sensory Systems; Cognition; Memory; Attention and Perception; Decision Making; Mental Workload; Human Error; Situational Awareness; Stress; Motivation and Job Satisfaction; Potential Applications of Cognitive Ergonomics. Introduction to human factors; Human Information Processing; Visual and Auditory Sensory Systems; Cognition; Memory; Attention and Perception; Decision Making; Mental Workload; Human Error; Situational Awareness; Stress; Motivation and Job Satisfaction; Potential Applications of Cognitive Ergonomics.

**ENM431 Advanced Production Systems 3+0 4.5**

Definition of production system; Traditional and Group Technology Production Systems; New Production Systems: Lean Production Systems and Toyota Philosophy; Learning to see, Value Stream Map, TAKT time, Group Technology, Cellular Production System, Flexible Manufacturing System, Agile Production System; Concept of Constraints, Green Production, Recycle approach.

- ENM432      Lean Thinking and Lean Manufacturing Management      3+0   4.5**  
 Manufacturing Systems; History of Manufacturing Systems; 7 base muda's; Muda's caused production activities ; What is the important non value added activities; How many techniques will be used to remove mudas; Value; Value Flow; Value Flow Maps; Kanpan; One piece flow; TAKT Time; Labor efficiency; Inventory reducing; Lean Six sigma Phases Manufacturing Systems; History of Manufacturing Systems; 7 base muda's; Muda's caused production activities ; What is the important non value added activities; How many techniques will be used to remove mudas; Value; Value Flow; Value Flow Maps; Kanpan; One piece flow; TAKT Time; Labor efficiency; Inventory reducing; Lean Six sigma Phases
- ENM435      Engineering Seminars I      0+2   1.5**  
 Series of seminars where industrial engineers working at service and manufacturing sectors and academicians at national and international universities share their knowledge and experience with students.
- ENM437 (Eng)   Structural Equation Modeling      3+0   4.5**  
 Structural Equation Models: Terminology and Application Areas; Basic Theory of Principal Components Analysis, Exploratory and Confirmatory Factor Analyses and Their Applications; Path Analysis; Models with Only Manifest Variables; Models With Latent Variables and General Models; Model Specification; Model Identification and Model Estimation; Evaluation and Development of Models: Model fit indices, Model testing and model modifications; Application Tools and Techniques of Structural SEM.
- ENM440 (Eng)   Introduction to Data Mining      3+0   4.5**  
 Introduction; Data: Types of data, Data preprocessing, Measures of similarity and dissimilarity; Exploring Data: The iris data set, Summary statistics, Visualization, OLAP and multidimensional data analysis; Classification: Basic concepts, Decision trees, Model evaluation, Nearest-neighbor classifiers, Bayesian classifiers, Artificial neural network (ANN), Support vector machine (SVM), Multiclass problems; Association Analysis: Basic concepts, Frequent item set generation; Cluster Analysis: Basic concepts, K-means, Cluster evaluation; Anomaly Detection: Statistical approaches, Clustering-based techniques.
- ENM442 (Eng)   Decision Analysis      3+0   4.5**  
 Decision Theory; Classification of Decision Problems; Decision Environments: Decision-making under uncertainty, Decision-making under risk; Utility Theory: Axioms of utility theory; Decision Trees: Use of decision trees under certainty, uncertainty and risk; Complete and Incomplete Information: Expected value of information; Decision-making in Multi-Criteria Environment; Multi-Objective Optimization Problems; Goal Programming. Decision Theory; Classification of Decision Problems; Decision Environments: Decision-making under uncertainty, Decision-making under risk; Utility Theory: Axioms of utility theory; Decision Trees: Use of decision trees under certainty, uncertainty and risk; Complete and Incomplete Information: Expected value of information; Decision-making in Multi-Criteria Environment; Multi-Objective Optimization Problems; Goal Programming.
- ENM444      Supply Chain Modeling And Analysis      3+0   4.5**  
 Fundamentals of Supply Chain Management; Supply Chain Operations: strategic, tactical, and operational; Network Design in The Supply Chain: vehicle routing, transportation, facility location, capacity planning; Planning and Managing Inventories in a Supply Chain: Cycle inventory, safety inventory, determining the optimal level; Supply Chain Analysis; Management of Uncertainty in Supply Chain; Measuring Supply Chain Performance, Supplier Relationship Management; Supply Chain Management Softwares.
- ENM446      Enterprise Resource Planning      3+0   4.5**  
 System Modelling; Data Flow; Database and Relations, Data and process modelling; Information Processing, Information processing phases, Information processing methods; Information System Applications: Enterprise resource planning, Enterprise resource planning modules: Material management, Production planning, Sales and distribution management, Warehouse management, Quality management, Customer relationship management, Service management, Human resource management, Financial modules; Application of Modules.
- ENM448 (Eng)   Project Planning and Management      3+0   6.0**  
 Project Management and its Steps; Project Management Process: Scoping agreement, Requirement statements, Task list, Work breakdown structure, Milestones; Developing a Plan and Scheduling a Project: CPM-PERT; Scheduling Resources and Costs; Reducing Project Duration; Leadership and Project Teams; Monitoring Project: Progress and Performance Measurement and Evaluation; Project Closure.
- ENM450 (Eng)   Introduction to Metaheuristic Optimization      3+0   6.0**  
 Optimization Models: Structure, Models, Exact solution methods; Introduction to Metaheuristic Optimization Methods: Np-hard problems, Necessity of metaheuristic optimization, Fundamentals, Hill climbing algorithm; Single-Solution Based Metaheuristics: Tabu search algorithm, Simulated annealing algorithm; Implementation of algorithms and industrial engineering applications; Evolutionary Algorithms: Fundamentals, Genetic algorithms, Ant colony algorithms, Bee colony algorithms, Implementation of algorithms and industrial engineering applications.



**ENM452 (Eng) Introduction to Multiobjective Optimization 3+0 5.0**  
 Basic Concepts: Decision variables space, Objectives space, Order relations in vector space and examples, Pareto optimality; Weighted Sum Method;  $\epsilon$ -Constrained Method; Benson Method; Chebyshev Scalarization Method; Pascoletti-Serafini Scalarization Method; Conic Scalarization Method; Goal Programming; Application of Scalarization Methods to an Industrial Engineering Problem.

**ENM454 (Eng) Risk Assessment and Hazard Analysis Techniques 3+0 4.5**  
 Fundamental Concepts of Risk Assessment; Risk Management; System Safety Concept; Causes of Accident Occurrence; Risk Assessment in Legislation; ISO 45001; Hazard Analysis Techniques: Methods using checklist and similar forms, Methods using matrix and form, Methods using flow diagrams, Other assessment methods; Risk Assessment and Hazard Analysis Techniques Practices; Precautions; Reporting of Occupational Accident and Risk Assessment. Fundamental Concepts of Risk Assessment; Risk Management; System Safety Concept; Causes of Accident Occurrence; Risk Assessment in Legislation; ISO 45001; Hazard Analysis Techniques: Methods using checklist and similar forms, Methods using matrix and form, Methods using flow diagrams, Other assessment methods; Risk Assessment and Hazard Analysis Techniques Practices; Precautions; Reporting of Occupational Accident and Risk Assessment.

**ENM456 Futures Thinking and Technology Foresight 2+0 3.0**  
 Future Thinking; Technology Forecasting; Scenario Analysis; Technology Management; Sectoral Applications; Forecast Analysis Tools; Technology Management Tools; International Future Thinking; Information Gathering; Intelligence Gathering; Information Gathering Tools; Future Description; Policy Development; Strategy Development; Futuristic Initiatives; Defense Industry; Open Innovation; Policy Testing; Strategy Testing.

**ENM457 Industrial Engineering Graduation Project I 2+2 4.5**  
 Defining the Problem; Creating the Project Plan; Evaluating the Contribution of the Project in Terms of Entrepreneurship and Innovation; Evaluating the Effects of the Project on Society Health and Safety Economy Sustainability and Environment by Considering the UN Sustainable Development Goals; Reviewing the Literature Related to the Project; Evaluating the Appropriate Solution Approaches for the Project and Determining Which Solution Approach Will Be Used; Developing Solution Approaches for the Problem.

**ENM458 Industrial Engineering Graduation Project II 2+3 5.5**  
 Developing Solution Approaches for the Problem; Determining the Problem Parameters; Solving the Problem with Developed Solution Approaches; Making Sensitivity and Cause-Effect Analyses about the Problem; Evaluating the Results and Determining Improvement Suggestions; Evaluating the Effects of the Project on Society Health and Safety Economy Sustainability and Environment by Considering the UN Sustainable Development Goals; Preparing a Report of the Study in Thesis Format.

**ENMSJ401 Industrial Engineering Internship I 0+2 2.5**  
 Professional Knowledge, Skills, Attitudes and Behaviors; Recognition of Business Areas and Industry; Gaining Work Experience; Learning Basic Computing Processes; Implementing Various Programs in Business; Data Transfer Between Departments; Interdepartmental Relations; Recognition of Software Programs; Recognizing Physical Items such as Materials, Machines and Workbenches; Analyzing the use of Items such as Materials, Machines and Workbenches in Production; Mathematical Modeling and Solving; Performing System Analysis and Proposing a New System; Report Writing and Editing.

**ENMSJ402 Industrial Engineering Internship II 0+2 2.5**  
 Professional Knowledge, Skills, Attitudes, and Behaviors; Recognition of Business Areas and Industry; Gaining Work Experience; Production Planning and Control; Forecasting; Work Study; Learning Quality Control Processes; Analyzing Ergonomic Conditions; Examining the Effects of Production on the Environment; Problem-Solving; Developing Computer Program; Project Planning and Execution; Performing System Analysis and Proposing a New System; Report Writing and Editing.

**ESTÜ1001 Story Analysis On World Literature 3+0 3.0**  
 Introduction and Description of the Story: General features; Historical Development of the Story Genre: Classical story understanding and Maupassant style, Chekhov style; Basic Elements of Story Analysis: Person, Time, Place, Theme, Language and Style, Structural Analysis of the Story; Maupassant Style Story Analysis: Plot and classical narrative understanding; Chekhov Style Story Analysis: Mood, character-oriented narration and modern story understanding; Existential Story Studies: Existentialism and the individual's search for meaning; Story in Turkish Literature: Depiction of people, nature and daily life, Postmodern understanding of story, irony and narrator characteristics, Minimalist narration and distribution; General Discussion and Comparison of Stories.

**ESTÜ1003 Yoga and Meditation 1+1 2.0**

Definition Yoga and Meditation; Yoga and Meditation Benefits; Basic Purposes of Yoga: Breath, Body awareness, Balance; Basic Principles of Meditation; Basic Yoga and Meditation Exercises, Yoga Poses.

**ESTÜ101 Introduction to University Life 0+1 2.0**

Orientation: Concept of university and understanding of university, General information about Eskisehir, Education and student discipline regulations, Ethics at the university, National and international exchange programs, General services of university, Faculty/department orientations; Self-improvement seminars: Research projects, Entrepreneurship, Respect to diversity, Social gender, Leisure philosophy, Zero waste and sustainability, Career planning and mind mapping, Scientific thinking and observation, Barrier - free living, Carbon footprint, Start-up practices, Project based internship.

**ESTÜ102 Negotiation Techniques Class 2+0 3.0**  
**(Eng)**

Basic Concepts: Communication, Communication Process, Individual Communication, Corporate Communication, Communication Conflicts, Communication Tools, Communication Problems, Negotiation Process, Definition of Negotiation, Stages of Negotiation, Negotiation Process, Negotiation Problems; Conflict Management: Communication and Conflict, Types of Conflict, Conflict Management; Crisis Management: Crisis in Communication, Crisis Assessment, Types of Crisis, Crisis Management Plan, Examples of Successful Crisis Management; Negotiation, Social Media and Communication, Negotiation and Social Media, Communication Techniques in Social Media; Effective Communication and Negotiation

**ESTÜ103 Ceramic Design Processes 2+1 3.0**

Ceramic Design: Definition, Uses, Functions; Principles of Ceramic Design: Line, Color, Texture, Form, Scale, Direction; Analyzing of Design Methods Related to Ceramic; Prepare a Draft Study on the Subject; Prepare a Project With Designs; Determination and Preparation of Ceramic Sludge Types Used in Forming; Defined Production Methods and Knowledge Series Production Methods; Drying; Bisque Firing; Glazing and Glazed Firing.

**ESTÜ104 Academic and Life Skills 2+1 3.0**

Self-Awareness: Development of self, Early adulthood and self-concept; Values and Goals: Goal setting, Concrete goals and priorities. Considering resources; Effective time Management: Management and planning Definition of Stress; Psychological and Physiological Aspects of Stress; Emotions, Cognitive processes; Coping with Stress. Definition of Stress; Psychological and Physiological Aspects of Stress; Emotions, Cognitive processes; Coping with Stress.

**ESTÜ104 (Eng) Academic and Life Skills 2+1 3.0**

Self-Awareness: Development of self, Early adulthood and self-concept; Values and Goals: Goal setting, Concrete goals and priorities. Considering resources; Effective time Management: Management and planning Definition of Stress; Psychological and Physiological Aspects of Stress; Emotions, Cognitive processes; Coping with Stress. Definition of Stress; Psychological and Physiological Aspects of Stress; Emotions, Cognitive processes; Coping with Stress.

**ESTÜ105 Big Data Analysis with SQL 2+2 4.5**

**ESTÜ106 Proje Yönetimi 2+1 3.0**

Project Management Fundamentals: Definition of project; Human Resources and Communication Management; Quality Management in Projects; Procurement Planning in Projects; Stakeholders Management; Gantt Chart; Causality Relationship Between Activities; SWOT Analysis; Planning of Risk Management in Projects; Project Compression Analysis and Cost Management; Project Resources and Resource Scheduling; Project Monitoring with Earned Value Management; Control and Progress in Line with the Objective of the Projects; R&D Sample Projects; Project Practices.

**ESTÜ111 Volunteering Works 1+2 4.0**

Management and Organization Concepts; The Concept of Volunteering and Volunteer Management; Fundamental Volunteering Areas (Disaster and Emergency, Environment, Education and Culture, Sports, Health and Social Services etc.); Project Development Related to Volunteer Work and Participation in Volunteer Work in the Field; Ethics, Moral, Religious, Traditional Values and Principles in Volunteer Work; Participation in Voluntary Work in Public Institutions, Local Governments and Non Government Organizations (NGOs); Risk Groups in Society and Volunteering; Immigrants and Volunteering.

**ESTÜ112 Cyber Security for Everyone 2+0 2.0**

Basic Concepts: Computer components and definitions; Software: System software, Application software; Computer Networks: Concept of Network and Internet; Malware and Network Attacks: Viruses, Attacks; Computer and Access Security: Password selection, File sharing, Backup; Internet security: SSL, Fake websites; Security on Social Platforms: Fake news and people; Security Analysis: System analysis, Network traffic analysis; System and Network Security: Network

<b>ESTÜ113</b>	<b>Design Thinking</b>	<b>3+0 3.0</b>
<p>Design Thinking Concepts: Design thinking, Human-centered design, User research, Problem identification, Problem definition, Empathy, Idea development, Creativity, Idea elimination and selection, Low-precision prototyping, High-precision prototyping, User tests, Usage tests, Usability, Revision and iteration, Visual thinking, User-centered design, Design processes and innovation, applications, Presentation techniques.</p>		

<b>ESTÜ115</b>	<b>Photographic Viewpoint</b>	<b>2+1 3.0</b>
<p>Course Introduction: Project work; Research and Discussion of the Project Subject: Evaluation of research results, Successful examples from photography and graphic art, Examination of examples of selected works, Determination of application subjects, Discussion of application possibilities, Basic design elements and principles in photography and graphic design process, Trial shooting and evaluation; Light and Lighting: Color and functions of color; Photography Techniques: Visual editing, Reading photographs; Methods and Techniques in Applied Photography: Technical evaluation of photographs and development stages of the photographs; Basic Rules of Composition in Photography: Perspective, Balance, Proportion, Texture, Shape, Perspective, Lens selection and application; Shooting Process and Graphic Interventions on Photographs; Photographic View Methods: Evaluation of shooting results; Preparation of Portfolio: Portfolio evaluation, Presentation methods and techniques, Exhibition preparation methods.</p>		

<b>ESTÜ117</b>	<b>Computer Aided Design II</b>	<b>3+0 3.0</b>
<p>Concepts of Computer Aided Design: Surface and solid modeling, Differences between surface and solid modeling, Surface creation, Arrangement; Sheet Metal Processing: Sheet metal processing creation and editing; Advanced Modeling Tools: Product part modeling; Introduction to Simulation: FEA simulation, Analyzing and interpreting simulation results; Generative Design: Generative design concept, Generative design tools, Simulating and evaluating generative design results; Manufacturing Tools: 3D printing, Introduction to CAM, Introduction to electronics.</p>		

<b>ESTÜ119</b>	<b>Flute</b>	<b>3+1</b>	<b>3.0</b>
<p>Breath Work: Breathing exercises the diaphragm and correctly use various activation studies; Technical Studies: Stance, Grip, Position, Fingering and embouchure work; Learning the Notes on the Flute: Learning the notes on the flute with octaves, The octave positions of the lip according to the study, A long blowing sound with learned notes; Technical Development; Proper Studies to be Determined by Instructor According to Student's Performance on the Scales: With learned notes, Sharp, Flat, Major and Minor, According to the ranking exercises scales; Flute Repertoire in the Context of Period, Style and Interpretation: Selected works according to student performance from periods in music history.</p>			

<b>ESTÜ120</b>	<b>Solfege</b>	<b>3+1</b>	<b>3.0</b>
Octave of the Tone to be Specified According to The Groups; The Signs Used in Writing Music; Signs Spelling Rules; Staff and Additional Lines; Arrays and Intervals; Major and Minor Scales, Interests, and Varieties: Natural, Harmonic, Melodic; Measure and Time; The Terms of the Transaction; Marks of Dynamics; The Expression of Terms; According to Student Level and Profile to be Created Reading Pieces by the Teacher; Reading with Piano Accompaniment; Rhythmic Perception			

<b>ESTÜ121</b>	<b>Piano</b>	<b>3+1</b>	<b>3.0</b>
<p>Starting Position on the Piano: By taking into consideration to correct position of hands, Arms, Fingers, And feet; Technical Development Exercises: Etudes, Scales, Chords and arpeggios studies; Techniques of Touching Piano Keyboard, Staccato, Legato, Non Legato; Information About Dynamics; Working with Learning Notes and Octaves: One hand and double hand into small pieces-small parts; Style and in the Context of Your Comment Piano Repertoire: Baroque, Classical, Romantic, And modern Turkish composers will be given according to the performance of student works.</p>			

ESTÜ123	Gender Equality in Work Life	2+0	3.0
<p>Understanding Gender; Historical and Social Foundations of Gender Equality; Gender and Education; Gender and STEM; Status of Women's Employment in Turkey; Decent work conditions and gender equality, Status of women's employment in the world; Production and Reproduction of Feminine and Masculine Identities in Work Life; Importance of Gender Equality in Work Life; International Norms and Standards on Gender Equality in Work Life; Legal Framework and National Policies on Women's Employment in Turkey; Gender and Leadership; Project Presentations.</p>			

<b>ESTÜ127</b>	<b>Diction</b>	<b>1+2</b>	<b>3.0</b>
Basic Elements of Diction; Pronunciation defects; Breathing Development and Diaphragm Exercises; Pronunciation Disorders; Rules about vowels; Correct Pronunciation of Words; Spelling and Pronunciation of Confused Words; Stress Exercises; Intonation Exercises; Pronunciation Exercises; Things to Do for Effective Speaking; Prepared Speech; Unprepared Speech; Vocalization Applications.			

<b>ESTÜ130</b>	<b>Turkish as a Foreign Language II</b>	<b>2+0</b>	<b>2.0</b>
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<b>ESTÜ132</b>	<b>History of Political Thought</b>	<b>3+0</b>	<b>3.0</b>
<p>Society, Thought and Fiction: Primitive societies and the beginning of thought, The emergence of political fiction; From Organic Evolution to Social-Cultural Evolution: Man's life in the stone ages, Primitive society's way of thinking; Transition from Primitive Community to Civilized Society and Spread of Civilization: Birth of the first civilized society and social division of labor, Spread of civilizations; Political Thinking in Pre-Greek Civilizations: Political Thought in Mesopotamia, Egypt and Anatolia; Political Thinking in Contemporary Greek Civilizations: Political Thinking in Persia, India, China, and the Hebrews; Society and political thought in ancient Greece; Society and Political Thinking in Rome: Economic and socio-political developments in Rome, political thinking in Rome; Society and Political Thinking in the Medieval Latin World:</p>			

Economic, social and political developments in the Latin world; political thought in the Latin world; Society and Political Thinking in the Modern Age: Economic, social and political developments in Western societies, transition from feudal order to capitalist system; Political Thinking in Modern Western Societies: Religious Reform, Absolute Monarchy and Enlightenment.

**ESTÜ133                      Disability and Awareness                      3+0    3.0**

Basic Concepts and Definitions in Special Education, History of Special Education Legal Basis of Special Education, Disabled Individuals and Their Characteristics, Disability and Discrimination, Accessibility is a Human Right! Universal Design, Disability Friendly Approach, Social and Adaptation Skills of Individuals with Disabilities, Business and Vocational Skills and Employment in Individuals with Disabilities, Social Contact in Individuals with Disabilities.

**ESTÜ2001                      AI Literacy                      2+0    2.0**

The general aim of this course is to provide undergraduate students from various disciplines with AI literacy. It enables students to understand the fundamental concepts of AI, recognize its applications in daily life and various sectors, use common AI tools effectively and responsibly, and critically evaluate the ethical and societal implications of AI technologies. The course aims to empower students to become informed citizens and adaptable professionals in an increasingly AI-driven world.

**ESTÜ201                      Turkish Sign Language                      3+0    3.0**

Deaf Society and Culture: Concept of Hearing Impaired and Deaf. Discrimination against deaf society (Audism). What is sign language? The place of it in deaf culture and social life. Sign language interpretation. 1st Grade Turkish Sign Language Education: Foundational concepts and terms. Sign language basic sentence structures and patterns, dialogue, sign language usage space and fluency, fingerspelling, use of non-manual expressions (gestures, mimicking, facial expressions, head and body positions), hand shapes and use, colours, numbers, syntax, directional verbs, self-introduction, comprehension.

**ESTÜ203                      Introduction to Sociology                      3+0    3.0**

Science, Society, Sociology: The comparison of physical science and social science, The Birth of Sociology, Theoretical Perspectives in Sociology: Development of sociology, classical and modern sociology; Social Change and Globalization: Theories of social change, Modernism and post-modernism, Culture and Society: Culture of sociology, Gender Equality, The socialization of gender; Work and Economy; Fordism, post-fordism, work and occupations, Political Sociology: Ideology; Sociology of Family: Family from sociological perspectives; Religion and Society; Law, Crime and Society: social deviance, Urbanization and Environment: Risk society.

**ESTÜ204                      Effective Reading and Writing Skills                      3+0    4.0**

The Activities Which Contribute The Reading And Writing Skills: Literary texts, Cultural and art activities; Reading Skill; Skill of Writing Efficiently: Widen one's viewpoint; Improvement of Creating Writing: To write originally impression of literary texts or activities; The Texts with Correct Expression: Spelling rules, Punctuation marks, Creating passage, Creating text, Vocabulary, The usage of dictionary; Expression Styles: Narrative expression, Descriptive expression, Explanatory expression, Definitive expression, Sampled expression, Substantive expression, Comparative expression; Types of Writing: Official writing, Fictional writing, Essays.

**ESTÜ206                      Financial Literacy                      3+0    3.0**

Key Issues in Financial Literacy: Money, Credit, Deposit, Interest; Conscious Use of Cards: Debit card, Credit card; Inflation and Its Effects on Our Lives; Personal Financial Planning: Spending, Saving, Investment, Budget; Investment Decisions and Investment Plans; Foreign Currencies and Foreign Currency Markets: Dollar, Euro, Pound Sterling; Precious Metals: Gold, Silver; Bonds, Bills and mutual funds; Stocks and Exchange Terminology; Private Pension System: Asset distribution, Participants' rights; Cryptocurrencies: Blockchain, Decentralized finance, NFT, Metaverse.

**ESTÜ207                      General Psychology                      2+0    4.0**

History of Psychology; Research Methods in Psychology: Descriptive methods, Correlation, Experiment; Learning Theories: Classical conditioning, Operant conditioning; Motives and Emotions; Perception and Sensation; Memory: Sensory memory, Short-term memory, Long-term memory; Social Psychology: Social influence, Conformity, Acceptance, Obedience, Attitude, Cognitive dissonance, Social categorization; Environmental Psychology; Developmental Psychology: Lifelong development, Developmental processes; Personality: Psychodynamic, Behavioral and social cognitive; Personality tests; Psychological Disorders: Anxiety and mood disorders, Eating disorders, Personality disorders.

**ESTÜ210                      Culture of Museum                      2+0    2.0**

Definition of Museum, its origin and Types of Museums, the story of Archaeological Excavations in Turkey, Ottoman Museology and Antiquities Laws; The Establishment of Museology in Turkey and the works of Osman Hamdi Bey; The importance of Archeology and Archaeological Museums in Turkey; Ruins (Open-Air Museums) in Turkey; Turkish and Islamic Arts Museums in Turkey, Methods of preserving and exhibiting works in museums; Ethnography Museums,

methods of preservation of artifacts; Painting and Sculpture Museums, methods of preserving and exhibiting works; Museums of Urban History; Modern Museums; General evaluation of the course

**ESTÜ301                      Science Communication                      2+0    3.0**

Science Culture And Science Communication; Actors in Science Communication Process; Open Access: Open access initiatives, Open access platforms; Role of Information Centers in Science Communication Process; Science and Technology Policies: Science-technology-invention-innovation, Science Policies and Science Communication; Academic Texts; Science Journalism: The development of science journalism, The effects of science journalism on the development of science, Writer-reader-scientist interaction ; Ethics In Science Communication; Project Presentations.

**ESTÜ307                      Children Rights and Family Education                      2+0    2.0**

Children, Rights and Legal Arrangements Related to Children, Children's Rights and Laws for the Protection of Rights, Children's Rights Convention, Children in Need of Protection, Child Family Relationship I, Child Family Relationship II, Child Neglect and Abuse, Child and Crime Relationship, Family Education and Principles, Family Education and Family Communication, Family Problems and Services for Children, Turkish Family Structure and Family Services.

**ESTÜ4001                      Sustainable Building Design                      3+0    3.0**  
**(Eng)**

Key Concepts: Principles of sustainable design, applications of sustainable design principles in buildings; Life Cycle Assessment (LCA): Production, use, and end-of-life stages; LCA environmental impact categories; ISO standards defining the LCA methodology; energy modeling methods for building structures and design principles based on energy performance; Key Concepts: "Leadership in Energy and Environmental Design" (LEED) green building certification; LEED categories: Location and Transportation, Sustainable Sites, Water Efficiency, Materials and Resources, Energy and Atmosphere, Indoor Environmental Quality.

**ESTÜ401                      Introduction to Professional Life                      1+1    2.0**

Information about PL, What is needed for PL?, Sector Meetings, 21. Century Competencies: Improving self-awareness, Basic communication skills, Problem solving, Decision making and leadership, Teamwork; Effective Interview Techniques and Interview Simulation; Career Planning; Resume Preparation Techniques, Networking: Social networks for professional life; Project Management; Job Search Strategies.

**ESTÜ402                      Coaching and Leadership                      3+0    3.0**

Definition of Coaching; The Difference of The Coaching Profession from Other Specializations Is the Basic Coaching Session; Characteristics Of Coach; Harmony In Coaching Relationship; Different Learning And Experience Styles, Coaching And Leadership-Based Communication; Listening Deeply, Asking Strong Questions, Giving Feedback. Coaching Levels; Goal, Motivation and Action Steps, Goal Setting Coaching Tool; Circle of Life, Values Assessment Coaching Tool; Determination of Core Values, Leadership; Vision and Mission Work, Holistic Leadership; Life Purpose Study, Leadership Styles; Teacher, Visionary, Warrior, Wise, Nourishing.

**ESTÜ403                      Basic Computer Utilization                      3+0    4.0**

Computers: Binary number system, Computer architecture, Input-output units, System units; Computer Software: Operating systems, Utilities; Peripheral Equipment: Printers, Scanners; Computer Security: Viruses, Worms, Trojans, Antivirus software; Basic Internet Concepts: Computer networks, Working principle; Word Processor: Editing documents, Text formatting, Working with Tables; Spreadsheet: Page structure, Cell logic, Filtering in tables, Graphics, VBA introduction; Presentation: Slide layout, Transitions, Animations; E-mail: POP3, IMAP, Exchange, Account setup; Application software: Software that comes with the operating system, PDF Reading, Compression.

**ESTÜ405                      Computer Programming                      3+0    5.0**

Modern Computers: Data storage, Binary system, Computer architecture, Arithmetic and logical unit; Algorithm Concept:, Algorithm design, Flow charts; Python Basics: Python versions, Integrated development environments, First program; Basic Data Types: Numerical and logical data types, Dictionaries, Sets, Lists; Variables and Operators: Variables, Operators; Control Statements: Sequential Statements, Decision Control Statements, Repetitive Statements; Functions: Creating and calling functions, Arguments, Recursive functions; Object-Oriented Approach: Classes, Objects, Methods; File Operations: Opening file, Reading file, File methods; Graphical User Interfaces.

**ETK208 (Eng)              Engineering Ethics                      1+0    2.0**

General Moral Principles; Moral Philosophy; Engineering Ethics Principles; Honesty and Responsibility in Engineering; Engineering Ethics Case Studies: Analysis of examples of situations which engineers may encounter in their professional life.

**FEL102                      Introduction to Philosophy                      2+0    2.5**

Fundamentals of Philosophy; Scope of Philosophy; History of Philosophy; Theory of Science; Theory of Knowledge; Logic; Ontology; Philosophy of Nature; Philosophy of History; Philosophy of Art; Philosophy of Language; Philosophical Anthropology; Ethics; Philosophy of Religion; Metaphysics; Schools of Philosophy; Development of Philosophical Perspective. Fundamentals of Philosophy; Scope of Philosophy; History of Philosophy; Theory of Science; Theory of Knowledge; Logic; Ontology; Philosophy of Nature; Philosophy of History; Philosophy of Art; Philosophy of Language; Philosophical Anthropology; Ethics; Philosophy of Religion; Metaphysics; Schools of Philosophy; Development of Philosophical Perspective.

**FEL401                      Philosophy of Science                      2+0    2.5**

Importance and Definition of Science: Science, Common Sense, Religion and philosophy, Formal disciplines, Science and Language, Scientific Method: Its content and boundaries, Various interpretations; Ways arriving at the phenomenon: Observation and experimentation, Logical structure of measurement; Scientific Explanation: Notion scientific law, Verification of hypothesis, Causal principle in science, Structure and Functions of Scientific Theory; Human-problems of Science: Responsibility of Scientist, Science and Humanism. Importance and Definition of Science: Science, Common Sense, Religion and philosophy, Formal disciplines, Science and Language; Scientific Method: Its content and boundaries, Various interpretations; Scientific Approach: Observation and experimentation, Logical structure of measurement, Scientific Explanation, Scientific law, Verification of hypothesis, Causal principle in science, Structure and Functions of Scientific Theory, Human-problems of Science; Responsibility of Scientist, Science and Humanism.

**FiN415 (Eng)            Financial Markets and Institutions                      3+0    4.5**

Financial System; Interest Rates; Efficiency in Financial Markets; Functions of Financial Institutions; Financial Crises; Central Banks; Monetary Policy: Goals, Tools; Money Markets; Bond Market: Properties of Bonds, Bond Valuation ; Stock Market: Properties of Stocks, Stock Valuation; Banking Industry: Structure and Competition of the Industry, Management of Banks ; Insurance Companies; Investment Banks; International Financial System.

**FiZ105                      Physics I                      4+0    6.0**

Measurement and Units: Measurement, Units, Dimensional analysis; Vectors: Vector and scalar quantities, Coordinate systems and frames of reference; Kinematics: Motion in one dimension, Motion in two dimensions; Dynamics; Work and Energy; Momentum and Collisions; Rotational Motion: Angular velocity and angular acceleration, Moments of inertia, Work and energy in rotational motion; Static Equilibrium. Measurement and Units: Measurement, Units, Dimensional analysis; Vectors: Vector and scalar quantities, Coordinate systems and frames of reference; Kinematics: Motion in one dimension, Motion in two dimensions; Dynamics; Work and Energy; Momentum and Collisions; Rotational Motion: Angular velocity and angular acceleration, Moments of inertia, Work and energy in rotational motion; Static Equilibrium.

**FiZ105 (Eng)            Physics I                      4+0    6.0**

Measurement and Units: Measurement, Units, Dimensional analysis; Vectors: Vector and scalar quantities, Coordinate systems and frames of reference; Kinematics: Motion in one dimension, Motion in two dimensions; Dynamics; Work and Energy; Momentum and Collisions; Rotational Motion: Angular velocity and angular acceleration, Moments of inertia, Work and energy in rotational motion; Static Equilibrium. Measurement and Units: Measurement, Units, Dimensional analysis; Vectors: Vector and scalar quantities, Coordinate systems and frames of reference; Kinematics: Motion in one dimension, Motion in two dimensions; Dynamics; Work and Energy; Momentum and Collisions; Rotational Motion: Angular velocity and angular acceleration, Moments of inertia, Work and energy in rotational motion; Static Equilibrium.

**FiZ106                      Physics II                      4+0    6.0**

Electric Fields: Electric charge, Coulomb's law, Electric flux, Gauss's law; Electric Potential: Potential difference, Potential energy, Obtaining the electric field from the electric potential; Capacitors: Definition and calculation of a capacitance, Capacitors with dielectrics, Energy stored in a charged capacitor, Electric dipole in an external electric field; Electric Current; Magnetic Field: Sources of the magnetic field, Electromagnetic induction.

**FiZ106 (Eng)            Physics II                      4+0    6.0**

Electric Fields: Electric charge, Coulomb's law, Electric flux, Gauss's law; Electric Potential: Potential difference, Potential energy, Obtaining the electric field from the electric potential; Capacitors: Definition and calculation of a capacitance, Capacitors with dielectrics, Energy stored in a charged capacitor, Electric dipole in an external electric field; Electric Current; Magnetic Field: Sources of the magnetic field, Electromagnetic induction.

**FiZ107                      Physics Laboratory I                      0+2    1.5**

SI Unit System and Dimension Analysis; Measurement and Error Calculations; Graph Analysis; Principles of Experimental Studying and Preparation of Experimental Reports; Variation of Range due to Shooting Angle; Conservation of Energy; Motion with Constant Acceleration; Measurement of Angular Velocity; Determination of Moment of Inertia; Freely Falling; Simple Pendulum; Motion on Inclined Plane; Mass-spring System; Viscosity.

**FiZ107 (Eng)            Physics Laboratory I                      0+2    1.5**

<b>Ph12108</b>	<b>Physics Laboratory II</b>	<b>0+2</b>	<b>1.5</b>
Usage of Electrical Measuring Instruments; Security Rules in Electrical Experiments; Principles of Experimental Studying and Preparation of Experimental Reports; Parallel-Plate Capacitor; Investigation of Charge Distribution on Surface of any Conductor; Ohm's Law through DC Electric Circuits; Wheatstone Bridge; Electromagnetic Induction; Transformer; Determination of Emf and Inner Resistance; Determination of Frequency; Oscilloscope.			

<b>FOT202</b>	<b>Photography</b>	<b>2+0</b>	<b>3.0</b>
<p>Introduction to Photography: Relations between architects and photography, Description of visual aspect of architecture, Use of photography in the presentation of architectural products; The camera; Process of photographing; Film Development Procedure for Black and White Films. Film Development Procedure for Colored Films and Slides; Printing Processes.</p>			

**FRA256 (Fra)      French II** **3+0   4.0**

Language functions: Imperatives and wishes; Evaluation, Proving and Thanking; Vocabulary: Nourishment, Accommodation, Clothing and colors, Bairams and activities; Ordinal Numbers; Grammar: Expressions showing quantity, Demonstrative and Possessive Adjectives, Prepositions and Time indicators, Stressed personal pronouns: Imperative moods, Verbs with double pronouns; Learning about Target Culture: An Area in France: La Bourgogne; Pronunciation: Intonation, Semi-Vowels, Gliding.

<b>HUK458</b>	<b>Industrial Rights and Technological Development</b>	<b>3+0 3.0</b>
Overall look at the intellectual systems; General principles of industrial rights; The categories of industrial rights; Patent, trademark; industrial design; Topographies of integrated circuits; Protection of microorganisms; Discussion on the "invention" concept; Background motivation of inventions; Use of inventions in daily life; The rights of the inventors; Special work on the patent system; The use of patent system in production by the engineers; Use of patent archives; Search for invention whether it is patentable or not; Preparing a patent file.		

<b>IKT151</b>	<b>Economics</b>	<b>3+0</b>	<b>3.0</b>
<p>Basic Economic Concepts; Production Process; Optimal Consumer Behavior; Demand; Supply; Equilibrium Price; Market Types; Determination of Factor Prices; National Product; Nominal and Real National Income; Introduction to Monetary Theory; Factors Determining Fluctuation and National Income: Consumption expenditures, Investment expenditures, Employment; International Economic Relations: International mobility of goods and services, International mobility of factors of production; Economic Growth and Development.</p> <p>Basic Economic Concepts; Production Process; Optimal Consumer Behavior; Demand; Supply; Equilibrium Price; Market Types; Determination of Factor Prices; National Product; Nominal and Real National Income; Introduction to Monetary Theory; Factors Determining Fluctuation and National Income: Consumption expenditures, Investment expenditures, Employment; International Economic Relations:</p>			



International mobility of goods and services, International mobility of factors of production; Economic Growth and Development.

**iKT151 (Eng)      Economics**

**3+0    3.0**

Basic Economic Concepts; Production Process; Optimal Consumer Behavior; Demand; Supply; Equilibrium Price; Market Types; Determination of Factor Prices; National Product; Nominal and Real National Income; Introduction to Monetary Theory; Factors Determining Fluctuation and National Income: Consumption expenditures, Investment expenditures, Employment; International Economic Relations: International mobility of goods and services, International mobility of factors of production; Economic Growth and Development. Basic Economic Concepts; Production Process; Optimal Consumer Behavior; Demand; Supply; Equilibrium Price; Market Types; Determination of Factor Prices; National Product; Nominal and Real National Income; Introduction to Monetary Theory; Factors Determining Fluctuation and National Income: Consumption expenditures, Investment expenditures, Employment; International Economic Relations: International mobility of goods and services, International mobility of factors of production; Economic Growth and Development.

**iKT209 (Eng)      Money and Banking**

**3+0    5.0**

Basic Concepts of Financial System; Difficulty in Defining Money; Asset- Demand Theory and Determination of Equilibrium Interest Rates; Risk, Term and Tax Structure of Interest Rates; Bank as a Firm: Asset and liability management in banking, Exchange rate risk and interest rate risk and risk management, Balance sheet of a bank and Creation of deposit; Role of House holds; Banks and Central Bank in Mechanism of Money Stock Determination; Tools of Monetary Policy; Money Demand Theories and the Equilibrium in Money Market. Basic Concepts of Financial System; Difficulty in Defining Money; Asset- Demand Theory and Determination of Equilibrium Interest Rates; Risk, Term and Tax Structure of Interest Rates; Bank as a Firm: Asset and liability management in banking, Exchange rate risk and interest rate risk and risk management, Balance sheet of a bank and Creation of deposit; Role of House holds; Banks and Central Bank in Mechanism of Money Stock Determination; Tools of Monetary Policy; Money Demand Theories and the Equilibrium in Money Market.

**iKT356 (Eng)      Engineering Economics**

**3+0    4.5**

Principles of Engineering Economics; Time Value of Money; Investment Problems; Capital Formation by Installments; Capital Formation; Consumer Loans; Payments with Equal Installments; Basic Evaluation Techniques: Present Worth Method; Internal Rate of Return Method; Comparison of Alternative Investment Decisions; Breakeven Analysis; Replenishment Investments.

**iKT427              Industrial Economics**

**2+0    3.0**

Industrial Market Structure and Economic Performance; Determinants of Market Structure; Determinants of Behavior and Performance; Acts of Firms in Different Industrial Structures; Overt and Covert Agreements; Entry to and Exiting from a Market; Pricing Strategies and the Market Power; Game theory.

**iLT201              Interpersonal Communication**

**3+0    4.5**

Verbal Communication; Speaking Skills As Dimension of Interpersonal Communication; Listening Capabilities As Dimension of Interpersonal Communication; Non-Verbal Communication; Signs And Meanings; Stress And Stress Management; Group; Group Dynamics; Small Group Characteristics; Persuasion; Speaking And Listening; Time And Time Management; Interpersonal Communication; History of Communication Research. Verbal Communication; Speaking Skills As Dimension of Interpersonal Communication; Listening Capabilities As Dimension of Interpersonal Communication; Non-Verbal Communication; Signs And Meanings; Stress And Stress Management; Group; Group Dynamics; Small Group Characteristics; Persuasion; Speaking And Listening; Time And Time Management; Interpersonal Communication; History of Communication Research.

**iLT201 (Eng)      Interpersonal Communication**

**3+0    4.5**

Verbal Communication; Speaking Skills As Dimension of Interpersonal Communication; Listening Capabilities As Dimension of Interpersonal Communication; Non-Verbal Communication; Signs And Meanings; Stress And Stress Management; Group; Group Dynamics; Small Group Characteristics; Persuasion; Speaking And Listening; Time And Time Management; Interpersonal Communication; History of Communication Research. Verbal Communication; Speaking Skills As Dimension of Interpersonal Communication; Listening Capabilities As Dimension of Interpersonal Communication; Non-Verbal Communication; Signs And Meanings; Stress And Stress Management; Group; Group Dynamics; Small Group Characteristics; Persuasion; Speaking And Listening; Time And Time Management; Interpersonal Communication; History of Communication Research.

**iLT328 (Eng)      Communication Skills**

**1+0    1.0**

Introduction to Communication Skills, Communication in Organisations Models of the Communication Process, Verbal, Non-verbal and Visual Communication, Interpersonal Communication Competence, Business Communication Skills, Elements of Efficient Presentational Communication, Preparation and Implementation of Presentations, Sales Communication, Negotiations and Persuasion, Cooperation, Conducting Business Meetings, Interviewing, Communication through Writing, Business Communications through Electronic Media.

**iLT370                      New Approaches in Management                      3+0    6.5**

Paradigm Changes in Management; System Approach; Organization Culture; Reconstruction; Total Quality Management; Team Work and Organization; Learning Organization; E-Business.

**iLT419                      Body Language and Diction                      2+0    5.0**

Research on Body Language and Concepts of Body Language; Face-to-Face Relations; Relation between Human and Society; Relation between Body and Objects; Relation between Body and Space; Orientation Exercises; Diction Exercises: Intonation, Stress, Articulation; Use of Voice: Control of sound volume, tone color and breath; Speech Control; Movements of Head and Eyes; Facial Expressions; Use of Hands and Arms; Use of Feet and Legs; Harmony in Body Use; Relation between Speech and Body Use; Harmonious Use of Body, Space and Objects.

**iNG250 (Eng)              Reading and Speaking in English                      2+0    2.0**

Combining reading and speaking skills; Reading and Discussing Contemporary texts; Reading Strategies: Skimming, Scanning, Guessing Meaning from the Context; Speaking Activities Based on the Readings

**iNG360 (Eng)              English for Business                      2+0    2.0**

Developing Business English Skills for Variety of Situations: Speaking to people in business situations; Practice in planning and writing letters, Telexes and memos; Practice in Making Different Kinds of Calls; Writing and Summarizing Reports; Ordering and Supplying Goods or Services; Going on Business Trips and Guiding Foreign Visitors; How to do Market Research and Promotion; Participating in Group Meetings; Informal One-to-one Meetings and Committee meetings.

**iN\$101                      Introduction to Civil Engineering                      2+0    3.5**

History of Civil Engineering; Introduction to Main Divisions of Civil Engineering Department; Engineering Materials; General Properties of Mechanical Behaviour; Theoretical and Experimental Studies; Taking and Analysing of Experimental Data; Selected Examples from the Design and Construction Site; Written and Oral Communication in Civil Engineering; Engineering Judgement; Evaluation with Department. History of Civil Engineering; Introduction to Subfields of Civil Engineering; Engineering Materials; General Properties of Mechanical Behaviour; Theoretical and Experimental Studies; Gathering and Analysis of Data; Samples of from Design and Construction Sites; Written and Oral Communication in Civil Engineering; Development of Engineering Judgement.

**iN\$118                      Computer Applications in Civil Engineering                      2+2    3.5**

Word Processor Program: General description, Page and paragraph layout, Adding symbols and equations, Adding figures and tables, Adding footer and header, Using the references tab, Writing a technical report; Spreadsheet Program: General description, Data input, Adding formulas and functions, Drawing graphs, Matrix operations, Data filtering, Conditional formatting, Applications for civil engineers, Macro and algorithm; Presentation Design Program: General description, Creating and editing slides, Preparing effective presentations; Introduction to 3D Drawing Program: Drawing basic geometric shapes, Using layers, Dimensioning; Technical Softwares for Civil Engineers.

**iN\$239                      Law and Ethics in Civil Engineering                      3+0    3.0**

A Brief History of Ethics; Introduction to Ethical Conflicts; Values and Value Systems/History of Engineering Profession; Engineering and Ethics; Environmental Ethics; Ethics, Liability and Legal Issues for Civil Engineers; Case Studies for Engineering Ethics; Introduction to Law in Construction Sector; Origins of the Construction Disputes; Construction Claims; Categories of Construction Problems; Resolution of Disputes; Productivity Dispute Relations; Disputes Arises From Project Change Orders; Reflections of Disputes to Parties. A Brief History of Ethics; Introduction to Ethical Conflicts; Values and Value Systems/History of Engineering Profession; Engineering and Ethics; Environmental Ethics; Ethics, Liability and Legal Issues for Civil Engineers; Case Studies for Engineering Ethics; Introduction to Law in Construction Sector; Origins of the Construction Disputes; Construction Claims; Categories of Construction Problems; Resolution of Disputes; Productivity Dispute Relations; Disputes Arises From Project Change Orders; Reflections of Disputes to Parties.

**iN\$240 (Eng)              Hydrology                      3+0    5.0**

Introduction: Hydrology in water resources engineering, The Hydrologic Cycle; Precipitation: Formation of precipitation, Analysis of precipitation data, Rational method, Statistical methods, Streamflow: Water stage measurement, Discharge computation, Interpretation of streamflow data; Evaporation and Transpiration: Factors affecting evaporation, Measurement of evaporation, Estimation of evaporation, Basin: Shape of the basin, Drainage characteristics of the basin, Time of concentration, Infiltration; Hydrograph Analysis: Components of runoff, Hydrograph, Hydrograph components; Flood Routing: Storage equation, Reservoir routing; Statistical Methods in Hydrology.

**iN\$241 (Eng)              Materials Science in Civil Engineering                      3+0    4.5**

Atomic Structure; Arrangement of the Atoms; Structural Defects: Point defects, Dislocations, Planar defects; Mechanical Tests and Properties: Tension, Compression, Impact test, Hardness, Fatigue; Deformation of the Materials; Metallography: Preparation of the samples, Observation with optic and electron microscope; Treatment Increasing the Strength of the

Materials; Solidifying and Cooling Curves, Phase diagrams; Iron Alloys: Steels, Cast irons, Heat treatments; Metals and Alloys Excluding Iron: Aluminum, Titanium, Copper alloys, Composite Materials.

**IN\$246 (Eng) Computer Programming in Civil Engineering 1+2 3.0**

Introduction To Programming; Fundamentals of Algorithms; Pseudocode and Flowcharts; Flowchart for design and algorithms; Basic Elements of Programming; String and Input; Control and Loop Structures; File Management; Sub Functions; Programming With A Spreadsheet Program; Graphic and Tabular Presentations; Algorithm Design and Numerical Solutions of Civil Engineering Problems.

**IN\$302 Reinforced Concrete I 3+2 6.0**

Concrete and Steel Materials; Basic Behavior of Reinforced Concrete; Principles of Calculation; Elastic Theory and Ultimate Strength Theory; Structural Safety; Axially Loaded Members; Ultimate Strength of Members Subject to Flexure; Combined Flexure and Axial Load Columns; Shear-Diagonal Tension; Torsion; Shear and Flexure; Bond and Anchorage.

**IN\$307 (Eng) Structural Analysis I 3+2 6.0**

Fundamentals of Structural Analysis; Assumptions in Structural Analysis; Loads and Supports; Classification of Structure Systems; Internal Forces in Structure Members; Determining Degree of Indeterminacy in Structural Systems; Determining Internal Forces in Statically Determinacy Systems: Simple beams, Cantilever beams, Hinged girders, Frames, Arches and frames of three hinges; Solving Live Loads Systems Using Influence Lines; Determining Internal Forces in Statically Indeterminacy Systems.

**IN\$308 (Eng) Hydrology 3+0 4.5**

Hydrologic cycle: Water resources in the world, Introduction to hydrology; Precipitation: Occurrence of precipitation and its measurement; Evapotranspiration; Factors influencing Evapotranspiration and Their Measurement; Infiltration: Computation of infiltration capacity, Infiltration index; Groundwater; Surface flow: Hydrologic region and surface flow, Measurement of level and velocity; Hydrographs: Characteristic Points of Flow Hydrograph; Analysis and Synthesis of Hydrograph; Statistical Analysis of Hydrologic Data.

**IN\$310 Water Supply and Sewerage 3+2 4.5**

Hydrology; Collection of Surface Water: Water Supply from Rivers, Lakes and Dams; Collection of Groundwater Supply: From Hillside and Wells; Water Transmission by Pipe Lines: Hydraulics; Operations and Distribution Systems: Waste Water Collection; Sewers; Flow in Sewers and Sewer Appurtenances; Design of Sewer System; Waste Water Treatment Methods.

**IN\$311 (Eng) Transportation Engineering I 3+2 6.0**

Transportation Types And Their Comparison; Description of Basis Members of Highway; Characteristics of Drivers, Pedestrians And Vehicles; Sight Distances; Highway Location Study; Reconnaissance Survey; Survey; Setting-Out; Relocation; Horizontal Curves; Vertical Curves; Profile Study; Pavement And Pavement Design; Traffic Engineering Applications; Traffic Flow And Density; Transportation Planning; Trip Generation And Distribution; Modal Split And Traffic Assignment.

**IN\$312 (Eng) Construction Engineering and Management 3+0 4.5**

Structure of Construction Firms; Management Functions; Management Techniques of Small -size And Family Owned Construction Companies; Process of Construction Contract And Documentation; Relationship Between Employee and Employer; Construction Safety; Project Management; Organization and Planning; Labour Law; Strike and Lock-out: Reasons; Precautions and Results of the Construction Defects; Application of Construction Cost Analysis and Estimating; Construction Bidding Principles; Site Management and Organization; Construction Projects Insurance; Change Orders and Construction Equipment Management. Structure of Construction Firms; Management Functions; Management Techniques of Small and Family Owned Construction Companies; Process of Construction Contract and Documentation; Relationship Between Employee and Employer; Construction Safety; Project Management; Organization and Planning; Labor Law; Strike and Lock-out: Reasons; Precautions and Results of the Construction Defects; Construction Cost Analysis and Estimation; Construction Bidding Principles; Site Management and Organization; Construction Projects Insurance; Change Orders and Construction Equipment Management.

**IN\$314 (Eng) Structural Analysis II 3+0 4.5**

Deflections of Beams and Frames, Double Integration Method; Moment-Area Method, Conjugate Beam Method; Work-Energy Methods, Virtual work method; Castigliano's Theorems, The Method of Least Work; Force Method of Analysis, and its application to beams and frames; Force Method of Analysis, application to trusses; Three Moments Equation; Slope Deflection Method, and its application to beams and frames without sidesway; Slope Deflection Method, application to beams and frames with sidesway; Symmetrical structures with symmetrical loadings; Symmetrical structures with skew-symmetrical loadings; Moment Distribution Method and its application to beams and frames without sidesway; Moment Distribution Method and its application to beams and frames with sidesway. Deflections of Beams and Frames, Double

Integration Method; Moment-Area Method, Conjugate Beam Method; Work-Energy Methods, Virtual work method; Castigliano's Theorems, The Method of Least Work; Force Method of Analysis, and its application to beams and frames; Force Method of Analysis, application to trusses; Three Moments Equation; Slope Deflection Method, and its application to beams and frames without sidesway; Slope Deflection Method, application to beams and frames with sidesway; Symmetrical structures with symmetrical loadings; Symmetrical structures with skew-symmetrical loadings; Moment Distribution Method and its application to beams and frames without sidesway; Moment Distribution Method and its application to beams and frames with sidesway.

**iN\$315 (Eng)      Soil Mechanics I      3+0   4.5**

Introduction to Soil Mechanics: Origin of soil; Physical and Index Properties of Soil: Soil structure, Grain size distribution, Weight-volume relationship, Consistency limits; Classification of Soils; Permeability; Seepage and Flow Nets; Soil Stresses: Total and effective stress in soil; Soil Compaction: Laboratory and field compaction methods; Stress Increases in Soil Due to Surface Loading; Soil Settlements: Immediate settlement, Consolidation theory, Settlement calculations, Consolidation coefficient, Time rate of consolidation.

**iN\$317 (Eng)      Soil Mechanics Laboratory      0+2   1.5**

Introduction: Experimental study, General laboratory safety rules; Relationship Between Theory and Experiments: Data analysis, Interpretation of results; Disturbed and Undisturbed Soil Sampling; Soil Index Tests: Sieve analysis and hydrometer, Water content, Specific gravity; Atterberg limits: Liquid limits, Plastic limits, Shrinkage limit; Soil Permeability Tests; Soil Compaction Tests: Standard proctor, Modified proctor, Sand cone and nuclear density meter; Oedometer Test; Soil Strength Tests: Unconfined compression test, Triaxial compression test, Shear box test; Introduction to Field Tests; Preparation of Soil Investigation Report.

**iN\$320 (Eng)      Steel Structures      3+0   4.5**

Introduction to Steel Structures; Steel for Structural Material; Steel Connection Tools: Bolt and bolted connections; Tension Members: Stress calculations, Connection of tension members; Compression Members; Effect of Combined Flexural and Axial Load on Constant Cross-Sectional Members; Truss Systems; Plate Girders: Profile beams, Welded beams, Beam joints, Supports and connections.

**iN\$322 (Eng)      Hydraulics      3+2   6.0**

Dimensional Analysis: Pi theorem; Flow in Pipes: Motions equations, Laminar flow, Turbulent flow, Energy losses, Energy losses of various semi-radius, Local energy losses, Hydraulic calculation of pipes; Flow in Open Channels: Uniform flow, Pressure distribution in a section, Energy losses, Calculation of the uniform flow, Best hydraulic section, Varied flow, Specific energy, Critical regime, Channel and flood regime, Properties of the channel flow and flood flow, Wave velocity distribution, Definitions of channel slopes, Differential equation of free surface water, Profiles of the varied flow, Calculation of varied flow, Local variation on surface water, Hydraulic jump, Variations of the section, Other local variations, Position of the section in the nonrectangular; Channel Controls: Introduction, Gates, Sharp-edged weirs, Spillway and diversion; Model Theory: Definitions, Conditions of the resemblance, Froude models, Reynold models.

**iN\$342      Foundation Engineering I      3+0   4.5**

Soil Exploration Methods; Number of Bore Holes and Determination of their Place; Methods of Sampling; Various Institutional Experiments; Various Loading Types Concern in Foundation Design; Open Excavations; Supporting of Excavation Surfaces; Retaining Wall; Shallow Foundations; Single, Combined and Mat Foundations, Deep Foundation; Introduction to Pile Foundation. Soil Exploration Methods; Number of Bore Holes and Determination of their Place; Methods of Sampling; Various Institutional Experiments; Various Loading Types Concern in Foundation Design; Open Excavations; Supporting of Excavation Surfaces; Retaining Wall; Shallow Foundations; Single, Combined and Mat Foundations, Deep Foundation; Introduction to Pile Foundation.

**iN\$401      Reinforced Concrete Project      3+0   4.5**

Introduction; Determination of Architectured Project; Slab Load Analysis; Static and Reinforced Concrete Calculations of Slab; Beam Load Analysis; Determination of Frames; Static Analysis of Vertical Loads; Determination of Earthquake Loads; Static Analysis under Earthquake Loads; Analysis of Reinforced Concrete Beams, Columns and Foundations.

**iN\$407      Reinforced Concrete II      3+0   4.5**

Introduction and Definitions; Types of Slab: Plate slab, Serrated slab, Method of approximate calculations; Foundations: Wall foundations, Individual foundations, Continuous foundations, Combined foundations, Mat foundations; Retaining Walls; Selection of Types; Calculations and Projects; Simple and Continuous High Beams; Stairs; Storage: High storage, Underground storage, Circular and rectangular storage.

**iN\$409      Pavement Design      3+0   4.5**

Theories, Principles And Practice In The Structural Design And Construction of Highway And Airport Pavements Including Stabilization Techniques; Pavement Types, Wheel Loads And Design Factors; Stresses In Flexible Pavements; Stresses In

Rigid Pavements; Vehicle And Traffic Consideration; Climate, Environment; Materials Characterization; Subgrades; Bases And Subbases; Bituminous Surfaces; Design of Pavement Evaluation Performance Evaluation Surveys And The Design of Asphaltic Mixtures; Rigid Pavement Design; Design of Flexible Airport Pavements; Design of Flexible Highway Pavements; Design of Rigid Airport Pavements; Design of Rigid Highway Pavements; AASHTO Design Methods; Shell Method.

**iN\$411                      Transportation Engineering II                      3+0    4.5**

Introduction; Railway Cars and Features; Mechanics of Traction: Equation of movement and application; Identification of Location Standard Elements; Geometric Features and Analysis; Slopes, Curves; Location Analysis: Rails, Railway Sleeper, Ballast, Top Structure Implementation; Circulation of Stones on Location; Stations: Principle of stations and railroad lines.

**iN\$414                      Applications of Design in Civil Engineering                      2+4    4.0**

Structure, Geotechnics, Hydraulics, Hydrology, Construction Management, Transportation, Construction Materials, Soil Modelling, Slope Stability, Rock Mechanics, Soil Dynamics, Deep Excavations, Composite Materials, Materials Modelling, Advanced Concrete Technology, Calculations of Special Concrete Mixtures, Water Supply Structures, Stacastical Methods in Hydrology, Flood Controls, Dams, Steel Structures, Tall Buildings, Advanced Structural Analysis, Construction Cost Analysis, Project Management, Transportation Planning, Traffic Flow Theory, Rail Way Management. Structure, Geotechnics, Hydraulics, Hydrology, Construction Management, Transportation, Construction Materials, Soil Modelling, Slope Stability, Rock Mechanics, Soil Dynamics, Deep Excavations, Composite Materials, Materials Modelling, Advanced Concrete Technology, Calculations of Special Concrete Mixtures, Water Supply Structures, Stacastical Methods in Hydrology, Flood Controls, Dams, Steel Structures, Tall Buildings, Advanced Structural Analysis, Construction Cost Analysis, Project Management, Transportation Planning, Traffic Flow Theory, Rail Way Management.

**iN\$415                      Special Topics in Civil Engineering                      2+2    3.0**

Literature Review: Structure, Geotechnics, Hydraulics, Construction management, Transportation, Construction materials, Mechanics; Civil Engineering Design Principles: Soil modelling, Foundations, Deep excavations, Advanced concrete technology, Calculations of special concrete mixtures, Water supply structures, Statistical methods in hydrology, Steel structures, Tall buildings, Advanced structural analysis, Construction cost analysis, Project management, Transportation planning, Traffic flow theory.

**iN\$417                      Design Project                      2+2    3.5**

Definition of Complex Engineering Problems: Modern desing methods, Analysis and Modeling; Complex Systems: Boundary conditions and other constraints, Components, Subsystems, Processes; Experimental study: Experimental design, Data analysis, Interpretation of results; Design in Multi-Disciplinary Teams: Determination of stakeholders, Analysis and solution methods; Reporting, presentation and sharing with the society.

**iN\$4502 (Eng)            Transportation Data Collection and Analysis                      3+0    4.5**

Transport data; Description of transport data, Data collection methods, Data collection considerations, Data storage and management, Transport data types and sources; Trip matrix data, Traffic data, Inventory and condition data, Environment and sustainability data, Transport data analysis; Basic definitions, Data types, Graphical presentation, Hypothesis testing, Introduction to advanced econometric analysis techniques.

**iN\$4504                      Surveying                      2+1    4.5**

Measuring instruments and units; Errors, Classification of Errors, Their Causes and Tolerance, Points in the Field, Marking of Points and Determination of Lines, Length Measurement, Length Measuring Instruments, Length Measurements in Different Terrain Types, Errors and Tolerances in Length Measurements, Rectangular Coordinate System and Basic Assignments, Measurement of Horizontal and Vertical Angles, Traverses; Their Establishment and Classification, Main, Auxiliary and Intermediate Traverses, Traverse Calculations; Measurement of Elevations, Geometric and Tacheometric Levelling and Instruments, Applications of Topographic Measurements.

**iN\$451 (Eng)            Geographic Information Systems (GIS) Applications in Hydrology and                      2+2    4.5**  
**Hydraulics**

Introduction to Geographic Information Systems; Spatial Coordinate Systems, Digital elevation models: TIN and GRID concepts for hydrologic and hydraulic studies, River and watershed networks, Soil and land use mapping, Terrain analysis for hydrologic and hydraulic modeling, 3-dimensional analysis, Flood modeling and flood plain mapping. Introduction to Geographic Information Systems; Spatial Coordinate Systems, Digital elevation models: TIN and GRID concepts for hydrologic and hydraulic studies, River and watershed networks, Soil and land use mapping, Terrain analysis for hydrologic and hydraulic modeling, 3-dimensional analysis, Flood modeling and flood plain mapping.

**iN\$452 (Eng)            Computer Applications in Hydrology and Hydraulics                      2+2    4.5**

Investigation of Widely Used Computer Software in Hydrology and Hydraulics: Presentation of software and computer tools relevant to hydrologic and hydraulic engineering problems, Theory underlying the programs, Application and

<b>IN\$453</b>	<b>Railway Engineering</b>	<b>3+0 4.5</b>
<p>Rail transport systems and their characteristics; Railway vehicles and characteristics; Equation of train's motion and applications; Route layout; Zero line; Plan and profile; Geometric characteristics of railway lines; Grades; Curves; Super elevation and transition curve; Clearance and types of cross section; Cross section and volume calculations; Mass diagrams; Earthwork balance according to General and Bruckner Method; Superstructure of railways; Rails; Sleepers; Connecting elements and ballast layer; Railways line capacity.</p>		

Earthquakes, Seismic waves; Measurement of ground motion; The concept of the earthquake zone; Earthquake magnitude and seismic energy; Richter scale; Vibration measuring instruments; Single degree of freedom systems; Multi-degree of freedom systems, earthquake motion; Strong ground motion; Identification and obtaining earthquake spectra. Design of structures against earthquakes; Design principles; Turkish Earthquake Regulation for the seismic analysis of structures.

Introduction to Highway Design; Highway Systems; Characteristics of Vehicles and Drivers; Characteristics of Traffic; Geometric Characteristics of Highways: Route choice, Sight distance criterion, Zero line application, Compound and reverse curves, Horizontal alignment, Transition length and superelevation, Vertical alignment, Climbing lanes; Cross Section Elements; Cross Section and Volume Calculations; Mass Diagram; Cost of Hauling; Types of Pavements; Material Characteristics; Pavement Thickness Designation: AASHTO design method, Other pavement design approaches; Properties of Asphaltic Concrete; Retaining Walls; Surface and Subsurface Drainage; Culvert design. Introduction to Highway Design; Highway Systems; Characteristics of Vehicles and Drivers; Characteristics of Traffic; Geometric Characteristics of Highways: Route choice, Sight distance criterion, Zero line application, Compound and reverse curves, Horizontal alignment, Transition length and superelevation, Vertical alignment, Climbing lanes; Cross Section Elements; Cross Section and Volume Calculations; Mass Diagram; Cost of Hauling; Types of Pavements; Material Characteristics; Pavement Thickness Designation: AASHTO design method, Other pavement design approaches; Properties of Asphaltic Concrete; Retaining Walls; Surface and Subsurface Drainage; Culvert design.

Introduction: Groundwater and hydrologic cycle, Groundwater as a resource, Groundwater contamination, Groundwater and geologic processes; Physical Properties and Principles: Darcy's law, Hydraulic head, Hydraulic conductivity, Porosity, Aquifers, Equations of groundwater flow, Hydrodynamic dispersion; Groundwater and Hydrologic Cycle: Steady-state groundwater flow, Steady-state hydrologic budgets, Transient groundwater flow, Infiltration and groundwater recharge. Groundwater Resource Evaluation: Development of groundwater resource, Pumping tests, Basin yield, Seawater intrusion. Groundwater contamination: Water quality standards, Transport processes, Hydrochemical behavior of contaminants, Measurement of parameters, Source of contamination

Drawings and Specifications; Drawings Reading and Analysis; Quantity Take-Off; Master Format; Unit Price and Work Breakdown Structure; Approximate Estimate; Final Estimate; Bidding Procedures; Risk Applications; Value Engineering; Unit Price Analysis; Electronic Cost Calculation Program; Web-Based Cost Calculation; Approximate Cost Applications; Cost Elements for Construction Projects; Project Delivery Methods and Bidding Processes. Drawings and Specifications; Drawings Reading and Analysis; Quantity Take-Off; Master Format; Unit Price and Work Breakdown Structure; Approximate Estimate; Final Estimate; Bidding Procedures; Risk Applications; Value Engineering; Unit Price Analysis; Electronic Cost Calculation Program; Web-Based Cost Calculation; Approximate Cost Applications; Cost Elements for Construction Projects; Project Delivery Methods and Bidding Processes.

<b>IN\$458</b>	<b>Testing of Concrete</b>	<b>3+0 4.5</b>
Introduction, quality control of concrete structures; types of tests applied on concrete; strength of concrete, standard testing, preparation of test samples; semi-destructive tests; pull-out tests, pull-off tests; non-destructive tests; rebound hammer test; ultrasonic pulse velocity test; radar imaging of concrete, x-ray diffraction on concrete materials; porosity by mercury intrusion porosimetry; differential scanning calorimetry tests on concrete; maturity of concrete, estimation of concrete strength by combined methods; Project presentations.		
<b>IN\$459</b>	<b>Geotechnical Design</b>	<b>2+2 4.5</b>
An Overview of Geotechnical Problems: In-situ and Laboratory experiments for geotechnical problems, Analysis of laboratory and in-situ experiments; Retaining Wall Projects; Sheet Pile Projects; Braced Cut Projects; Slope Stability Analysis; Shallow Foundation Projects: Single foundation projects, Combined foundation projects, Mat foundation projects; Deep foundation; Pier and caisson foundation projects; Pile foundation projects; Soil Improvement Projects; Reinforced Earth Projects. An Overview of Geotechnical Problems: In-situ and Laboratory experiments for geotechnical problems, Analysis of laboratory and in-situ experiments; Retaining Wall Projects; Sheet Pile Projects; Braced Cut Projects; Slope Stability Analysis; Shallow Foundation Projects: Single foundation projects, Combined foundation projects, Mat foundation projects; Deep foundation; Pier and caisson foundation projects; Pile foundation projects; Soil Improvement Projects; Reinforced Earth Projects.		
<b>IN\$460</b>	<b>Admixture for Concrete</b>	<b>3+0 4.5</b>
Introduction, concrete properties and use of admixtures; benefits of concrete admixtures; types of admixtures; air entraining admixtures, water reducing admixtures, superplasticizers; set controlling admixtures; accelerating and retarding admixtures; mineral admixtures; pozzolans, natural pozzolans, artificial pozzolans; fly ashes, silica fumes, trass, ground granulated blast furnace slags; special types of admixtures; corrosion inhibiting admixtures, permeability reducing admixtures, coloring admixtures; Project presentations.		
<b>IN\$461</b>	<b>Structural Design for Reinforced Concrete Buildings</b>	<b>2+2 4.5</b>
Factors Affecting the Choice of Concrete as the Structural Material; Structural Safety; Load Combinations and Limit States; Concrete: Concrete class and mixture proportions, Performance based concrete production; National and International Codes; Preliminary Design and Structural Carrying System; Behavior of Reinforced Concrete Structures under Earthquake Loads; Internal Force Diagrams and Use of Computer Packages, Design of Structural Members: Slab Systems, Columns, beams, Shear Walls, Stairs; Interpretation of Soil Properties and Selection of Appropriate Foundation Systems and Foundation Designs; Structural Drawings and Details. Factors Affecting the Choice of Concrete as the Structural Material; Structural Safety; Load Combinations and Limit States; Concrete: Concrete class and mixture proportions, Performance based concrete production; National and International Codes; Preliminary Design and Structural Carrying System; Behavior of Reinforced Concrete Structures under Earthquake Loads; Internal Force Diagrams and Use of Computer Packages, Design of Structural Members: Slab Systems, Columns, beams, Shear Walls, Stairs; Interpretation of Soil Properties and Selection of Appropriate Foundation Systems and Foundation Designs; Structural Drawings and Details.		
<b>IN\$462</b>	<b>Properties of Fresh and Hardened Concrete</b>	<b>3+0 4.5</b>
Introduction, concrete making principles; properties of fresh concrete; workability, pumpability, placing, compacting, bleeding, segregation, setting of concrete, curing of concrete; properties of hardened concrete; strength of concrete, nature of strength of concrete, microcracking, aggregate-cement paste interface, maturity of concrete; effect of age on strength of concrete, durability of concrete, shrinkage of concrete, creep of concrete; Project presentations.		
<b>IN\$463</b>	<b>Hydraulic Design</b>	<b>2+2 4.5</b>
Introduction to the Design of Hydraulic Structures for the Storage and Conveyance of Water: Canals, Culverts, Weirs, Spillways, Water Distribution Networks; Basic Principles of Hydrology, Fluid Mechanics, Hydraulics; Closed Conduits and Open Channel Flows; Hydraulics of Rivers, Waterways, Man-made Structures; Introduction to Professional Design of Hydraulic Structures; Emphasis on Teamwork, Project Documentation, Oral Presentations. Introduction to the Design of Hydraulic Structures for the Storage and Conveyance of Water: Canals, Culverts, Weirs, Spillways, Water Distribution Networks; Basic Principles of Hydrology, Fluid Mechanics, Hydraulics; Closed Conduits and Open Channel Flows; Hydraulics of Rivers, Waterways, Man-made Structures; Introduction to Professional Design of Hydraulic Structures; Emphasis on Teamwork, Project Documentation, Oral Presentations.		
<b>IN\$464</b>	<b>Concrete Durability</b>	<b>3+0 4.5</b>
Introduction, causes of destruction of concrete; transport of agents in concrete; pore system, absorption, permeability of concrete; sulfate attack on concrete; mechanism of attack; acid attack on concrete; mechanism of attack; effect of sea water on concrete; corrosion of reinforcement; abrasion of concrete; freezing and thawing; action of frost; effect of elevated temperatures on concrete, fire resistance of concrete; Project presentations.		
<b>IN\$465 (Eng)</b>	<b>Steel Structural Design</b>	<b>2+2 4.5</b>
History; Material; Loads on Industrial Buildings; Static Systems of Steel Industrial Buildings; Industrial Buildings with Single and Multiple Span; Special Industrial Buildings; Aeroplane Hangars; Cable Systems; Static System Properties of		

Tall Buildings; Investigation of Economic Structural Systems; Loads on Tall Buildings; System and Member Stability; Rigidity of Tall Buildings and Limits of Lateral Displacements; Special Beams Used in Tall Buildings. History; Material; Loads on Industrial Buildings; Static Systems of Steel Industrial Buildings; Industrial Buildings with Single and Multiple Span; Special Industrial Buildings; Aeroplane Hangars; Cable Systems; Static System Properties of Tall Buildings; Investigation of Economic Structural Systems; Loads on Tall Buildings; System and Member Stability; Rigidity of Tall Buildings and Limits of Lateral Displacements; Special Beams Used in Tall Buildings.

**İNŞ467 (Eng) Construction Equipments 3+0 4.5**

Basic concepts about construction equipments; Reasons to use construction equipments; Use and maintenance of construction equipments; Selection of equipments in construction projects; Construction equipments management; Organization of construction equipments; Cost of operating construction equipments; Safety in construction equipments; Construction equipment accidents; Safety requirements for construction equipment. Basic concepts about construction equipments; Reasons to use construction equipments; Use and maintenance of construction equipments; Selection of equipments in construction projects; Construction equipments management; Organization of construction equipments; Cost of operating construction equipments; Safety in construction equipments; Construction equipment accidents; Safety requirements for construction equipment.

**İNŞ468 Computer-Based Project Management 3+0 4.5**

Introduction to planning; Types and reasons of planning; Project Planning and control using computer; Project communication using computer; Computer-Based resource-cost planning; Relations between activities; Risk factors in planning; Short-Middle-Long term planning. Introduction to planning; Types and reasons of planning; Project Planning and control using computer; Project communication using computer; Computer-Based resource-cost planning; Relations between activities; Risk factors in planning; Short-Middle-Long term planning.

**İNŞ469 (Eng) Renewable Energy with Water, Wind and Wave Power 3+0 4.5**

Introduction to renewable energy; Energy consumption, recent data; Global energy crisis; Energy production: introduction to renewable energy resources, hydropower, energy from wind power, energy from wave power; new energy production methods; Cost of energy generation; Global and Turkish renewable energy policies, Energy related investments in Turkey. Introduction to renewable energy; Energy consumption, recent data; Global energy crisis; Energy production: introduction to renewable energy resources, hydropower, energy from wind power, energy from wave power; new energy production methods; Cost of energy generation; Global and Turkish renewable energy policies, Energy related investments in Turkey.

**İNŞ470 (Eng) Concrete Technology 3+0 4.5**

Ordinary Concrete Technology; New Developing Concrete Materials; Additive Materials; Quality Assurance and Quality Control; Special Production Technologies; Concrete Pouring in Extreme Weather Conditions (Hot and Cold Weather); Ready Mixed Concrete; Pump Concrete; Shotcrete; Injection Mortar; Vacuum Concrete; Concrete Under Water; Heat Treatment Application in Prefabrication; Massive Concrete and Roller Compacted Concrete; Light Weight Concrete; Highway and Airport Concrete. Ordinary Concrete Technology; New Developing Concrete Materials; Additive Materials; Quality Assurance and Quality Control; Special Production Technologies; Concrete Pouring in Extreme Weather Conditions (Hot and Cold Weather); Ready Mixed Concrete; Pump Concrete; Shotcrete; Injection Mortar; Vacuum Concrete; Concrete Under Water; Heat Treatment Application in Prefabrication; Massive Concrete and Roller Compacted Concrete; Light Weight Concrete; Highway and Airport Concrete.

**İNŞ471 (Eng) Numerical Modeling in Hydrology and Hydraulics 2+2 4.5**

Programming with QuickBASIC: QuickBASIC compiler, Reading and writing data, Dimensional variables, Loops, Conditional statements; Monthly Dam Reservoir Budget Calculation; Calculating Normal and Critical Depths in Open Channels by Using Numerical Methods; Correcting the Inhomogeneous Records of a Hydrological Station; Filling the Missing Data of a Hydrological Station by Regression; Calculating the Water Surface Profiles in Open Channels by Using Numerical Methods; Cross section changes, Gradually varied flow; Flood Routing in Open Channels: Muskingum approach, Saint-Venant equation approach.

**İNŞ472 (Eng) Introduction Traffic Engineering 3+0 4.5**

Introduction to Traffic Engineering; Traffic Flow Characteristics; Characteristics of Traffic; Fundamental Models of Traffic Flow; Statistical Aspects of Traffic Flow; Traffic Study and Evaluation; Count and Observation Techniques; Inquiry and Forecast Techniques: Intersections, Design Characteristics of Intersections; Capacity / performance Analysis, Signalized Inter-sections, Traffic Signs and Signing, Traffic Safety.

**İNŞ473 Timber Structures 3+0 4.5**

Introduction: Brief history, advantages and disadvantages; Characteristics and Classifications of Wood: Density, Material defects, Moisture content; Unit Stresses; Working Stresses for Structural Members; Properties of Sections; Bending Moments and Shear: Shearing stress in beams; Compression Perpendicular to Grain; Deflection of Beams; Design of Timber Connections: Joint slip, Effective cross-section, Spacing rules, Nailed joints, Screwed joints, Bolted and dowelled joints,



<b>IN\$474</b>	<b>Tunnels</b>	<b>3+0</b>	<b>4.5</b>
Substructures; Stability of Substructure Body: Preventing Slides; Types of Protection Construction: Retaining Walls, Cover Walls, Gutters, Ripraps, Snow Fences, Substructure for Passing Rivers, Culverts, Tunnels: Definition and History, Tunnel Investigations, Pressures on Tunnels, Cover Dimension and Forms, Galleries, Shafts, Methods of Tunnel Construction, Special Tunneling Methods.			

Introduction: Definition of a tall building, Lateral load design philosophy, Concept of premium for height; Wind Effects: Design considerations, Extreme wind conditions, Code wind loads; Seismic Design: Tall building behavior during earthquakes, Philosophy of earthquake design, Dynamic approach; Steel Buildings: Introduction, Semi-rigid frames, Rigid frames, Braced frames, Eccentric bracing systems, Framed tube systems, Trussed framed systems.

Introduction to Primavera; Reasons of using Primavera, its advantages, disadvantages; Dividing the project; Special data sections; Dividing cost calculations; Resource balancing; Managing more than one project; Late times and free float calculations; Defining activities; Relations between activities in Primavera; Resource and budget planning with Primavera.

Introduction to Construction Cost; Definition of Cost Analysis; Bidding Law; Bidding Qualification; Optimum Proposal Preparation; Bid Bond; Performance Bond; Final Cost; Project Acceptance; Blue-Print Reading; Material Resources; Total Project Cost.

Introduction, concrete making, concrete casting; cements; types of cements, manufacture of cementitious materials; Portland cement, properties of Portland cement, tests on properties of Portland cement; pozzolanic materials; types of pozzolanic materials, artificial and natural pozzolans; effects of pozzolans on properties of fresh and hardened concrete; aggregates; types of aggregate, properties of aggregate; effects of aggregate type and properties on concrete properties; water; mixing water, properties of mixing water; admixtures; classification of admixtures, purpose of use of admixtures in concrete; Project presentations.

Shear Strength of Soil, Bearing Capacity of Shallow Foundations; Stress Distribution in Soil; Consolidation Theory: Finding Coefficient of Consolidation with Square-root-of time and logarithm-of-time; Drained and Undrained Loading in Soil; Computing of Settlement for Load Conditions; Settlement Boundaries for Structures; Calculations of Earth Pressure, Retaining Walls, Slope Stability. Shear Strength of Soil, Bearing Capacity of Shallow Foundations; Stress Distribution in Soil; Consolidation Theory: Finding Coefficient of Consolidation with Square-root-of time and logarithm-of-time; Drained and Undrained Loading in Soil; Computing of Settlement for Load Conditions; Settlement Boundaries for Structures; Calculations of Earth Pressure, Retaining Walls, Slope Stability.

Preloading; Vertical Drains; Deep Compaction of Cohesion less Soils: Vibrofloatation, Vibratory probes, Compaction piles, Dynamic compaction, Blasting; Grouting: Permeating grouting, Compaction grouting; Chemical grouting, Jet grouting; Soil Reinforcement: Soil nailing, Micro piles, Reinforced earth, Stone columns, Lime columns, Geotextiles, Freezing, Electro-osmosis. Preloading; Vertical Drains; Deep Compaction of Cohesion less Soils: Vibrofloatation, Vibratory Probes, Compaction Piles, Dynamic Compaction, Blasting; Grouting: Permeating Grouting, Compaction Grouting; Chemical Grouting, Jet Grouting; Soil Reinforcement: Soil Nailing, Micro Piles, Reinforced Earth, Stone Columns, Lime Columns, Geotextiles, Freezing, Electro-osmosis.

Highway and Railway Fills; Earth Dams; General Principles of Design; Choice of Dam Type. Circular arc Method of Stability Analysis; Prediction of Pore Pressures During Construction: Steady Seepage and Rapid Draw Down; Special Methods of Analysis for Puddle Core and Rock Fill Dams; Design in Earthquake Areas. Highway and Railway Fills; Earth Dams; General Principles of Design; Choice of Dam Type. Circular arc Method of Stability Analysis; Prediction of Pore Pressures During Construction: Steady Seepage and Rapid Draw Down; Special Methods of Analysis for Puddle Core and Rock Fill Dams; Design in Earthquake Areas.

Protection of Used Materials in Foundation Construction: Ground improvement, Protection of foundation hole against underground water and surface water, Cofferdams; Keeping Dry of Foundation Hole; Insitu Experiments and Evaluation; Calculations of Shallow Foundations; Methods of Rigid and Flexible Computation; Single. Strip and Mat foundations; Deep foundation: Group piles, Calculation of piles according to horizontal loads; Specific Foundations. Protection of Used Materials in Foundation Construction: Ground Improvement, Protection of Foundation Hole Against Underground and surface water, Cofferdams; Keeping Dry of Foundation Hole; Insitu Experiments and Evaluation; Calculations of Shallow Foundations; Methods of Rigid and Flexible Computation; Single. Strip and Mat foundations; Deep foundation: Group piles, Calculation of piles under horizontal loads; Specific Foundations.

**IN\$485                      Irrigation and Drainage                      3+0    4.5**

Introduction; Properties of Soil and Water; Irrigation Systems: Element of classical water intake networks, Element of classical water discharge network, Computation of discharge network; Water Distribution Methods and System Design; Hydrology and Computation of Channel; Theoretical Bases of Drainage; Drainage with Trenches; Design of Trench Networks.

**IN\$486                      Introduction to Soil Dynamics                      3+0    4.5**

Fundamentals of Vibration; Earthquakes and Ground Vibrations; Shear Modulus and Damping in Soils; Response of Soil Layers to Earthquake Motions; Lateral Earth Pressure on Retaining Walls; Theories Connected with Active Earth Pressure; Liquefaction of Soils; Stability of Slopes and Dams Under Seismic Loads; Dynamic Bearing Capacity and Settlement of Foundations.

**IN\$487                      Water Structures                      3+0    4.5**

Introduction; Developing Water Resources and Contribution to Economy, River Morphology, Sediment Motion in Rivers, River Regulation. Flood Control: Preventing structures; Transportation on River and Types of Transportations: Diversions, Dams and reservoirs; Structures of Energy Dissipaters; Intake Structures; Hydroelectric Power; Irrigation-Drainage; Theoretic Fundamentals; Economic Analysis of Water Resources.

**IN\$488                      Environmental Geotechnology                      3+0    4.5**

Environmental Cycle; Solid Waste Groups; Soil Formation; Constituents and Properties; Waste-Soil Interaction; Waste Dumping; Physico-Chemical Properties of Soil: Cation exchange capacity, Specific surface area, Ph, Electrical conductivity, Organic matter content, Zeta potential, Dielectric constant, Double layer theories, Heavy metal, Salt and hydrocarbon pollution in soil; Micro-Structure Properties of Soil: Scanning electron microscopy, X-Ray analysis; Improvement of Polluted Soil: Stabilization/Solidification Methods: Fly ash, lime, cement and asphalt stabilization, Sanitary landfill design. Environmental Cycle; Solid Waste Groups; Soil Formation; Constituents and Properties; Waste-Soil Interaction; Waste Dumping; Physico-Chemical Properties of Soil: Cation exchange capacity, Specific surface area, Ph, Electrical conductivity, Organic content, Zeta potential, Dielectric constant, Double layer theories, Heavy metal, Salt and hydrocarbon pollution in soil; Micro-Structure Properties of Soil: Scanning electron microscopy, X-Ray analysis; Improvement of Polluted Soil: Stabilization/Solidification Methods: Fly ash, lime, cement and asphalt stabilization, Sanitary landfill design.

**IN\$489 (Eng)              Open Channel Hydraulics                      3+0    4.5**

General Equation of Gradually Varied Flows (GVF); Types of Channel Slopes; Characteristics and Classification of GVF Profiles; Solution of GVF Equations; Characteristics of Rapidly Varied Flow; Flow Over Spillways; Crest Shape and Discharge of Overflow Spillways; Basic Characteristics of Jump; Flow Measurement in Open Channel; Types of Flow Measurement Structures; Sharp, Short and Broad Crested Weirs.

**IN\$490                      Coastal and Port Engineering                      3+0    4.5**

Introduction to Coastal and Port Engineering; Sea Waves; Methods of Wave Prediction; Variation of Waves in Coastal Area; Wave Energy and Wave Force; Coastal Currents; Motion of Coastal Sediments Transport; Effect of Sea Water to Coastal Structure Materials; Protective Coastal Structure; Properties of Ports and General Design Principles; Unit System in Port; Breakwaters: Types of structure, project and Principles of calculations; Quay and Jetties.

**IN\$492 (Eng)              Water Resources Engineering                      3+0    4.5**

Classification of Dams: Types of spillways, Crest gates, Outlet works; Uses, Quantities, Characteristics and quality of water; Treatment and Distribution System; Characteristics; Collection, Treatment and Management of Wastewater; Soil-Water Relationships; Irrigation Methods; Drainage Flow and Land Drainage; Municipal Storm and Highway Drainage; Culverts and Bridge Waterways; Hydroelectric Power Plants; Turbines; Operation, Planning.

**IN\$494                      Civil Engineering Construction                      3+0    4.5**

Fundamental Principles for System; Introduction and Selection and Introduction to Analytic Operation; Mathematical Optimised Theory in Engineering Issue and Systematic Investigation of Applications; Solution Development of Single and Multi-purposes Problems; Usage Theory; Statistical Decision-support System; Uncertainty and Risk analysis; Design for Uncertainty and Failure. Fundamental Principles of Systems; Investigation of Introduction to Analytic Operation;

Mathematical Optimization Theory in Engineering Problems and its Applications; Solving of Single and Multi-purpose Problems; Use Theory; Statistical Decision-support System; Uncertainty and Risk analysis; Design for Uncertainty and Failure.

**iN\$495 Highway Pavements 3+0 4.5**

Definition of Highway Pavement and Introduction; Stresses in Flexible Pavements: Traffic load, Design of highway pavements; Flexible Pavements: Design methods and laboratory tests; Rigid Pavement: Design methods, Properties of pavement components; Properties of Aggregates and Bituminous; Quality Control Test of Materials; Flexible, Asphalt and Concrete Pavement Construction.

**iN\$496 (Eng) Construction Planning and Management 3+0 4.5**

Project Management and Organisation: Application-organisation of construction management; Construction Engineering and Marketing Applications; Long-Short Fixed Term Strategic Marketing Planning; Using Financial Sources in Civil Engineering; International Construction Market; Communication and Concepts of Sales Marketing. Project Management and Organization: Application-organization of construction management; Construction Engineering and Marketing Applications; Long-Short Term Strategic Marketing Planning; Using Financial Sources in Civil Engineering; International Construction Market; Communication and Concepts of Sales Marketing.

**iN\$498 (Eng) Introduction to Structural Dynamics 3+0 4.5**

Introduction; Reasons and Preventives of Dynamic Disturbance; Single and Multiple Degree of Freedom Systems; Continuous Systems; Motion Equations; Theoretical Explanations and Solutions; Energy Methods in Structural Dynamics; Applications in Structural Dynamics; Areas of Structural Dynamics; Earthquake Engineering; Project against Explosion; Random Vibrations; Reactions of Structures against Earthquake; Preventives; Estimations and Criteria of Damage Determination.

**iN\$SJ301 Civil Engineering Internship I 0+2 2.5**

Professional Work in a Business Environment; Professional Knowledge, Skills, Attitudes and Behaviors; Recognition of Business Areas And Industry; Adapting to Business Life; Gaining Work Experience; Learning the Applications in Institutions/Organizations; Growing Up in a Real Production and Service Environment; Applying Learned Knowledge and Skills; Recognizing, Analyzing, Modeling and Solving Complex Systems and Real Life Problems; Report Writing.

**iN\$SJ302 Civil Engineering Internship II 0+2 2.5**

Professional Work in a Business Environment; Professional Knowledge, Skills, Attitudes and Behaviors; Recognition of Business Areas And Industry; Adapting to Business Life; Gaining Work Experience; Learning the Applications in Institutions/Organizations; Growing Up in a Real Production and Service Environment; Applying Learned Knowledge and Skills; Recognizing, Analyzing, Modeling and Solving Complex Systems and Real Life Problems; Report Writing.

**iSG401 Occupational Health and Safety I 2+0 2.0**

Overview of Occupational Health and Safety: Scope, Importance, Related concepts; Workplace Accidents and Occupational Diseases: Reasons, Precautions, Costs; Occupational Health and Safety: Responsible institutions, Problems in applications, Legal basis for occupational safety, Legislation, Regulations for employers; Legal Responsibility of Employers for Workplace Accidents and Occupational Diseases: Liability concept, Regulations for employer responsibility.

**iSG402 Occupational Health and Safety II 2+0 2.0**

Compensation Claims for Occupational Health and Safety: Compensation types; Legislation for Employers not Abide by Occupational Health and Safety Instructions: Administrative sanctions, Criminal sanctions, Investigations for workplace accidents; Organization in Workplace for Occupational Health and Safety: Employee representative, Obligation for constituting board for occupational health and safety, Workplace health and safety board; International Legislation for Occupational Health and Safety: International legislation, European legislation, Comparison of national and international legislation.

**iSN309 Mass Media 3+0 3.0**

Concept of the Mass Media; Emergence of Mass Media; Historical Development of Mass Media Research; Liberal and Critical Approaches to Mass Media; Optimistic Approach to Mass Media: Marshall McLuhan; Pessimistic Approach to Mass Media: Herbert Marcuse; Quasi Optimistic Approach to Mass Media: Alvin Toffler; Ideological Function of Mass Media; Globalization and Consumer Society; Advertising and Consumer Society; News and Reality; Myth Production in Mass Media: Advertising, TV, News; Discussions on Information Society: Internet and the Problem of Participation; Media and Women; Media and Democracy. Concept of the Mass Media; Emergence of Mass Media; Historical Development of Mass Media Research; Liberal and Critical Approaches to Mass Media; Optimistic Approach to Mass Media: Marshall McLuhan; Pessimistic Approach to Mass Media: Herbert Marcuse; Quasi Optimistic Approach to Mass Media: Alvin Toffler; Ideological Function of Mass Media; Globalization and Consumer Society; Advertising and Consumer Society;

News and Reality; Myth Production in Mass Media: Advertising, TV, News; Discussions on Information Society: Internet and the Problem of Participation; Media and Women; Media and Democracy.

**iSN309 (Eng)      Mass Media**

**3+0    3.0**

Concept of the Mass Media; Emergence of Mass Media; Historical Development of Mass Media Research; Liberal and Critical Approaches to Mass Media; Optimistic Approach to Mass Media: Marshall McLuhan; Pessimistic Approach to Mass Media: Herbert Marcuse; Quasi Optimistic Approach to Mass Media: Alvin Toffler; Ideological Function of Mass Media; Globalization and Consumer Society; Advertising and Consumer Society; News and Reality; Myth Production in Mass Media: Advertising, TV, News; Discussions on Information Society: Internet and the Problem of Participation; Media and Women; Media and Democracy. Concept of the Mass Media; Emergence of Mass Media; Historical Development of Mass Media Research; Liberal and Critical Approaches to Mass Media; Optimistic Approach to Mass Media: Marshall McLuhan; Pessimistic Approach to Mass Media: Herbert Marcuse; Quasi Optimistic Approach to Mass Media: Alvin Toffler; Ideological Function of Mass Media; Globalization and Consumer Society; Advertising and Consumer Society; News and Reality; Myth Production in Mass Media: Advertising, TV, News; Discussions on Information Society: Internet and the Problem of Participation; Media and Women; Media and Democracy.

**iSN409              Organizational Communication**

**3+0    4.5**

Communication and Models; The Functions of Communication; Perception and Persuasive Communication; Conformity and Obedience; The Goals and Functions of Communication in Organizations; Communication Forms in Organization; The Importance of Communication in Organization; Preventative Factors Related to Effective Communications in Organization and Conflict; Effective Speaking and Listening; Public Relations as a Form of Organizational Communication; The Techniques of Writing Reports.

**iSP151 (Spa)      Spanish I**

**4+0    4.0**

Introduction: Greeting, Giving information; Gender in Nouns and Adjectives; Verbs in the Present Tense; Demonstrative Adjectives and Pronouns; Plural Forms of Nouns and Adjectives; Description: House, Objects, Numbers; Asking Questions; Asking for Directions and the Time; Verbs in the Present Progressive Tense; At a Restaurant: Ordering, Asking for the Bill, Talking about Preferences; Describing People; Reflexive Verbs; Shopping: Cost, Likes and Dislikes, Quantity; Invitation: Accepting, Refusing; Gerunds; Seasons.

**iSP152 (Spa)      Spanish II**

**4+0    4.0**

The Past: Near and remote past, Prepositions, Indefinite pronouns; The Future: Future plans, Making a phone call, Comparison; The Future Perfect Tense; Habits in the Past; Regular and Irregular Verbs; Senses; Some Grammar Rules: Obligation, Personal pronouns, Passive construction, conjunctions; Reading Texts: Biography, Narration, Picture stories.

**iST2001            Engineering Statistics**

**3+0    4.0**

Tabular and Graphical Representation of Data: Bar, Pie, Dot, Stem-Leaf Plots, Histogram; Central Tendency and Variability Measures; Box Plot; Probability, Random Variable; Probability Distribution, Expected Value; Discrete Random Variables, Bernoulli, Binomial and Poisson Distributions; Continuous Random Variables, Normal Distribution and its Applications; Sampling Distributions; Confidence Intervals for Population Mean and Proportion; Hypothesis Testing: Basic Notions, Tests for population Mean and Proportions; Simple Linear Regression: Method of least squares, Testing significance of the model; Correlation Coefficient. Tabular and Graphical Representation of Data: Bar, Pie, Dot, Stem-Leaf Plots, Histogram; Central Tendency and Variability Measures; Box Plot; Probability, Random Variable; Probability Distribution, Expected Value; Discrete Random Variables, Bernoulli, Binomial and Poisson Distributions; Continuous Random Variables, Normal Distribution and its Applications; Sampling Distributions; Confidence Intervals for Population Mean and Proportion; Hypothesis Testing: Basic Notions, Tests for population Mean and Proportions; Simple Linear Regression: Method of least squares, Testing significance of the model; Correlation Coefficient.

**iST2001 (Eng)    Engineering Statistics**

**3+0    4.0**

Tabular and Graphical Representation of Data: Bar, Pie, Dot, Stem-Leaf Plots, Histogram; Central Tendency and Variability Measures; Box Plot; Probability, Random Variable; Probability Distribution, Expected Value; Discrete Random Variables, Bernoulli, Binomial and Poisson Distributions; Continuous Random Variables, Normal Distribution and its Applications; Sampling Distributions; Confidence Intervals for Population Mean and Proportion; Hypothesis Testing: Basic Notions, Tests for population Mean and Proportions; Simple Linear Regression: Method of least squares, Testing significance of the model; Correlation Coefficient. Tabular and Graphical Representation of Data: Bar, Pie, Dot, Stem-Leaf Plots, Histogram; Central Tendency and Variability Measures; Box Plot; Probability, Random Variable; Probability Distribution, Expected Value; Discrete Random Variables, Bernoulli, Binomial and Poisson Distributions; Continuous Random Variables, Normal Distribution and its Applications; Sampling Distributions; Confidence Intervals for Population Mean and Proportion; Hypothesis Testing: Basic Notions, Tests for population Mean and Proportions; Simple Linear Regression: Method of least squares, Testing significance of the model; Correlation Coefficient.

**iST2044 (Eng)    Engineering Probability**

**3+1    5.0**

Sample Space and Probability: Introduction to probability theory, Review of set theory, Probability spaces, Axioms and properties of probability, Discrete and continuous probability laws, Conditional probability, Law of total probability and Bayes' theorem, Independence and conditional independence, Independent trials and counting techniques; Discrete Random Variables: Introduction and examples of probability mass functions (PMFs), Expectation, mean, and variance, Properties of expectation and variance, Joint PMFs, Conditional PMFs, Conditioning one random variable on another, Conditional expectation, Iterated expectation; Independence of a random variable from an event, Independence of random variables; General Random Variables: Continuous random variables and probability density functions (PDFs), Expectation and the cumulative distribution function (CDF), The Gaussian CDF, Conditional PDFs and joint PDFs, Conditioning one random variable on another, Independence and the continuous Bayes' rule; Advanced Topics on Random Variables: Derived distributions, Functions of two random variables, Correlation and covariance, Applications of covariance; Conditional expectation and variance, Transforms (Moment Generating Functions); Introduction to statistics: Data Representation, Random Sampling, Point Estimation of Parameters, Confidence Intervals, Testing of Hypotheses (Decisions), Goodness of Fit, Nonparametric Tests, Regression, Fitting Straight Lines.

**iST237                      Programming With MATLAB                      4+0   4.0**

Introduction to MATLAB Programing; Fundamental MATLAB Operations and Commands; Algorithm and Programing Logic in MATLAB; Data Processing, Reading and Writing in MATLAB; File Types; M-files: Creating and using functions by using M-files; Program Control Commands, Conditional Control, Loop Control; Matrix and Vector Operations, Functions, Numerical Methods: Root Finding with MATLAB; Drawing Two- and Three Dimensional Graphics with MATLAB; Program Examples in MATLAB for Statistical Applications.

**iST244                      Engineering Probability                      3+0   5.0**

Combinatorial Analysis: Permutations, Combinations; Axioms of Probability: Sample Space and Events; Conditional Probability and Independence: Bayes' Formula, Independent Events; Discrete Random Variables: Expected Value, Variance, the Bernoulli and the Binomial Random Variables, the Poisson Random Variable, the Geometric Random Variables, Properties of the Cumulative Distribution Function; Continuous Random Variables: the Uniform Random Variable, Normal Random Variables, the Normal Approximation to the Binomial Distribution, Exponential Random Variables; Jointly Distributed Random Variables: Independent Random Variables, Sums of Independent Random Variables, Order Statistics; Conditional Expectation: Computing Probabilities by Conditioning, Conditional Variance; Conditional Expectation and Prediction; Moment Generating Functions; the Chebyshev's Inequality and the Weak Law of Large Numbers; the Central Limit Theorem; the Strong Law of Large Numbers; Other Inequalities: the One-sided Chebyshev Inequality, the Chernoff Bounds, the Jensen's Inequality; the Poisson Process; Markov Chains. Combinatorial Analysis: Permutations, Combinations; Axioms of Probability: Sample Space and Events; Conditional Probability and Independence: Bayes' Formula, Independent Events; Discrete Random Variables: Expected Value, Variance, the Bernoulli and the Binomial Random Variables, the Poisson Random Variable, the Geometric Random Variables, Properties of the Cumulative Distribution Function; Continuous Random Variables: the Uniform Random Variable, Normal Random Variables, the Normal Approximation to the Binomial Distribution, Exponential Random Variables; Jointly Distributed Random Variables: Independent Random Variables, Sums of Independent Random Variables, Order Statistics; Conditional Expectation: Computing Probabilities by Conditioning, Conditional Variance; Conditional Expectation and Prediction; Moment Generating Functions; the Chebyshev's Inequality and the Weak Law of Large Numbers; the Central Limit Theorem; the Strong Law of Large Numbers; Other Inequalities: the One-sided Chebyshev Inequality, the Chernoff Bounds, the Jensen's Inequality; the Poisson Process; Markov Chains.

**iST244 (Eng)                      Engineering Probability                      3+0   5.0**

Combinatorial Analysis: Permutations, Combinations; Axioms of Probability: Sample Space and Events; Conditional Probability and Independence: Bayes' Formula, Independent Events; Discrete Random Variables: Expected Value, Variance, the Bernoulli and the Binomial Random Variables, the Poisson Random Variable, the Geometric Random Variables, Properties of the Cumulative Distribution Function; Continuous Random Variables: the Uniform Random Variable, Normal Random Variables, the Normal Approximation to the Binomial Distribution, Exponential Random Variables; Jointly Distributed Random Variables: Independent Random Variables, Sums of Independent Random Variables, Order Statistics; Conditional Expectation: Computing Probabilities by Conditioning, Conditional Variance; Conditional Expectation and Prediction; Moment Generating Functions; the Chebyshev's Inequality and the Weak Law of Large Numbers; the Central Limit Theorem; the Strong Law of Large Numbers; Other Inequalities: the One-sided Chebyshev Inequality, the Chernoff Bounds, the Jensen's Inequality; the Poisson Process; Markov Chains. Combinatorial Analysis: Permutations, Combinations; Axioms of Probability: Sample Space and Events; Conditional Probability and Independence: Bayes' Formula, Independent Events; Discrete Random Variables: Expected Value, Variance, the Bernoulli and the Binomial Random Variables, the Poisson Random Variable, the Geometric Random Variables, Properties of the Cumulative Distribution Function; Continuous Random Variables: the Uniform Random Variable, Normal Random Variables, the Normal Approximation to the Binomial Distribution, Exponential Random Variables; Jointly Distributed Random Variables: Independent Random Variables, Sums of Independent Random Variables, Order Statistics; Conditional Expectation: Computing Probabilities by Conditioning, Conditional Variance; Conditional Expectation and Prediction; Moment Generating Functions; the Chebyshev's Inequality and the Weak Law of Large Numbers; the Central Limit Theorem; the Strong Law of Large Numbers; Other Inequalities: the One-sided Chebyshev Inequality, the Chernoff Bounds, the Jensen's Inequality; the Poisson Process; Markov Chains.

**iST252 (Eng) Probability and Statistics 3+0 4.0**

Data Representation: Average, Spread, Experiments, Events; Probability: Permutations and combinations, Random variables, Probability distributions, Mean and variance of a distribution, Binomial, Poisson and hypergeometric distributions, Normal distribution, Multivariate distribution, Random sampling, Point estimation of parameters, Confidence intervals, Testing hypothesis, Decisions, Quality control, Acceptance sampling, Goodness of fit, X2 tests, Nonparametric tests, Regression, Fitting straight lines, Correlation.

**iST401 Multivariate Statistics I 3+0 4.5**

Overview of Matrix Theory: Minitab and Mat lab Applications; Multivariate Gaussian Distribution and Properties; Hotelling's T2 Test: Hypothesis testing and interval estimation for multivariate data, Hypothesis testing for two independent multivariate populations, Interval estimation for two mean vectors, SPSS and Minitab applications; Multivariate Variance Analysis: One-way multivariate variance analysis, Multiple comparisons, Two- way multivariate variance analysis.

**iST402 Multivariate Statistics II 3+0 4.0**

Multivariate Linear Regression Analysis: Simple linear and multiple linear and multivariate regression analysis, Tests for regression coefficients; Principal Component Analysis: Principal component matrices for principal components; Factor Analysis: Factor models, Estimation of factors, Factor coefficients and scores, Factor transformation; Cluster Analysis: Distance, Standardization and transformation of variables, Clustering methods; Discriminant Analysis; Multidimensional Scaling and Computer Applications

**iST411 Time Series Analysis 4+0 5.0**

Definition and Properties of Time Series; Purposes of Time Series Analysis; Classification of Time Series: Stationary and non-stationary time series, seasonal and non-seasonal series; Forecasting in Time Series Analysis by Using One Variable Technique: Trend analysis, Moving averages, Exponential smoothing; Linear Stationary Stochastic Models: AR and MA models; Non-Stationary Linear Stochastic Models: ARIMA models, Seasonal models.

**iST411 (Eng) Time Series Analysis 4+0 5.0**

Definition and Properties of Time Series; Purposes of Time Series Analysis; Classification of Time Series: Stationary and non-stationary time series, seasonal and non-seasonal series; Forecasting in Time Series Analysis by Using One Variable Technique: Trend analysis, Moving averages, Exponential smoothing; Linear Stationary Stochastic Models: AR and MA models; Non-Stationary Linear Stochastic Models: ARIMA models, Seasonal models.

**iST415 Reliability Analysis 3+0 5.0**

Fundamental Concepts of Reliability: Failure rate function, Cumulative failure rate function and bathtub curve, Conditional reliability and mean time to failure; Constant Failure Rate Model: Two-parameter exponential distribution; Time-dependent Failure Models: Weibull distribution, Normal distribution and Lognormal distribution; Reliability of Systems: Series systems, Parallel systems, Series-parallel systems; Implementation of Survival Analysis in Reliability; Exponential and Weibull Models in Survival Analysis; Kaplan-Meier Method and Cox Regression Analysis.

**işL101 Introduction to Business 3+0 4.5**

Concept of business: Economic systems, Production factors, Needs and wants, Demand, Goods and services, Consumption and consumer; Success criterion: Efficiency and related concepts; Characteristics of Businesses: Goals and functions of businesses, Relationships with the environment and responsibilities of businesses, Grouping of businesses; Foundation of businesses: Foundation decision, Determining plant location; Extending Businesses; Business ethics and social responsibility ( Ethical and moral rules); Concept of management; Functions of management; Human resources management; Functions of human resources management; Principles of marketing. Concept of business: Economic systems, Production factors, Needs and wants, Demand, Goods and services, Consumption and consumer; Success criterion: Efficiency and related concepts; Characteristics of Businesses: Goals and functions of businesses, Relationships with the environment and responsibilities of businesses, Grouping of businesses; Foundation of businesses: Foundation decision, Determining plant location; Extending Businesses; Business ethics and social responsibility ( Ethical and moral rules); Concept of management; Functions of management; Human resources management; Functions of human resources management; Principles of marketing.

**işL101 (Eng) Introduction to Business 3+0 4.5**

Concept of business: Economic systems, Production factors, Needs and wants, Demand, Goods and services, Consumption and consumer; Success criterion: Efficiency and related concepts; Characteristics of Businesses: Goals and functions of businesses, Relationships with the environment and responsibilities of businesses, Grouping of businesses; Foundation of businesses: Foundation decision, Determining plant location; Extending Businesses; Business ethics and social responsibility ( Ethical and moral rules); Concept of management; Functions of management; Human resources management; Functions of human resources management; Principles of marketing. Concept of business: Economic systems, Production factors, Needs and wants, Demand, Goods and services, Consumption and consumer; Success criterion: Efficiency and related concepts; Characteristics of Businesses: Goals and functions of businesses, Relationships with the environment and responsibilities of businesses, Grouping of businesses; Foundation of businesses: Foundation decision,

Determining plant location; Extending Businesses; Business ethics and social responsibility ( Ethical and moral rules); Concept of management; Functions of management; Human resources management; Functions of human resources management; Principles of marketing.

**işL102                      Management and Organization                      3+0    4.0**

Management: Definition, Significance of Management for Business Enterprises; Development of Management Science: Classical, Behavioral and Modern Theories; Management Systems; Decision Making and Planning; Concepts of Authority and Power: Characteristics of Authority and Power, Delegation of Authority; Organization: Characteristics and Principles; Comparison of Organization and Planning Processes; Departmentalization; Staffing: Fundamentals, Staffing Process; Leading: Fundamentals, Leading Process; Organizational Structures: Development and Varieties of Organizational Structures; Controlling: Fundamentals and Controlling Process.

**işL103 (Eng)            Business Management                      3+0    3.5**

Management: Basic Concepts, Significance of Management for Business Enterprises; Comparison of Management with Similar Concepts; Development of Management Science: Classical, Behavioral, and Modern Theories; Management System: Fundamentals and Significance of Management System for Business Enterprises; Planning and Decision Making: Planing process ,Types of Plans; Organization: Fundamentals, Organization Process, Comparison of organization and planning processes; Authority and Power: Characteristics and Importance of Authority and Power, Delegation of Authority; Controlling: Characteristics, Controlling process. Management: Basic Concepts, Significance of Management for Business Enterprises; Comparison of Management with Similar Concepts; Development of Management Science: Classical, Behavioral, and Modern Theories; Management System: Fundamentals and Significance of Management System for Business Enterprises; Planning and Decision Making: Planing process ,Types of Plans; Organization: Fundamentals, Organization Process, Comparison of organization and planning processes; Authority and Power: Characteristics and Importance of Authority and Power, Delegation of Authority; Controlling: Characteristics, Controlling process.

**işL116 (Eng)            Fundamentals of Business                      3+0    3.0**

Business Environment; Business Ethics & Social Responsibility in Business; Business Ownership; Management Process: Planning, Organizing, Leading, Controlling; Organizational Design; Human Resources Management; Marketing Management; Marketing Mix: 4 P's of Marketing, 4 C's of Marketing; Management Information Systems; E-Business; Accounting: Financial Accounting, Cost Accounting; Financial Management: Financial Markets, Financial Institutions; International Business; Business Strategy.

**işL201                      Business Organization                      3+0    4.0**

Departmentalisation: Fundamentals and systems of departmentalisation; Authority: Definition and sources; Power: Definition and sources, Comparison of sources of authority and power; Delegation of Authority: Stages and principles; Centralization and Decentralization; Authority of Command and Staff Authority; Span of Management. Departmentalisation: Fundamentals and systems of departmentalisation; Authority: Definition and sources; Power: Definition and sources, Comparison of sources of authority and power; Delegation of Authority: Stages and principles; Centralization and Decentralization; Authority of Command and Staff Authority; Span of Management.

**işL201 (Eng)            Business Organization                      3+0    4.0**

Departmentalisation: Fundamentals and systems of departmentalisation; Authority: Definition and sources; Power: Definition and sources, Comparison of sources of authority and power; Delegation of Authority: Stages and principles; Centralization and Decentralization; Authority of Command and Staff Authority; Span of Management. Departmentalisation: Fundamentals and systems of departmentalisation; Authority: Definition and sources; Power: Definition and sources, Comparison of sources of authority and power; Delegation of Authority: Stages and principles; Centralization and Decentralization; Authority of Command and Staff Authority; Span of Management.

**işL209                      Business Management                      2+0    2.0**

Business and Basic Concepts, Aims and Relationship with Environment of Management: Basic concepts, Business' aims, Importance in economical structure, Difference between manager and entrepreneur; Classification of Businesses: Dimension, Property, Legal structure etc.; Establishment Studies, Dimension and Capacity: Foundation stages, Location, Dimension definion, Capacity; Functions of Business: Management, Organization, Control, Planning; Organization Operation Process: Leathership and management, Strategic management, Change, Groups, Motivation.

**işL301                      Human Resources Management                      3+0    4.0**

Human Resources Management: Development, Goals and Principles; Functions of Human Resources Management: Human resources planning; Recruitment, Performance Appraisal, Training, Orientation and Development; Wage and Salary Administration; Career Management; International Human Resources Management; Technology in Human Resources Management. Human Resources Management: Development, Goals and Principles; Functions of Human Resources Management: Human resources planning; Recruitment, Performance Appraisal, Training, Orientation and Development; Wage and Salary Administration; Career Management; International Human Resources Management; Technology in Human Resources Management.

**İŞL301 (Eng) Human Resources Management 3+0 4.0**

Human Resources Management: Development, Goals and Principles; Functions of Human Resources Management: Human resources planning; Recruitment, Performance Appraisal, Training, Orientation and Development; Wage and Salary Administration; Career Management; International Human Resources Management; Technology in Human Resources Management. Human Resources Management: Development, Goals and Principles; Functions of Human Resources Management: Human resources planning; Recruitment, Performance Appraisal, Training, Orientation and Development; Wage and Salary Administration; Career Management; International Human Resources Management; Technology in Human Resources Management.

**İŞL302 (Eng) Production Management and Systems 3+0 4.5**

Functions of Production: Definition, Inputs, Transformation process; Production Systems: Customized production, Mass Production Systems, Large-Batch Production; Product Design: Concept of design, Standardization, Leaning, Coding, Product-Based Process Design, Process-Based Design System, Production Chamber Process Design; Choosing of Technology: Expert Systems; Capacity Planing: Types of Capacity, Capacity Policies; Project Planning Models: Gantt Method CPM, PERT; Inventory Control Models; Production Planing Model. Functions of Production: Definition, Inputs, Transformation process; Production Systems: Customized production, Mass Production Systems, Large-Batch Production; Product Design: Concept of design, Standardization, Leaning, Coding, Product-Based Process Design, Process-Based Design System, Production Chamber Process Design; Choosing of Technology: Expert Systems; Capacity Planing: Types of Capacity, Capacity Policies; Project Planning Models: Gantt Method CPM, PERT; Inventory Control Models; Production Planing Model.

**İŞL321 Applied Entrepreneurship 3+1 5.0**

Introduction to Entrepreneurship: Basic Concepts; Climate for Entrepreneurship: Economic Perspective: Opportunity Recognition and Idea Creating: Theory and practice; Feasibility Analysis; Industry and Competitive Analysis; Marketing Plan: Theory and practices; Operations Plan: Theory and practices; Management Plan: Theory and practices; Financial Plan: Theory and practices; Business Model Development; Financing and Funding for Entrepreneurial Business; Marketing Issues in Entrepreneurial Business; Franchising and Buying an Existing Business.

**İŞL323 (Eng) Human Resources Management 3+0 5.0**

Introduction: Importance of human as a resource, Importance of human resources management busines; Historical Development of Human Resources Management: Personel management, Human resource management, Strategic human resource management and Talent management; Human Resources Planning: Methods and Planning instruments; Job Analysis: Methods and process, Job descriptions and Job requirements; Functions of Human Resources Management: Recruitment, Finding and selecting, Placement, Orientation, Training and development, Performance appraisal, Wage and salary administration, Career management, Occupational health and safety, Industrial relations and discipline. Introduction: Importance of human as a resource, Importance of human resources management busines; Historical Development of Human Resources Management: Personel management, Human resource management, Strategic human resource management and Talent management; Human Resources Planning: Methods and Planning instruments; Job Analysis: Methods and process, Job descriptions and Job requirements; Functions of Human Resources Management: Recruitment, Finding and selecting, Placement, Orientation, Training and development, Performance appraisal, Wage and salary administration, Career management, Occupational health and safety, Industrial relations and discipline.

**İŞL406 Strategic Management 3+0 4.5**

Fundamental Principles of Strategic Management: Vision, Mission Strategy, Politics; Strategic Management in Corporations: Definition of strategic management, Principles of Strategic Management, Nature of Strategic Management; Fundamental Principles of Strategic Management; Strategic Management Processes; Strategic Management: Developments from 1960 to 1990; Process of Development in Strategy; Purposes of Strategy; Analysis of External Environment; Analysis of Corporate.

**İŞL412 Strategic Management 2+0 3.0**

Fundamental Principles of Strategic Management; Vision, Mission, Straegy, Politics: Strategic Management in Corporations: Definition of Strategic Management; Nature of Strategic Management; Fundamental Principles of Strategic Management; Strategic Management Processes; Development of Human Recources Between (1960-1990); Strategy; Process of Strategy, Purpose of Strategy; Analysis of External Environment; Corporate Analysis.

**İŞL421 Entrepreneurship 2+0 3.0**

Importance and Evolution of Entrepreneurship: Entrepreneurship within the framework of Manager, Concepts of Entrepreneur, Employer, Boss and Investor; Leadership in Entrepreneurship and Importance of Management Characteristics; Characteristics of Entrepreneurship; Changing Views of Entrepreneurship; General Evaluation of Entrepreneurship in Turkey: Change and Entrepreneurship; Entrepreneurship before and after the Republic; Female Entrepreneurs.



<b>işL454</b>	<b>Management of Technology</b>	<b>3+0 4.5</b>
Structures of Management Organizations; Organization of Project Groups; Project Management and Its Principles; Management Functions; Employee's Organization; Basic Principles in Project Management and Formation of Project Groups; Time Management; Project Planning; PERT Technique; GANTT Charts and Other Presentation Techniques; Pricing and Cost Control. Structures of Management Organizations; Organization of Project Groups; Project Management and Its Principles; Management Functions; Employee's Organization; Basic Principles in Project Management and Formation of Project Groups; Time Management; Project Planning; PERT Technique; GANTT Charts and Other Presentation Techniques; Pricing and Cost Control.		
<b>işL454 (Eng)</b>	<b>Management of Technology</b>	<b>3+0 4.5</b>
Structures of Management Organizations; Organization of Project Groups; Project Management and Its Principles; Management Functions; Employee's Organization; Basic Principles in Project Management and Formation of Project Groups; Time Management; Project Planning; PERT Technique; GANTT Charts and Other Presentation Techniques; Pricing and Cost Control. Structures of Management Organizations; Organization of Project Groups; Project Management and Its Principles; Management Functions; Employee's Organization; Basic Principles in Project Management and Formation of Project Groups; Time Management; Project Planning; PERT Technique; GANTT Charts and Other Presentation Techniques; Pricing and Cost Control.		
<b>işL475</b>	<b>Techno-Entrepreneurship</b>	<b>3+0 4.0</b>
Techno-Entrepreneurship: Definitions, Concepts, History; Creativity and Innovation: Concepts, Innovation types, Situation in Turkey and world; Idea to Market: Emergence and commercialization process of business idea, road maps; Entrepreneurial Marketing: Concepts, strategy and implementation; Managerial Issues: Performance, Team work, Strategic orientations; Legal Issues: Patents, Copyrights, Law and regulations; Financial Issues: Sources of funding, Sponsorships; Characteristics of Techno-Entrepreneur: Background, Education, Personality; Sustainability and Innovator's Dilemma: Concepts, Reasons of failure; Future of Techno-Entrepreneurship: Trends.		
<b>iTA255 (ita)</b>	<b>Italian I</b>	<b>3+0 4.0</b>
Sounds in Italian; Masculine and Feminine Definite Articles; Personal and Demonstrative Pronouns; Use and Conjugation of Verbs 'Essere?' and 'Avere?'; Introducing Oneself; Improving Reading Comprehension by means of Dialogs ; Describing People ; Days ; Months ; Years ; Asking the Time ; Ordinal and Cardinal Numbers.		
<b>iTA256 (ita)</b>	<b>Italian II</b>	<b>3+0 4.0</b>
Simple and Compound Prepositions; Past Tense and Conjugation of Verbs in this Tense; Transitive and Intransitive Verbs in Past Tense; Improving Reading Skills; Analyzing Paragraphs and Texts; Interrogatives: Asking Questions; Introduction to Italian Culture and Daily Language.		
<b>JAP301 (Jap)</b>	<b>Japanese I</b>	<b>4+0 4.0</b>
Basic Verbs; Words and Sentence Structures Used In Daily Speech; Greetings; Meeting Someone new; Introducing Oneself; Asking For Price; Time Concept; Numbers; Verbs And Words About Traveling By Train And By Bus; Likes And Dislikes; Apologizing.		
<b>JAP302 (Jap)</b>	<b>Japanese II</b>	<b>4+0 4.0</b>
Introducing Oneself And One's Family; Ordering Food And Beverages In A Restaurant Or Cafe; Asking for the Bill; Meals And Expressions Used for Ordering Meals; Making A Reservation; Talking On The Phone; Asking For Information; Quantifiers; Demonstrative Adjectives; Talking About Past And Future.		
<b>JEO201</b>	<b>Engineering Geology</b>	<b>3+0 4.5</b>
Principles of Geology; Structure of the Earth; Geological Cycles; Minerals and Rocks: Sedimentary, igneous and metamorphic; External Processes on Land and in Sea; Internal Processes: Including deformation of rocks; Earthquake areas in Turkey; Topics of Interest to Civil Engineering (Tunnel route evaluation; case studies); Introduction to Soil and Rock slope stability. Principles of Geology; Structure of the Earth; Geological Cycles; Minerals and Rocks: Sedimentary, igneous and metamorphic; External Processes on Land and in Sea; Internal Processes: Including deformation of rocks; Earthquake areas in Turkey; Topics of Interest to Civil Engineering (Tunnel route evaluation; case studies); Introduction to Soil and Rock slope stability.		
<b>KİM1001 (Eng)</b>	<b>General Chemistry I</b>	<b>4+0 6.0</b>
Matter and Measurement: Dimension analysis and significant figures; Atomic Structure and Atom Theory; Chemical Compounds: Classification and nomenclature; Chemical Reactions and Stoichiometry; Reactions in Aqueous Solutions; Gases and Gas Laws; Thermochemistry; Electrons in Atoms: Electromagnetic radiation and electron configuration; The Periodic Table and Some Atomic Properties; Chemical Bonding: Lewis theory and molecular geometry. Matter and Measurement: Dimension analysis and significant figures; Atomic Structure and Atom Theory; Chemical Compounds: Classification and nomenclature; Chemical Reactions and Stoichiometry; Reactions in Aqueous Solutions; Gases and Gas		

Laws; Thermochemistry; Electrons in Atoms; Electromagnetic radiation and electron configuration; The Periodic Table and Some Atomic Properties; Chemical Bonding: Lewis theory and molecular geometry.

**KiM1002 (Eng) General Chemistry II**

**4+0 6.0**

Intermolecular Forces: Properties of liquids and solids, Phase diagrams; Solutions and Their Properties: Liquid-vapor equilibria, Colligative properties; Chemical Kinetics: Reaction rate laws; Principles of Chemical Equilibrium; Spontaneous Change: Entropy and Gibbs free energy; Acids and Bases; Reactions of Acid and Bases: Buffer solutions, Titration curves; Solubility Equilibria; Electrochemistry. Intermolecular Forces: Properties of liquids and solids, Phase diagrams; Solutions and Their Properties: Liquid-vapor equilibria, Colligative properties; Chemical Kinetics: Reaction rate laws; Principles of Chemical Equilibrium; Spontaneous Change: Entropy and Gibbs free energy; Acids and Bases; Reactions of Acid and Bases: Buffer solutions, Titration curves; Solubility Equilibria; Electrochemistry.

**KiM1005 General Chemistry**

**4+0 6.0**

Introduction: Matter and Measurement; Atoms, Molecules and Ions; Chemical Reactions and Reaction Stoichiometry; Reactions in Aqueous Solutions; Electronic Structure of Atoms; Periodic Properties of the Elements; Basic Concepts of Chemical Bonding; Gases, Liquids, Intermolecular Forces and Solids; Properties of Solutions; Chemical Kinetics; Chemical Equilibrium and Acid-Base Equilibria; Thermochemistry and Chemical Thermodynamics; Electrochemistry. Introduction: Matter and Measurement; Atoms, Molecules and Ions; Chemical Reactions and Reaction Stoichiometry; Reactions in Aqueous Solutions; Electronic Structure of Atoms; Periodic Properties of the Elements; Basic Concepts of Chemical Bonding; Gases, Liquids, Intermolecular Forces and Solids; Properties of Solutions; Chemical Kinetics; Chemical Equilibrium and Acid-Base Equilibria; Thermochemistry and Chemical Thermodynamics; Electrochemistry.

**KiM1005 (Eng) General Chemistry**

**4+0 6.0**

Introduction: Matter and Measurement; Atoms, Molecules and Ions; Chemical Reactions and Reaction Stoichiometry; Reactions in Aqueous Solutions; Electronic Structure of Atoms; Periodic Properties of the Elements; Basic Concepts of Chemical Bonding; Gases, Liquids, Intermolecular Forces and Solids; Properties of Solutions; Chemical Kinetics; Chemical Equilibrium and Acid-Base Equilibria; Thermochemistry and Chemical Thermodynamics; Electrochemistry. Introduction: Matter and Measurement; Atoms, Molecules and Ions; Chemical Reactions and Reaction Stoichiometry; Reactions in Aqueous Solutions; Electronic Structure of Atoms; Periodic Properties of the Elements; Basic Concepts of Chemical Bonding; Gases, Liquids, Intermolecular Forces and Solids; Properties of Solutions; Chemical Kinetics; Chemical Equilibrium and Acid-Base Equilibria; Thermochemistry and Chemical Thermodynamics; Electrochemistry.

**KiM1010 General Chemistry Laboratory**

**0+2 1.5**

Laboratory Rules and Safety; Introduction of Basic Laboratory Materials and Applications; Identification of Substances According to Their Properties; Solution Preparation; Determination of Molecular Mass of Volatile Liquids; Thermal Decomposition of Potassium Chlorate and Determination of the Molar Volume of Oxygen; Intermolecular Interactions: Dissolution of alcohols in water and ether; Colligative Properties: Freezing point depression and boiling point elevation; Titration of Weak Acids, pH and Buffers; Investigation of Factors Affecting Reaction Rate; Chemical Equilibrium and Determination of Equilibrium Constant; Redox Reactions: Investigation of metal activities. Laboratory Rules and Safety; Introduction of Basic Laboratory Materials and Applications; Identification of Substances According to Their Properties; Solution Preparation; Determination of Molecular Mass of Volatile Liquids; Thermal Decomposition of Potassium Chlorate and Determination of the Molar Volume of Oxygen; Intermolecular Interactions: Dissolution of alcohols in water and ether; Colligative Properties: Freezing point depression and boiling point elevation; Titration of Weak Acids, pH and Buffers; Investigation of Factors Affecting Reaction Rate; Chemical Equilibrium and Determination of Equilibrium Constant; Redox Reactions: Investigation of metal activities.

**KiM1010 (Eng) General Chemistry Laboratory**

**0+2 1.5**

Laboratory Rules and Safety; Introduction of Basic Laboratory Materials and Applications; Identification of Substances According to Their Properties; Solution Preparation; Determination of Molecular Mass of Volatile Liquids; Thermal Decomposition of Potassium Chlorate and Determination of the Molar Volume of Oxygen; Intermolecular Interactions: Dissolution of alcohols in water and ether; Colligative Properties: Freezing point depression and boiling point elevation; Titration of Weak Acids, pH and Buffers; Investigation of Factors Affecting Reaction Rate; Chemical Equilibrium and Determination of Equilibrium Constant; Redox Reactions: Investigation of metal activities. Laboratory Rules and Safety; Introduction of Basic Laboratory Materials and Applications; Identification of Substances According to Their Properties; Solution Preparation; Determination of Molecular Mass of Volatile Liquids; Thermal Decomposition of Potassium Chlorate and Determination of the Molar Volume of Oxygen; Intermolecular Interactions: Dissolution of alcohols in water and ether; Colligative Properties: Freezing point depression and boiling point elevation; Titration of Weak Acids, pH and Buffers; Investigation of Factors Affecting Reaction Rate; Chemical Equilibrium and Determination of Equilibrium Constant; Redox Reactions: Investigation of metal activities.

**KiM208 Organic Chemistry**

**3+0 4.0**

Structure, Reactivity and Mechanism; Mechanisms of Electrophilic and Nucleophilic Substitution Reactions; Chemical Bonds; Alkanes; Alkenes; Alkynes; Nomenclature of Organic Compounds; Alcohols; Alkyl Halides; Ethers; Geometric and Stereo chemical Isomers; Aldehydes and Ketones; Carboxylic Acids; Esters; Acyl Halides; Amids; Concept of Aromaticity;

Aromatic Substitutions; Aromatic Nitro Compounds; Phenols; Aromatic Aldehydes and Ketones; Aromatic Acids; Aromatic Amines. Structure, Reactivity and Mechanism; Mechanisms of Electrophilic and Nucleophilic Substitution Reactions; Chemical Bonds; Alkanes; Alkenes; Alkynes; Nomenclature of Organic Compounds; Alcohols; Alkyl Halides; Ethers; Geometric and Stereo chemical Isomers; Aldehydes and Ketones; Carboxylic Acids; Esters; Acyl Halides; Amides; Concept of Aromaticity; Aromatic Substitutions; Aromatic Nitro Compounds; Phenols; Aromatic Aldehydes and Ketones; Aromatic Acids; Aromatic Amines.

**KiM211                      Analytical Chemistry                      3+0    3.0**

Methods and Classification of Quantitative Analysis; Analytical Processes; Statistical Treatment of Analytical Data; Gravimetric Analysis Methods; Titrimetric Analysis Methods; Activity; Solubility; Acid-Base Equilibria in Water; pH, Polyfunctional acids and bases, Hydrolysis, Salts of polyfunctional acids, Buffer solutions; Neutralization Titration; Precipitation Titration; Compleximetric Titrations; Oxidation-Reduction Reactions; Application on Industrial Problems.

**KiM226                      Physical Chemistry                      3+0    4.0**

Basic Concepts: Ideal gases and ideal gas mixtures; Kinetic Theory of Gases; Fundamental Laws of Thermodynamics and Related Equations; First, Second and Third Law of Thermodynamics; States of matter; Phase Equilibrium; Physical Properties of matter; Real Gases; Mixtures; General Properties of Mixtures; Ideal Mixtures; Non-Electrolyte Real Mixtures; Chemical Thermodynamics: Thermochemistry; Chemical Equilibrium; Electrochemistry; Electrical Concepts; Thermodynamics of Electrolyte Solutions; Electrolytic Conductivity; Ionic Equilibrium; Electrochemical Cells; Surface Chemistry and Colloids: Interfacial and Related Phenomena; Adsorption; Chemistry of Colloids.

**KiM231                      Physical Chemistry Laboratory                      0+3    1.5**

Determination of the Molecular Mass of a Liquid; Viscosity Measurements with the Falling Ball Viscometer; Determination of the Critical Quantities of a Real Gas; Freezing Point Depression; Determination of the Enthalpy of Combustion with a Calorimetric Bomb; Evaporative Equilibrium; Vapour Pressure of Mixtures of Ideal Fluids; Boiling Point Diagram of a Binary Mixture; Distribution Equilibrium; Determination of the Surface Tension of Pure Liquids with the Bubble Pressure Method; Conductivity of Strong and Weak Electrolytes; Electrogravimetric Determination of Copper.

**KiM282                      Organic Chemistry Laboratory                      0+3    3.0**

Separation, Purification Methods: Filtration, Crystallization, Sublimation, Extraction, Distillation methods and applications; Chromatography Methods and Applications: Thin layer chromatography, Column chromatography; Nucleophilic Substitution Reactions; Elimination and Addition Reactions; Electrophilic Aromatic Substitution Reactions; Catalytic Hydrogenation Reactions; Esterification Reactions: Synthesis of soap, Synthesis of biodiesel from vegetable oil; Diazonium Salt Synthesis: Synthesis of dye pigment; Polymerization; Qualitative Organic Analysis: Solubility test, Functional group analysis.

**KiM457                      Chemical Technologies I                      3+0    4.0**

Introduction to Crushing and grinding, Crushing and grinding Techniques, Introduction to Ceramic Technology, Production Methods of Ceramics, Introduction to Cement Production Technology, Production Methods of Cement, Introduction to Iron-Steel-Aluminum Production Technology, Production Methods of Iron-Steel-Aluminums, Introduction to Glass Industries, Production Methods of Glasses, Methods of water purification Technology, Wastewater Treatment Methods, Methods of Fertilizer Production, Methods of Ammonia Production, Methods of Pulp and Paper Production, Sugar and Starch Industries and Production Methods.

**KiM458                      Chemical Technologies II                      3+0    4.0**

Introduction to Dyes and pigments industry, Types of Dyes and pigments and Production Methods, Introduction to Soap and Detergent Industry, Types of Soap and Detergents and Production Methods, Introduction to Corrosion industry, Types of Oil and Fats and Production Methods, Introduction to Milk and By-Product Industries, Types of Milk and By-Products and Production Methods, Introduction to Rubber-Plastic Industries, Types of Rubber-Plastics and Production Methods, Introduction to Acid Industries, Types of Acids and Production Methods, Fermentation Industries and Production Methods, Types of Industrial Gases and Production.

**KiMSJ301                      Chemical Engineering Laboratory Internship                      0+2    2.5**

Learning the Equipment in the Laboratories of the Enterprises; Recognizing and Experiencing the Laboratory Environment in Business; Learning Applications in Laboratory Environments; Learning the Analyzes For Production And Quality Control and The Theory And Principles of These Analyzes; Performing Analysis in Accordance with Standards in a Real Production Environment; Interpreting the Results Obtained from Laboratory Analysis.

**KiMSJ401                      Chemical Engineering Plant Internship                      0+2    2.5**

Professional Work in a Business Environment; Professional Knowledge, Skills, Attitudes and Behaviors; Recognition of Business Areas And Industry; Adapting to Business Life; Gaining Work Experience; Learning the Applications in

Institutions/Organizations; Growing Up in a Real Production and Service Environment; Applying Learned Knowledge and Skills; Recognizing, Analyzing, Modeling and Solving Complex Systems and Real Life Problems; Report Writing.

**KMH105 (Eng) Technical English**

**2+0 2.0**

The courses reinforces academic writing, reading, translation and listening skills on the technical subjects. Report writing is emphasised and also audio-visual practices to improve the chemical engineering terminology involving vocabulary are made.

**KMH108 (Eng) Introduction to Chemical Engineering**

**2+0 2.5**

Description of Different Sample Processes; Fluid mechanics; Heat Transfer and Applications; Heat Exchangers; Evaporators; Mass Transfer and Applications; Phase Equilibrium in the Stage Separation Processes; Fractional Distillation; Solid-Liquid and Liquid-Liquid Extractions, Gas Absorption, Humidification; Drying of Solids; Operations Including Solid Particles; Chemical Reactions and Reactors.

**KMH2006 Computer Programming in Chemical Engineering**

**2+2 4.0**

**(Eng)**

Introduction to basic programming concepts; matrix and vector definitions and basic operations on these structures; definition of polynomials and their use in mathematical operations; two and three dimensional graphics; definition and use of programming environment objects such as data structures, variables and character arrays; algorithm development and creation of flow diagrams; basic program structures using conditional statements and loop structures; preparation of function and script files for modular programming; application of numerical analysis techniques such as fixed point iteration, Newton-Raphson, Runge-Kutta and Simpson methods in a programming environment; integration of these methods into chemical engineering problems.

**KMH210 Instrumental Analysis**

**3+0 4.0**

Interaction of Materials and Beam; Spectroscopy: Theory, Infrared spectroscopy, Ultraviolet and visible spectroscopy, Qualitative and quantitative applications, Atomic Absorption Spectroscopy, Nuclear Magnetic Resonance Spectroscopy; Chromatographic Methods: Theory, Paper Chromatography, Thin Layer Chromatography, Column Chromatography, Gas Chromatography (GC).

**KMH212 Computer Applications in Chemical Engineering**

**3+0 4.0**

The Fortran Programming; Use of Matlab; Using Numerical Computer Methods to Solve Chemical Engineering Problems; Introduction to Software Used in the Simulation and Design of Chemical Engineering Systems. The Fortran Programming; Use of Matlab; Using Numerical Computer Methods to Solve Chemical Engineering Problems; Introduction to Software Used in the Simulation and Design of Chemical Engineering Systems.

**KMH213 (Eng) Chemical Process Calculations**

**3+2 6.0**

Material Balance: Recycle and bypass, Balances on reactive processes; Combustion reactions; Single-phase Systems: Ideal gases, Equations of state for non-ideal gases, Compressibility factor; Multicomponent gas-liquid systems; Energy Balances: Forms of energy, Kinetic and potential energy, Energy balances on closed and open systems, Balances on Non-reactive Processes: Elements of energy balance calculations, Effects of temperature and pressure on energy changes; Balances on Reactive Processes: Heats of reaction, Hess's law, Heats of formation and combustion, Fuels and combustion. Material Balance: Recycle and bypass, Balances on reactive processes; Combustion reactions; Single-phase Systems: Ideal gases, Equations of state for non-ideal gases, Compressibility factor; Multicomponent gas-liquid systems; Energy Balances: Forms of energy, Kinetic and potential energy, Energy balances on closed and open systems, Balances on Non-reactive Processes: Elements of energy balance calculations, Effects of temperature and pressure on energy changes; Balances on Reactive Processes: Heats of reaction, Hess's law, Heats of formation and combustion, Fuels and combustion.

**KMH2501 Introduction to Engineering Calculations**

**2+0 3.0**

Arithmetic calculations; Scientific notation, Normalized floating point notation, Significant figures, Rounding, Truncating, Addition and Substraction, Multiplication and Division, Exponentiation, Combined Operations, Approximate Calculations, Algebraic and Trigonometric Functions; Units and Dimensions; Fundamental Dimensions, Derived Dimensions, The International Metric System, The American Engineering System, Units Conversions, Dimensional Consistency; Graphs and Nomographs; Cartesian Coordinates, Bar Graphs, Semilogarithmic Coordinates, Logarithmic Coordinates, Other Coordinates Systems, Nomographs; Data Reduction Techniques; Measured Data, Errors, The Arithmetic Average, Statistical Data Characteristics, Grouped Data, Frequency Distributions, Cumulative Distributions, The Normal Distributions, Curve-fitting Procedures, Correlation Coefficient; Approximate Solution of Equations; Graphical Solution of Algebraic Equations, Numerical Solution of Algebraic Equations, Solution of Simultaneous Linear Equations, Graphical Integration, Numerical Integration.

**KMH303 Mathematical Modeling in Chemical Engineering**

**4+0 5.0**

**(Eng)**

Obtaining of Steady and Unsteady State Momentum, Mass and Energy Equations for Lumped and Distributed Systems Including Physical and Chemical Changes; Ordinary Differential Equations and Their Analytical Solutions; Laplace Transforms; Matrices; Series and Numerical Solutions of the Ordinary Differential Equations; Formulation of Partial Differential Equations and Their Solutions; Finite Differences

**KMH307 Experimental Design Techniques 3+0 4.0**

Introduction to Quality Engineering and Taguchi Method; Introduction to Experimental Design and Variance Analysis; Basic Statistics; Factorial and Partial Factorial Experiments; Introduction to Orthogonal Arrays: Definition, Two-three level standard orthogonal arrays, Interaction graphics; Modification of Orthogonal Arrays and Inner and Outer Orthogonal Arrays; Planning and Conducting Successful Experiments; Factors Affecting the Process; Methods Used For Detecting Controllable and Non-Controllable Factors; Taguchi Loss Functions; Signal/Noise Ratio; Dynamic Quality Characteristics.

**KMH308 Mass Transfer 4+0 5.0**

Basic Principles of Mass Transfer: Molecular diffusion, Mass transfer coefficients, Phase equilibria; Gas-Liquid Operations: Distillation, Gas absorption, Humidification; Extraction; Leaching; Drying; Adsorption; Mass Transfer Applications and Design: Mc Cabe Thiele and enthalpy-concentration methods, Determination of plate spacing and ideal number of plates.

**KMH310 Heat Transfer 4+0 5.0**

Basic Principles of Heat Transfer: Heat transfer conduction in solids, Principles of heat flow in fluids, Heat transfer without phase change, Radiation heat transfer; Heat transfer Applications: Double pipe heat exchangers, Design of shell and tube heat exchangers, Design of single and multi stage boilers.

**KMH313 Biorefinery Processes 3+0 4.0**

Definition and Classification of Biorefinery, Triglyceride based biorefineries, Sugar and starch based biorefineries, Lignocellulose based biorefineries; Biological and chemical processes: Combustion and gasification, Liquefaction and pyrolysis, Biogas and biodiesel, Conversion of lignin and C5-C6 sugars to fine chemicals: Platform chemicals, homogenous and heterogeneous catalyst based conversion processes, Biological catalyst based conversion processes.

**KMH314 (Eng) Chemical Reaction Engineering I 4+0 5.0**

Fundamentals of Chemical Reaction Kinetics; Concept of Reaction Rate; Classification of Chemical Reactions; Kinetics of Homogeneous Reactions: Reaction mechanisms, Interpretation of constant-volume batch reactor data; Interpretation of variable-volume batch reactor data, Homogenous catalyst; Temperature and Reaction Rate; Heats of Reaction and Equilibrium; Introduction to Heterogeneous Reaction Kinetics: Fluid-fluid reactions, Fluid-particle reactions. Fundamentals of Chemical Reaction Kinetics; Concept of Reaction Rate; Classification of Chemical Reactions; Kinetics of Homogeneous Reactions: Reaction mechanisms, Interpretation of constant-volume batch reactor data; Interpretation of variable-volume batch reactor data, Homogenous catalyst; Temperature and Reaction Rate; Heats of Reaction and Equilibrium; Introduction to Heterogeneous Reaction Kinetics: Fluid-fluid reactions, Fluid-particle reactions.

**KMH316 Biotechnology (Eng) 3+0 4.0**

Introduction to biotechnology: History, Principles; Microorganisms: Eukaryotes, Prokaryotes, Viruses; Cell Cultivation: Microbial, plant, animal cell cultures; Structure and Properties of Biomolecules; Genetic Engineering: Chromosome structure, DNA replication, Genomes, RNA and protein synthesis, Mutagenesis; Metabolic Pathways; Cell Growth Kinetics; Fermentation Techniques; Recovery and Purification of Products; Applications of Biotechnology; Biosafety and Ethics. Introduction to biotechnology: History, Principles; Microorganisms: Eukaryotes, Prokaryotes, Viruses; Cell Cultivation: Microbial, plant, animal cell cultures; Structure and Properties of Biomolecules; Genetic Engineering: Chromosome structure, DNA replication, Genomes, RNA and protein synthesis, Mutagenesis; Metabolic Pathways; Cell Growth Kinetics; Fermentation Techniques; Recovery and Purification of Products; Applications of Biotechnology; Biosafety and Ethics.

**KMH317 Chemical Engineering Thermodynamics I 3+0 4.0**

The Scope of Thermodynamics: Concepts of Force, Temperature, Pressure, Work, Energy and Heat; First Law of Thermodynamics: Internal energy, Energy balance for closed systems, State functions, Enthalpy, Mass and energy balances for open systems; Second Law of Thermodynamics: Heat engines, Carnot cycle, Entropy, Ideal work; Third Law of Thermodynamics; Thermodynamic Properties of Fluids: Property relations for homogeneous phases, Two-phase systems, Thermodynamic diagrams; Thermodynamics of Flow Systems; Production of Power from Heat; Refrigeration and Liquefaction: Carnot refrigerator, Heat pumps, Liquefaction processes.

**KMH318 Chemical Engineering Thermodynamics II 3+0 4.0**

Thermodynamic Properties of Fluids: Property relations for homogeneous phases, Residual properties, Two-phase systems; Diagrams and Tables for Thermodynamic Properties; Solution Thermodynamics: Fundamental property relation, Chemical potential and phase equilibria, Partial properties, Fugacity; Applications of Solution Thermodynamics; Chemical Reaction

Equilibria; Phase Equilibria: Equilibrium and stability, Vapor-liquid and Liquid-liquid equilibria, Vapor-liquid-liquid equilibrium, Solid-liquid and solid-vapor equilibria; Thermodynamic Analysis of Steady-State Flow Processes.

**KMH319                      Fundamentals of Polymer Chemistry                      3+0    4.0**

Basic concepts and terms in polymer chemistry; Classification of polymers; Condensation polymerization reaction mechanism; Chain polymerization; Radical chain polymerization reaction mechanism; Ionic polymerization and coordination complex polymerization reaction mechanism; Controlled radical polymerization techniques; Copolymer types and synthesis; Modification reactions of polymers; Polymerization processes; Properties and characterization methods of polymers; Industrial polymers and their applications; Advanced technological applications of polymeric materials.

**KMH320                      Paint Technology                      3+0    4.0**

Introduction to Paint Technology: Definition of paints and types of paints, Materials used in paint production, Paint components: Solvents, Paint components: Resins, Paint components: Pigments, paint components: Fillers, paint manufacturing process, Paint application systems, Equipments used in paint production, Paint quality control methods used in the industry, Analysis methods applied to paints.

**KMH323                      Biochemical Engineering Fundamentals                      3+0    4.0**

Definition and importance of bioprocesses; Enzymes: Enzyme kinetics, Enzyme reactors, Immobilized enzymes, Industrial applications of enzymes; Cell cultivation and kinetics; Batch and continuous fermentation processes and industrial applications: Production of organic acids, ethyl alcohol; antibiotics and vitamins.

**KMH326                      Introduction to Pharmaceutical Technology                      3+0    4.0**

Historical development of the pharmaceutical industry, Introduction to pharmaceutical technology, Definition and production of Pharmaceutical active ingredients, Definition and production of Pharmaceutical excipients, Biotechnological drug production, Tablet drug production, Liquid drug production, Cream and Gel drug production, stability of drug, Quality management in the pharmaceutical industry.

**KMH3501                      Materials for Biomedical Applications                      3+0    4.0**

Definition and Characteristics of Materials for Biomedical Applications:, Biocompatibility, Biological Functionality, Chemical Stability, Machinability; Classification: Natural materials, Protein Origin materials, Polysaccharide Origin materials, Synthetic materials, Ceramic materials, Metallic, Polymeric materials; Material Manufacturing Techniques; Applications: Tissue Engineering, Applications in Orthodontics, Cardiovascular System Applications, Ophthalmic Applications, Orthopaedic Applications, Applications in Drug Delivery Systems.

**KMH3502                      Rubber Technology                      3+0    4.0**

Fundamental concepts of rubber elasticity, physical and mechanical behavior; elastomer synthesis and polymerization methods; structural characterization techniques; molecular basis of elasticity, viscoelastic behavior and blend dynamics; rheology and processing of raw rubber; vulcanization mechanisms; reinforcement with particulate fillers; adhesion and joining techniques; mechanical strength, chemical modifications; thermoplastic elastomers; tire design and production; rubber recycling techniques and environmental impacts.

**KMH3503                      Electrochemical Power Sources                      3+0    4.0**

Aqueous electrolyte batteries; overview, battery types, performance characteristics, various batteries, non-aqueous electrolyte batteries; different electrolyte types, primary lithium batteries, lithium-ion batteries, solid-state batteries, molten salt electrolyte batteries, fuel cell technology; overview, fuel cells with gaseous or liquid reactant feed, other fuel cells, applications and characterizations of fuel cells, overview of electrolytes for PEMFC and DMFC, supercapacitors; supercapacitors with carbon electrodes, pseudocapacitor electrodes, comparative characteristics of supercapacitors, photoelectrochemical systems; electrochemical aspects of solar energy conversion.

**KMH351                      Sugar Technology                      3+0    4.0**

Sugar Beet Root Composition; Preparation: Storage, Cleaning, Sampling, Grading; Losses; Determination of Sugar Content; Production and Purification of Liqueur; Evaporation; Crystallization; Dehumidification; Molasses; Basic equipment and instrumentation.

**KMH352                      Water Technology                      3+0    4.0**

Characteristics of Water: Physical Characteristics, Chemical characteristics; Physical Purification; Chemical Purification; Industrial Water Quality; Boiler Water Quality; Cooling Water Quality; Swimming Pool Water Quality; Irrigation Water Quality; Disinfection; Corrosion; Toxic Materials

**KMH353                      Air Pollution Removal Equipments                      3+0    4.0**

The reasons of air pollution, Effects of Air pollutions: Effects on living and non-living creatures; Control of particulates: Precipitators, Centrifugal precipitators and electrostatical precipitators, Filters and varieties; Control of volatile organic

<b>KMH354</b>	<b>Boron Technology</b>	<b>3+0</b>	<b>4.0</b>
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<b>KMH355</b>	<b>Food Chemistry</b>	<b>3+0</b>	<b>4.0</b>
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<b>KMH356</b>	<b>Buble Column Technology</b>	<b>3+0</b>	<b>4.0</b>
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<b>KMH357</b>	<b>Electrochemistry</b>	<b>3+0</b>	<b>4.0</b>
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<b>KMH358</b>	<b>Measurement and Control in Chemical Processes</b>	<b>3+0</b>	<b>4.0</b>
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<b>KMH360 (Eng)</b>	<b>Carbon Materials</b>	<b>3+0</b>	<b>4.0</b>
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<b>KMH406 (Eng)</b>	<b>Separation Processes</b>	<b>3+0</b>	<b>4.0</b>
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<b>KMH407</b>	<b>Fuel and Energy Technologies</b>	<b>3+0</b>	<b>4.0</b>
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<b>KMH409</b>	<b>Oil Technology</b>	<b>3+0</b>	<b>4.0</b>
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Raw materials: Resources of animal fat, Resource of vegetable oil, Resource of mineral, Oil; Oil seeds: Storing, Cleaning, Conditioning, Sizing; Oil Recovery Methods: Mechanical pressing, Solvent extraction; Oil Refinement: Removal of adhesive material; Removal of coloring material; Removal of odor, Removal of gums; ,Quality of Edible Oil; Applications of Waste Oil Processing.

- KMH410 Coal Technologies 3+0 4.0**  
Coal Formation Petrography and Classification of Coal; Physical Properties of Coal and Other Technological Properties; Thermal Properties of Coal; Methods of Coal Production and Effect of Coal Quality; Desulphurisation of Coal: Combustion of Coal; Preparation of Coal-Water Mixtures and Combustion of coal-Water Mixtures; Coking of Coal; Pyrolysis of Coal; Low Temperature Carbonisation of Coal; Gasification of Coal; Underground Gasification of Coal; Coal Liquefaction.
- KMH411 Polymer Technology 3+0 4.0**  
Polymer and Polymer Terms; Types of Polymer and Polymerization Reactions; Structure of Polymers, Molecular Weight and Distribution; Polymeric Solutions and Gel Forms; Morphology, Reology and Basic Properties of Polymers; Reactors for Polymers and Chemical Reactions of Polymers; Handling of Polymers; Analysis and Test Methods of Polymers; Industrial Applications of Polymers.
- KMH412 Petroleum Refinery Engineering 3+0 4.0**  
History and Development of Refining; Petroleum Refinery; Formation and Content of Crude Oil; Classification of Crude Oil; Distillation of Crude Oil; Acquirement of Light Hydrocarbon; Naphtha Hydrogenation; Evaluation of gasoline: Assessment of Gasoline; Acquirement of Aromatic Hydrocarbons; Thermal Cracking: Acquirement of gas; Obtaining of Cracking Gasoline; Isomerization of Butane; Alkylolation; Extraction of Furfural; Hydrogenation of Lubricating Oil; Lubricating Oil and Obtainment of Wax; Removal of Asphalt with Propane; Coking; Asphalt Processing; Wastewater Treatment.
- KMH415 (Eng) Process Dynamics and Control 4+0 5.0**  
Definition of Process Control and Its Content; The Laplace Transforms; Linear Open-Loop Systems: Modeling of the First Order Systems, Transfer functions and Dynamic Behaviors; Dynamic behaviors of the First Order Systems in Series; Second Order Systems and Transportation Lag, Linear Closed-Loop Systems: Control System, Controllers and Final Control Elements; Dynamic Behavior of a Basic Control System; Stability; Root Locus; Design of Feedback Controller; Frequency Response Analyze: Nyquist and Bode Diagrams; Design of a Control System via Frequency Response.
- KMH425 (Eng) Chemical Reaction Engineering II 4+0 5.0**  
Material and Energy Balances for Reactors; Design for Ideal Reactors: Batch reactors, Continuous stirred tank reactors, Plug-flow reactors, Ideal reactors connected in series/parallel; Design for Multiple Reactions and Product Distribution; Autocatalytic Reactions and Recycle Reactor; Temperature and Pressure Effects; Introduction to Heterogeneous Reactor Design: Design for fluid-fluid reactions, Design for fluid-particle reactions. Material and Energy Balances for Reactors; Design for Ideal Reactors: Batch reactors, Continuous stirred tank reactors, Plug-flow reactors, Ideal reactors connected in series/parallel; Design for Multiple Reactions and Product Distribution; Autocatalytic Reactions and Recycle Reactor; Temperature and Pressure Effects; Introduction to Heterogeneous Reactor Design: Design for fluid-fluid reactions, Design for fluid-particle reactions.
- KMH429 Special Topics in Chemical Engineering 1+2 2.0**  
Mass and heat transfer, separation processes, chemical kinetics, thermodynamics, chemical process calculations, process control; Chemical technologies such as coal, petroleum, biomass, oil, food and natural products, cement, paper, drug, fertilizer and environment.
- KMH431 (Eng) Chemical Engineering Design I 4+0 6.0**  
Process Evaluation: Mass and heat balances; Flow Sheets; Process Plant Design: Cost estimation and optimization; Design Information and Data; Materials of Construction; Piping and Instrumentation; Safety and Loss Prevention; Plant Location and Site Selection; Plant Layout; Environmental Considerations. Process Evaluation: Mass and heat balances; Flow Sheets; Process Plant Design: Cost estimation and optimization; Design Information and Data; Materials of Construction; Piping and Instrumentation; Safety and Loss Prevention; Plant Location and Site Selection; Plant Layout; Environmental Considerations.
- KMH432 (Eng) Chemical Engineering Design II 4+0 6.0**  
Selection of Main and Ancillary Equipment, Specification and Design; Heat Exchange Equipment; Towers; Packed Towers; Sieve and Valve Tray Design; Mechanical Design of Process Equipment; Scale-up of Process Equipment; Software Applications Used in the Simulation and Design of Chemical Engineering Systems. Selection of Main and Ancillary Equipment, Specification and Design; Heat Exchange Equipment; Towers; Packed Towers; Sieve and Valve Tray Design; Mechanical Design of Process Equipment; Scale-up of Process Equipment; Software Applications Used in the Simulation and Design of Chemical Engineering Systems.
- KMH433 Industrial Equipments in Chemical Engineering 3+0 4.0**  
Basic concepts of Chemical Engineering; Chemical Reactions and Chemical Reactors; Fluid Mechanics Equipments: Manometers, Pressure indicators, Fluid flow measurement elements, Valves, Fluid mover equipments; Heat Transfer Equipments: Heat exchangers, Boilers, Evaporators; Mass Transfer Equipments: Distillation Columns, Extractors, Absorbers, Cooling towers, Drier-dehumidifiers, Adsorbers; Equipment within the scope of thermodynamics: Nozzles,



Diffusers, Compressors, Fans, Sprayers; Thermal conversion and power conversion equipments; Solid particle processing equipment; Investment cost analysis.

**KMH434 Chemical Engineering Applications 2+4 5.0**

Synthesis of theoretical and practical engineering knowledge; literature review; research techniques in chemical engineering.

**KMH435 (Eng) Chemical Engineering Laboratory I 0+4 3.0**

Tubular and Plate Heat Exchangers Experiment; Gas Phase Diffusion Coefficient Experiment; Liquid Phase Diffusion Experiment; Temperature Measurement and Calibration Experiment; Batch Reactor Experiment; Measurement of Fluid Friction (Osbourne-Reynolds) Experiment, Fixed and Fluidized Bed Experiment; Measurement of Viscosity Experiment; Ion Exchange Experiment; Heat Transfer from Radial and Linear Surfaces Experiment.

**KMH436 (Eng) Chemical Engineering Laboratory II 0+4 3.0**

Tubular and Continuous Stirred Tank Reactor Experiment; Gas Absorption Experiment; Distillation Experiment; Evaporator Experiment; Extraction Experiment; Process Control Experiment; Petroleum Distillation Experiment; Shell and Tube Heat Exchanger and Jacketed Vessel Experiment; Unsteady State Heat Transfer Experiment; Extended Surface Heat Transfer and Radiant Heat Transfer Experiment.

**KMH437 (Eng) Alcohol Based Fuels 3+0 4.0**

Introduction: Global energy problem; Alcohol-based Fuels: Production of alcohols; Production of Methanol from Biomass: Process technology; Production of Ethanol from Corn: Industrial production process; Production of Methanol from Landfill-Gas: Production of methanol from landfill gas; Domestic uses of methanol; Production of Butanol from Corn: Biochemistry of butanol production; Process economy; Ethanol-Based Fuels: Ethanol-based fuels and their uses; Production of Hydrogen from Methanol: Catalytic steam reforming process; Production of Hydrogen from Ethanol: Catalytic ethanol reforming; Alcohol Based Bio-Fuel Cells with Enzyme Electrodes. Introduction: Global energy problem; Alcohol-based Fuels: Production of alcohols; Production of Methanol from Biomass: Process technology; Production of Ethanol from Corn: Industrial production process; Production of Methanol from Landfill-Gas: Production of methanol from landfill gas; Domestic uses of methanol; Production of Butanol from Corn: Biochemistry of butanol production; Process economy; Ethanol-Based Fuels: Ethanol-based fuels and their uses; Production of Hydrogen from Methanol: Catalytic steam reforming process; Production of Hydrogen from Ethanol: Catalytic ethanol reforming; Alcohol Based Bio-Fuel Cells with Enzyme Electrodes.

**KMH438 (Eng) Computer Aided Design in Chemical Engineering 3+0 4.0**

Preparation of flow sheet; Mixer and splitter simulation; Simulation of vapor-liquid equilibrium of binary mixtures; Heat exchanger simulation; Batch reactor simulation; Continuous stirred tank reactor (CSTR) simulation; Plug flow reactor (PFR) simulation; Gas absorber simulation; Extraction simulation; Recycle module simulation; Simulation of a simple chemical process: Selection of a chemical process and definitions of main items; Design of the process as a whole.

**KMH439 Catalytic Materials 3+0 4.0**

Introduction: The phenomenon catalysis, Action of catalysts; Classification of catalysts; Comparison of homogeneous and heterogeneous catalysis; Heterogeneous catalyst materials, properties and preparation: Physical, chemical and dynamic properties of catalysts; Preparation of catalyst supports; Deposition of the active components onto a support; Principles and objectives of catalyst characterization: Determining properties of catalysts; Solid Catalyzed Reaction: Steps in a heterogeneous catalytic reaction; Adsorption and desorption; Reaction and diffusion resistances for a catalytic reaction; Kinetics of catalytic surface reactions; Catalyst deactivation.

**KMH440 (Eng) Polymer Materials Science 3+0 4.0**

Introductory concepts and definitions of polymers; Chemical structure of polymers; Chemical structure and properties of polymers; Tests applied to polymers; Optical properties of polymers; Mechanical properties of polymers; Electrical properties of polymers; Thermal properties of polymers; Solubility and chemical stability of polymers; Polymer processing; Polymer composites; Applications of polymer composites. Introductory concepts and definitions of polymers; Chemical structure of polymers; Chemical structure and properties of polymers; Tests applied to polymers; Optical properties of polymers; Mechanical properties of polymers; Electrical properties of polymers; Thermal properties of polymers; Solubility and chemical stability of polymers; Polymer processing; Polymer composites; Applications of polymer composites.

**KMH441 (Eng) Catalysis 3+0 4.0**

General characteristics of catalysts; Classification and preparation methods; Principles and mechanisms of catalysis; Kinetics of fluid-solid catalytic reactions; Internal and external diffusion; Adsorption, surface reaction and desorption; Reactor design for heterogeneous catalytic reaction; Deactivation of catalysts.

**KMH442 (Eng) Textile Chemical Processing 3+0 4.0**

<b>KMH4502</b>	<b>Chemical Process Safety</b>	<b>3+0</b>	<b>4.0</b>
<p>Safety culture, engineering ethics, accident statistics, inherently safer design approach, major industrial accidents; toxic substance entry routes, dose-response relationships and exposure limits; legal regulations such as OSHA, EPA, and MSDS, risk management and control techniques; liquid-gas flow, flashing, evaporation, dispersion and explosion models; types of fires and prevention methods; pressure relief systems; risk assessment methods such as HAZOP and fault tree; accident investigations and case studies for safe design principles.</p>			

Introduction of green chemistry and engineering: Definitions and key principles, Concept of sustainability; Twelve Principles of Green Chemistry; Green Chemistry Metrics, Atom Economy and Life Cycle Analysis; Green Chemical Synthesis : Green Reaction Pathways and Reaction Conditions; Green Chemical Synthesis : Chemical Solvents and Catalysis; Green and Sustainable Chemical Processes; Process Intensification; Industrial Applications.

The Phase Rule and Duhem's Theorem; Thermodynamic Properties of Real Matters; Stability and Equilibrium Equations in Single Component Systems; State Function; Phase Equilibrium of Pure Fluids; Vapor Pressure; Multiphase System; Multicomponent System; Nature and Criteria of Phase Equilibrium; Multiphase System; Models of Activity Coefficients; Phase Equilibrium in Mixtures; Gas-Liquid and Liquid-Liquid Vapor Equilibrium; Supercritical Fluids; Distribution Coefficient.

Basic methods of food preservation. Physical and chemical characteristics of Food; Industrial Processing: Dehydration, Freezing, Canning, Fermentation, Irradiation, Chemicals; Storage and Transportation.

Properties and Handling of Particulate Solids; Size Reduction Equipment; Mixing of Solids and Pastes; Mechanical Separations: Screening, Screening Equipment, Separation through Fluids: Gravity Settling, Centrifugal Settling; Filtration: Principles of Filtration and Clarification.

Heat Exchangers: Types of Heat Exchangers; Condensers; Boilers; Extended Surface Equipment; Scraped Surface Exchangers; Evaporators; Types of Evaporators

Definitions of Food Additives; Antioxidants; Emulsifying Agents; Gums; Food Preservatives; Flavourings; Flavour Enhancers; Coloring Agents; Chelat Agents; Sweeteners Anticoagulants; Flour Additives

Mortality and Serious Injury in the Workplace; Prevention of Accidents: Workers Compensation for Risky Working Environments; Magnetic Fields; Cancer and Other Effects; Diseases Caused by Organic Dusts; Vibration and Noise; Industrial Hygiene; Characteristics of Some Toxic Materials and Their Effects: Properties of Some Hazardous Organic Compounds, Organic Solvent Neurotoxicity; Characteristics and Classification of Explosives: Exposure assessments for Risk Control; Occupational Health and Safety Regulations. Quality Assurance in Occupational Health Services; Promoting Safe Behaviour. Preparation of MSDS Forms: Emergency and First-Aid Applications.

Momentum Transfer: Mechanism of viscosity and momentum transfer, Velocity distribution in laminar flow, Equation of continuity, Equation of motion; Energy Transfer: Mechanism of heat conductivity and energy transfer, Temperature distribution in solid and laminar flow, Equation of change in nonisothermal systems; Mass Transfer: Mechanism of diffusivity and mass transfer, Concentration distribution in solid and laminar flow, Equations of change at multicomponent systems

Problem Formulation: The Nature and Organization of Optimization Problems; Fitting Models to Data; Formulation of Objective Functions; Optimization Theory and Methods: Basic Concepts of Optimization; Optimization of Unconstrained Functions-One Dimensional Search; Unconstrained Multivariable Optimization; Linear Programming and Applications;

Nonlinear Programming with Constrains; Optimization of Staged and Discrete Processes; Application of Optimization to the Chemical Engineering Processes.

**KMH459 (Eng) Geopolymer Production and Applications 3+0 4.0**

Introduction to Geopolymers; Raw Materials for Geopolymers; Macromolecular Structure of Geopolymers; Geopolymer synthesis; Characterization Techniques of Geopolymers; Physical Properties of Geopolymers; Chemical Properties of Geopolymers; Applications of Geopolymers: Geopolymer cement production, geopolymer concrete production, Foam production, Block production, Adsorption.

**KMH460 Membrane Separation Processes 3+0 4.0**

Membrane Materials; Transport in Membrane: Liquid Diffusion, Gas Diffusion, Cascades; Dialysis and Electrodialysis; Membrane Structure: Reverse Osmosis Membranes, Microfiltration Membranes, Ultra Filtration Membranes; Pervaporation; Gas Permeation.

**KMH462 (Eng) Membrane Science and Technology 3+0 4.0**

Introduction to Membrane Processes: Driving forces in membranes, Flow configuration, Types of membrane processes, Membrane transport mechanism; Membrane Materials and Material Properties; Preparation Techniques for Membranes; Characterization Techniques for Membranes; Pressure Driven Membrane Processes; Concentration Driven Membrane Processes; Thermally Driven Membrane Processes; Electrically Driven Membrane Processes; Membrane Reactors; Applications of Membrane Technology.

**KMH464 Chemical Admixtures for Concrete Production 3+0 4.0**

**KÜL451 History of Science and Engineering 3+0 4.5**

Science and Technology in Ancient Age: Mesopotamia, Ancient Egypt, Ancient Greece and Rome, Ancient Anatolia, Ancient Chinese and Central Asian Civilizations; Science and Technology in Middle Age: Medieval Europe; Islamic World; Renaissance and Modern Science; Enlightenment Age, Industrial Revolution; Technologic Development: Steam Engine, Internal Combustion Engine, Usage of Electricity, Conversion of Electrical Energy to Mechanical Energy, Telegraph and Telephones, Wireless Communication, Radio, Television, Space Travel, Vacuum Tube Technology, Invention of Transistor and Silicon Age, Development of Computer Technology; Information Age. Science and Technology in Ancient Age: Mesopotamia, Ancient Egypt, Ancient Greece and Rome, Ancient Anatolia, Ancient Chinese and Central Asian Civilizations; Science and Technology in Middle Age: Medieval Europe; Islamic World; Renaissance and Modern Science; Enlightenment Age, Industrial Revolution; Technologic Development: Steam Engine, Internal Combustion Engine, Usage of Electricity, Conversion of Electrical Energy to Mechanical Energy, Telegraph and Telephones, Wireless Communication, Radio, Television, Space Travel, Vacuum Tube Technology, Invention of Transistor and Silicon Age, Development of Computer Technology; Information Age.

**KÜL451 (Eng) History of Science and Engineering 3+0 4.5**

Science and Technology in Ancient Age: Mesopotamia, Ancient Egypt, Ancient Greece and Rome, Ancient Anatolia, Ancient Chinese and Central Asian Civilizations; Science and Technology in Middle Age: Medieval Europe; Islamic World; Renaissance and Modern Science; Enlightenment Age, Industrial Revolution; Technologic Development: Steam Engine, Internal Combustion Engine, Usage of Electricity, Conversion of Electrical Energy to Mechanical Energy, Telegraph and Telephones, Wireless Communication, Radio, Television, Space Travel, Vacuum Tube Technology, Invention of Transistor and Silicon Age, Development of Computer Technology; Information Age. Science and Technology in Ancient Age: Mesopotamia, Ancient Egypt, Ancient Greece and Rome, Ancient Anatolia, Ancient Chinese and Central Asian Civilizations; Science and Technology in Middle Age: Medieval Europe; Islamic World; Renaissance and Modern Science; Enlightenment Age, Industrial Revolution; Technologic Development: Steam Engine, Internal Combustion Engine, Usage of Electricity, Conversion of Electrical Energy to Mechanical Energy, Telegraph and Telephones, Wireless Communication, Radio, Television, Space Travel, Vacuum Tube Technology, Invention of Transistor and Silicon Age, Development of Computer Technology; Information Age.

**LOJ401 Logistics Management and Models 3+0 6.0**

Logistics Concept; Historical Development of Logistics; Logistics Management and Supply Chain Management: Insurance, Customs; Forecasting; Facility Location Selection; Logistic Network Design; Transportation Vehicles; Types of Transportation; Warehouse Management: Warehouse Design; Types of Consolidation; Cargo Loading; Fleet Composition; Short and Long Term Vehicle Routing Problems: Modeling and Application Examples.

**LOJ401 (Eng) Logistics Management and Models 3+0 6.0**

Logistics Concept; Historical Development of Logistics; Logistics Management and Supply Chain Management: Insurance, Customs; Forecasting; Facility Location Selection; Logistic Network Design; Transportation Vehicles; Types of

<b>MAKSJ401</b>	<b>Mechanical Engineering Internship I</b>	<b>0+2</b>	<b>2.5</b>
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<b>MAKSJ402</b>	<b>Mechanical Engineering Internship II</b>	<b>0+2</b>	<b>2.5</b>
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<b>MAT1011</b>	<b>Calculus I</b>	<b>4+2</b>	<b>7.5</b>
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Basic Concepts: Real numbers and the real axis, Cartesian coordinates in the plane, Complex numbers, Graphs of quadratic equations, Functions; Limit and Continuity: Limits of functions, Continuity; Derivative: Tangent lines and their slopes, Concept of derivative, Differentiation Rules; Inverse, Exponential and Logarithmic Functions; Applications of Derivative: Indeterminate forms, Extremum values, Sketching the graph of a function; Integral: Definite integral and its properties, Indefinite integral; Integration Techniques: Change of variables, integration by parts, Integrals of rational functions, Improper integrals.

<b>MAT1011</b> <b>(Eng)</b>	<b>Calculus I</b>	<b>4+2</b>	<b>7.5</b>
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Basic Concepts: Real numbers and the real axis, Cartesian coordinates in the plane, Complex numbers, Graphs of quadratic equations, Functions; Limit and Continuity: Limits of functions, Continuity; Derivative: Tangent lines and their slopes, Concept of derivative, Differentiation Rules; Inverse, Exponential and Logarithmic Functions; Applications of Derivative: Indeterminate forms, Extremum values, Sketching the graph of a function; Integral: Definite integral and its properties, Indefinite integral; Integration Techniques: Change of variables, integration by parts, Integrals of rational functions, Improper integrals.

<b>MAT1012</b>	<b>Calculus II</b>	<b>4+2</b>	<b>7.5</b>
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Applications of Integration: Volumes of solids of revolution, Arc length and surface area, Mass, Moment and Centre of mass; Polar Coordinates and Polar Curves; Sequences and Series: Sequences and convergence, Infinite series, Power series, Taylor and Maclaurin series; Vectors; Functions of Several Variables: Partial derivatives, Gradients and directional derivatives, Applications of partial derivatives; Multiple Integration and Applications; Vector Calculus. Applications of Integration: Volumes of solids of revolution, Arc length and surface area, Mass, Moment and Centre of mass; Polar Coordinates and Polar Curves; Sequences and Series: Sequences and convergence, Infinite series, Power series, Taylor and Maclaurin series; Vectors; Functions of Several Variables: Partial derivatives, Gradients and directional derivatives, Applications of partial derivatives; Multiple Integration and Applications; Vector Calculus.

<b>MAT1012</b> <b>(Eng)</b>	<b>Calculus II</b>	<b>4+2</b>	<b>7.5</b>
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Applications of Integration: Volumes of solids of revolution, Arc length and surface area, Mass, Moment and Centre of mass; Polar Coordinates and Polar Curves; Sequences and Series: Sequences and convergence, Infinite series, Power series, Taylor and Maclaurin series; Vectors; Functions of Several Variables: Partial derivatives, Gradients and directional derivatives, Applications of partial derivatives; Multiple Integration and Applications; Vector Calculus. Applications of Integration: Volumes of solids of revolution, Arc length and surface area, Mass, Moment and Centre of mass; Polar Coordinates and Polar Curves; Sequences and Series: Sequences and convergence, Infinite series, Power series, Taylor and Maclaurin series; Vectors; Functions of Several Variables: Partial derivatives, Gradients and directional derivatives, Applications of partial derivatives; Multiple Integration and Applications; Vector Calculus.

<b>MAT2004</b> <b>(Eng)</b>	<b>Differential Equations and Numerical Methods</b>	<b>3+0</b>	<b>4.5</b>
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Introduction to Differential Equations: Classification of differential equations, initial and boundary value problems; First-Order Ordinary Differential Equations: Exact equations, integrating factor, separable equations; Higher-Order Ordinary Differential Equations: Higher-order constant coefficient differential equations, Method of undetermined coefficients;

<b>MAT2011</b>	<b>Differential Equation</b>	<b>3+1</b>	<b>4.5</b>
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<b>MAT2011</b>	<b>Differential Equation</b>	<b>3+1</b>	<b>4.5</b>
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<b>MAT2021</b>	<b>Linear Algebra</b>	<b>3+1</b>	<b>4.5</b>
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<b>MAT2023</b>	<b>Linear Algebra and Numerical Methods</b>	<b>2+2</b>	<b>4.5</b>
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<b>MAT2023</b>	<b>Linear Algebra and Numerical Methods</b>	<b>2+2</b>	<b>4.5</b>
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**(Eng)** Matrices and Systems of Linear Equations: Matrix concept, Matrix algebra, Systems of linear equations and solutions with matrices; Determinant: Determinants and its properties, Inverse of a matrix, Applications of Determinants; Vector Spaces: Vectors in the plane and in space, Vector space and subspaces, Linear independence and basis; Linear Transformations and Their Matrices; Solutions of Nonlinear Equations: Bisection, Newton-Raphson methods; Curve Fitting: Least squares and

Interpolation methods; Numerical Integration: Trapezoid and Simpson's rule; Numerical Solutions of Ordinary Differential Equations: Runge-Kutta, Euler and Taylor expansion methods. Matrices and Systems of Linear Equations: Matrix concept, Matrix algebra, Systems of linear equations and solutions with matrices; Determinant: Determinants and its properties, Inverse of a matrix, Applications of Determinants; Vector Spaces: Vectors in the plane and in space, Vector space and subspaces, Linear independence and basis; Linear Transformations and Their Matrices; Solutions of Nonlinear Equations: Bisection, Newton-Raphson methods; Curve Fitting: Least squares and Interpolation methods; Numerical Integration: Trapezoid and Simpson's rule; Numerical Solutions of Ordinary Differential Equations: Runge-Kutta, Euler and Taylor expansion methods.

**MAT2093                      Engineering Mathematics                      4+0    6.0**  
**(Eng)**

Introduction to the vectors, vector operations (dot product, cross product and scalar triple product) and their applications, equations of lines and planes, cylinders and quadratic surfaces, vector and scalar functions and their fields, vector calculus: derivatives, arc length, functions of several variables (review), directional derivatives, gradients, divergence of vector field, curl of a vector field, cylindrical coordinates, spherical coordinates, vector integration: line integrals, double integral (short review), Green's theorem, surface integrals, divergence theorem of Gauss, Stokes' theorem, complex numbers, complex plane, complex functions and mappings, analytic and elementary functions, integration in the complex plane, Cauchy's theorems (Cauchy-Goursat theorem, Cauchy integral formula), Laurent series and singularities, residue theorem.

**MAT226                      Introduction to Graph Theory                      3+0    5.0**

What is a Graph: Fundamental concepts, Graph, Vertex, Edge, Adjacency, Degree, Isomorphism, Various examples, Certain special graphs, Digraphs and multigraphs; Paths and Cycles: Walk, Trail, Cycle, Connected graphs, Eulerian trail, Eulerian graph, Hamiltonian cycle, Hamiltonian graph; Trees: Fundamental properties, Counting trees, Cayley's theorem, Minimum spanning tree problem; Planar Graphs: Definition and examples, Kuratowski's theorem, Euler's formula, Dual graphs; Colouring Graphs: Colouring vertices, Chromatic number, Brook's theorem, The four colour theorem, Chromatic polynomials, Colouring maps, Colouring edges; Matching: Perfect matching, Marriage theorem

**MAT410                      Game Theory                      3+0    5.0**

Examples of Games; Game Theory Notions; Two-Person Zero-Sum Games, Mixed strategies, Minmax (von Neumann) theorem, Equilibrium strategies, Solution of (nxm) games; Two-Person Non-Zero-Sum games, Nash theorem, Equilibrium strategies, Solution methods; Cooperative games; N-Person Games, Stable Sets, Non-Cooperative Games, Shapley value; Market Games and Oligopoly, M-N Market Game, Duopoly, Cournot equilibrium, Metagames.

**MEK201 (Eng)    Statics                      3+0    4.5**

Definition of the Mechanics and Introduction; Static of Particles: Principles and the problems; Force Systems in a Plane; Static of Rigid Bodies: Equivalent systems, Equilibrium of rigid bodies; Trusses; Method of joints, Method of sections; Space Force System; Distributed Loads; Centre of Gravity; Analysis of Structures; Forces in Beams and Cables; Distributed Loads: Moment of inertia; method of Virtual Work; Friction. Definition of the Mechanics and Introduction; Static of Particles: Principles and the problems; Force Systems in a Plane; Static of Rigid Bodies: Equivalent systems, Equilibrium of rigid bodies; Trusses; Method of joints, Method of sections; Space Force System; Distributed Loads; Centre of Gravity; Analysis of Structures; Forces in Beams and Cables; Distributed Loads: Moment of inertia; method of Virtual Work; Friction.

**MEK206 (Eng)    Dynamics                      3+0    4.0**

Definition and Introduction; Kinematics of a Particle; Kinetics of a Particle: Newton's second law, Impulse and momentum; Work-Force Area; Potential and Kinetic Energy; Vibration; System of Particles; Motion of Particles with Variable Mass; Kinetics of a Rigid Body; Euler Angles; Centre of Gravity Theorems; Eccentric Rotation and Plane Motion; Relative Motion. Definition and Introduction; Kinematics of a Particle; Kinetics of a Particle: Newton's second law, Impulse and momentum; Work-Force Area; Potential and Kinetic Energy; Vibration; System of Particles; Motion of Particles with Variable Mass; Kinetics of a Rigid Body; Euler Angles; Centre of Gravity Theorems; Eccentric Rotation and Plane Motion; Relative Motion.

**MEK212 (Eng)    Strength of Materials I                      3+2    6.0**

General Definitions and Principles of Mechanics; Definition of Stress and Strain; Mechanical Properties of Materials; Linear Elasticity and Hook's Law; Statically Indeterminate Structures under Axial Load; Torsion: General Torsion Formulas for Circular Cross-Sections, Statically Indeterminate Systems under Torque; Bending: Internal Force Diagrams, Bending Stresses, Composite Cross-Sections; Transverse Shear; Stress and Strain Transformation: General Principles of Transformation, Use of Mohr Circle; Combined Loading of Axial Load Moment, Shear and Torsion; Elastic Curve of Beams. General Definitions and Principles of Mechanics; Definition of Stress and Strain; Mechanical Properties of Materials; Linear Elasticity and Hook's Law; Statically Indeterminate Structures under Axial Load; Torsion: General Torsion Formulas for Circular Cross-Sections, Statically Indeterminate Systems under Torque; Bending: Internal Force Diagrams, Bending Stresses, Composite Cross-Sections; Transverse Shear; Stress and Strain Transformation: General Principles of Transformation, Use of Mohr Circle; Combined Loading of Axial Load Moment, Shear and Torsion; Elastic Curve of Beams.

**MEK215 (Eng) Statics and Strength of Materials 3+0 4.5**

Introduction to the General Principles of Mechanics: Idealizations, Units, Significant Figures, Newton's Laws; Force Vectors and Force System Resultants; Equilibrium of Particles and Rigid bodies; Structural Analysis; Method of Sections; Method of Joints; Frames and Machines; Internal Forces; Shear and Moment Diagrams; Concepts of Stress and Strain; Axial Loading and Deformation; Thermal Stresses; Factor of Safety. Introduction to the General Principles of Mechanics: Idealizations, Units, Significant Figures, Newton's Laws; Force Vectors and Force System Resultants; Equilibrium of Particles and Rigid bodies; Structural Analysis; Method of Sections; Method of Joints; Frames and Machines; Internal Forces; Shear and Moment Diagrams; Concepts of Stress and Strain; Axial Loading and Deformation; Thermal Stresses; Factor of Safety.

**MEK216 (Eng) Engineering Mechanics: Dynamics 3+0 4.0**

Newton's Laws of Motion; Unit systems, Kinetics of particles, Applying the laws of motion to Cartesian, Cylindrical and spherical coordinates, Definitions of force-mass-momentum, Work and energy, Function of forces and potential energy, Impulse-momentum, Collision, Kinematics of rigid bodies, rotation around a fixed axis and general planar motion, Mechanical vibrations, Practice and problem solutions.

**MEK217 (Eng) Engineering Mechanics: Statics 3+0 5.0**

Vector Algebra; Forces and Moments; Equivalent Force Systems in Rigid Bodies; Free Body Diagram; Equilibrium; Center of Gravity; Distributed Forces; Introduction to Structural Mechanics; Planar Truss Systems; Frames and Machines; Internal Forces in Structural Members; Joint Points and Cutting Method; Shear and Bending Moment Diagrams; Moment of Inertia; Friction; Principle of Virtual Work.

**MEK307 (Eng) Fluid Mechanics 3+0 4.5**

Fundamental Concepts: Pressure, Liquids with Different inherent weight and liquids in relative balance, Static of fluids, Kinematics of fluids; Fundamental Equations of One-Dimension Flows: Continuity equation and Bernoulli equation; Theorem of Impulse-Momentum; One Dimension Flows of Ideal Fluids; One Dimension Flows of Real Fluids; Two-Dimension Flows of Ideal Fluids; Two-Dimension Flows of Real Fluids; Uniform Flow in Open Channels; Gradually Varied Flow in Open Channels. Fundamental Concepts: Pressure, Liquids with Different inherent weight and liquids in relative balance, Static of fluids, Kinematics of fluids; Fundamental Equations of One-Dimension Flows: Continuity equation and Bernoulli equation; Theorem of Impulse-Momentum; One Dimension Flows of Ideal Fluids; One Dimension Flows of Real Fluids; Two-Dimension Flows of Ideal Fluids; Two-Dimension Flows of Real Fluids; Uniform Flow in Open Channels; Gradually Varied Flow in Open Channels.

**MEK311 (Eng) Strength of Materials 4+0 5.5**

Introduction and Basic Concepts; Stress; Strain; Relations between Stress and Deformation (Hooke Law); Yielding and Failure Criteria; Mohr's Circle; Area Moments; Axial Loading; Torsional Stress; Simple Bending and Biaxial Bending; Torsion; Shear Force and Bending Moment Diagrams; Stress in Beams; Deflection in Beams and Elastic Curves; Hypotheses for Failure.

**MEK315 Fluid Mechanics 3+2 5.0**

Basic Concepts: Unit systems, Mechanical energy balance; Fluid Mechanics: Fluid static and its applications; Basic Equations of Fluid Flow; Flow of Incompressible Fluids in Conduits and Thin Layers; Flow of Compressible Fluids; Flow of Fluids Through Fixed Beds; Transportation of Fluids and measuring Flow Speed; Agitation and Mixing of Liquids. Basic Concepts: Unit systems, Mechanical energy balance; Fluid Mechanics: Fluid static and its applications; Basic Equations of Fluid Flow; Flow of Incompressible Fluids in Conduits and Thin Layers; Flow of Compressible Fluids; Flow of Fluids Through Fixed Beds; Transportation of Fluids and measuring Flow Speed; Agitation and Mixing of Liquids.

**MEK317 Fluid Mechanics 4+0 5.0**

Basic Concepts: Unit Systems, Mechanical energy balances; Fluid mechanics: Fluid static and its applications; Basic Equations of Fluid Flow; Flow of Incompressible Fluids in Conduits and Thin Layers; Flow of compressible Fluids; Flow of Fluids Through Fixed Beds; Transportation of Fluids and measuring Flow Speed; Agitation and mixing of Liquids. Basic Concepts: Unit Systems, Mechanical energy balances; Fluid mechanics: Fluid static and its applications; Basic Equations of Fluid Flow; Flow of Incompressible Fluids in Conduits and Thin Layers; Flow of compressible Fluids; Flow of Fluids Through Fixed Beds; Transportation of Fluids and measuring Flow Speed; Agitation and mixing of Liquids.

**MEK323 (Eng) Fundamentals of Fluid Mechanics 4+0 6.0**

Definition of Fundamental Fluid Mechanics Terms Like Pressure Viscosity etc., Stationary Fluids and Hydrostatic; Eulerian and Lagrangian flow Analysis; Bernoulli Equation and its Applications; Boundary Layer Definition; Boundary Layer Theory; Reynolds Transport Theory; Dimensional Analysis and Meaning of the Non-dimensional Parameters, Pipe Flow and its Applications; External Flow and its Applications; Open Channel Flow and its Applications; Design of Fluid Systems.

**MEK403 (Eng) Strength of Materials II 3+0 4.5**

Three Dimensional Stress Analysis; Bending with Shear; Shear Centre; Investigation of Elastic Curve by Different Methods: Effect of shear; Normal Force and Bending: Nucleus, Materials not resisting tension, Second rank theory; Torsion with Bending; Virtual Work Theorem: Betti's and Castigliano's theorems; Principles of Minimum; Elastic Stability: Euler conditions, Torsion outside elastic zone; Approximate Methods, Rayleigh Ratio. Three Dimensional Stress Analysis; Bending with Shear; Shear Center; Investigation of Elastic Curve using Different Methods: Effect of shear; Normal Force and Bending: Nucleus, Materials not resisting tension, Second rank theory; Torsion with Bending; Virtual Work Theorem: Betti's and Castigliano's theorems; Principles of Minimum; Elastic Stability: Euler conditions, Torsion outside elastic zone; Approximate Methods, Rayleigh Ratio.

**MEK404 (Eng) Applied Fluid Mechanics**

**2+2 5.0**

Fundamental Concepts of Fluid Dynamics; Conservation Laws; Mathematical Models; Mathematical Classification of Flows; Components of Numerical Solutions; Introduction to Finite Differences; Concepts of Finite Differences; Introduction to Finite Volumes; Concepts of Finite Volumes; Introduction to Finite Elements; Concepts of Finite Elements; Iteration Methods; Examples; Laminar Flows; Examples; Turbulent Flows.

**MEK405 (Eng) Applied Strength of Materials**

**3+0 5.0**

Analysis of Stress; Definition of Strain; Stress and Strain Relations; Strain Energy and its Components; Airy Stress Function; Solution of Simple Elasticity Problems; Yield Criteria; Bending Moments of Inertia in Beams; Bending and Elementary Theory of Bending in Beams; Theory of Torsion of Circular Bars; Torsion Membrane Analogy; Castigliano's Theorem; Principle of Minimum Potential Energy; Plastic Behavior of Materials.

**MEK406 (Eng) Mechanical Vibrations**

**3+0 5.0**

Kinematics of Vibration, Single-degree of freedom systems, Undamped free vibrations, Determining natural frequencies via energy method, Rayleigh method, Damped free vibrations, Viscous damped vibrations, Logarithmic decrement, Forced damped vibrations, Vibration isolation, Two degree of freedom systems, Dynamic vibration absorber, Multi-degree of freedom systems, Torsional vibrations.

**MEK439 (Eng) Thermal System Design**

**2+2 5.0**

Concepts of Thermal System Design; Mathematical Modeling; Optimization Methods; Fans, Pumps, Heat exchangers, Nozzles and diffusers, Pipe flow; Steady-state Simulations of Complex Thermal Systems; Applications of the Principles of Thermodynamics, Heat Transfer and Fluid Mechanics in Designing Thermal System and its Components; Features of the Components and their Effect on the General System Performance.

**MFALM101 German for Engineering I (Ger)**

**3+0 4.0**

Articles; The Plural of Nouns; Sentence Structures and Building Sentences (interrogative, imperative and declarative sentences); Pronouns (personal, reciprocal and possessive pronouns); Numbers (ordinal, prime, fractional numbers); Telling Time; Adverbs of Time; Tenses (Present, Past, Perfect and Future Tenses); Reviewing the Current Different Bodies of Literature on Engineering; Authentic Materials for Improving Reading and Writing Skills, Exercises on Introduction to Engineering Terminology.

**MFALM102 German for Engineering II (Ger)**

**3+0 4.0**

Adverbs of time used to indicate days of the week and time zones of the day, seasons and months; Prepositions (Präposition); Prepositions used with accusatives (ohne, entlang, etc.), prepositions used with datives (mit, von, bei, aus, etc.), prepositions used with genitives (wegen, während, etc.), prepositions used with both accusatives and datives (in, auf, an, neben etc.); Making sentences with prepositions, including engineering terminology; Making sentences about the field studied, including engineering terminology.

**MFALM201 German for Engineering III (Ger)**

**3+0 4.0**

Reflexive Verbs (Reflexive Verben); Modals (Modalverben); Passive (Passiv) Sentences (man pronoun, Zustandspassiv, Vorgangspassiv, Making passive sentences using modal verbs); Conjunctions / Subordinate Clauses (Time, Reason, Condition, Sequence, Contrast-Restriction, Comparison, Intention/Wish Subordinate Clauses), Sentence Building with Engineering Terminologies.

**MFALM202 German for Engineering IV (Ger)**

**3+0 4.0**

Relative Clauses (Relativsätze), Using Relative Clauses with the Four Cases in German (Nominativ, Akkusativ, Dativ and Genitiv), Using Relative Clauses with Prepositions; Using Relative Clauses with W-Question Words; Indirect Expression Sentences (Konjunktiv I); Probability, Wish, and Unreal State Expressions (Konjunktiv II); Use of Present and Past Tense; Use of Konjunktiv I and II in Engineering; Translation Exercises Related to the Field of Engineering.



<b>MKM101</b>	<b>Technical Drawing for Mechanical Engineers</b>	<b>2+2 3.0</b>
Importance of Technical Drawing and Standards in Engineering; Drawing Lines and their Meaning in Technical Drawing; Technical writing; Principles of Dimensioning and Tolerancing, Principles of Projections; Drawing of Views; Section Views; Surface finishing symbols, Machine materials symbols; Machine Assembly Drawing; Machine Elements Drawing; Welding Symbols; Dimensional tolerances; Geometric Tolerances.		
<b>MKM102</b>	<b>Introduction to Mechanical Engineering</b>	<b>3+0 4.0</b>
<b>(Eng)</b> History and Emergence of Mechanical Engineering; Engineering Profession and the Place of Mechanical Engineering in It; Development of Mechanical Engineering; The General Definitions, Importance and Working Areas of Mechanical Engineering and Engineering Ethics; Basic Concepts and Subjects, Fields of Work, Qualifications and Skills of Mechanical Engineers; An Overview of the Mechanical Engineering Program at Anadolu University.		
<b>MKM103</b>	<b>Technical English for Mechanical Engineers</b>	<b>2+0 2.0</b>
<b>(Eng)</b> Basics of Engineering; Main Branches of Engineering and Relations between them; Engineering Materials, Terms Related with Materials: Metals, Alloys, Thermo plastics; Grammar Revision: Active vs. Passive, Adjective vs. Adverb; Materials Technology; Metals and their Molecular Structure; Mechanisms of Deformation, Alloys, Thermoplastics, and Composites; Physical Forces and Mathematical Formulae; Chipping Machining, Cutting, Sawing, Milling, Drilling; Turbofan, and the Forces Involved; Alternative Energy, Hydroelectric Power Plants, Heat Pump, Solar Energy, Wind Power; Car Technology: Combustion, Hybrid, and Electric Car Engines.		
<b>MKM104</b>	<b>Computer Aided Engineering Technical Drawing</b>	<b>2+2 5.0</b>
Introduction to Computer Aided Technical Drawing; Sketch Modeling; Assigning Geometric Constraints to Sketches; Projection Drawings; General Concepts in Three Dimensional Modeling; Creating Parts in Three Dimensional Design and Solid Modeling; Dimensioning Principles; Arranging Models; Sectioning; Assembly Modeling; Machinery and Construction Parts; Creating Animations and Simulations.		
<b>MKM104</b>	<b>Computer Aided Engineering Technical Drawing</b>	<b>2+2 5.0</b>
<b>(Eng)</b> Introduction to Computer Aided Technical Drawing; Sketch Modeling; Assigning Geometric Constraints to Sketches; Projection Drawings; General Concepts in Three Dimensional Modeling; Creating Parts in Three Dimensional Design and Solid Modeling; Dimensioning Principles; Arranging Models; Sectioning; Assembly Modeling; Machinery and Construction Parts; Creating Animations and Simulations.		
<b>MKM220</b>	<b>Problem Solving Methods</b>	<b>3+0 4.5</b>
Introduction to Engineering Design and Engineering Problem Solving; Engineering Problem Solving Format, Problem description, Problem classification, Problem analysis; Problem Solving Methods; TRIZ Method; 6 Sigma and Engineering; Computer Assisted Problem Solving Methods; Design of Experiments; Analysis of Variable Data; ANOVA; Presentation and Reporting Methods; Complex Problem Solving Applications.		
<b>MKM222</b>	<b>Technical Report Writing and Presentation Skills in Engineering</b>	<b>3+0 4.5</b>
<b>MKM3006</b>	<b>Experimental Engineering I</b>	<b>1+2 3.0</b>
<b>(Eng)</b> Basic measurement information and measurement elements; measurement errors and data analysis; pressure measurements; temperature measurements; velocity and flow measurement; vibration characterization; measuring force; dimensional measurements; data processing and interpretation; error analysis and uncertainty analysis, use of statistical information on data.		
<b>MKM301</b>	<b>Theory of Machines</b>	<b>3+0 5.0</b>
<b>(Eng)</b> Mechanisms and Element pairs; Kinematic Chains; Kinematic Analysis and Synthesis of Planar Mechanisms; Dynamics of Machines; Cam Design; Gears and Gear Systems; Linkage Mechanisms; Force Analysis of Machines; Mass Balancing in the Machines; Undamped, Damped and Forced Vibrations of Single Degree of Freedom Systems; Vibration Measuring Instruments, Vibration Control and Isolation; Flywheels; Gyroscopes.		
<b>MKM302</b>	<b>Machine Design I</b>	<b>4+0 6.0</b>
<b>(Eng)</b>		

<b>MKM303</b>	<b>Heat Transfer</b>	<b>4+0</b>	<b>6.0</b>
<b>(Eng)</b>			

<b>MKM304</b>	<b>Manufacturing Techniques</b>	<b>2+2</b>	<b>4.0</b>
<b>(Eng)</b>			

<b>MKM307</b>	<b>Engineering Materials for Mechanical Engineers</b>	<b>3+0</b>	<b>5.0</b>
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<b>MKM309</b>	<b>Introduction to Finite Element Analysis</b>	<b>3+0</b>	<b>5.0</b>
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<b>MKM330</b>	<b>MATLAB Programming for Engineers</b>	<b>1+2</b>	<b>5.0</b>
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<b>MKM339</b> <b>(Eng)</b>	<b>Introduction to Finite Element Method</b>	<b>2+2</b>	<b>5.0</b>
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<b>MKM4007</b> <b>(Eng)</b>	<b>Experimental Engineering II</b>	<b>1+2</b>	<b>3.0</b>
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<b>MKM401</b>	<b>Machine Design II</b>	<b>4+0</b>	<b>6.0</b>
<b>(Eng)</b>			

<b>MKM403</b>	<b>Mechanical Engineering Design I</b>	<b>2+2</b>	<b>4.5</b>
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Introduction to the Fundamental Mechanical Engineering Fields: Materials, Automotive, Energy machines, Robotics and system control; General Machine Design; Selection of the Design Project based on Fundamental Mechanical Engineering Fields; Studies about the Selected Design Project: System analysis, Conceptual design, Predesign; Detailed Design:

Dimensioning, Strength of materials calculations and engineering analyses; Documentation of Project Design Studies; Documentation and oral presentation of numerical or experimental analyses at the end of the semester.

**MKM404                      Mechanical Engineering Design II                      3+0    5.5**

Introduction to the Current Studies on Fundamental Mechanical Engineering Research Fields; Materials, Automotive, Energy machines, Robotics and system control; Selection of the Design Project on Fundamental Mechanical Engineering Fields; Studies on Selected Project: Literature review, System analysis, Conceptual design, Predesign; Research Project Selection; Determination of the Theoretical, Modeling and/or Experimental Stages of the Research; Detailed Design of the Research Project: Determining the steps of the theoretical and/or experimental studies; Documentation of the Research Studies: Documentation and oral presentation of the numerical and/or experimental analyses at the end of the semester.

**MKM405                      Machining and Machine Tools                      3+0    5.0**

Introduction: Fundamentals of Machining, Machining Mechanics, Machining Dynamics, Machining Parameters: Machining Quality and Tool Life, Machine Tools and Machining Operations: Turning, Milling, Drilling, Broaching, Grinding. Machine Tool Design, Cutting Tools and Jigs and Fixtures: Cutting Tool Materials, Process Planning: Economic Analysis of Machining, Machining Automation. Machining and Sustainable Manufacturing

**MKM406                      Reliability in Machine Design                      3+0    5.0**

Introduction to Reliability in Machine Design; Safety Factor in Machine Design; Basics of the Statistics; Frequency Distribution Functions and Reliability; Reliability in Static and Dynamic Loading; Cumulative Fatigue Damage and Determination Service Life; Wear: Wear rate, Statistical calculation method in wear, Exponential distribution function applied in wear computation, Wear and reliability; Analytic Relationship Between Safety factor and Reliability; Application of Reliability and Life Estimation on the Different Engineering Applications.

**MKM407                      Maintenance in Mechanical Engineering                      3+0    5.0**

Knowledge About Maintenance and Maintenance engineering: Maintenance, Fault, Control and Revision concepts; Balancing: Shaft alignment and rotor balancing; Bearings, Couplings and Clutches: Applications, Properties and Maintenance; Seals: Properties and types; Knowledge of Gears and Driving mechanisms and Maintenance; Centrifugal Pumps: Properties and applications; Maintenance of Centrifugal Fans and Compressors; Lubricants: Types, Greases and synthetic lubricants; Lubricant Applications: Hydraulics, Internal combustion engines and automotive components, Other industrial applications.

**MKM408                      Non-destructive Testing Methods                      3+0    5.0**

Elements of liquid/dye penetrant inspection method, its pros and cons, and detailed application steps; Elements of evaluation method using magnetic particles, its pros and cons, and detailed application steps; Elements of ultrasonic inspection method, its pros and cons, and detailed application steps; Elements of inspection method with Eddy currents, its pros and cons, and detailed application steps; Basics and technology of X-ray inspection, and its field of application; Basics and technology of scanning electron microscope (SEM), and its field of application; Industrial value of NDT; Career opportunities as an accredited NDT personnel from engineering perspective.

**MKM409                      Shape Memory Alloys                      3+0    5.0**

Overview of Active Materials; Introduction to Shape Memory Alloys; Mechanism of shape memory effect and superelasticity; NiTi shape memory alloys; Cu- based shape memory alloys; Fabrication of shape memory alloys; Characteristics of shape memory alloys; Thermomechanical Characterization of Shape memory Alloy; Thermomechanical Constitutive Modeling of Shape Memory Alloys; Shape memory polymers; Shape memory ceramics; Applications of shape memory alloys.

**MKM410                      Aircraft Engine Design                      3+0    5.0**

General design consideration of aircraft engine; Gas turbine performance analysis and selection of component operating conditions; Mission analysis and relation with performance analysis; Interface definitions; Design approach of turbine and compressor; Combustion chamber and afterburner design; Air intake and exhaust system design.

**MKM411                      System Engineering Fundamentals                      3+0    5.0**

Definition of System Engineering and its fundamental processes; Requirement analysis and management; Design inputs and approach; Qualification and validation processes; Operations and maintenance process; Decision management; Risk and opportunity analysis; Product development and strategies; System engineering planning and organization.

**MKM412                      Internal Combustion Engines                      3+0    5.0**

Definitions and classification of internal combustion engines; Operation principles; Otto and Diesel cycle analysis; Comparison of Otto, Diesel and Hybrid cycles ; Characteristics of engine fuels and combustion chemistry; Analysis of air-fuel cycles; Properties of real cycles; Air capacity and volumetric efficiency; Engine knocking and ignition delay; Classification of fuel injection systems; Forces acting on engine elements; Supercharging of internal combustion engines

**MKM413                      Engineering Applications of Finite Element Analysis                      3+0   5.0**

Introduction to ANSYS Workbench Software: Project management page, Work flow, Analysis systems, Component systems, Design tools, User interface, Basic analysis procedure; Mechanical Basics: Preliminary decisions, Pre-processing, Solving procedure, Post-processing, Menus and toolbars; General Pre-processing: Material properties, Geometry creation, Contact algorithms, Coordinate systems; Meshing Techniques: Global and local meshing controls, mesh quality check; Model Parameters: Connections, Boundary conditions, Loading conditions; Analysis Types: Static structural, Thermal analysis, Modal analysis, Explicit analysis; General Post-Processing.

**MKM413                      Engineering Applications of Finite Element Analysis                      3+0   5.0**  
**(Eng)**

Introduction to ANSYS Workbench Software: Project management page, Work flow, Analysis systems, Component systems, Design tools, User interface, Basic analysis procedure; Mechanical Basics: Preliminary decisions, Pre-processing, Solving procedure, Post-processing, Menus and toolbars; General Pre-processing: Material properties, Geometry creation, Contact algorithms, Coordinate systems; Meshing Techniques: Global and local meshing controls, mesh quality check; Model Parameters: Connections, Boundary conditions, Loading conditions; Analysis Types: Static structural, Thermal analysis, Modal analysis, Explicit analysis; General Post-Processing.

**MKM414                      Refrigeration Systems                      3+0   5.0**

General Aspects of Thermodynamics, Fluid Flow and Heat Transfer: Fundamentals of thermodynamics, Psychrometrics, Fundamentals of fluid flow, Fundamentals of heat transfer; Refrigerants; Refrigeration System Components: Compressors, Condensers, Evaporators, Throttling Devices, Auxiliary devices; Refrigeration Cycles and Systems: Vapor-compression refrigeration systems, Energy analysis of vapor-compression refrigeration cycle, Absorption-refrigeration systems (ARSS), Advanced Refrigeration Cycles and Systems; Heat Pumps: Classification of heat pumps, Vapor-compression heat pump systems.

**MKM416                      Theory of Elasticity                      3+0   5.0**

Introduction to Theory of Elasticity; Elasticity; Stress; Notation of Forces and Stresses; Components of Stress and Strain; Hooke's Law; Plane Stress and Strain; Measurement of Surface Strains; Construction of Mohr Strain Circle; Differential Equations of Equilibrium, Boundary Conditions and Compatibility Equations; Strain Energy Methods, Strain Energy, Principle of Virtual Work, Castigliano's Theorem, Principle of Least Work; Plates and Shells. Introduction to Theory of Elasticity; Elasticity; Stress; Notation of Forces and Stresses; Components of Stress and Strain; Hooke's Law; Plane Stress and Strain; Measurement of Surface Strains; Construction of Mohr Strain Circle; Differential Equations of Equilibrium, Boundary Conditions and Compatibility Equations; Strain Energy Methods, Strain Energy, Principle of Virtual Work, Castigliano's Theorem, Principle of Least Work; Plates and Shells.

**MKM416                      Theory of Elasticity                      3+0   5.0**  
**(Eng)**

Introduction to Theory of Elasticity; Elasticity; Stress; Notation of Forces and Stresses; Components of Stress and Strain; Hooke's Law; Plane Stress and Strain; Measurement of Surface Strains; Construction of Mohr Strain Circle; Differential Equations of Equilibrium, Boundary Conditions and Compatibility Equations; Strain Energy Methods, Strain Energy, Principle of Virtual Work, Castigliano's Theorem, Principle of Least Work; Plates and Shells. Introduction to Theory of Elasticity; Elasticity; Stress; Notation of Forces and Stresses; Components of Stress and Strain; Hooke's Law; Plane Stress and Strain; Measurement of Surface Strains; Construction of Mohr Strain Circle; Differential Equations of Equilibrium, Boundary Conditions and Compatibility Equations; Strain Energy Methods, Strain Energy, Principle of Virtual Work, Castigliano's Theorem, Principle of Least Work; Plates and Shells.

**MKM417                      Nonconventional Manufacturing Techniques                      3+0   5.0**

Introduction: Definition of nonconventional manufacturing methods and general concepts, Benchmarking of conventional and unconventional manufacturing methods; Mechanical Energy Methods: Ultrasonic machining; Abrasive Methods: Water jet cutting; Thermal Methods: Electrical discharge machining, Wire electrical discharge machining; Chemical Machining; Electrochemical Machining; Laser Processing; Plasma Processing; Electron Beam Processing.

**MKM418                      Materials Handling Techniques                      3+0   5.0**

Principles of Materials Handling; Classification of Materials Handling Equipment; Pneumatic and Hydraulic Conveyors; Hoisting Equipment; Ropes, Chains, Drums, Pulleys, Block and Tackles, Standard and Ramshorn Hooks, Hook Sleepers and Hook Blocks; Handling Mechanism; Reason of Handling Resistance, Rails, Wheels, Gearwheels; Bulk Handling Equipment and Systems; Brakes; Block Brakes, Band Brakes, Disk Brakes, Cone Brakes; Cranes.

**MKM419                      Mechanics of Materials II                      3+0   5.0**

Combined Loading; Stress and Strain: General state of stress, Three-dimensional analysis of strain; Material Property: Generalized hook's law; dilatation, bulk modulus; Theories of Failure: Ductile materials, Brittle materials; Energy Methods:

External work and strain energy, Strain energy density, Elastic strain energy for various types of loading, Strain energy for a general state of stress, Conservation of energy, Impact loading, Virtual work.

**MKM420                      Manufacturing Quality                      3+0    5.0**

Introduction: Quality concept and awareness; Quality Techniques; Quality Control; Inspection and Tests; Quality Assurance; Quality Development; Quality Planning; Quality Costs; Total Quality Management; Quality Standards; Quality Management Documentation; System Documentation; Internal Audit; Certification; Process Control; Quality Circles; Data Collection and Analysis; Calibration; Quality Improvement Methods; ISO 9000 Standards.

**MKM421                      Energy Management and Efficiency                      3+0    5.0**

Energy Resources, the world energy production and consumption, energy production and consumption in Turkey, defining the energy efficiency and savings and its importance, applicable law and director on energy efficiency, energy efficiency and savings potential in industry (in electric motors, compressed air and steam systems) Energy efficiency and saving in buildings (in heating and cooling systems), energy efficiency and saving potential in daily life (in household devices and vehicles), Sample applications related to energy efficiency and saving.

**MKM422                      Micro/ Nanoscale Fabrication and Characterization                      3+0    5.0**  
**(Eng)**

Introduction to Micro/Nano-Fabrication Methods; Important Materials Science Concepts in Micro/Nano-Fabrication Processes; Thin Film Deposition; Thin Film Growth; Photolithography; Electron-Beam Lithography; Thermal Oxidation; Wet And Dry Etching; Doping; Wafer Dicing; Wafer Bonding; Characterization Techniques Used During/After Micro/Nano-Fabrication; Example MEMS Devices and Their Working Principles.

**MKM423                      Welding Technologies                      3+0    5.0**

Introduction to Welding Technology; Weldability in Metals and Classification of Welding Techniques; Pressure Welding Types; Arc Welding; Gas Welding; Special Welding Techniques; Metallurgical Properties of HAZ and Welding Joint; Calculation of Weld Seam's Strength; Residual Stress and Cracks in Weld Seams; Stress Corrosion Fracture in Welding; Heat Treatments in Welding; Welding Defects; Inspection of Welding Quality; Health and Safety in Welding Processes.

**MKM424                      Advanced Driver Assistance Systems                      3+0    5.0**

**MKM426                      Analysis and Evaluation of Cogeneration Systems                      3+0    5.0**

**MKM427                      Introduction to Composite Materials                      3+0    5.0**

Introduction to composite materials: Definition, classification, application, and manufacturing methods of composites; Components of composites: Reinforcement and matrix materials, Fiber-matrix interface; Macro-mechanical analysis of orthotropic materials; Failure theories; Micro-mechanical analysis: Elasticity modulus, Poisson's ratio, Shear modulus, Toughness; Mechanical properties of composites: Factors affecting the mechanical properties of composites, Fatigue, Mechanical tests; Experimental design modeling, Central composite design, Response surface methodology, Taguchi method.

**MKM428                      Computational Fluid Dynamics                      3+0    5.0**

**MKM429                      Vehicle Simulation                      3+0    5.0**

Vehicle dynamics, vehicle mathematical models, vehicle Dynamics software, basic of Matlab-Simulink, vehicle model adaptation in MATLAB-Simulink environment, vehicle model adaptation in IPG-CarMaker environment, vehicle dynamics, emergency braking system, driving dynamics basics, lane change maneuvers, autopilot design, urban road and driving design, road and driving design on intercity highway.

**MKM432                      Hydraulics and Pneumatic                      3+0    5.0**

Definition of Hydraulic Systems and Principles; Properties of Hydraulic Fluid, Advantages and Disadvantages of Hydraulic System; Hydraulic Pumps and Hydraulic Cylinders; Hydraulic Valves; Hydraulic Accumulators and Other Circuit Elements; Standard Symbols Used in Hydraulics; Hydraulic Circuit Designs; Physical Properties of Air and Boyle's Law; Charles' Law and Absolute Temperature; Working Principles of Pneumatic Circuits; Pneumatic Circuit Elements; Pneumatic Circuits with Standard Symbols; Working Sequences of Pneumatic-Hydraulic Circuits; Hydraulic and Pneumatic Circuit Applications Used in Machines.

<b>MKM437</b> <b>(Eng)</b>	<b>Engineering Materials</b>	<b>3+0 5.0</b>
Introduction to Engineering Materials; Mechanical and Physical Properties of Materials; Engineering Metals and Alloys; Micro Structure of Metals; Phase Diagrams of Ferrous Alloys; Engineering Plastics; Engineering Ceramics; Composite Materials; Nano Materials; Semi-conductives; Destructive and Non-destructive Testing of Materials; Selection and Development of Materials; Tables on Material Selection; Advanced Materials, Foam Materials; Design with Materials; Engineering Faults and Accidents.		
<b>MKM440</b> <b>(Eng)</b>	<b>Introduction to Computer Aided Manufacturing</b>	<b>3+0 5.0</b>
Basic Knowledge about Computer Aided Manufacturing in the Design Process; Creation of Tool Path in Turning and Milling Process; Selection of Appropriate Tool and Cutting Parameters; Creation of Tool Path for 3D Parts, Formation of M and G Codes for CNC Machines; Three Dimensional CAD Modeling; Feature-Based Modeling; Variational and Parametric Modeling; Tools for PLC Logic Design; Kinematics of NC Machines; Fundamentals of Industrial Control; Rapid Prototyping.		
<b>MKM440</b> <b>(Eng)</b>	<b>Introduction to Computer Aided Manufacturing</b>	<b>2+2 5.0</b>
Basic Knowledge about Computer Aided Manufacturing in the Design Process; Creation of Tool Path in Turning and Milling Process; Selection of Appropriate Tool and Cutting Parameters; Creation of Tool Path for 3D Parts, Formation of M and G Codes for CNC Machines; Three Dimensional CAD Modeling; Feature-Based Modeling; Variational and Parametric Modeling; Tools for PLC Logic Design; Kinematics of NC Machines; Fundamentals of Industrial Control; Rapid Prototyping.		
<b>MKM4501</b> <b>(Eng)</b>	<b>Three-Dimensional Kinematics and Kinetics of Rigid Bodies</b>	<b>3+0 5.0</b>
Plane Motion of Rigid Bodies: Forces and Accelerations, Work and Energy, Energy and Momentum Methods; Kinematics of Rigid Bodies in Three Dimensions; Rotation About Fixed Point, The Time Derivative of a Vektor Measured From a Fixed or Translating-Rotating Systems, General Motion, Relative Motion Analysis Using Translating and Rotating Axes, Kinetics of Rigid Bodies in Three Dimensions; Moments and Products of Inertia, Angular Momentum, Kinetic Energy, Equation of Motion, Gyroscopic Motion, Torque-Free Motion.		
<b>MLZ109 (Eng)</b>	<b>Materials World</b>	<b>2+0 2.5</b>
Importance of Matrials Science; Classification of Materials and Their Production Methods: Ceramics, Polmers, Metallic materials, Composites, Nano materials; Properties of Materials; Crystal Structure of Materials and their Characterisation; Applications of Materials; Sport Materials; Materils in Racing Cars; Aircraft Materials; Bio Materials; Special Materials used in Daily Life; Special Examples for Newly Developed Materials.		
<b>MLZ114 (Eng)</b>	<b>Structure of Materials</b>	<b>2+0 2.5</b>
Introduction to materials structures: structure-property-processing-performance relation; Structure of crystalline solids: crystal structure, energy, amorphous materials, pattern, motif; Atomic positions and packaging factor of cubic structures; Stacking and density: Polycrystalline materials, single crystals, anisotropy, polymorphs; Bravais lattices; Crystallographic directions; Crystallographic planes; Structure of metals, semiconductors and ceramics: bonding in metals, semiconductors and ceramics, ionic-covalent character, substitutional and interstitial atoms, interstitial spaces, coordination number; Symmetry of crystals.		
<b>MLZ116 (Eng)</b>	<b>Freshman Project</b>	<b>1+0 1.0</b>
Application of Students Projects; Laboratory Capabilities; Literature Research and Assignment of Student Project; Planning of Projects, Creation of Hypothesis; Analysis and Experiment; Evoluation; Presentation of Projects; Education of Interdiciplinar Student Project; Education of TÜBİTAK-BAP Projects, Engineering Problems; Materials Rlated Problems; Solving Techniques; Student Projects; How to Write a Project; Project Work on the Basis of Materials.		
<b>MLZ203</b>	<b>Materials Science</b>	<b>3+0 3.0</b>
Atomic Structure; Arrangement of the Atoms; Structural Defects: Point defects, Dislocations, Planar defects; Mechanical Tests and Properties: Tension, Compression, Impact test, Hardness, Fatigue; Deformation of the Materials; Metology: Preparation of the samples, Observation with optic and electron microscope; Treatment Increasing the Strength of the Materials; Solidifying and Cooling Curves, Phase Diagrams; Iron Alloys: Steels, Cast Irons, Heat treatments; Metals and Alloys Excluding Iron: Aluminium, Titanium, Copper alloys. Atomic Structure; Arrangement of the Atoms; Structural Defects: Point defects, Dislocations, Planar defects; Mechanical Tests and Properties: Tension, Compression, Impact test, Hardness, Fatigue; Deformation of the Materials; Metology: Preparation of the samples, Observation with optic and electron microscope; Treatment Increasing the Strength of the Materials; Solidifying and Cooling Curves, Phase Diagrams; Iron Alloys: Steels, Cast Irons, Heat treatments; Metals and Alloys Excluding Iron: Aluminium, Titanium, Copper alloys.		

**MLZ203 (Eng) Materials Science****3+0 3.0**

Atomic Structure; Arrangement of the Atoms; Structural Defects: Point defects, Dislocations, Planar defects; Mechanical Tests and Properties: Tension, Compression, Impact test, Hardness, Fatigue; Deformation of the Materials; Metallography: Preparation of the samples, Observation with optic and electron microscope; Treatment Increasing the Strength of the Materials; Solidifying and Cooling Curves, Phase Diagrams; Iron Alloys: Steels, Cast Irons, Heat treatments; Metals and Alloys Excluding Iron: Aluminium, Titanium, Copper alloys. Atomic Structure; Arrangement of the Atoms; Structural Defects: Point defects, Dislocations, Planar defects; Mechanical Tests and Properties: Tension, Compression, Impact test, Hardness, Fatigue; Deformation of the Materials; Metallography: Preparation of the samples, Observation with optic and electron microscope; Treatment Increasing the Strength of the Materials; Solidifying and Cooling Curves, Phase Diagrams; Iron Alloys: Steels, Cast Irons, Heat treatments; Metals and Alloys Excluding Iron: Aluminium, Titanium, Copper alloys.

**MLZ204 Materials of Construction****3+2 5.0**

Cementation Materials; Lime, Cement, Pozzolans; Physical and Mechanical Properties; Aggregates: Properties, Experiments; Factors Affecting the Strength of the Concrete; Properties of Fresh Concrete; Calculation of Concrete Mix; Production and Curing of the Concrete; Reinforcement Steels and Properties; Metals and Alloys; Other Alloys Used in Structures; Glasses; Plastic Based Materials; Wood. Cementation Materials; Lime, Cement, Pozzolans; Physical and Mechanical Properties; Aggregates: Properties, Experiments; Factors Affecting the Strength of the Concrete; Properties of Fresh Concrete; Calculation of Concrete Mix; Production and Curing of the Concrete; Reinforcement Steels and Properties; Metals and Alloys; Other Alloys Used in Structures; Glasses; Plastic Based Materials; Wood.

**MLZ208 (Eng) Electrical, Magnetic and Optical Properties of Materials****2+0 3.0**

Introduction to applications of solid-state physics; Crystal anisotropy; Electrical properties of materials: Electrical band structure, Real and imaginary part, Thermal conductivity, Ionic conductivity; Magnetic properties of materials: Ferromagnetic, ferrimagnetic, paramagnetic, diamagnetic, antiferromagnetic properties; Optical properties of materials: Optical spectrum, Optical absorption, diffraction, transparency and refraction, Intrinsic factor, Real and imaginary part of dielectric factor, Non-linear optic; Multifunctional effects: Magneto-electric, Magneto-resistive, Magneto-optic-, Opto-electric, Thermo-electric, Ferro-electric, Piezo-electric effects.

**MLZ216 (Eng) Mechanical Behaviour of Materials I****2+0 3.0**

The Analysis of the Mechanical Behavior of Materials: Stress, Strain, Elasticity, Plasticity, Ductile versus brittle behavior; Factors Affecting Stress-Strain Relationship: Bonding types, Defects, Second phases and their effects on deformation behavior; Dislocation Theory; Strengthening Mechanisms; Mechanical Tests: Tension, Compression, Hardness, Impact; Creep: Effect of temperature on deformation.

**MLZ218 (Eng) Ceramic Processing****2+0 3.0**

Introduction to Ceramic Materials and Applications; Ceramic Powders: Definitions, Properties, Requirements; Ceramic Raw Materials: Common raw materials, Special inorganic chemicals; Ceramic Characterisation: Processing Additives: Liquids, Surfactants, Deflocculants and Coagulants; Stability of Ceramic Suspensions; Importance of Interfaces; Charged Interfaces and Electric Double Layer; DLVO Theory; Deflocculation of Clays; Rheological Properties and Measurements; Shaping Methods: Slip casting, Dry and isostatic pressing, Additive manufacturing, Plastic shaping and others; Drying; Sintering: Solid state sintering, Liquid phase sintering, Vitrification.

**MLZ221 (Eng) Physical Properties of Materials****2+0 2.5**

Introduction to Materials Science and Engineering; Atomic Structure and Chemical Bonding; Crystal Structures; Solidification, Crystalline Imperfections and Diffusion in Solids; Mechanical Properties of Metals; Polymeric Materials; Phase Diagrams; Engineering Alloys; Ceramic Materials; Composite Materials; Corrosion; Electrical Properties of Materials; Optical Properties; Superconducting Materials; Magnetic Materials.

**MLZ222 (Eng) Materials Characterization Techniques Laboratory****0+2 3.0**

Specimen Preparation Laboratory; Optical Microscope Laboratory; Scanning Electron Microscope Laboratory; Microanalysis Techniques Laboratory; Atomic Force Microscope Laboratory; X-ray Diffraction Laboratory; X-ray Fluorescence Laboratory; Thermal Analysis Laboratory. Specimen Preparation Laboratory; Optical Microscope Laboratory; Scanning Electron Microscope Laboratory; Microanalysis Techniques Laboratory; Atomic Force Microscope Laboratory; X-ray Diffraction Laboratory; X-ray Fluorescence Laboratory; Thermal Analysis Laboratory.

**MLZ223 (Eng) Polymer Chemistry (****2+0 3.0**

Structure and Bonding of Organic Compounds; Nomenclature of Organic Molecules; Classes of Hydrocarbons; Mechanism of Organic Reactions; Functional Groups; Classification of Polymers; Polymer Structure (Morphology); Molecular Weight of Polymers; Introduction to Polymerization Techniques; Step-Reaction Polymerization; Ionic Chain Reaction and Complex Coordination Polymerization; Free Radical Chain Polymerization; Co-Polymerization; Types of Co-Polymers.

**MLZ225 (Eng) Raw Materials and Unit Operations****2+0 2.0**

Processing of Ores Concentrates, Recycled and Partially Processed Raw Materials to Render them Amenable to Further Metallurgical Treatment; Process Flowsheets and Details of Physical and Chemical Separation Methods for the Concentration of Raw Materials; Principles and Applications of Mineral Processing; Pretreatment Processes; Drying, Calcinations, Roasting and Agglomeration.

**MLZ229 (Eng) Materials Characterization Techniques I 2+0 3.0**

Importance of Characterization; Properties and Production of X-rays; Interaction between X-Rays and Solid; Bragg Law and Diffraction; The Use of X-Rays; Intensity of Diffracted Peaks; Calculation of Expected Theoretical Patterns; The Identification of Phases Obtained from Different Materials; Heat-Solid Interactions; Thermal Analysis Techniques; Properties Measured by Thermal Analysis; Thermogravimetric Analysis (TG); Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC) and Simultaneous Thermal Analysis; Dilatometry; Interpretation of TG, DTA, DSC and Dilatometer Curves; Parameters Effecting the Thermal Analysis Results; Quantitative Analysis.

**MLZ230 (Eng) Materials Characterization Techniques II 2+0 3.5**

Importance of Microstructure; Microscopic Characterization Techniques; Brief History of Microscopes; Specimen Preparation; Light-Solid Interactions and the Resulting Signals; Light Microscopes, Types of Light Microscopes and Contrast Techniques; Resolution, Aberrations and Why We Need to Use Electron Microscopes; Interactions Between Electrons and Solids; Light vs Electrons; Scanning Electron Microscopes (SEM); Imaging Techniques in SEM; Chemical Analysis Techniques for SEM; Qualitative and Quantitative Analysis; Important Parameters to Obtain Best Results; Transmission Electron Microscopy (TEM) and Imaging Techniques; Diffraction and Chemical Analysis in TEM.

**MLZ231 (Eng) Materials Thermodynamics I 2+1 4.5**

Basics of Thermodynamics; First Law of Thermodynamics and Enthalpy; Kirchhoff Equation; Hess Law; Fuels and Adiabatic Flame Temperature; Second Law of Thermodynamics and Entropy; Third Law of Thermodynamics and Free Energy; Maxwell Relations; Phase Transformations in One-Component Systems; Ellingham Diagrams; Carbothermic Reduction; Metallothermic Reduction.

**MLZ232 (Eng) Introduction to Materials Science 3+0 3.5**

Introduction to Materials Science; Atom and the Crystal Structure; Solid State Diffusion; Imperfections in Solids; Dislocations and Strengthening Mechanisms; Mechanical Properties of Materials and Materials Testing: Tension, Compression, Torsion, Bending, Impact, Creep testing; Ferrous and Non-ferrous Alloys; Fracture; Phase Diagrams and Iron-Carbon Phase Diagram; Polymers; Ceramics; Composite Materials.

**MLZ307 (Eng) Phase Diagrams 3+0 4.5**

Thermodynamic and Phase Equilibria; One Component System Phase Diagrams; Two Component System Phase Diagrams: Binary eutectic, Intermediate compounds, Solid solution, Liquid immiscibility; Determination of Phase Diagrams: Experimental methods, Thermodynamic estimations and calculations; Ternary Systems: Method of determining composition, Isolethal studies in ternary systems, Binary and ternary intermediate compounds, Solid solutions; Four and Six Component Systems.

**MLZ314 (Eng) Transport Phenomena in Materials Processing 4+0 6.0**

Introduction to Transport Phenomena: Momentum transfer, Heat transfer and mass transfer; Applications of Transport Phenomena in Material Processing; Fluid Flow in Materials Processing; Crystal growth, Fiber processing, Continuous casting; Heat Transfer in Material Processing: Powder processing, Die casting, Welding; Mass Transfer in Material Processing: Crystal growth, Casting, Semiconductor device fabrication.

**MLZ315 (Eng) Electrochemistry 1+0 2.0**

Introduction to Electrochemistry; Electrolytic Conductance: The theory of electrolytic conductance, The migration of ions, Free energy and activity; Reversible Cells; Electrode Potentials: Oxidation-reduction systems, Acid and bases, The determination of hydrogen ions, Neutralization and hydrolysis, Nernst equations; Amphoteric Electrolytes, Polarization and Overvoltage; The Deposition and Corrosion of Metals; Electrolytic Oxidation and Reduction.

**MLZ318 (Eng) Metallic Materials 4+0 4.0**

Fe-Fe<sub>3</sub>C equilibrium phase diagram; Heat Treatment of Steels; Time-Temperature-Transformation Diagrams; Alloy Steels; Tool Steels; Standard Designation of Iron Base Alloys; D.I.N Standards; AISI/SAE Standards; White, Gray, Tempered and Nodular Cast Irons; Nonferrous Metals and Alloys; Copper and its Alloys; Aluminum and its Alloys; Nickel and its Alloys; Titanium and its Alloys. Fe-Fe<sub>3</sub>C equilibrium phase diagram; Heat Treatment of Steels; Time-Temperature-Transformation Diagrams; Alloy Steels; Tool Steels; Standard Designation of Iron Base Alloys; D.I.N Standards; AISI/SAE Standards; White, Gray, Tempered and Nodular Cast Irons; Nonferrous Metals and Alloys; Copper and its Alloys; Aluminum and its Alloys; Nickel and its Alloys; Titanium and its Alloys.

**MLZ326 (Eng) Project Management 1+0 2.0**



What is a Project?; Introduction to Project and Project Management; Classification of Projects; The Process Groups during Project Management; The Project Management Life Cycle; Project Management Knowledge Areas; Project Integration Management; Project Scope Management; Project Schedule Management; Project Cost Management; Project Quality Management; Project Resource Management; Project Communications Management; Project Risk Management; Project Procurement Management; Project Stakeholder Management; Project Planning; The Triple Constraints Triangle; Project Manager Skills; Different Project Methodologies; Project Writing and Presenting.

**MLZ327 (Eng) Mechanical Behaviour of Materials II** **2+0 3.0**

Overview of Mechanical Properties/Behaviours of Materials; ASTM Standards; Mechanical Properties/Behaviours of Metals; Elastic/Plastic Deformation; Tensile Properties; Dislocations; Strengthening Mechanisms in Metals; Hardness; Design/Safety Factors; Mechanical Properties/Behaviours and Toughening Mechanisms in Ceramics; Test Methods; Weibull Modulus; Thermal Stress/Shock Parameters; Thermal Properties/Behaviours of Materials; Mechanical Properties/Behaviours, Mechanisms of Deformation and for Strengthening of Polymers; Mechanical Properties/Behaviours and Toughening Mechanisms of Composites; Fundamentals/Principles of Fracture Mechanics; Fatigue; Creep.

**MLZ328 (Eng) Materials and Energy Balance** **2+0 3.0**

Introduction to Engineering Calculations; Process and Process Variables; Fundamentals of Materials Balances: Process classification, Recycle and bypass, Stoichiometric calculations, Combustion reactions; Single Phase Systems; Multiphase Systems; Energy Balances: Energy balance on closed systems, Energy balance on open systems; Energy Balance on Nonreactive Process; Materials and Energy Balance Applications for Selected Process.

**MLZ329 (Eng) Materials Thermodynamics II** **2+1 4.5**

Introduction to Solutions Thermodynamics; Partial Molar Thermodynamic Properties; Integral Molar Thermodynamic Properties; Ideal Solutions; Raoult's Law; Non-ideal Solutions; Gibbs-Duhem Equation; Regular Solutions; Thermodynamic Excess Properties; Activity-composition Relations in Binary Phase Diagrams; Alternative Standard States; Gibbs Phase Rule; Thermodynamics of Electrochemical Cells.

**MLZ330 (Eng) Silicate Ceramics** **2+0 3.0**

Silicate Ceramic Industry Overview; Raw Materials for Silicate Ceramics; Ceramic Tiles: Porous and Vitreous Tile Formulations, Critical Issues in Production; Ceramic Sanitarywares: Porous and Vitreous Sanitaryware Formulations; Critical Issues in Production; Ceramic Tableware: Porous and Vitreous Tableware Formulations; Critical Issues in Production; The Definition of Ceramic Glazes and The Raw Materials Used in Glaze Production; Major Oxides, Raw Materials Supplying the Relevant Oxides, Application Fields of Glazes, Other Incorporations to Glaze Batches, Certain Glaze Systems; Glass-ceramic Glaze Systems, Glaze Defects and Corrections.

**MLZ331 (Eng) Materials Processing Laboratory I** **0+2 2.0**

Characterisation of Ceramic Powders and Raw Materials: Raw material preparation, Ore dressing, Particle Size Analysis, Density Measurements, Archimedes rules, Water absorption experiment; Traditional Ceramic Processes: Wall tile production, floor tiles production, Sanitaryware production, Porcelain production; Frits and Glazes; Advanced Structural Ceramics, Sintering of Alumina; Extrusion, Thin Film Technics.

**MLZ332 (Eng) Processing of Polymers** **2+0 3.0**

Introduction to the Science of Large Molecules; Polymerization; Condensation and Addition Polymerization, Ionic and Coordination Chain (addition) Polymerization, Copolymerization, Polymerization Conditions and Polymer Reactions, Characterization; Polymer Solutions, Measurement of Molecular Weight and Size, Analysis and Testing of Polymers, Structure and Properties; Morphology and Order in Crystalline Polymers, Rheology and the Mechanical Properties of Polymers, Polymer Structure and Physical Properties, Properties of Commercial Polymers; Hydrocarbon Plastics and Elastomers, Other Carbon-Chain Polymers, Heterochain Thermoplastics, Polymer Production.

**MLZ333 (Eng) Phase Diagrams** **2+0 3.0**

Thermodynamics and Phase Equilibrium, Phase Diagrams of Single Component Systems, Phase Diagrams of Two Component Systems, Solidification of Liquids in Two Component Equilibrium Diagrams, Solid Solutions, Congruently and Incongruently Melting Intermediate Compounds, Immiscibility of Liquids, Drawing of Phase Diagrams, Experimental Methods, Thermodynamic Calculations, Phase Diagrams of Three Component Systems, Determination of Composition, Solidification of Liquids in Three Component Equilibrium Diagram, Intermediate Compounds in Three Component Systems, Solid Solutions, Phase Diagrams of Four Component Systems.

**MLZ334 (Eng) Fundamentals of Semiconductors** **2+0 3.0**

Introduction to Semiconductors: Conductors, Semiconductors, Insulators, Band theory, Crystalline, Polycrystalline and amorphous materials; Growth Techniques for Semiconductors: Czochralski, Chemical vapor deposition, Molecular beam epitaxy, E-beam deposition, Sputtering; Characterization Technique: Photoluminescence spectroscopy, Fourier transform infrared spectroscopy, Raman spectroscopy, I-V, C-V; Applications of Semiconductors: PNP transistors, NPN transistors,

Field effect transistors, LED, Solar cells; Fabrication Steps of Semiconductor Devices: Oxidation, Photolithography, Etching, Diffusion and doping with ion implantation, Metallization.

**MLZ335 (Eng) Metallic Materials I**

**2+0 3.0**

Theory of Alloying: Why and how alloying is done?; The Parameters That Affect Solid Solubility: Phase, Phase mixture, Formation of secondary phases, Intermetallics; The Effects of Alloying Additions, Grain Size, Secondary Phases on Mechanical Performance; The Effects of Deformation and Heat Treatment: The effects of cold deformation, Annealing, Ageing, Etc.; Non-Ferrous Alloys (Al, Cu, Ti alloys).

**MLZ336 (Eng) Metallic Materials II**

**2+0 3.0**

Classification of Steels and Cast Irons; Metastable Iron-Cementite and Stable Iron-Graphite Equilibrium Phase Diagrams: Lever rule, Microstructure development of steels and cast irons, Carbon solubility of austenite and ferrite; Phase Transformations in Steels: Embryo and nucleus, Homogeneous and heterogeneous nucleation, Supercooling, Nucleation rate, Growth rate, Avrami equation, Isothermal transformation and continuous cooling transformation diagrams, Non-equilibrium phases; Steel Standards; Alloy Steels: Alloying elements, Impurities, High strength-low alloy steels, Tool steels.

**MLZ337 (Eng) Transport Phenomena in Materials Processing I**

**2+0 3.0**

Introduction to Transport Phenomena; Fluid Dynamics: Properties of fluids, Laminar flow and momentum balances, Energy balance applications in fluid flow, Flow from Ladles, Flow through piping networks; Heat Transfer: Thermal conductivity of materials, Heat transfer and the energy equation, Convection and heat transfer correlations, Conduction heat transfer, Conduction of heat in solids, Solidification of metals, Radiation heat transfer.

**MLZ338 (Eng) Transport Phenomena in Materials Processing II**

**2+0 3.0**

Mass Transport: Fick's Laws and diffusivity of materials, Kirkendall effect, Diffusion in ceramic materials, Ambipolar diffusion, Role of defects in diffusion, Kröger-Vink notation system; Steady-State and Non-Steady State Diffusion; Thin Film Source; Diffusion Couple with Variable Diffusion Coefficient; Finite System Solutions; Microelectronic Diffusion Processing; Homogenization of Alloys.

**MLZ339 (Eng) Non-Crystalline Materials**

**2+0 3.0**

Introduction: Identification of crystalline and non-crystalline materials, Production of non-crystalline materials from solid, liquid and gas systems, Polymers; The Differences between Crystalline and Non-Crystalline Solids: Glass Formation: Structural models, kinetical models; Using of Sol-Gel Technique in the Production of Non-Crystalline Solids: Chemical Composition in Oxide Based Glasses: The properties of oxide based glasses; Colour Formation in Glass: The effect of chemical composition, Different colouring methods; Various Glass Systems; Glass Production Processes.

**MLZ342 (Eng) Whitewares**

**2+0 3.0**

Traditional Ceramic Raw Materials: Clay, Quartz, Feldspar and Other Raw Materials; Role of Raw Materials in Traditional Ceramic Bodies and Physical and Chemical Changes During Firing; Wall, Floor And Porcelain Tile Bodies and Their Production Methods; Frit and Glaze Preparation; Digital Decoration; Sanitaryware Bodies and Their Production Methods; Waste Management in Traditional Industry; Energy Efficiency in Traditional Industry.

**MLZ354 (Eng) Spectroscopic Analysis of Materials**

**2+0 3.0**

Measurement Principles and Electronics: Introduction to the analytical process, Basic electronics, Signals and noise; Basics of Spectroscopy: Introduction to spectroscopic methods, Components of optical systems; Atomic Spectroscopy: An introduction to optical atomic spectroscopy, Atomic absorption spectroscopy, Atomic emission spectroscopy; Molecular Spectroscopy: Introduction to UV-Vis molecular spectroscopy, Applications of UV-Vis spectroscopy, Fluorescence, phosphorescence and chemiluminescence, Infrared absorption spectroscopy, Applications of infrared spectrometry, Nuclear magnetic resonance spectroscopy; Mass spectrometry; Separation Science.

**MLZ413 (Eng) Powder Metallurgy**

**3+0 4.0**

Principles of the P/M Process; Powder Characterization, Properties of Metal Powders and their Testing; Methods of Metal Powder Production; Precompaction Powder Handling; Compaction Processes; Densification Mechanisms; Sintering Theory; Liquid Phase and Activated Sintering; Sintering Atmospheres and Furnaces; Full Density Processing; Finishing Operations; Compact Characterization.

**MLZ431 (Eng) Alloys**

**3+0 4.0**

Theory of Alloying: Why and How Alloying is Done?; Phase Transformations in Alloys: Aging, Martensitic Transformation, Formation of Secondary Phases (Intermetallics and Solid Solution Systems); The Effect of Deformation and Heat Treatment; Steels; High Temperature Alloys; Light Alloys (Al, Mg, Ti Alloys); Special Alloys (Invars, Magnetic Alloys and etc.) Theory of Alloying: Why and How Alloying is Done?; Phase Transformations in Alloys: Aging, Martensitic Transformation, Formation of Secondary Phases (Intermetallics and Solid Solution Systems); The Effect of Deformation

and Heat Treatment; Steels; High Temperature Alloys; Light Alloys (Al, Mg, Ti Alloys ); Special Alloys (Invars, Magnetic Alloys and etc.)

#### **MLZ433 (Eng) Thin Film Technology**

**3+0 4.0**

Introduction to Physics of Thin Film and Overview; Growth and Film Formation; Vacuum and Kinetic Theory of Gases; Evaporation; Sputter Deposition; General Process; Specific methods; Film Characterization Techniques; Optical Electrical Magnetic and Mechanical Properties of Thin Films. Introduction to Physics of Thin Film and Overview; Growth and Film Formation; Vacuum and Kinetic Theory of Gases; Evaporation; Sputter Deposition; General Process; Specific methods; Film Characterization Techniques; Optical Electrical Magnetic and Mechanical Properties of Thin Films.

#### **MLZ434 (Eng) Aviation Materials**

**3+0 4.0**

Common Aviation Materials and Alloys: Stainless Steels; Super Alloys, Titanium Alloys, Aluminium Alloys, Composite Materials; Material Properties under Tensile, Fatigue and Creep; Raw Material Production Methods and Effect of Production Methods on Material Properties: Ingot Production, Casting, Forging, Material Production Processes: Welding, Brazing, Form Operations, Heat Treatment, Material Testing: Testing at Room Temperature, Testing at High Temperature, Wear and Corrosion; Quality Control: Non-destructive and Destructive Testing Methods, Quality Insurance Systems. Common Aviation Materials and Alloys: Stainless Steels; Super Alloys, Titanium Alloys, Aluminium Alloys, Composite Materials; Material Properties under Tensile, Fatigue and Creep; Raw Material Production Methods and Effect of Production Methods on Material Properties: Ingot Production, Casting, Forging, Material Production Processes: Welding, Brazing, Form Operations, Heat Treatment, Material Testing: Testing at Room Temperature, Testing at High Temperature, Wear and Corrosion; Quality Control: Non-destructive and Destructive Testing Methods, Quality Insurance Systems.

#### **MLZ444 (Eng) Welding Technologies**

**3+0 4.0**

Welding and Soldering; Micro structural Evolution of Metals During Welding and Soldering; Power Sources in Welding; Electrical Concepts in Welding (AC and DC Sources; Constant Current and Constant Voltage and Electrical Stick Out); Effects Polarity of Work Piece and Electrode; Consumable and Non-Consumable Electrodes; Choosing Electrodes for Specific Welding Operations; Welding Methods: Diffusion welding; Spot Welding; Shielded Metal Arc Welding; Gas-Tungsten Arc Welding; Gas Metal Arc Welding; Flux-Cored Arc Welding; Submerged Arc Welding; Electro slag Welding; E-Beam and Laser Welding; Welding of Reactive Metals Al and Mg; Soldering Alloys; Case Studies Involving Soldering and Welding. Welding and Soldering; Micro structural Evolution of Metals During Welding and Soldering; Power Sources in Welding; Electrical Concepts in Welding (AC and DC Sources; Constant Current and Constant Voltage and Electrical Stick Out); Effects Polarity of Work Piece and Electrode; Consumable and Non-Consumable Electrodes; Choosing Electrodes for Specific Welding Operations; Welding Methods: Diffusion welding; Spot Welding; Shielded Metal Arc Welding; Gas-Tungsten Arc Welding; Gas Metal Arc Welding; Flux-Cored Arc Welding; Submerged Arc Welding; Electro slag Welding; E-Beam and Laser Welding; Welding of Reactive Metals Al and Mg; Soldering Alloys; Case Studies Involving Soldering and Welding.

#### **MLZ445 (Eng) Phase Transformations in Metals and Alloys**

**3+0 4.0**

Phenomenological and Atomistic Approaches in Solid State Diffusion; Diffusion Transformations in Solids; Free energy-composition diagrams in precipitation: Precipitation transformations; Solid-state nucleation; precipitation kinetics; Eutectoid Transformation and Discontinuous Precipitation. Diffusionless Transformations: Martensite crystallography; thermodynamics and types of marten sites; Bainite transformation. Phenomenological and Atomistic Approaches in Solid State Diffusion; Diffusion Transformations in Solids; Free energy-composition diagrams in precipitation: Precipitation transformations; Solid-state nucleation; precipitation kinetics; Eutectoid Transformation and Discontinuous Precipitation. Diffusionless Transformations: Martensite crystallography; thermodynamics and types of marten sites; Bainite transformation.

#### **MLZ447 (Eng) Materials Processing Laboratory II**

**0+2 3.0**

Physical Test, Physical Properties Test of Metals: Strain Gages; Charpy Test; Tensile Test; High Temperature Tensile Test; Bending Test; Impact Test; Hardness Test; Compression Test; Creep Test; Fatigue Test; Fracture Toughness Test, Pig-iron, Stainless Steel, Copper-Brass Samples Tests; Non-destructive Test Methods: Ultraviolet and X-ray non-destructive test methods, Loops Experiment.

#### **MLZ449 (Eng) Innovation and Entrepreneurship**

**1+0 1.0**

Creativity and Innovation Process; Understanding Entrepreneurship; Definition, Role, Evaluation; Entrepreneurial Journey: Challenges and opportunities, Getting ready; Business Model Development; Developing and positioning a business concept; Feasibility Analysis; Market Analysis: Industry lifecycle, Target market characterisation, Analysis of product risks and benefits; Building a Business Plan: Concept, Structure, Presentation; Financial Opportunities for Entrepreneurship; Entrepreneurial Experiences

#### **MLZ450 (Eng) Computational Materials Science**

**3+0 4.0**

<b>MLZ453 (Eng)</b>	<b>Advanced Materials and Composites</b>	<b>2+0</b>	<b>3.0</b>
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<b>MLZ454 (Eng)</b>	<b>Smart Materials</b>	<b>3+0</b>	<b>4.0</b>
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<b>MLZ455 (Eng)</b>	<b>Heat Treatment</b>	<b>2+0</b>	<b>3.0</b>
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<b>MLZ456 (Eng)</b>	<b>Phsysical Properties of Nanomaterials</b>	<b>3+0</b>	<b>4.0</b>
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<b>MLZ457 (Eng)</b>	<b>Manufacturing with Materials</b>	<b>2+0</b>	<b>3.0</b>
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<b>MLZ459 (Eng)</b>	<b>Degradation of Engineering Materials</b>	<b>2+0</b>	<b>3.0</b>
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<b>MLZ460 (Eng)</b>	<b>Materials Selection and Design</b>	<b>2+2</b>	<b>4.0</b>
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<b>MLZ461 (Eng)</b>	<b>Glass Technology</b>	<b>2+0</b>	<b>3.0</b>
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<b>MLZ462 (Eng)</b>	<b>Applications in Materials Engineering</b>	<b>2+0</b>	<b>3.5</b>
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<b>MLZ463 (Eng)</b>	<b>Project Preparation for Material Science and Engineering</b>	<b>1+2</b>	<b>3.0</b>
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Preliminary Research on the Topic Chosen under the Guidance of an Advisor; A Broad Literature Survey about the Topic; Preliminary Studies for Setting-up Laboratory Experiments; Design of Experimental Set-ups; Acquisition of Data for Theoretical and/or Modeling Studies; Determining Steps of the Study; Reporting the Results.

**MLZ464 (Eng) Project Practice for Material Science and Engineering 2+4 5.0**

Theoretical and/or Experimental Works Related to the Chosen Topic Under the Guidance of an Advisor; Reporting the Results; Presentation of the Results as a Poster; Oral Presentation Before a Jury, Skill of Presentation by English, Skill of Indicate of Results, Skill of Answer for Jury Questions, Skill of Selection and Design of Ptoject, Skill of Evolution of Results by Graphics.

**MLZ465 (Eng) Machining Technology of Metals 2+0 3.0**

Definition and Explanation of Main Metal Cutting Operations (Turning, Drilling And Milling); Chip Formation Fundamentals and Mechanics, Built-Up Edge, Tool-Chip Interface, Cutting Forces and Stresses; Calculations of Machining Parameters, Material Removal Rate, Machining Time etc.; Cutting Tool Geometry and Its Effects on Cutting Process; Cutting Tool Wear Mechanisms at Low and High Temperatures; Structure, Property and Performance Relationship of The High Speed Steels and Cemented Carbides Tools; Structure, Property and Performance Relationship of the Ceramics and Ultra-Hard Cutting Tools; Machining of Superalloys; Titanium Alloys; Steels and Cast Irons.

**MLZ466 (Eng) Enamels 2+0 3.0**

Identification of Enamel; Their Advantages and Disadvantages; Chemical Composition; Commonly Known Enamel Systems; Suitable Metallic Substrates; Enamel Productions; Defects; Enamel Based Defects, Substrate Based Defects; Elimination of Defects; Characterization of Enamelled Products; Enamel Application Fields, Why We Use Enamels from Metals amd How to Cover from Metal for Corrosion Behaviour.

**MLZ467 (Eng) Particle Size Control Mechanism 2+0 3.0**

Fundamentals of Processing; Particle Sizing Process; Particle Sizing Techniques; Raw Material Preparation Criteria; Particle Size Reduction and Aim of Size; Crushing and Grinding Systems; Choosing a Suitable Process in View of Grinding and Bond Index Criteria; Classification of Particle Sizes; Mineral Processing and Applications; Submicron Grinding and Size Control; High Technology Grinding Processes.

**MLZ468 (Eng) Rubber and Rubber Technology 2+0 3.0**

Introduction; Fundamental Concepts: Polymers, Morphology, Thermoplastics, Elastomers, Thermosets; Brief History of Rubber; Types of Rubber: Golden rules, Natural rubber, Synthetic rubbers; Properties and Testing of Rubber: Tests on compound, Tests on vulcanizate; Compounding Materials: Recipe, Dispersion, Fillers, Process oils, Vulcanization and vulcanization chemicals, Antidegradants, Processing aids; Processing and Associated Equipment: Mixing, Extrusion, Moulding, Finishing operations; Engineering with Rubber; Rubber Products: Tyres, Belts, Rubber-to-metal parts, Sealing elements, Profiles, Hoses, Footwear, Wire and cable.

**MLZ470 (Eng) Cement and Concrete 2+0 3.0**

Definition of Cement; Cement Production; Furnace Reactions; Composition of Clinker; Effects of Cement Production Process Parameters on the Properties of Final Product; Hydration; Hardening and Its Certain Crystal Phases and Their Interactions with Each Other; Standard Cement Experiments; General Properties of Cement; Definition of Concrete; Aggregates for Concrete; General Properties of Concrete; Special Concretes.

**MLZ471 (Eng) Nanomaterials and Nanotechnology 2+0 3.0**

Introduction to Nanomaterials and Nanotechnology; History of Nanotechnology; Examples of Nanotechnology from the Nature; Nanomaterials Synthesis; Solution-based Synthesis Methods; Carbon Nanotube Growth Techniques; Nanofabrication; Top-Down and Bottom-Up Approaches; Tools for Characterization of Nanomaterials; Physical and Mechanical Properties of Nanomaterials; Size Dependent Thermal, Mechanical, Optical, Electrical and Magnetic Properties; Applications of Nanomaterials; Future of Nanomaterials; Opportunities and Challenges.

**MLZ472 (Eng) Biomaterials 2+0 3.0**

Introduction to Biomaterials; Bioceramics: Ceramic implant materials, Alumina and zirconia, Calcium phosphate, Hydroxyapatite, Glass-ceramics; Biometal; Metallic Implant Materials: Stainless steels, Ti and Ti-based alloys, Dental metals, Dental amalgam, Nickel-titanium alloys; Biopolimer; Polymeric Implant Materials; Polyamides, Polyethylene, Polypropylene, Polyacrylates, Fluorocarbon Polymers; Composite Biomaterials: Mechanics of composites, Applications of composite biomaterials; Type of Tissues; Tissue Response to Implants; Soft Tissue Replacement; Hard Tissue Replacement.

**MLZ473 (Eng) Carbon Nanomaterials 2+0 3.0**

Carbon Element; Carbon Allotropes in Nanoscale; Role of Carbon Nanomaterials in Evolving of Nanotechnology; An Overview of Nanoparticle Synthesis; Structure, Properties, Production Methods and Applications of Carbon Nanomaterials: Fullerene, Carbon Nanotube, Carbon Nanofiber, Graphene and Nanodiamond; Comparison of Graphene with Other Two-Dimensional Materials.

**MLZ474 (Eng) Aviation Materials 2+0 3.0**

Common Aviation Materials and Alloys: Stainless steels; Super Alloys, Titanium Alloys, Aluminium Alloys, Composite Materials; Material Properties under Tensile, Fatigue and Creep; Raw Material Production Methods and Effect of Production Methods on Material Properties: Ingot Production, Casting, Forging, Material production processes: Welding, Brazing, Form operations, Heat treatment, Material testing: Testing at room temperature, Testing at high temperature, Wear and corrosion; Quality control: Non-destructive and destructive testing methods, Quality insurance systems.

**MLZ475 (Eng) Polymer Matrix Composites 2+0 3.0**

General Aspects of Composite Materials: Fibers and fiber architecture; Matrices; Elastic Deformation of Long-Fiber Composites; Laminates and Their Elastic Behavior; Stress and Strain in Short Fiber Composites; Characterization of Interface Region Between Matrix and Fiber; Introduction to Interface Formation Mechanisms: Measurement of bonding strength; Strength and Toughness of Polymer Matrix Composites; Introduction to Processing Technologies for Polymer Matrix Composites: Hand Lay-Up; Pre-Preg; SMC (Sheet Molding Compound); RTM (Resin Transfer Molding); VARTM (Vacuum Assisted Resin Transfer Molding); Poltrusion; Filament Winding; Recent Applications of Polymer Matrix Composites.

**MLZ476 (Eng) Engineering Materials for Armour Applications 2+0 3.0**

Ballistics and Classification: Internal ballistics, Transition ballistics, External ballistics, Terminal ballistics; Types of Threats and Mechanisms; Mechanical Behavior of Bullets and Rockets; Armor Types: Ceramic armors, Metallic armors, Polymer based armors, Auxiliary materials, B4C-Al composite; Alumina (Al<sub>2</sub>O<sub>3</sub>); Mullite; Cordierite; Silicon Carbide (SiC); TiB<sub>2</sub>-Ni Composite; Kevlar; Active and Reactive Armors; Armor Design.

**MLZ477 (Eng) Microscopy in Practice 2+0 3.0**

Light-Solid and Electron-Solid Interactions and Their Results; Offering a Solution to the Problem Encountered in the Material; Sample Preparation to Realize the Solution; Problem Solving with Light Microscopy Techniques; Microstructural Problem Solving in Scanning Electron Microscopy; Problem Solving by Chemical Analysis in Scanning Electron Microscopy; Problem Solving by Phase Analysis in Scanning Electron Microscopy; Problem Solving by Combining Other Techniques with Microscopic Techniques; Problem Solving with Transmission Electron Microscopy (TEM) Techniques and Scanning Transmission Electron Microscopy (STEM) Techniques; Case Study: Metallic and Ceramic Base Mat..

**MLZ478 (Eng) Mathematical Relations in Powder Processing 2+0 3.0**

Particle Size Distribution Models; Stoke's Law; Langmuir Theory; Brunaueremmetteller (BET); Equations for Compaction; Bimodal Powder Packing; Washburn Equation; Random-Walk Diffusion; Fick's First and Second Law; Herring Scaling Law; Laplace Equation; Densification and Grain Growth Mechanisms; Combined Stage Sintering Model; Creep Models; Stereological Analysis; Weibull Distribution.

**MLZ479 (Eng) Electroceramic Materials 2+0 3.0**

Ceramic Insulators, Semiconductor Ceramics, PTC and NTC Thermistors, Ferroelectric ceramics and hysteresis loops, Barium Titanate capacitors, PZT ceramics and their applications, Thermistors, Superconducting ceramics, PLZT Optical ceramics, Measurement of electromechanical properties, Application Examples.

**MLZ480 (Eng) Tile and Brick 2+0 3.0**

Definition of Structural Ceramics, Its Importance and classification; Raw Materials: Storage of raw materials, Preparation of raw materials; Processing of Structural Ceramics: Shaping, Surface treatment, Cutting, Drying, Firing, Final product finishing, Test analysis on structural ceramics; Quality Control Standards of Structural Ceramics; Structural Ceramics Industry of Turkey.

**MLZ482 (Eng) Refractories 2+0 3.0**

What is a Refractory Material?; Classification by Fabrication Methods; Shaping of Refractories; Classification of Refractories: Chemical composition, Raw and synthetic, Acidic, Basic and neutral; Flowcharts: Pressing, Slip casting; Raw Materials of Refractories; How Refractories are Made?; Fabrication Techniques; Test Methods; Properties of Refractories; Refractoriness; Refractoriness Under Load; Creep; Thermal Shock Behaviour; Slag Resistance; Mechanical Properties; Thermal Stress/Shock Parameters; Solutions of Example Problems; Types of Refractories; Refractories in Cement Rotary Kilns; Use of Refractories in the Iron and Steel Industry; Glass Melting Refractories.

**MLZ484 (Eng) Glass Ceramics 2+0 3.0**

Introduction to Glass Ceramics; samples of Glass Ceramic Systems; Preparation of Glass Ceramic Materials; Types of Simple Phase Transformation in Glass Systems; Crystallisation Mechanisms; Bulk Crystallisation in Simple Systems; General Properties of Glass Ceramics and Comparisons with Conventionally Prepared Glass Ceramics; Properties of Commercially Available Glass Ceramics and Their Application.

**MLZ486 (Eng) Strengthening Mechanisms in Materials 2+0 3.0**

Classification of Materials; Mechanical Properties/Behaviours of Metals; Elastic/Plastic Deformation; Dislocations; Mechanical Properties/Behaviours of Ceramics; Mechanical Properties/Behaviours of Polymers; Viscoelastic Deformation; Mechanical Properties/Behaviours of Composites; Fundamentals/Principles of Fracture Mechanics; Mechanisms of Strengthening in Metals; Recovery, Recrystallization and Grain Growth; Toughening Mechanisms in Ceramics; Mechanisms of Deformation and for Strengthening of Polymers; Toughening Mechanisms in Composites; Thermo-Mechanical Properties of Materials; Thermal Stress/Shock Parameters; Thermal Properties/Behaviours of Materials.

**MLZ488 (Eng) Technical Glasses 2+0 3.0**

The Description of a Technical Glass; Common Technical Glass Systems, Chemical Compositions; Commercially Available Technical Glasses: Laboratory glasses, Bio glasses, Metallic glasses, Chalcogenide glasses, Te-based glasses, Smart glasses, Automotive industry's glasses, Glasses used in aviation, Glass microspheres; Technical Properties; Production Methods; Application Fields.

**MLZ492 (Eng) Materials in Cosmetic Science 2+0 3.0**

Cosmetic Science; Cosmetic Products and Classification of These Products; Skin Anatomy and Physiology; Materials and Chemistry in Cosmetics; Cosmetic Production Process-I; Cosmetic Production Process-II; Effect of Material Characteristics on Properties of Skin Cleansing and Moisturizing Products; Special Skin Products: Acne and anti-aging; Sunscreens: Chemical and physical UV-filters; Colored Cosmetic Products; Regulations; Characterization Methods of Cosmetic Products; Rheology Applications in Cosmetics.

**MLZ494 (Eng) Data Analysis and Optimization in Materials Science 2+0 3.0**

**MLZSJ301 Materials Science and Engineering Internship I 0+2 2.5**  
(Eng)

**MLZSJ402 Materials Science and Engineering Internship II 0+2 2.5**  
(Eng)

**MTH456 Future Literacy and Foresight Analysis 3+0 5.0**

Future Literacy; Foresight Analysis; Scenario Analysis; Technology Management; Sectoral Applications; Foresight Analysis Tools; Technology Management Tools; International Futuristic Thinking; Information Gathering; Intelligence Collection; Information Gathering Tools; Future Depiction; Policy Development; Strategy Development; Futurism; Defense Industry; Creativity; Mental Flexibility.

**MTH458 Lean Manufacturing Strategies and Applications in Industry 3+0 5.0**

Lean Manufacturing, Performance Tracking via Performance Boards, Standard Operation Procedure, JIT, Production Planning - Heijunka, Waste Walks, Gemba Effective Problem-Solving Strategies, Techniques for Influencing and Engagement, Flexible Manufacturing Systems (FMS) and Workforce Flexibility, Basic Principles Maintenance of Standards and Management Kamishibai, Product and Process Segmentation Strategies, Value Stream Mapping (VSM) and Analysis, Ergonomic Workstation Design, Overall Equipment Effectiveness (OEE) Calculation and Improvement, Yamazumi Chart for Line Balancing, Pull-Based Production Systems and Kanban Applications, Total Productive Maintenance (TPM) and Maintenance Strategy Development, SMED (Single Minute Exchange of Die) for Setup Reduction, 5S Framework for Workplace Optimization, Failure Modes and Effects Analysis (FMEA) for Risk Mitigation.

**MTR301 Introduction to Mechatronics 3+0 5.0**

Introduction, Engineering and Mechatronics Engineering, Mechatronics Engineering Design; Sensor and Transducers; Digital Systems and Digital Logics, Signal Processing in Mechatronics Systems; Pneumatic Actuation Systems; Hydraulic Actuation Systems; Mechanical Actuation Systems; Electrical Actuation Systems; Mechatronics System Modelling; PLC Controllers and Microprocessors; Mechatronics Systems Software.

**MTR401 (Eng) Mechatronics 2+2 5.0**

Introduction to Mechatronics, The concept of mechatronic system, Introduction to system components and classifications; Sensors and Transducers, Introduction to sensors and transducers used in mechatronic systems, Selection of useful sensor and transducers; Data Acquisition Systems; Signal Conditioning; Actuators; System Modeling-Mechanics; Electric-Electronic System Modeling; Controller Design; Microprocessors and PLC.

**MUH151 Introduction to Accounting 3+0 4.5**

Concepts of Business and Accounting; Financial Transactions; Balance of Assets-Liabilities; Balance Sheet and Income Statement; Accounts: Concept of account, Types of accounts, Account chart; Document and Books; Accounting Process; Follow up Goods Transactions: Inventories and transactions of the purchase and sale of goods, Periodic inventory system, Perpetual inventory system; Liquid Assets: Cash, Banks, Checkups; Marketable Securities: Share certificates, Bonds; Receivables: Trade receivable, Other receivable; Long Term Assets; Liabilities; Shareholders Equity; Transactions of Income and Expenses; End of Period Transactions; Preparing Financial Statements and Closing Transactions.

### **MUH151 (Eng) Introduction to Accounting**

**3+0 4.5**

Concepts of Business and Accounting; Financial Transactions; Balance of Assets-Liabilities; Balance Sheet and Income Statement; Accounts: Concept of account, Types of accounts, Account chart; Document and Books; Accounting Process; Follow up Goods Transactions: Inventories and transactions of the purchase and sale of goods, Periodic inventory system, Perpetual inventory system; Liquid Assets: Cash, Banks, Checkups; Marketable Securities: Share certificates, Bonds; Receivables: Trade receivable, Other receivable; Long Term Assets; Liabilities; Shareholders Equity; Transactions of Income and Expenses; End of Period Transactions; Preparing Financial Statements and Closing Transactions.

### **MUH210 General and Cost Accounting**

**3+0 3.0**

Company and Accounting; Financial qualified operations, Balance of assets-resource, Balancing income, Accounts: Concept of account, Types of accounts, Planning of account(s); Documents and books; Process of account; Intermittent Inventory method, Perpetual Inventory method; Income and Expenditure Process; End of Period process; Arrangement of Financial Statement and Closing Process; Cost Accounting and Main concepts; Uniform Accounting System; Type of cost: Standard, Variable cost system; Classification of Costs; Material costs; Labor costs and performance evaluation tool; Manufacturing overhead costs; Cost Centers and cost allocations; Job cost system, Process cost system; Cost in joint production.

### **MÜH302 Interdisciplinary Applications**

**1+2 4.5**

The Notion of Interdisciplinary Study; Topic Selection; Conduction of an Extensive Literature Survey about the Topic; Discussion of the Topics Among Students from Different Disciplines; Conclusion of the Study by Overseeing Up-to-Date Economical and Social Criteria and Following Ethical Standards; Preparation of a Poster Presentation Incorporating the Steps and Results of the Study; Presentation of the Study Before a Jury or an Audience.

### **MÜH302 Interdisciplinary Applications**

**1+2 4.5**

**(Eng)**

The Notion of Interdisciplinary Study; Topic Selection; Conduction of an Extensive Literature Survey about the Topic; Discussion of the Topics Among Students from Different Disciplines; Conclusion of the Study by Overseeing Up-to-Date Economical and Social Criteria and Following Ethical Standards; Preparation of a Poster Presentation Incorporating the Steps and Results of the Study; Presentation of the Study Before a Jury or an Audience.

### **MÜH402 Engineering Ethics**

**2+0 3.0**

A Brief History of Ethics; Introduction to Ethical Conflicts; Values and Value Systems/History of engineering profession; Computer and Hacker Ethics/Business Ethics; Incident at Morales; Environmental Ethics/Climate Change Ethics; Case studies for engineering ethics.



**MÜH402 (Eng) Engineering Ethics** **2+0 3.0**

A Brief History of Ethics; Introduction to Ethical Conflicts; Values and Value Systems/History of engineering profession; Computer and Hacker Ethics/Business Ethics; Incident at Morales; Environmental Ethics/Climate Change Ethics; Case studies for engineering ethics. A Brief History of Ethics; Introduction to Ethical Conflicts; Values and Value Systems/History of engineering profession; Computer and Hacker Ethics/Business Ethics; Incident at Morales; Environmental Ethics/Climate Change Ethics; Case studies for engineering ethics.

**MÜH404 Innovation Management** **3+0 3.0**

Innovation Concept: History and Evolution of Knowledge, World of Innovation, Defining Innovation Models; Innovation and Creativity: Creativity Concept, Fostering Creativity in Organizations, Factors Fostering Creativity, Creativity to Innovation, Tools for Creativity; Innovation in Information Age: Innovation Process, Innovation Types, Barriers to Innovation, Recent Innovation Trends, Analyzing Innovation, Conditions of Information Age, Innovative Thinking, Breakthrough Innovation Process, Innovative Idea Generation, Encouraging Innovation in the Organization, Building an Innovative Organization, Measures of Innovation: Recent Measures of Innovation, Process Based Measures of Innovation; Institutionalizing Innovation: Innovation in Service, Protecting the Innovation, Commercializing the Innovation, Managing Campus-Based Innovations, Managing Innovative Activities. Innovation Concept: History and Evolution of Knowledge, World of Innovation, Defining Innovation Models; Innovation and Creativity: Creativity Concept, Fostering Creativity in Organizations, Factors Fostering Creativity, Creativity to Innovation, Tools for Creativity; Innovation in Information Age: Innovation Process, Innovation Types, Barriers to Innovation, Recent Innovation Trends, Analyzing Innovation, Conditions of Information Age, Innovative Thinking, Breakthrough Innovation Process, Innovative Idea Generation, Encouraging Innovation in the Organization, Building an Innovative Organization, Measures of Innovation: Recent Measures of Innovation, Process Based Measures of Innovation; Institutionalizing Innovation: Innovation in Service, Protecting the Innovation, Commercializing the Innovation, Managing Campus-Based Innovations, Managing Innovative Activities.

**MÜH404 (Eng) Innovation Management** **3+0 3.0**

Innovation Concept: History and Evolution of Knowledge, World of Innovation, Defining Innovation Models; Innovation and Creativity: Creativity Concept, Fostering Creativity in Organizations, Factors Fostering Creativity, Creativity to Innovation, Tools for Creativity; Innovation in Information Age: Innovation Process, Innovation Types, Barriers to Innovation, Recent Innovation Trends, Analyzing Innovation, Conditions of Information Age, Innovative Thinking, Breakthrough Innovation Process, Innovative Idea Generation, Encouraging Innovation in the Organization, Building an Innovative Organization, Measures of Innovation: Recent Measures of Innovation, Process Based Measures of Innovation; Institutionalizing Innovation: Innovation in Service, Protecting the Innovation, Commercializing the Innovation, Managing Campus-Based Innovations, Managing Innovative Activities. Innovation Concept: History and Evolution of Knowledge, World of Innovation, Defining Innovation Models; Innovation and Creativity: Creativity Concept, Fostering Creativity in Organizations, Factors Fostering Creativity, Creativity to Innovation, Tools for Creativity; Innovation in Information Age: Innovation Process, Innovation Types, Barriers to Innovation, Recent Innovation Trends, Analyzing Innovation, Conditions of Information Age, Innovative Thinking, Breakthrough Innovation Process, Innovative Idea Generation, Encouraging Innovation in the Organization, Building an Innovative Organization, Measures of Innovation: Recent Measures of Innovation, Process Based Measures of Innovation; Institutionalizing Innovation: Innovation in Service, Protecting the Innovation, Commercializing the Innovation, Managing Campus-Based Innovations, Managing Innovative Activities.

**MÜZ101 Evolution of Music** **2+0 3.0**

History of Music: Antique period, Middle Ages, Renaissance, Baroque, Music in the 17th and 19th centuries; Music in the 20th Century: Regionalism, Nationalism, Universality; Cultural Mosaic of Anatolian Music; Place of Turkish Music in the International Arena; Developing Appreciation of Music from Different Periods. History of Music: Antique period, Middle Ages, Renaissance, Baroque, Music in the 17th and 19th centuries; Music in the 20th Century: Regionalism, Nationalism, Universality; Cultural Mosaic of Anatolian Music; Place of Turkish Music in the International Arena; Developing Appreciation of Music from Different Periods.

**MÜZ151 Short History of Music** **2+0 3.0**

Mile Stones in the History of Music; Music of the Antique Period; Music of Far East; Music of Anatolia; Music of the Middle Ages: Gregorian Chants; Music of Renaissance: Bach and Handel; Music of the Classical Age; Pianoforte in the Classical Age; Romantic Age; Nationalist Movement; Contemporary Music; Nationalism and Universality.

**MÜZ155 Turkish Folk Music** **2+0 2.0**

Folk songs from different Regions of Turkey are Taught; Aegean Region Zeybek Folk Songs: Eklemedir koca konak, Ah bir ateş ver, Çökertme, Kütahya'nın pınarları, Çemberinde gül oya; Kars Region Azerbaijani Folk Songs: Bu gala daşlı gala, Yollarına baka baka, Dağlar gızı Reyhan, Ayrılık, Dut ağacı boyunca; Central Anatolian Region Folk Songs: Seherde bir bağa girdim, Uzun ince bir yoldayım, Güzelliğin on para etmez, Mihriban ve Acem kızı; Southeastern Anatolian Region; Urfa and Diyarbakır Folk Songs: Allı turnam, Urfanın etrafı, Mardin kapısından atlayamadım, Fırat türküsü, Evlerinin önü kuyu; Blacksea Region; Trabzon, Rize, Artvin Folk Songs: Maçka yolları taşlı, Ben giderim Batuma, Dere geliyor dere.

**MÜZ157 Traditional Turkish Art Music** **2+0 2.0**

Description of Traditional Art Music: Basic concepts, Characteristics, Types, Notes, Instruments; The Mode System of Traditional Turkish Art Music; The Rhythmic Pattern of Traditional Turkish Art Music; Samples from Different Modes; Samples from Different Rhythmic Patterns.

**NÜM301 (Eng) Numerical Methods**

**3+0 3.5**

Numerical Solutions of Nonlinear Systems of Equations: Graphical method, Interval halving method, Newton-Raphson methods; Interpolation: Forward, Backward and Central interpolation; Numerical Integration: Trapezoidal Rule of Integration and Simpson's Rule; Numerical Differentiation: Undetermined coefficients method; Numerical Solution of Ordinary Differential Equations: Taylor series method, Runge-Kutta method, Euler methods; Curve Fitting: Method of least squares. Numerical Solutions of Nonlinear Systems of Equations: Graphical method, Interval halving method, Newton-Raphson methods; Interpolation: Forward, Backward and Central interpolation; Numerical Integration: Trapezoidal Rule of Integration and Simpson's Rule; Numerical Differentiation: Undetermined coefficients method; Numerical Solution of Ordinary Differential Equations: Taylor series method, Runge-Kutta method, Euler methods; Curve Fitting: Method of least squares.

**ÖMB322 Ethics of Science and Research**

**2+0 3.0**

Science, the nature of science, its development and scientific research; the concept of ethics and ethical theories; research and publication ethics; unethical behavior and ethical violations in the research process; ethical issues related to writing and copyright; biased publication, editor, refereeing and ethics; unethical behavior in broadcast ethics and broadcasting; legal regulations and boards on research and publication ethics; Ways to be followed in detecting ethical violations; common research, publication ethics violations and methods to prevent them.

**PSİ102 Psychology**

**3+0 3.5**

What is Psychology?: Theoretical developments, Major Sub-Disciplines and methodology; Growth and Development; Motivation and Defense Mechanisms; Attention and Perception; Learning: Behavioral and cognitive approaches; Verbal Learning and Memory; Language and communication; Personality; Abnormal Behavior: Causes, Types and treatment. What is Psychology?: Theoretical developments, Major Sub-Disciplines and methodology; Growth and Development; Motivation and Defense Mechanisms; Attention and Perception; Learning: Behavioral and cognitive approaches; Verbal Learning and Memory; Language and communication; Personality; Abnormal Behavior: Causes, Types and treatment.

**PSİ102 (Eng) Psychology**

**3+0 3.5**

What is Psychology?: Theoretical developments, Major Sub-Disciplines and methodology; Growth and Development; Motivation and Defense Mechanisms; Attention and Perception; Learning: Behavioral and cognitive approaches; Verbal Learning and Memory; Language and communication; Personality; Abnormal Behavior: Causes, Types and treatment. What is Psychology?: Theoretical developments, Major Sub-Disciplines and methodology; Growth and Development; Motivation and Defense Mechanisms; Attention and Perception; Learning: Behavioral and cognitive approaches; Verbal Learning and Memory; Language and communication; Personality; Abnormal Behavior: Causes, Types and treatment.

**PSİ301 Industrial Psychology**

**3+0 4.5**

Introduction to Industrial Psychology: Job analysis, Uses of job analysis, Selection of employees; Performance Evaluation: Goals, Evaluation techniques, Employee training and development; Motivation and Job Gratification: Job gratification and its effects on the job, Resistance toward organizational change and solutions; Work Conditions and Accidents: Lighting, Noise, Humidity, Air pollution, Internal work conditions, Boredom and fatigue, Causes of Work Place Accidents; Stress; Causes of stress, Ways of overcoming stress. Introduction to Industrial Psychology: Job analysis, Uses of job analysis, Selection of employees; Performance Evaluation: Goals, Evaluation techniques, Employee training and development; Motivation and Job Gratification: Job gratification and its effects on the job, Resistance toward organizational change and solutions; Work Conditions and Accidents: Lighting, Noise, Humidity, Air pollution, Internal work conditions, Boredom and fatigue, Causes of Work Place Accidents; Stress; Causes of stress, Ways of overcoming stress.

**PZL211 (Eng) Principles of Marketing**

**3+0 5.0**

Marketing: Scope, Evolution of Marketing; Marketing Environment; Marketing Research and Marketing Information Systems; Market Segmentation; Selecting Target Markets; Elements of Marketing Mix: Product, Price, Distribution channels, Promotion; Organization of Marketing Activities; International Marketing. Marketing: Scope, Evolution of Marketing; Marketing Environment; Marketing Research and Marketing Information Systems; Market Segmentation; Selecting Target Markets; Elements of Marketing Mix: Product, Price, Distribution channels, Promotion; Organization of Marketing Activities.

**PZL302 Marketing Management**

**3+0 4.5**

Concept of Marketing; Evolution of Marketing; Functions of Marketing; Environmental Conditions of Marketing; Marketing Information Systems and Marketing Research; Market Concept; Market Segmentation and Target Market Selection; Customer Behavior in Industrial Markets; Product; Price; Distribution Channels and Physical Distribution; Sales Promotions; International Marketing. Concept of Marketing; Evolution of Marketing; Functions of Marketing; Environmental Conditions of Marketing; Marketing Information Systems and Marketing Research; Market Concept; Market

Segmentation and Target Market Selection; Customer Behavior in Industrial Markets; Product; Price; Distribution Channels and Physical Distribution; Sales Promotions; International Marketing.

**PZL302 (Eng) Marketing Management**

**3+0 4.5**

Concept of Marketing; Evolution of Marketing; Functions of Marketing; Environmental Conditions of Marketing; Marketing Information Systems and Marketing Research; Market Concept; Market Segmentation and Target Market Selection; Customer Behavior in Industrial Markets; Product; Price; Distribution Channels and Physical Distribution; Sales Promotions; International Marketing. Concept of Marketing; Evolution of Marketing; Functions of Marketing; Environmental Conditions of Marketing; Marketing Information Systems and Marketing Research; Market Concept; Market Segmentation and Target Market Selection; Customer Behavior in Industrial Markets; Product; Price; Distribution Channels and Physical Distribution; Sales Promotions; International Marketing.

**PZL310 (Eng) Marketing Management**

**3+0 5.0**

Concept of Product; Product and service decisions, Branding strategy, New product development strategy, New product development process and management, Product life cycle strategies; Concept of Price: Major pricing strategies, New product pricing strategies, Product mix pricing strategies, Price adjustment strategies, Price changes, Marketing channels; Supply Chains and Value Delivery Network; Channel Behavior and Organization; Integrated Marketing Communications: Promotion mix, Communication mix, Advertising and public relations, Personal selling and sales promotion, Direct and online marketing. Concept of Product; Product and service decisions, Branding strategy, New product development strategy, New product development process and management, Product life cycle strategies; Concept of Price: Major pricing strategies, New product pricing strategies, Product mix pricing strategies, Price adjustment strategies, Price changes, Marketing channels; Supply Chains and Value Delivery Network; Channel Behavior and Organization; Integrated Marketing Communications: Promotion mix, Communication mix, Advertising and public relations, Personal selling and sales promotion, Direct and online marketing.

**PZL452 (Eng) Revenue Management and Pricing**

**3+0 6.0**

Basic Concepts About Revenue Management and Pricing; Different Approaches to Pricing; Application Examples; Price-Response Function; Pricing Models; Basic Price Optimization; Price Differentiation; Pricing With Constrained Supply; Pricing Under Competition; Variable Pricing; Market Segmentation; Capacity Allocation; Overbooking; Dynamic Pricing; Promotions and Markdown Management.

**REK2522 Sports Aviation**

**1+1 4.0**

Introduction to Air Sports: History of aviation; Air Sports Institutions and Organizations; Air Sports Branches: General aviation, Acrobatics, Ultralight aircraft, Microlight aircraft, Gyrocopters, Gliders, Parachutes, Drones, Hang gliders, Balloons, Paragliding, Air modeling; Paragliding Sport: Paragliding sport in the world and in Türkiye, Introduction of paragliding flight equipment, Paragliding aerodynamics, Paragliding control, Dispatch and management, Meteorology, Paragliding flight safety, Paragliding air traffic rules, Paragliding emergencies and procedures, First aid, Paragliding folding, Maintenance and storage, Paragliding ground work; Recent Developments in Aviation.

**RTV281 Digital Literacy**

**2+2 4.0**

Internet Technology and Uses; Abbreviations on Internet Addresses; Accessing Information over the Internet; Effective Participation on the Web; Web Literacy Reading Skills and Competencies; Terms and Concepts in New Media; Social media: Social Media Literacy Components; Social Media Security Threats and Precautions: Malware on the Web, Access to Reliable, Accurate and Updated Information in the Web Environment; Misinformation and Disinformation Concepts; Information Usage and Sharing in the Web Environment; Web Ethics: Privacy and Privacy in Social Media Use.

**RUS255 (Rus) Russian I**

**3+0 4.0**

Russian Alphabet; Transcriptions of Sounds in Russian; Russian Orthography; Phonetic Perception of Sounds; Consonants and Vowels; Intonation and Stress; Nouns: Proper and Common Nouns; Masculine, Feminine and Neutral Nouns; Russian Names for Men and Women; The Use of Number with Nouns; Greeting Structures; Asking for Directions; Introducing Oneself; Asking and Telling the Time; Patterns Used in Shopping; Patterns Used in Telephone Conversations.

**RUS256 (Rus) Russian II**

**3+0 4.0**

Plural Nouns; Construction of Plural Nouns: Plural-only and Singular-only Nouns; Adjectives: Types of adjectives, Forms of Adjectives; Numbers: Different Types of Numbers; Verbs: Types of verbs; Infinitives; Tenses: Present Continuous Tense, Past Tense, Future Tenses; Action Verbs.

**SAĞ102 First Aid**

**2+0 2.5**

Social Importance of First Aid; Aims of First Aid; Precautions To Be Considered by The One Who Will Apply First Aid; Human Body; First Aid Materials; Strangulations and Supplying Respiration; Stopping Bleedings and Supplying The Blood Circulation: External and internal bleeding signs and first aid, Recognition of blackout of consciousness and first aid, Shock causes and recognition of shock related to bleeding and first aid, Coma degrees and first aid, First aid in heartbeat stopping, Applying cardiopulmonary resuscitation (CPR) and artificial respiration together; Injury Types and First Aid; Burn and

Boils; Fractures, Dislocations and Spraining; Poisonings, Freezing, Hot and Electric Shocks; Communication; Preparation of Injured Person for Carrying and Carrying Types.

**SAN155 Hall Dances 0+2 2.0**

Basic concepts. The ethics of dance, Dance Nights, Dance Costumes, National International Competitions and rules/grading, Basic Definitions, Classifications of Dances: Social Dances; Salsa, Cha Cha, Samba, Mambo, Jive, Rock'n Roll, Jazz, Merenge; Flamenko, Rumba, Passa -Doble, Argentina tango, Vals, Disco, Quickstep, Foxtrot, Bolero, European Tango: Ballroom Dances; Sportive Dances; Latin American Dances; Samba, Rumba, Jive, Passa-Doble, Cha Cha, Standart Dances; European Tango, Slow vals (English), Viyana vals, Slow foxtrot, Quickstep.

**SNT155 History of Art 2+0 2.0**

History of Civilization and Evolution of Art: Prehistory to Present; Concepts and Terminology in Art with Samples; Interrelation among Art-Religion and Society; Effects of Religion on Artistic Development; Reflections and Interpretations of Judaism, Christianity and Islam on Art; Renaissance: Emergence, Effects, Artists, Works of Art; Architecture and Plastic Arts; Art in the 19th and 20th Centuries: Relevance of the main historical events of the period.

**SOS153 Sociology 3+0 3.5**

What is Sociology?; Methods and Research Strategies in Sociology; Theories of Sociology; Culture; Socialization; The Family; The Economy; Education; Religion; Political Institutions; Population; Social Groups; Social Stratification; Social Change; Urbanization and Urban Social Problems; The Industrialization Process and Effects of Industrialization; The Characteristics of Industrial Society; Crime and the Society; Science, Technology and Environment; Wars and the Effects of War on Society. What is Sociology?; Methods and Research Strategies in Sociology; Theories of Sociology; Culture; Socialization; The Family; The Economy; Education; Religion; Political Institutions; Population; Social Groups; Social Stratification; Social Change; Urbanization and Urban Social Problems; The Industrialization Process and Effects of Industrialization; The Characteristics of Industrial Society; Crime and the Society; Science, Technology and Environment; Wars and the Effects of War on Society.

**SOS154 Man and Sociology 2+0 3.0**

Sociology; Definition; Development of Sociology; Methods and Methodology in Social Sciences: Research procedure, Scientific method and sociology, Validity and reliability, Ethics of Social Research; Culture and Society; Family and Gender Issues; Environmental Issues and Society; Media and Communications; Stages of Industrialization; Industrial Revolution and its Consequences; Urban Life and Urbanization: Urban problems in Turkey; Social Inequalities; Social Stratification.

**SOS155 Folkdance 2+0 2.0**

Dance in Primitive Cultures; Dance in Earlier Civilizations; Dance in the Middle Age and Renaissance; Dance in the 18th and 19th Centuries; Dances of the 20th Century; Ballet; Turkish Dances; Emergence of Folkdance; Anatolian Folkdance: Classification, Accompanying instruments; Methods and Techniques of Collecting Folkdance; Problems in Collecting Folkdance; Teaching of Folkdance; Adapting Folkdance for Stage: Stage, Stage aesthetics and Choreography, Orientation and choreography.

**TAR165 Atatürk's Principles and History of Turkish Revolution I 2+0 2.0**

Reform efforts of Ottoman State, General glance to the stagnation period, Reform searching in Turkey, Tanzimat Ferman and its bringing, The Era of Constitutional Monarchy in Turkey, Policy making during the era of first Constitutional Monarchy, Europe and Turkey, 1838-1914, Europe from imperialism to World War I, Turkey from Mudros to Lausanne, Carrying out of Eastern Question, Turkish Grand National Assembly and Political construction 1920-1923, Economic developments from Ottomans to Republic, The Proclamation of New Turkish State, from Lausanne to Republic.

**TAR166 Atatürk's Principles and History of Turkish Revolution II 2+0 2.0**

The Restructuring Period; The Emergence of the fundamental policies in the Republic of Turkey (1923-1938 Period); Atatürk's Principles, and Studies on Language, History and Culture in the period of Atatürk; Turkish Foreign Policy and Application Principles in the period of Atatürk; Economic Developments from 1938 to 2002; 1938-2002 Period in Turkish Foreign Policy; Turkey after Atatürk's period; Social, Cultural and Artistic Changes and Developments from 1938 to Present.

**TAR201 History of Science 2+0 2.5**

Science in Ancient Civilisations: Egypt and Mesopotamia, Antique Greece and Hellenistic Period, The Roman Civilisation; Science in the Middle Ages in Europe and Islamic World; Renaissance and Modern Science: Astronomy, Chemistry, Medicine, Biology, Physics, Mathematics, Galileo Galilei, Newton; The Age of Enlightenment: Astronomy, Mathematics and Physics in the 18th Century; The Industrial Revolution; Modern Science: Einstein's Revolution, Quantum Theory; Appearance of Atom Physics; Science today.

**TER207 (Eng) Thermodynamics I 3+0 4.0**

Basic Concepts; System; Phase and State; Phase Transitions; Zeroth Law of Thermodynamics; Ideal Gas and Phase Equation, First Law of Thermodynamics; Specific Heats; Internal Energy, Enthalpy and Specific Heat Capacity of Ideal Gases; Specific Heats of Solids and Fluids; Conservation of Mass; Conservation of Energy; Flow Work; Steady Flow Open System; Second Law of Thermodynamics; Heat Engines; Reversible and Irreversible Phase Transitions; Carnot Cycle; Clausius Inequality; Entropy, Principle of the Increase of Entropy; Third Law of Thermodynamics; Entropy Change of a Pure Substance; Entropy Changes in Ideal Gases; Reversible Steady Flow Work, Exergy and Second Law Analysis.

**TER208 (Eng) Thermodynamics II 3+0 5.0**

The Concept of Entropy; Entropy Change of a Pure Substance; Entropy Changes of Ideal Gases; Isentropic State Changes; T-Ds Relations; Reversible Processes; Work and Efficiency; Basic Thermodynamic Cycles; Carnot Cycle; Rankine Cycle; Inter-Combustion Engine Cycles: Otto and Diesel Cycles; Air Standards; Stirling and Ericson Cycles; Brayton Cycle; Refrigeration Cycles; Interheating; Effect of Intercooling and Regeneration Processes on Cycles.

**TER403 Thermodynamics 3+0 3.5**

Energy Engineering: Natural analogies and models; State and Path Functions; Heat and Work; Deviations from Ideals; Closed and Open Systems; Four Laws of Thermodynamics; Energy Transfer Processes: Power cycles, Alternative energy applications; Physical and Chemical Equilibrium Conditions; Free Energy: Its relationship with temperature, Pressure and composition; Availability, Efficiency; Coordination of Energy- Environment Interactions.

**THU203 Community Services 0+2 3.0**

Various Community Projects: Helping young students during their study periods or after school study sessions, Aiding the elderly in nursing homes, helping disabled individuals with various tasks, helping social services and aiding children with their education etc., take part in the projects which raise environmental awareness, Integrating with the community and enabling use of knowledge accumulated in the courses.

**TiY121 Introduction to Theatre 2+0 3.0**

Fundamentals of Theatre; Historical Developments of Theatre; Important Periods in World Theatre; Study of Contemporary Interpretations: Plays and Actors; Application of Basic Acting Techniques; Critiquing; Evaluation; Improvisation.

**TiY152 Theatre 2+0 2.5**

Theatre as a Cultural Institution: Relation of culture and theatre; The Place and Importance of Theatre in Culture; Theatre as a Communication Art: Definition of theatre, Origin and evolution of theatre, Aesthetic communication; Elements of Communication in Theatre: Decor, Costume, Stage, Actor, Director; Theatre Management: Historical development, Administration and Organization; Art Sociology: Theatre and society; Reflections of Cultural Issues in Turkish Plays. Reflections of Cultural Issues in Turkish Plays.

**TiY308 Republic Era Turkish Theatre 2+0 3.0**

Republic Era Turkish Theatre: Political, Social, Cultural Art Life; Theatre Concepts; Western Theatre; Theatre Perception; Effects of Western Theatre on Turkish Theatre; Dramatic Types; Acting Methods, Directing, Playwriting, Dramatic Styles; Theatre Buildings; Directing Techniques; Analyzing Developments of Theatre; Theatre Education; State Theatres; Private Theatre Companies.

**TKY302 Quality Control 3+0 4.5**

Quality Development and Quality Control: Quality development and dimensions of its concept, Probability and statistics in quality control; Quality Control in Total Quality Management; Statistical Methods Used in Quality Control: Variations and its measurement, Important batch and continuous dispersion, Sampling dispersions, Parameter estimate and hypothesis tests; Statistical Process Control (SPC): Philosophy of SPC and methods, Practice, Control charts for attributable and quantity variables, Other statistical process control methods, Process ability analysis, Acceptance (consent) sampling and sampling plans, Various quality standards. Quality Development and Quality Control: Quality development and dimensions of its concept, Probability and statistics in quality control; Quality Control in Total Quality Management; Statistical Methods Used in Quality Control: Variations and its measurement, Important batch and continuous dispersion, Sampling dispersions, Parameter estimate and hypothesis tests; Statistical Process Control (SPC): Philosophy of SPC and methods, Practice, Control charts for attributable and quantity variables, Other statistical process control methods, Process ability analysis, Acceptance (consent) sampling and sampling plans, Various quality standards.

**TKY405 Total Quality Management 3+0 4.5**

History of Total Quality Management; Excellence Model; Total Quality Management Service and Production Sector; Advanced Quality Techniques such as Failure Mode and Effect Analysis: Type of Failure Mode and Effect Analysis, Methods; Customer Satisfaction; Transformation of Customer Needs to Technical Requirements; Quality Function Deployment; Reducing Variance; Six Sigma Approach to Quality.

**TKY411 (Eng) Quality Control 2+0 3.0**

<b>TOP102</b>	<b>Surveying</b>	<b>2+2</b>	<b>4.5</b>
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**2+2 4.5**

<b>TRS110</b>	<b>Technical Drawing in Civil Engineering</b>	<b>2+2</b>	<b>3.5</b>
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**2+2 3.5**

<b>TRS127</b>	<b>Technical Drawing</b>	<b>2+2</b>	<b>4.5</b>
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**2+2 4.5**

<b>TRS127 (Eng)</b>	<b>Technical Drawing</b>	<b>2+2</b>	<b>4.5</b>
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**2+2 4.5**

<b>TÜR120</b>	<b>Turkish Sign Language</b>	<b>3+0</b>	<b>3.0</b>
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**3+0 3.0**

<b>TÜR125</b>	<b>Turkish Language I</b>	<b>2+0</b>	<b>2.0</b>
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**2+0 2.0**

Language: Characteristics of language, Relationship between language and thought and language and emotion, Theories about the origin of languages, Language types, The position of Turkish Language among world languages; Relationship Between Language and Culture; Historical Progress of the Turkish Language; Alphabets Used for Writing in Turkish; Turkish Language Studies; Turkish Language Reform; Phonetics; Morphology and Syntax; The Interaction of Turkish Language with Other Languages; Wealth of Turkish Language; Problems Facing Turkish Language; Derivation of Terms and Words; Disorders of Oral and Written Expression.

**TÜR126 Turkish Language II 2+0 2.0**

Composition: Written composition, Paragraph and ways of expression in paragraphs; Punctuation; Spelling Rules; Types of Written Expression and Practices I: Expository writing; Types of Written Expression and Practices II: Narrative writing; Academic Writing and Types of Correspondence; Reading and Listening: Reading, Reading comprehension strategies, Critical reading; Listening; Relationship between Listening and Reading; Oral Expression: Basic principles of effective speech; Body Language and the Role of Body Language in Oral Expression; Speech Types; Principles and Techniques of Effective Presentation; Some Articulatory Features of Oral Expression.

**UCK102 (Eng) Theory of Flight 3+0 4.0**

Aerodynamics Basics; Aerodynamic Forces in Flight Phases; Types of Drag; Wing Design; Stability and Control; Flight Instruments; Aircraft Structures and Systems; Flight Envelopes; Aircraft Performance; High-Speed Flight; Flight Dynamics; Human Factors in Flight; Weather and Flight; Emergencies and Abnormal Situations.

**UCK202 (Eng) Circuits, Signals and Systems 3+0 4.5**

Basic Components and Electric Circuits; Open Circuit and Short Circuit Concepts; Resistance and Ohm's Law: Independent and dependent voltage and current sources, Kirchoff's current and voltage law; Analysis Methods: Loop analysis, Nodal analysis, Source transformations, Superposition theorem, Thevenin and Norton equivalent circuits operational amplifiers; Capacitors and Inductors; Basic RL and RC Circuits: Natural and forced response of RL and RC circuits, The RLC circuit, Natural and forced response of RLC circuits; Laplace Transform: Definitions and properties, Circuit analysis in s-domain, Transfer function; Stability; Frequency response; Filters; Fourier Transform: Definitions and properties.

**UCK3005 Aerodynamics I 3+0 4.5**

(Eng)  
Introduction to fluid mechanics principles; Fundamental aerodynamic concepts; Bernoulli's equation; Streamlines, potential flow; Vorticity and irrotational flows; Two-dimensional aerodynamics; Airfoil geometry; Lift and drag force calculation; Kutta-Joukowski theorem; Viscous effects, boundary layer theory; Separation, stall. phenomenon; Prandtl's asymptotic theory and linear airfoil theory; Basic computational flow solutions and applications.

**UCK3006 Aerodynamics II 3+0 4.5**

(Eng)  
Introduction to three-dimensional aerodynamics; Wing theories; Induced drag; Prandtl's lifting line theory; Load distribution; Swept wings, wing tips and vortices; Compressible flows: Mach number; Acoustic waves; Subsonic and supersonic flows; Shock waves, shock-wave interactions; Thin airfoil theory; Transonic flows; Applications of computational aerodynamics; Introduction to experimental methods and wind tunnel testing techniques.

**UCK3008 Introduction to Helicopter Aerodynamics and Design 2+0 3.0**

(Eng)  
History of helicopters; Fundamental aerodynamic principles; Rotor aerodynamics; Helicopter flight principles; Lift and torque; Autorotation; Advanced flight aerodynamics; Rotor blade airfoils; Moment balance and control surfaces; Helicopter performance calculations; Static and dynamic stability; Vibration and resonance; Fundamentals of the helicopter design.

**UCK301 (Eng) Flight Mechanics 3+0 5.0**

Basic Definitions: Coordinate systems and axes; Wing Planforms; Relationship between Lift, Weight, Thrust and Drag; Lift Augmentation: Flaps, Leading edge slots, Slats, Boundary layer control, Slat and slotted flap combinations; Flight Controls: Aerodynamic balancing, Power operated control, Mass balance, Three-axis control, Tabs; Steady-State Flights: Steady level flight and performance characteristics; Steady climb, steady descent and gliding, Glide ratio; Basic Maneuvers: Coordinated turn, Load factor, Bank angle, Stall; Flight Envelope and Structural Limitations; V-speeds; Flight Stability: Basic concepts, Static and dynamic stability, Effects of high speed flight on stability, Longitudinal stability, Pitching moment, Lateral stability, Directional stability.

**UCK3010 Aeronautical Engineering Design 3+0 4.5**

(Eng)  
Introduction to aircraft design; Fundamentals of aerodynamics; Design process; Conceptual design; Airfoil selection and design, Thrust-weight ratio, wing loading and jet engine compatibility; Preliminary sizing; Propulsion system selection;

Fuel system selection; Landing gear design; Structural design principles and materials, In-depth design; Design optimisation; Simulations and design validation.

**UCK401 (Eng) Aeronautical Engineering Design Project I 2+2 4.5**

Determining and Planning of the Project Topic; Literature Survey and Analysis; Developing Theoretical or Experimental Models/Designs; Determination and Explanation of the Analysis Method, Experimental Method or Design Verification Method; Reporting.

**UCK402 (Eng) Aeronautical Engineering Design Project II 1+5 4.5**

Determining and Planning of the Project Topic; Literature Survey and Analysis; Developing Theoretical or Experimental Models/Designs; Determination and Explanation of the Analysis Method, Experimental Method or Design Verification Method; Reporting.

**UCK403 (Eng) Professional Practice 0+25 20.0**

Introduction and Orientation: Presentation of the organization, Organization culture and ethical rules, Company policies; Occupational Health and Safety; Production Processes: Production planning, Production methods, Production management; Quality Control and Quality Assurance Processes: Quality control procedures, Quality assurance system; Project Management Processes: Project planning and management, Project risk analysis, Resource and time planning; Research and Development Processes: Project development, Design and analysis process, Prototyping and testing process; Technical Documentation; Aeronautical Engineering Applications; Reporting.

**UCKSJ401 Aeronautical Engineering Internship I 0+2 2.5 (Eng)**

Gaining Work Experience; Adapting to Industrial and Business Life; Experiencing a Real Production and/or Service Environment; Observing Professional Skills, Attitudes and Behaviors; Learning Aerospace Engineering Applications in Institutions/Organizations; Understanding and Recognizing How Theoretical Knowledge is Applied to Real Life Engineering Problems in an Industrial And Business Environment; Report Writing.

**UCKSJ402 Aeronautical Engineering Internship II 0+2 2.5 (Eng)**

Gaining Work Experience; Adapting to Industrial and Business Life; Experiencing a Real Production and/or Service Environment; Observing Professional Skills, Attitudes and Behaviors; Learning Aerospace Engineering Applications in Institutions/Organizations; Understanding and Recognizing How Theoretical Knowledge is Applied to Real Life Engineering Problems in an Industrial And Business Environment; Report Writing.

**UZY101 (Eng) Introduction to Aerospace and Ethics 2+0 3.0**

History of Aerospace; Ethical Considerations in Aerospace Engineering; Aircraft Design (Structure); Aircraft Design (Propulsion); Aerospace Materials and Technologies; Flight Mechanics; Introduction to Avionics; Space Exploration; Satellite Technology; Rockets; Environmental Considerations and Conditions; Safety and Regulation; Future Trends in Aerospace; International Collaboration in Aerospace.

**UZY202 (Eng) Thermodynamics 3+0 4.5**

Introduction to Thermodynamics; Basic Concepts and Terminology; Laws of Thermodynamics; Energy Forms and Transfers; Thermodynamic Processes; Properties of Pure Substances; Equations of State; Heat Engines and Refrigerators; Entropy and the Second Law; Thermodynamic Cycles; Exergy (Availability) Analysis; Psychrometrics; Chemical Thermodynamics; Applications of Thermodynamics.

**UZY301 (Eng) Aerospace Structures 3+0 5.0**

Introduction to Aerospace Structures; Materials in Aerospace Structures; Load Analysis; Stress and Strain Analysis; Structural Components (Fuselage); Structural Components (Wings); Structural Components (Empennage); Joints and Connections; Fatigue and Fracture Mechanics; Structural Dynamics and Vibrations; Buckling and Stability; Composite Structures; Non-Destructive Testing (NDT) Methods; Modern Trends and Future Directions.

**UZY302 (Eng) Propulsion Systems 3+0 4.0**

Introduction to Aviation Propulsion Systems; The Basics of Jet Engines; Propeller-Driven Engines; The Evolution of Turbojet Engines; Turbofan Engines; Comparing Turboprop and Turbofan Engines; The Role of Afterburners in Military Aviation; Sustainable Aviation Fuels and Propulsion Systems; Electric Propulsion Systems for Aircraft; Scramjets and Ramjets; Propulsion at Hypersonic Speeds; Challenges in Supersonic and Hypersonic Flight Propulsion; Future Trends in Aviation Propulsion; Propulsion System Maintenance and Reliability; Case Study: The Development of the GE9X Engine.

**UZY310 (Eng) Flight Stability and Control 3+0 4.5**



Introduction: Basic definitions of flight mechanics, control and control surfaces; General Structure of Flight Control Systems; Aircraft Static and Dynamic Stability and Stability Derivatives: Nonlinear dynamic equations, Linearization of equations; Static Longitudinal and Lateral Stability: Aircraft longitudinal and lateral dynamic equations, Longitudinal and lateral transfer functions, Longitudinal modes of motion, Short and long period approximation, Transient response of aircraft dynamic; Basic Concept of Aircraft Control Systems: The types of autopilot. Autopilot design, Root locus analysis, Inner and outer loop concepts, Pitch orientational control system, Acceleration control system, Matlab Simulink simulation of aircraft autopilots.