

FACULTY OF ENGINEERING

Dean: SEZER, Erol, Prof. Dr., B.S., M.S., Ph.D., Middle East Technical University

Associate Dean: BAYRAKTAR, Erkan, Assoc. Prof. Dr., B.S., M.S., Dokuz Eylül University, Ph.D., University of Iowa.

Associate Dean: EREN, Levent, Asst. Prof. Dr., B.S., M.S., Ph.D., University of Missouri-Columbia.

GENERAL INFORMATION: The mission of the College of Engineering is to educate individuals who

- have the knowledge and skills to carry out high-quality engineering work,
- are conscious of professional and ethical responsibilities, and
- are dedicated to life-long learning.

To fulfill its mission, the College of Engineering adopts an education program that

- is based on a well-balanced composition of Mathematics and Basic Sciences, Engineering Sciences, and Social Sciences, Humanities and Communication, and complemented with practical work,
- is flexible to follow and integrate new developments in its discipline,
- promotes creativity and innovation,
- encourages collaboration and teamwork,
- emphasizes diversity and mutual respect.

Mutual agreements with industrial partners and other universities worldwide provide our students with endless opportunities for self-development.

DEPARTMENT OF COMPUTER ENGINEERING

PROFESSORS

KURU, Selahattin (*Vice President*): B.S., Istanbul Technical University, M.S., Boğaziçi University, Ph.D., Carnegie Mellon University.

ASSISTANT PROFESSORS

GÖKÇÖL, Orhan: B.S., M.S., Ph.D., Istanbul Technical University.

GÖREN UĞURDAĞ, Sezer: B.S., M.S., Boğaziçi University, Ph.D., University of California-Santa Cruz.

KURŞUN, Olcay: B.S., M.S., Boğaziçi University, M.S., Ph.D., University of Central Florida.

UĞURDAĞ, Hasan Fatih: B.S., Boğaziçi University, M.S., Ph.D., Case Western Reserve University.

INSTRUCTORS

AYTEKİN, Tevfik: B.S., Bilkent University, M.S., Hacettepe University, M.A., Ph.D., Middle East Technical University.

ERMİŞ, Orhan: B.S., M.S., Bahçeşehir University.

KALELİ, Fatih: B.S., M.S., Bahçeşehir University.

KAPTAN, Selvihan N.: B.S., M.S., Bahçeşehir University.

MİMAROĞLU, Selim Necdet: B.S., Hacettepe University, M.S., Ph.D., University of Massachusetts.

SARISARAY, Pınar: B.S., Karadeniz Technical University, M.S., Bahçeşehir University.

TEACHING ASSISTANTS

ATEŞ, Özgür: B.S., Bahçeşehir University.

BAYRAKTAR, Vehbi Eşref: B.S., Marmara University.

CANBAY, Ferhat: B.S., Bahçeşehir University.

EĞİLMEZ, Mehmet Cihan: B.S., Bahçeşehir University.

KARAKELLE, Musa: B.S., Bahçeşehir University.

ÖZKURT, Özgür: B.S., Bahçeşehir University.

ŞAKAR, Cemal Okan: B.S., Yıldız University, M.S., Bahçeşehir University.

ADJUNCT PROFESSORS

ANARIM, Emin: B.S., Turkish Air Force Academy, B.S., M.S., Ph.D., Boğaziçi University.

İNANOĞLU, Zeynep: B.A., Harvard University, M.S., Ph.D., University of Cambridge.

KOCA, Mutlu: B.S., Boğaziçi University, M.S., Ph.D., University of California-Davis.

ÖZGÜNER, Füsün: B.S., M.S., Istanbul Technical University, Ph.D., University of Illinois, Urbana-Champaign.

GENERAL INFORMATION: Computers, which have become the symbol of the information age, are used in almost every aspect of our lives. The increase in computer use, from home to office, from manufacturing to marketing and sales, has generated the critical need for well-trained computer engineers. The main objective of our department is to produce students that are fully equipped with the right skills and knowledge to work effectively and efficiently in the “information age”.

The Department of Computer Engineering aims to add to the work force engineers that can design efficient computer algorithms, develop software with state of the art methodologies, use information technology to solve problems in the industry, data processing, and enterprises. Our graduates are capable of adapting to rapid changes and improvements in information technology. They also have the awareness for the potential behind information sharing and have the motivation to involve research in their work.

The course curriculum covers computer networking, hardware design, database design, internet engineering technology, and enterprise software systems as well as the foundations of computer science.

Graduates of our program are able to find jobs as software engineers, embedded programming/design engineers, digital hardware/chip designers, system analysts/engineers, sales/support engineers, network engineers, web designers/administrators, IT administrators/experts, and computer security personnel among many other types of positions. They are also able to find full-time positions as teaching and/or research assistants at well-reputed universities in Turkey and abroad while pursuing MS and PhD at the same time.

In short, the Computer Engineering Department at Bahçeşehir University produces the computer engineers of the 21st century, who are equipped with the breadth of knowledge as well as the special competencies needed by computer engineering professionals of our age.

RESEARCH INTERESTS AND FACILITIES: Our faculty members focus their research efforts in 3 main areas:

1. Artificial Intelligence
2. Embedded Systems
3. Information Systems

More specifically in Artificial Intelligence, research is carried out in Data Mining, Machine Learning, Pattern Recognition, Biomedical Image Processing, Neural Networks, and Cognitive Science.

In Embedded Systems area, there is activity in Digital IC/FPGA Design (VLSI), Embedded Hardware/Software Design, Software/Hardware Test/Verification, Machine/Computer Vision, Embedded Video Systems, Industrial Automation, and Robotics.

In Information Systems on the other hand, there is work conducted in Database Systems, Networking, Computer Graphics, Distributed and Scientific Computing, Online Learning, Cryptography, and Web Programming.

As for the facilities, we have teams of faculty members and graduate assistants working on funded projects. They are equipped with hardware and software dedicated to their research. In addition to that, we have several “smart classes” with a PC on every desk. These classrooms are open to students when they are not used for lectures/labs. These PCs and the servers they are networked to are equipped with software necessary for software development (such as MS Visual Studio .NET) as well as database, networking, graphics, and scientific computing software. In addition to these, we have what we call “Chip Lab” where we have FPGA and Gumstix boards and associated software. In this lab, we conduct lab hours for Digital IC/FPGA Design and Embedded Systems courses and carry out research work. There is a facility inside Chip Lab where we perform Computer Vision research work. We have a Robotics Lab as well as an Industrial Automation Lab we share with the Mechatronics Department. The Robotics Lab is purely for research work and undergraduate projects. We also share the CIM (Computer Integrated Manufacturing) Lab with the Industrial Engineering Department.

CURRICULUM

CODE	COURSE TITLE	WEEKLY HOURS and CREDITS
FIRST YEAR		
First Semester		
MATH 1051	Calculus I	(3-2)4
MATH 2033	Discrete Mathematics	(3-0)3
PHYS 1001	Physics I	(3-2)4
CMPE 1001	Introduction to Programming (C++)	(2-2)3
ENG 1003	Communication Skills and Academic Reporting I	(2-2)3
Second Semester		
MATH 1052	Calculus II	(3-2)4
PHYS 1002	Physics II	(3-2)4
CMPE 1002	Object Oriented Programming (C++)	(2-2)3
CMPE 1004	Introduction to Digital Logic and Microprocessors	(2-2)3
CMPE 1900	Introduction to Information Technologies	(0-2)1
ENG 1004	Communication Skills and Academic Reporting II	(2-2)3
SECOND YEAR		
Third Semester		
MATH 1042	Linear Algebra with MATLAB	(2-2)3
CMPE 2003	Data Structures and Algorithms (C++)	(3-2)4
CMPE 2007	Digital System Design	(2-2)3
EEE 2180	Electronic Devices and Circuits	(3-2)4
TLL 2021	Turkish Language and Literature I	(2-0)2
GEP 1005	History of Civilization I	(3-0)3
Fourth Semester		
MATH 3082	Probability and Statistics	(3-0)3
CMPE 2002	Systems Programming	(2-2)3
CMPE 2008	Computer Organization	(3-0)3
CMPE 2204	Introduction to Computer Networks	(2-2)3
SE 2006	Software Laboratory (C#)	(1-2)2
TLL 2022	Turkish Language and Literature II	(2-0)2
GEP 1006	History of Civilization II	(3-0)3

THIRD YEAR

Fifth Semester

MATH 2062	Differential Equations	(3-0)3
CMPE 3001	Operating Systems	(3-0)3
CMPE 3005	Analysis of Algorithms	(3-0)3
CMPE 3990	Summer Training I	Non-Cr
SE 2101	Database Management Systems	(3-2)4
SE 3001	Software Engineering Analysis and Design	(3-0)3
HIST 3051	History of Turkish Republic I	(2-0)2

Sixth Semester

MATH 3012	Numerical Analysis	(2-2)3
CMPE 3002	Data Communication Standards	(3-0)3
CMPE 3006	Embedded Systems Programming	(2-2)3
SE 3004	Web Programming	(2-2)3
SE 3006	Software Architecture	(2-2)3
HIST 3052	History of Turkish Republic II	(2-0)2

FOURTH YEAR

Seventh Semester

CMPE 4001	Computer Communication Networks	(3-0)3
CMPE 4911	Design Project I	(0-6)3
CMPE 4990	Summer Training II	Non-Cr
Technical Elective		(3-0)3
Technical Elective		(3-0)3
Free Elective		(3-0)3
GE Elective		(3-0)3

Eighth Semester

CMPE 4003	Formal Languages and Automata Theory	(3-0)3
Technical Elective		(3-0)3
Technical Elective		(3-0)3
Technical Elective		(3-0)3
Free Elective		(3-0)3
GE Elective		(3-0)3

LIST OF TECHNICAL ELECTIVE COURSES

CMPE 4220	Multimedia Systems and Communications	(3-0)3
CMPE 4321	Introduction to Network Security and Cryptography	(3-0)3
CMPE 4322	Advanced Cryptology and Networks	(3-0)3
CMPE 4336	Introduction to Data Mining	(3-0)3
CMPE 4409	Real Time Operating Systems	(3-0)3
CMPE 4414	Information Security Management	(3-0)3
CMPE 4501	Introduction to Artificial Intelligence and Expert Systems	(3-0)3
CMPE 4502	Distributed Databases	(3-0)3

CMPE 4912	Design Project II	(0-6)3
CMPE 4311	Special Topics in Computer Engineering I	(3-0)3
CMPE 4312	Special Topics in Computer Engineering II	(3-0)3
SE 4406	Advances in Web Programming	(3-0)3
SE 4422	Scripting Languages	(3-0)3
SE 3301	Computer Graphics and Animation	(3-0)3
SE 3302	Human Computer Interface Design	(3-0)3
SE 4503	Introduction to IT Services Management	(3-0)3
SE 4504	Management Information Systems	(3-0)3
EEE 4012	Computational Programming for Engineers	(2-2)3
EEE 4203	Digital Integrated Circuit Design	(3-2)4
EEE 4340	Fuzzy Systems and Neural Networks	(3-0)3
MCH 4002	Autonomous Robotics	(3-0)3
Junior or Senior Engineering or Math Course		(3-0)3
Graduate Level Engineering or Math Course		(3-0)3

MINOR PROGRAMS IN COMPUTER ENGINEERING

Bahçeşehir University Computer Engineering Department offers 3 different minors, namely, Computer Systems Minor (CSM), Computer Networks Minor (CNM), and Computer Hardware Minor (CHM). CSM is offered to all Engineering majors as well as Math and Computer Sciences (Math & CS) majors within the Faculty of Arts and Sciences. On the other hand, CNM and CHM are only offered to students of Electrical & Electronics Engineering (EEE), Mechatronics Engineering (MCH), Software Engineering (SE), and Math & CS.

Each minor program requires a student to complete a group of 6 courses. The minimum credit requirement for a minor program is 18. None of the courses can be counted towards completing requirements of the student's major program. If the student takes any of the minor's courses for her major she has to take another course approved by her minor advisor in order to fulfill the minimum credit requirement..

Computer Systems Minor (offered to all engineering majors and to Math and Computer Science majors)

CMPE 1002 Object Oriented Programming (C++)
 CMPE 2002 Systems Programming
 CMPE 2003 Data Structures and Algorithms (C++)
 CMPE 2204 Introduction to Computer Networks
 SE 2101 Database Management Systems or SE 3004 Web Programming
 CMPE elective

Computer Networks Minor (offered to Electrical and Electronics Engineering, Software Engineering, Mechatronics Engineering and to Math and Computer Science majors)

CMPE 2002 Systems Programming
 CMPE 2204 Introduction to Computer Networks
 CMPE 3002 Data Communication Standards
 CMPE 4001 Computer Communication Networks
 CMPE 4414 Information Security Management or CMPE 4321 Introduction to Network Security & Cryptography
 CMPE elective

Computer Hardware Minor (offered to Electrical and Electronics Engineering, Software Engineering, Mechatronics Engineering and to Math and Computer Science majors)

CMPE 2002 Systems Programming
CMPE 2007 Digital System Design
CMPE 2008 Computer Organization
CMPE 3006 Embedded Systems Programming
EEE 4203 Digital Integrated Circuit Design
CMPE elective

COURSE DESCRIPTIONS

CMPE 1001 Introduction to Programming (C++) (2-2)3

In this course, students will learn how to develop efficient algorithms and write computer programs in C++. Fundamental programming concepts will be discussed and students will gain hands-on experience to develop their programming and algorithmic and object-oriented thinking.

CMPE 1002 Object Oriented Programming (C++) (2-2)3

This course provides in-depth coverage of object-oriented programming principles and techniques using C++. Topics include classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions.

Prerequisite or co-requisite: CMPE1001

CMPE 1004 Introduction to Digital Logic and Microprocessors (2-2)3

This course features a strong emphasis on the fundamentals underlying contemporary logic design. The topics include digital systems, combinational/sequential logic design, arithmetic functions and circuits.

Prerequisite or co-requisite: CMPE1001

CMPE 1401 Introduction to Programming (C) (2-2)3

This course teaches how to develop efficient algorithms and implement them in C. Fundamental programming concepts will be discussed and students will gain hands-on experience in coding and algorithmic thinking.

CMPE 1403 Introduction to Programming (VB) (2-2)3

The course presents efficient algorithm development techniques and implementation using VB.NET. Fundamental programming concepts like event-driven Windows programming, data types, objects and properties, menus, procedures, control structures, loops, strings, arrays, and file processing will be discussed, and students (even with no prior programming experience) will gain hands-on experience in coding and algorithmic approach.

CMPE 1404 Problem Solving with VB (2-2)3

Advanced Visual Basic controls, file access, graphics controls in Visual Basic, database management, introduction to object oriented programming, an overview of the professional business computer programs used in Industrial Engineering field. Each student will do programming projects where he/she will have an opportunity to show his/her ability from modeling to computer solution and implementation of selected problems.

CMPE 1900 Introduction to Information Technologies (0-2)1

Main objective is to give a brief overview of the practical use of computers and information technologies to acquire, manage, and use information that will be vital to the personal and professional lives. Basic computer hardware and software concepts, computer networks, effective use of Internet, Microsoft Office programs and their use in the respective

fields, web page design and web site publishing preliminaries will be presented.

CMPE 2002 Systems Programming (2-2)3

Introduction to the UNIX operating system using Linux. Coverage will include using UNIX shells, commands, the role of the system administrator, the UNIX file system, editors, file processing, shell programming utilities, PERL and CGI programming, Connecting databases, PHP programming.

Prerequisite: CMPE1002

CMPE 2003 Data Structures and Algorithms (C++) (3-2)4

Strategies of algorithm design: top-down design, divide and conquer, average and worst-case criteria, asymptotic costs. Some key data structures: arrays, lists, stacks, queues, trees, graphs, hash tables. Applications to sorting and searching, shortest-path and spanning tree problems. Graph algorithms: depth first and breadth first search. Implementation of the above mentioned in C++ in dedicated lab sessions.

CMPE 2007 Digital System Design (2-2)3

Digital logic design, system-level design using current state of the art in EDA tools. Students learn to design large-scale logic circuits from fundamental building blocks and methods. Topics include architectures of FPGAs, behavioral design specification, system partitioning, synthesis tools, design verification, and studies of novel systems implemented with FPGAs. Intended to familiarize students with the techniques and tools in ASIC designs.

CMPE 2008 Computer Organization (3-0)3

This course provides a comprehensive presentation of the organization and architecture of modern-day computers, emphasizing both fundamental principles and the critical role of performance in driving computer design. The topics include number system, digital logic, computer evolution and performance, memory, input/output, the central processing unit, computer arithmetic, instruction sets, addressing modes and formats, the control unit, control unit operation, microprogrammed control, etc.

CMPE 2204 Introduction to Computer Networks (2-2)3

This course will emphasize on the architecture, protocols of the Internet. Topics include local area networking, networking devices, IP classes, Sub-setting, routing, network security, installing and using Linux as an Internet server, and network management.

Prerequisite: CMPE1900

CMPE 3001 Operating Systems (3-0)3

This course is a core course on one of the pillars of computer systems: Operating Systems (OS). The course will make the student appreciate things he takes for granted such as process management, file systems, and so on. It will also help him/her make an entry into the domains of efficient use of OSes and OS design.

Prerequisites: CMPE2002, CMPE2008 or SE2201

CMPE 3002 Data Communication Standards (3-0)3

Today the technological world is governed by standards. Equipments and software from different companies operate in harmony thanks to standards authored by consortia of companies or international organizations. This way, technology advances more rapidly, and we build on top of each other's work. This course intends to make students technologically literate in today's popular standards in the computer world, data transmission methods, and the underlying digital systems.

CMPE 3005 Analysis of Algorithms (3-0)3

Rigorous analysis of the time and space requirements of important algorithms, including worst case, average case, and amortized analysis. Analysis of the key data structures: trees, hash tables, balanced tree schemes, priority queues, Fibonacci and binomial heaps. Algorithmic paradigms such as divide and conquer, dynamic programming, union-find with path compression, augmenting paths. Selected advanced algorithms.

CMPE 3006 Embedded Systems Programming (2-2)3

This course is a hands-on course that requires software work as well as board-level work where the student connects multiple building blocks to each other. It has 2 lecture hours and

2 lab hours every week. This course sits at the intersection of fields such as microprocessors, digital design, operating systems, assembly programming, software design, and industrial automation.

Prerequisites: CMPE1004, CMPE2002

CMPE 3990 Summer Training I Non-Cr

The objective of summer training is for the student to get to know different sectors and expertise areas of his profession, to start building up a CV, and to get the kind of work experience that will put him/her ahead of his peers when he/she goes out looking for a job after graduation.

CMPE 4001 Computer Communication Networks (3-0)3

Computer network architectures, protocol layers, network programming. Transmission media, encoding systems, switching, multiple access arbitration. Network routing, congestion control, flow control. Transport protocols, real-time, multicast, network security.

Prerequisite: CMPE2204

CMPE 4003 Formal Languages and Automata Theory (3-0)3

Strings and languages. Classification of grammars. Finite-state automata and regular expressions. Pushdown automata and context-free grammars. Context sensitive grammars and linear bounded automata. Turing machines.

Prerequisites: MATH1081, CMPE2003

CMPE 4220 Multimedia Systems and Communications (3-0)3

A top-down analysis of video processing applications, algorithms, tools, and fundamentals. Applications include digital TV, computer games, cinema special effects, 3D TV, medical imaging, and forensics. Algorithms include motion estimation, filtering and restoration, deinterlacing and enhancement, interpolation and super-resolution, stereo and 3D video processing, coding, and compression standards.

CEMP 4311 Special Topics in Computer Engineering I (3-0)3

This course enables the department to allow especially part-time faculty members to teach specialized courses in their areas of expertise. It is possible that we have an opportunity of

offering a course by a visiting world-class professor/professional on a highly specialized subject matter. If it is very likely that we may not offer such course for a long time, we offer the course under this general-purpose course title/code instead of creating a new course title/code.

CEMP 4312 Special Topics in Computer Engineering II (3-0)3

This course is just like CMPE 4311. It will be used if there is more than one Special Topics course in the same semester.

CMPE 4321 Introduction to Network Security and Cryptography (3-0)3

Security fundamentals, definitions, principles of security, the layered approach. Overview of cryptography, encryption, decryption, stream ciphers, block ciphers, hash functions, message authentication codes, public-key cryptography, digital signatures. Identification, authentication, password schemes, spoofing attacks, single sign-on, and other approaches.

CMPE 4322 Advanced Cryptology and Network (3-0)3

This course gives a comprehensive introduction into the field of cryptography and network security. It begins with the introduction of the concepts of data and network security, where classical algorithms serve as an example. Different attacks on cryptographic systems are classified. The concepts of public and private key cryptography are developed. DES and IDEA are described. The public key schemes RSA and ElGamal, and systems based on elliptic curves are then developed.

CMPE 4336 Introduction to Data Mining (3-0)3

This course will provide a global focus on the data mining techniques which are used in very large databases. Firstly Data Warehouse and OLAP Technology for Data Mining are considered and then probabilistic and soft computing techniques are adapted for data mining algorithms.

Prerequisite: MATH 2082

CMPE 4409 Real Time Operating Systems (3-0)3

This course starts with a review of fundamental OS concepts and builds on them with real-time operating system (RTOS) concepts. It continues with a comparison of objectives and architecture of a regular OS versus an RTOS. It later includes a close look at RTOS IO subsystems, memory management, and scheduling. The course also covers a close look at some real RTOSes.

Prerequisite: CMPE 3001

CMPE 4414 Information Security Management (3-0)3

The main objectives of this course are to teach students how to identify and prioritize information assets, identify and prioritize threats to information assets, define an information security strategy and architecture, describe legal and public relations implications of security and privacy issues, present a disaster recovery plan for recovery of information assets after an incident. ISO approach to security management (ISO27001) will also be introduced.

CMPE 4501 Introduction to Artificial Intelligence and Expert Systems (3-0)3

Artificial intelligence, fundamentals of expert systems, evaluation of expert systems, problem analysis, machine learning, game theory and playing, search, problem solving, theorem proving and logic programming, knowledge engineering, knowledge acquisition and representation, uncertainty, probabilistic and fuzzy reasoning, fuzzy systems, neural networks, neural-fuzzy systems, evolutionary computing, and genetic algorithms.

Prerequisite: MATH 2082

CMPE 4502 Distributed Databases (3-0)3

Communication paradigms: client/server protocols, remote procedure call (e.g., Java RMI), multicast protocols handling asynchronous communication and failures. Distributed transaction management requires enhanced concurrency control methods.

Comparing algorithms proposed by researchers and commercial solutions. Replicating data to increase fault-tolerance and the performance of databases.

Prerequisite: SE 2101

CMPE 4911 Design Project I (0-6)3

Every computer engineering student must submit a working graduation project to qualify for graduation. At the beginning of each Fall Semester, faculty members announce their graduation project offerings. Students go and talk to faculty members and agree on a particular project with a particular professor. Hence, this course may be taught by a different professor for each student. Every student preferably works on a different project. If that is not the case, each student should at least have a well-defined and unique subtask within joint projects. That should be documented on the design project sign-up form, which must be approved by the project advisor as well as the academic advisor. A design project should preferably involve a working and demonstrable system design that preferably involves original software and/or hardware components. At the end of the semester, the project advisor forms a review committee for each student. Students give a presentation of their work and submit their project reports that comply with standard templates published by the department. The committee reviews the presentation, demo (if any), and report and makes a suggestion to the project advisor for the student's grade.

CMPE 4912 Design Project II (0-6)3

If a student wants to do a second design project, he/she takes this course. The procedures and expectations of this course are identical to Design Project I.

CMPE 4990 Summer Training II Non-Cr

The objective of summer training is for the student to get to know different sectors and expertise areas of his profession, to start building up a CV, and to get the kind of work experience that will put him/her ahead of his peers when he/she goes out looking for a job after graduation.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PROFESSORS

ÖZGÜLER, Bülent (*Director of Graduate School/Chairperson*): B.S., M.S., Middle East Technical University, Ph.D., University of Florida.

ÜÇTUĞ, Yıldırım (*Provost*): B.S., M.S., Ph.D., Middle East Technical University

ASSOCIATE PROFESSORS

ERDEM, A. Tanju: B.S., Boğaziçi University, M.S., Ph.D., University of Rochester.

ASSISTANT PROFESSORS

BİLİR, Bülent: B.S., Boğaziçi University, M.S., Istanbul Technical University, Ph.D., University of Missouri-Columbia.

EREN, Levent (*Associate Dean*): B.S., M.S., Ph.D., University of Missouri-Columbia.

SOYSAL, Alkan: B.S., Middle East Technical University, M.S., Ph.D., University of Maryland.

ŞİMŞEK, Ergün: B.S., Bilkent University, M.S., University of Massachusetts-Dartmouth, Ph.D., Duke University.

TEACHING ASSISTANTS

BAYAT, Fazlı Kemal: B.S., Yıldız Technical University.

KESKİN, Okan: B.S., Bahçeşehir University.

ÖZEN, U. Bahadır: B.S., Bahçeşehir University.

TOPDEMİR, Erinç: B.S., M.S., Bahçeşehir University.

ULUKAYA, Sezer: B.S., Ankara University.

YILMAZ, Mutlu: B.S., Bahçeşehir University.

ZAİM GÖKBAY, İnci: B.S., Işık University, M.S., Bahçeşehir University.

ADJUNCT PROFESSORS

AKAN, Aydın: B.S., Uludağ University, M.S., Istanbul Technical University, Ph.D., Pittsburg University.

GÜLÇÜR, H. Özcan: B.S., M.S., Middle East Technical University, Ph.D., New Jersey Institute of Technology.

ONAYGIL, Sermin: B.S., Yıldız Technical University, M.S., Ph.D., Istanbul Technical University.

GENERAL INFORMATION: Electrical and Electronics Engineering has played a major role in most technological developments for many decades. It has had a high impact in shaping the information age and is now supporting an industry in Turkey that exceeds ten billion dollars worth of total production. Electronics Engineering is the basis for engineering fields such as computer, telecommunication, control, mechatronics, and biomedical engineering. Department curriculum provides knowledge related to many engineering disciplines and our graduates have the option of specializing in a number of different areas such as Electronic Devices, Communications, Signal Processing, Electromagnetics, Control, Power, and Energy Systems. A large number of technical elective courses and an up-to-date basic curriculum are offered by faculty members who are experts in their fields and who have work experience in industry.

Graduates of Electrical and Electronics Engineering Department will be employed in the fields such as telecommunications, microelectronics, consumer electronics, defense industry, power systems, electric machinery, automation, automotive, medical devices, and software systems. Our graduates may pursue advanced degrees in these fields or in management to prepare themselves for managerial positions.

RESEARCH INTERESTS AND FACILITIES: The Department of Electrical and Electronics Engineering offers undergraduate and graduate educational programs and research opportunities in the areas of Electric Circuits & Devices, Signal Processing & Communications, Control & Automation, Power Systems, and Electronics, Computational and Applied Electromagnetics. Many of on-going projects are cross-disciplinary and involve collaborations with faculty and students in other departments such as Computer, Energy Systems, Mechatronics, and Software Engineering. Graduate students can pursue course work and research leading to MS degree.

Electric Circuits and Devices: Chip & FPGA design and automation, machine vision, microelectronics.

Signal Processing and Communications: Algorithm development in video compression, image restoration, and motion tracking; 3D graphics, 3D television applications; multiple-antenna, broadband wireless communications and networking, information theory, error control coding.

Control and Automation: Multivariable and large-scale control systems, decentralized control, structural modeling, system theory, robot dynamics and control, stability robustness, realization theory, linear matrix equations.

Power Systems: Motor condition monitoring, power quality instrumentation, power electronics.

Computational and Applied Electromagnetics/Optics: Wave propagation and scattering in complex media; novel algorithms for metamaterials and surface plasmon based sensors; inverse problems for biomedical imaging and land-mine detection; elastic wave propagation in anisotropic media.

There are various laboratories available at the Department of Electrical and Electronics Engineering in order to support education and research. These include Circuit Theory Lab., DSP Lab., Electronics Lab., Microprocessors Lab., Power Electronics and Electric Drives Lab., Power Systems Lab., Telecommunication Lab., VLSI Design Lab. In addition, there are other facilities such as smart classes and computer laboratories for the use of students.

CURRICULUM

CODE	COURSE TITLE	WEEKLY HOURS and CREDITS
FIRST YEAR		
First Semester		
MATH 1051	Calculus I	(3-3)4
CHEM 1001	General Chemistry I	(3-2)4
PHYS 1001	Physics I	(3-2)4
CMPE 1401	Introduction to Programming (C)	(2-2)3
ENG 1003	Communication Skills and Academic Reporting I	(2-2)3
Second Semester		
MATH 1052	Calculus II	(4-0)4
MATH 1042	Linear Algebra with MATLAB	(2-2)3
PHYS 1002	Physics II	(3-2)4
CMPE 1900	Introduction to Information Technologies	(0-2)1
EEE 1000	Introduction to Electrical and Electronics Engineering	(2-2)3
ENG 1004	Communication Skills and Academic Reporting II	(2-2)3
SECOND YEAR		
Third Semester		
MATH 2062	Differential Equations	(3-0)3
EEE 2101	Circuit Theory I	(3-2)4
CMPE 2003	Data Structures and Algorithms (C)	(3-2)4
TLL 2021	Turkish Language and Literature I	(2-0)2
GEP 1005	History of Civilization I	(3-0)3
Math/Science Elective		(3-0)3
Fourth Semester		
EEE 2102	Circuit Theory II	(3-0)3
EEE 2116	Electronics I	(3-2)4
EEE 2204	Introduction to Digital Design	(3-2)4
EEE 2312	Modeling, Analysis and Simulation	(2-2)3
TLL 2022	Turkish Language and Literature II	(2-0)2
GEP 1006	History of Civilization II	(3-0)3

THIRD YEAR

Fifth Semester

MATH 3083	Probability and Statistics	(3-0)3
EEE 3117	Electronics II	(3-2)4
EEE 3205	Microprocessors	(3-2)4
EEE 3501	Signals and Systems	(3-0)3
EEE 3703	Electromagnetic Field Theory	(3-0)3
EEE 3990	Summer Training I	Non-Cr
HIST 3051	History of Turkish Republic I	(2-0)2

Sixth Semester

EEE 3304	Feedback Control Systems	(3-2)4
EEE 3406	Electromechanical Energy Conversion	(3-2)4
EEE 3602	Introduction to Communication Theory	(3-0)3
EEE 3704	Electromagnetic Wave Theory	(3-0)3
HIST 3052	History of Turkish Republic II	(2-0)2
Math/Science Elective		(3-0)3

FOURTH YEAR

Seventh Semester

EEE 4911	Design Project I	(0-6)3
EEE 4990	Summer Training II	Non-Cr
Restricted Elective		(3-0)3
Restricted Elective		(3-0)3
Restricted Elective		(3-0)3
Free Elective		(3-0)3

Eighth Semester

IE 4400	Principles of Engineering Economics	(3-0)3
Restricted Elective		(3-0)3
Restricted Elective		(3-0)3
Free Elective		(3-0)3
Free Elective		(3-0)3

LIST OF RESTRICTED ELECTIVE COURSES

Control and Automation Option

Compulsory Courses:

EEE 4321	Industrial Automation	(3-2)4
EEE 4316	Digital Control Systems	(3-0)3

Elective Courses:

EEE 4314	Nonlinear Control Systems	(3-0)3
EEE 4331	Measurement and Instrumentation	(2-2)3
EEE 4338	Remote Sensing	(3-0)3
EEE 4340	Fuzzy Systems and Neural Networks	(3-0)3
MCH 4001	Fundamentals of Robotics	(2-2)3

Electronic Circuits and Systems Option

Compulsory Courses:

EEE 4132	Introduction to Integrated Circuit Design	(2-2)3
EEE 4203	Digital Integrated Circuit Design	(3-2)4

Elective Courses:

EEE 4102	Physics of Semiconductor Devices	(3-0)3
EEE 4111	RF Electronics	(3-0)3
CMPE 3005	Analysis of Algorithms	(3-0)3
CMPE 3006	Embedded Systems Programming	(2-2)3
CMPE 4003	Formal Languages and Automata Theory	(3-0)3

Power Systems Option

Compulsory Courses:

EEE 4401	Introduction to Power Systems	(3-0)3
EEE 4441	Power Electronics	(3-2)4

Elective Courses:

EEE 4412	Power Plant Engineering	(3-0)3
EEE 4421	Power Transmission and Distribution	(3-0)3
EEE 4422	High Voltage Techniques	(3-0)3
EEE 4432	Illumination Engineering	(3-0)3
EEE 4442	Electrical Devices	(3-2)4

Signals and Communications Option

Compulsory Courses:

EEE 4501	Digital Signal Processing	(3-0)3
EEE 4603	Communication Systems	(3-0)3

Elective Courses:

EEE 4611	Optical Communications	(3-0)3
EEE 4614	Wireless Communications	(3-0)3
EEE 4621	Microwave Antennas	(3-0)3
EEE 4622	Microwave Engineering	(3-0)3
CMPE 4001	Computer Communication Networks	(3-0)3

Common Courses:

EEE 4010	Optimization	(3-0)3
EEE 4012	Computational Programming for Engineering	(2-2)3
EEE 4912	Design Project II	(0-6)3
EEE 4920	Independent Study	(0-6)3
EEE 4931	Special Topics in EEE I	(3-0)3
EEE 4932	Special Topics in EEE II	(3-0)3
MCH 4202	Autonomous Robotics	(2-2)3
MATH 3012	Numerical Analysis	(2-2)3
	Junior or Senior Engineering or Math Course	(3-0)3
	Graduate Level Engineering or Math Course	(3-0)3

MINOR PROGRAMS IN ELECTRICAL AND ELECTRONICS ENGINEERING

The minor programs in Electrical and Electronics Engineering at Bahçeşehir University offer courses on some concentration areas such as Control and Automation, Electronic Circuits and Systems, Power Systems, and Signals and Communications to undergraduate students from other engineering or science majors. Students are required to complete 24 credits to get a minor in the aforementioned programs.

Courses to select for minor in Control and Automation

EEE 1000	Introduction to EEE
EEE 2101	Circuit Theory I
EEE 2102	Circuit Theory II
EEE 2116	Electronics I
EEE 2204	Introduction to Digital Design
EEE 3205	Microprocessors
EEE 3304	Feedback Control Systems
EEE 3406	Electromechanical Energy Conversion
EEE 3501	Signals & Systems
EEE 4314	Nonlinear Control Systems
EEE 4316	Digital Control Systems
EEE 4321	Industrial Automation
EEE 4331	Measurement and Instrumentation
EEE 4338	Remote Sensing
EEE 4340	Fuzzy Systems and Neural Networks
MCH 4001	Fundamentals of Robotics

Courses to select for minor in Electronic Circuits and Systems

EEE 1000	Introduction to EEE
EEE 2101	Circuit Theory I
EEE 2116	Electronics I
EEE 2204	Introduction to Digital Design
EEE 3501	Signals & Systems
EEE 4102	Physics of Semiconductor Devices
EEE 4111	RF Electronics
EEE 4132	Introduction to Integrated Circuit Design
EEE 4203	Digital Integrated Circuit Design
CMPE 3005	Analysis of Algorithms
CMPE 3006	Embedded Systems Programming
CMPE 4003	Formal Languages and Automata Theory

Courses to select for minor in Power Systems

EEE 1000	Introduction to EEE
EEE 2101	Circuit Theory I
EEE 2102	Circuit Theory II
EEE 2116	Electronics I
EEE 2312	Modeling, Analysis and Simulation
EEE 3406	Electromechanical Energy Conversion
EEE 4401	Introduction to Power Systems
EEE 4412	Power Plant Engineering
EEE 4421	Power Transmission and Distribution
EEE 4432	Illumination Engineering
EEE 4441	Power Electronics

EEE 4442 Electrical Drives

Courses to select for minor in Signals and Communications

EEE 1000 Introduction to EEE
EEE 2101 Circuit Theory I
EEE 2116 Electronics I
EEE 3501 Signals & Systems
EEE 3602 Introduction to Communication Theory
EEE 4010 Optimization
EEE 4501 Digital Signal Processing
EEE 4603 Communication Systems
EEE 4611 Optical Communications
EEE 4614 Wireless Communications
EEE 4621 Microwave Antennas
EEE 4622 Microwave Engineering
CMPE 4001 Computer Communication Networks
MATH 3083 Probability and Random Variables

COURSE DESCRIPTIONS

EEE 1000 Introduction to Electrical and Electronics Engineering (2-2)3

An overview of Electrical and Electronics Engineering: Brief history, subjects. Electrical quantities and basic electrical components. Resistor, capacitor, inductor, diode, operational amplifier. Familiarization with laboratory equipment: Measuring devices, signal generator, power supply, oscilloscope. Experiments with simple linear and nonlinear circuits. Transistor. Examples of analog electronic circuits. Logic gates and simple combinatorial circuits. AC current, transformer.

EEE 2101 Circuit Theory I (3-2)4

Lumped circuits. Kirchoff's laws. Resistors, sources, simple resistive circuits. Node and mesh analyses. Linearity and superposition. Thévenin and Norton theorems. Maximum power transfer. Operational amplifier. Capacitor and inductor. Waveforms, average and rms values. Response of first and second order circuits.

EEE 2102 Circuit Theory II (3-0)3

Review of Laplace transform. S-domain electrical circuit analysis. Network functions. Sinusoidal steady-state analysis. Phasors.

Node, mesh analysis. Power at sinusoidal steady-state. Three-phase circuits. Line and phase concepts. Frequency response. First- and second-order filters. Bode diagrams.

Prerequisite: EEE2101

EEE 2116 Electronics I (3-2)4

Introduction to the theory of semiconductors and electronic devices. Analysis and design of electronic circuits and systems. Analog amplifier design using bipolar transistors and field-effect transistors.

EEE 2180 Electronic Devices and Circuits (3-2)4

Fundamentals of electric circuits. Resistive networks. AC network analysis. First order networks, transient analysis. Semiconductors and diodes. Bipolar Junction Transistors: operation, circuit models, applications. Operational amplifiers.

EEE 2190 Fundamentals of Electrical Engineering (3-2)4

Fundamentals of electric circuits. DC and AC network analysis. Transient analysis. AC power. Principles of electromagnetics. Introduction to electric machines.

EEE 2204 Introduction to Digital Design (3-2)4

Boolean algebra and logic gates. Computer arithmetic, fixed point representation. Hardware description languages, FPGA based design. Architectural design. Simulation, test benches, timing issues, waveforms.

EEE 2312 Modeling, Analysis and Simulation (2-2)3

System as an interconnection of components. Component models. System models: block diagrams, state equations, transfer functions. Analysis of static and dynamic systems. Simulation using SIMULINK.

EEE 3117 Electronics II (3-2)4

Small signal analysis of bipolar-junction transistors (BJT) and junction field-effect transistor (JFET). Frequency response (Bode plot) of BJT and JFET amplifiers. Differential amplifiers, operational amplifiers and applications of operational amplifiers. Power amplifiers. Feedback and oscillator circuits. Power supplies and voltage regulators.

EEE 3205 Microprocessors (3-2)4

An introduction to microprocessor hardware and software. Assembly language instructions and programming, troubleshooting, and input/output techniques are studied. Computer-based program editing and assembly techniques are used.

EEE 3304 Feedback Control Systems (3-2)4

Mathematical models of dynamical systems. System response, stability. Feedback. Root-locus technique. Nyquist stability criterion. Frequency response. Frequency- and time-domain controller design.

EEE 3406 Electromechanical Energy Conversion (3-2)4

Magnetic circuits and magnetic materials. Single-phase and three-phase transformers. AC operation. Induction machines. Synchronous machines. DC machines. Special machines.

EEE 3501 Signals and Systems (3-0)3

Continuous and discrete time signals and systems. Linear, time-invariant systems and convolution. Continuous- and discrete-time Fourier analysis. Filtering and modulation.

Sampling and reconstruction. Review of Laplace transform. Z-transform.

EEE 3602 Introduction to Communication Theory (3-0)3

Analysis of analog and digital communications systems, including modulation, transmission, and demodulation of AM, FM, and TV systems. Design issues, channel distortion and loss, bandwidth limitations, and additive noise.

EEE 3703 Electromagnetic Field Theory (3-0)3

Axioms and definitions of electromagnetic theory, harmonic electromagnetic fields. Electrostatics, axioms and definitions, conductors, and conductive systems, image method, dielectrics, boundary value problems, energy and power, stationary electric fields, stationary magnetic fields, Ampere's theorem, Biot-Savart's theorem, magnetic circuits, self and mutual inductances, energy and forces, induction theorem, superconductivity, linear motors.

EEE 3704 Electromagnetic Wave Theory (3-0)3

Axioms and definitions of electromagnetic theory, harmonic waves, energy of electromagnetic waves, solution methods for wave and Helmholtz equations, vector and scalar potentials, antennas; radiation from Hertz dipole and dipoles, dipole arrays, plane waves, transmission lines, wave guides, and resonators. Introduction to microwave antennas.

EEE 3990 Summer Training I Non-Cr

Minimum four weeks (20 working days) of practical work in an organization with a sizable operation is required. A formal report satisfying the Summer Practice Report Format is to be submitted.

EEE 4010 Optimization (3-0)3

Formulation of optimization problems. Unconstrained optimization: necessary conditions and sufficient conditions; general optimization algorithms; line search methods; the gradient algorithm; Newton algorithm; conjugate gradient methods; quasi-Newton methods; methods without derivatives. Constrained optimization: necessary conditions and sufficient conditions; the notions of regularity and of complementarity; penalty

functions methods; augmented Lagrangians; recursive quadratic programming. Global optimization: methods for Lipschitz functions; deterministic methods; stochastic methods.

EEE 4012 Computational Programming for Engineers (2-2)3

Scientific problem solving, computational tools, MATLAB interactive environment; syntax, built-in functions, scripts, functions, programming in MATLAB; programming elements, control structures.

EEE 4102 Physics of Semiconductor Devices (3-0)3

This course examines the physical principles underlying semiconductor device operation and the application of these principles to specific devices. Emphasis is placed on understanding device operation, rather than on circuit properties. Topics include elementary excitations in semiconductors such as phonons, photons, conduction electrons and holes; charge and heat transport; carrier trapping and recombination; effects of high doping; contacts; the p-n junction; the junction transistor; surface effects; the MIS diode; and the MOSFET.

EEE 4111 RF Electronics (3-0)3

Impedance matching, noise and distortion, practical implementation issues and parasites. RF filters: image parameter method, insertion loss method, scaling and transformation, stepped-impedance low pass filters, coupled line filters, filters using coupled resonators, simulation issues. Noise, isolation, linearity, conversion gain; performance optimization; bandwidth; power consumption. Oscillators: oscillator types and architecture; voltage controlled oscillators and tunability; phase noise; power consumption; resonators. Phase locked loops: types of PLL; analysis and dynamics of PLL.

EEE 4132 Introduction to Integrated Circuit Design (2-2)3

This course teaches the fundamentals of IC design from a digital circuit design perspective at the transistor level. It builds on Electronics II course and takes the students to the next level in electronic circuit design. It introduces simulation methodology with Spice. It also talks about physics and implementation aspects of ICs and teaches how to incorporate IC

uncertainties into the design process. The circuit design examples are chosen from the digital world.

EEE 4203 Digital Integrated Circuit Design (3-2)4

Processors, ASICs, FPGAs. ASIC design methodology. Review of digital design basics. CMOS implementation of gates. Verilog review. Timing analysis. Computer arithmetic. High Level Synthesis based design. Using Block RAMs in FPGAs. Using digital clock managers in FPGAs. Using tri-state pins in FPGAs. Metastability.

EEE 4314 Nonlinear Control Systems (3-0)3

Mathematical preliminaries. Describing function analysis. Lyapunov stability, Chetaev's theorem. Input/output stability. Invariance principle and Lyapunov indirect method. Control Lyapunov functions. Time-varying systems and converse theorems. Analysis of feedback systems. Feedback linearization. Sliding control. Singular perturbation. Gain scheduling. Nonlinear servomechanisms. Averaging.

EEE 4316 Digital Control Systems (3-0)3

Fundamentals of sampled linear systems from a control perspective, encompassing both frequency-domain and time-domain control strategies. Topics covered include analysis of difference equations, the z-transform, sampling, stability, minimality, discrete approximation, and stabilization techniques.

EEE 4321 Industrial Automation (3-2)4

Principles and practices of automating production and distribution systems. Sensors, actuators, controllers, and control algorithms. Computer control and interfaces. Integration of automated systems with enterprise-wide computing systems, networks, and communication between devices.

EEE 4331 Measurement and Instrumentation (2-2)3

Concepts related with static and dynamic characteristics of instruments, operation principles of sensors and actuators, and different sensors for detection and monitoring. The use of LabVIEW in intelligent instrumentation, signal conditioning systems, signal acquisition systems and digital bus-

based technologies. Statistics on measurement and calibration systems.

EEE 4338 Remote Sensing (3-0)3

This course will explore fundamental concepts of remote sensing as they relate to engineering and environmental problems. Other topics covered include energy interactions, reflectance, scanning systems, satellite systems, digital image processing, and image classification. Students will work with image processing software.

EEE 4340 Fuzzy Systems and Neural Networks (3-0)3

The structure of the brain. Learning in machines. Pattern recognition. Classification techniques. Linear classifiers. Neuron model, neural network structures. Perceptron, single layer feed-forward networks. Multilayer feed-forward networks, least mean square algorithm, error back-propagation. Kohonen self-organizing network. Hopfield network. Neural network classifiers. Adaptive resonance theory. Cellular neural networks.

EEE 4401 Introduction to Power Systems (3-0)3

Introduces the principles, concepts, and analysis of major components of an electric power system and provides students with a complete overview of interconnected power system operation.

EEE 4412 Power Plant Engineering (3-0)3

This course covers nuclear and fossil fuel sources, analysis and design of steam supply systems, gas turbines, nuclear power plants, auxiliary systems, power plant efficiency and operation, power plant planning and design.

EEE 4421 Power Transmission and Distribution (3-0)3

Power transmission, substations, transmission equipments, transmission lines, HVDC transmission. Power distribution, distribution lines, distribution substations, distribution metering and efficient energy management.

EEE 4422 High Voltage Techniques (3-0)3

This course covers field analysis: experimental methods and applications. Electrical breakdown in gases, electrical break-down of

liquids, electrical breakdown of solid, insulating oils and solid dielectrics. Generation and measurement of high AC, DC, and impulse voltages and impulse currents: AC to DC conversion and electrostatic generators. Operation, design and construction of impulse generators.

EEE 4432 Illumination Engineering (3-0)3

This course covers light and vision. Photometric quantities and laws. Fundamentals of physiological and optical concepts. Light generation. Light sources, lamp types, lighting terminology, lighting calculations, installation of wiring systems, selection of conductor cross-sectional area, and preparation of reports.

EEE 4441 Power Electronics (3-2)4

Power switches and their characteristics. Power converter definitions, classification. VTA method. Rectifiers: Non-ideal commutation, harmonics, input power factor, utility-factor, winding utilization and unbalances in rectifier transformers. Forced commutated circuits. Inverters. DC and AC choppers.

EEE 4442 Electric Drives (3-2)4

DC Drives: single-phase drives, three-phase drives, power control, regenerative brake control, rheostatic brake control, combined regenerative and rheostatic brake control, choppers drives. AC Drives: induction motor drives, synchronous motor drives.

EEE 4501 Digital Signal Processing (3-0)3

Review of discrete time signals and systems, the z-transform, sampling. Transform analysis of linear shift invariant systems. Discrete Fourier transform, discrete cosine transform, Fast Fourier transform. Digital filter design. Random signals and correlation. Power and higher order spectra. Hilbert transform and spectrum. Time-frequency representations.

EEE 4603 Communication Systems (3-0)3

Communications Systems: Terrestrial wideband communication systems, satellite communications, microwave repeaters, frequency coordination. Satellite design and power systems; satellite antenna design. Video communication systems: NTSC, PAL and

SECAM formats; camera, receiver and monitor design; monochrome and color systems; signal measurement; transmitter, receiver and antenna design. Lasers and fiber optic communication systems.

EEE 4611 Optical Communications (3-0)3

Optical fiber properties, characteristics of optical fiber, optical waveguides, optical sources and transmitters, optical detectors and receivers, optical amplifiers and repeaters, noise and detection, optical modulators, optical networks, and review of digital communications.

EEE 4614 Wireless Communications (3-0)3

Introduction to wireless communication systems, modern wireless communications systems, the cellular concept-system design fundamentals, mobile radio propagation: large-scale path loss, mobile radio propagation: small-scale fading and multipath, modulation techniques for mobile radio, multiple access techniques for wireless communications.

EEE 4621 Microwave and Antennas (3-0)3

Fundamentals of microwave antenna theory: physical optical method and Green function, Fourier transform methods, equivalence principle. Radiation from the opening of waveguides. Microstrip antennas and arrays. Sectoral horn antennas. Parabolic reflector antennas. Dielectric lens antennas.

EEE 4622 Microwave Engineering (3-0)3

Circuit properties of transmission lines, use of Smith Charts, circuit elements made with transmission pipes, analysis of circuits with disturbed parameters, microwave resonators,

Microwave power supplies, Klystron and Magnetron, traveling wave tubes, S Parameters and their properties.

EEE 4911 Design Project I (0-6)3

Completion of a technical project emphasizing engineering design principles on a specific topic in any field of electrical and electronics engineering to be carried out by the student under faculty member supervision.

EEE 4912 Design Project II (0-6)3

Continuation of the technical project chosen in EEE4911 Design Project I. A short report and a presentation will be required for the completion of the course.

EEE 4920 Independent Study (0-6)3

Advanced study in area of specialization selected by student and approved by faculty member.

EEE 4931 Special Topics in EEE I (3-0)3

Contemporary topics at the advanced undergraduate elective level. Faculty presents advanced elective topics not included in the established curriculum.

EEE 4932 Special Topics in EEE II (3-0)3

Contemporary topics at the advanced undergraduate elective level. Faculty presents advanced elective topics not included in the established curriculum.

EEE 4990 Summer Training II Non-Cr

Minimum four weeks (20 working days) of practical work in an organization with a sizable operation is required. A formal report satisfying the Summer Practice Report Format is to be submitted.

DEPARTMENT OF ENERGY SYSTEMS ENGINEERING

PROFESSORS

TACER, Emin (Part-time): B.S., M.S., Ph.D., Istanbul Technical University.
YALÇIN, Şenay (*Vice President*): B.S., M.S., Ph.D., Ege University.

ASSOCIATE PROFESSORS

ALBOSTAN, Ayhan (*Chairperson*): B.S., M.S., Firat University, Ph.D., Gazi University.

TEACHING ASSISTANTS

FIRTINA, İrem: B.S., M.S., Istanbul University.
GÜNER, Sıtkı: B.S., Bahçeşehir University.
ŞAHİN, Hatice: B.S., Erciyes University.

ADJUNCT PROFESSORS

AKDOĞAN, Taylan: B.S., Boğaziçi University, M.S., University of Pittsburgh, Ph.D., Massachusetts Institute of Technology.
ARSLAN, Mehmet Ali: B.S., Istanbul Technical University, M.S., Ph.D., Rensselaer Polytechnic Institute.
ŞİŞMAN, Altuğ: B.S., M.S., Ph.D., Istanbul Technical University.
TOSUNOĞLU, Melahat: B.S. Boğaziçi University, M.S. University College of Swansea, M.S., Ph.D., University of Surrey.
USTA, Metin: B.S., Istanbul Technical University, M.S., Ph.D., Rensselaer Polytechnic Institute.

GENERAL INFORMATION: For some time scientists and technologists have started searching alternative energy sources due to the fact that fossil-based energy resources are becoming scarcer. It is predicted that nuclear and renewable energy resources will play a major role in meeting energy needs of the world in the near future. Economical and environmental factors increasingly necessitate the use of clean and renewable energy resources.

Bahçeşehir University established the first Energy Systems Engineering Department in Turkey considering the need for such a program in our country. The aim of the department is to graduate young engineers who have leadership qualities and who are capable of designing energy system components and managing all types of energy systems, and knowledgeable in nano-energy technologies.

Bahçeşehir University signed a partnership agreement with the International Centre for Hydrogen Energy Technologies (UNIDO-ICHET) of the United Nations. This agreement gives our students the opportunity to apply their theoretical knowledge in the field of study while doing internship at UNIDO-ICHET. Our graduates will be able to work as designer and manager in the areas of energy production, distribution, and consumption. There will be demand for Energy Systems Engineers in the areas ranging from research and development to energy economics in the near future.

RESEARCH INTERESTS AND FACILITIES: Research activities in Energy Systems Engineering at Bahçeşehir University aim at providing solutions to generate clean energy and develop energy systems to meet the future energy demands. Research interests in Energy Systems Engineering focus on three major areas of energy systems engineering: new and renewable energy systems, energy efficiency and nuclear energy. Students in the Energy Systems Engineering program learn the skills to design and develop tomorrow's energy systems.

Due to the depletion of conventional energy sources, various forms of new and renewable energy have attracted attention. Active research in areas such as solar, wind, hydrogen, thermal, solar photovoltaics, biomass, etc. is being pursued.

The need of the energy saving in every area is well known to all, especially due to increase in energy cost. Energy Systems Engineering has been developing sustainable energy solutions with a clear focus on energy saving strategies.

Courses are supported by applied sessions in various facilities available at Bahçeşehir University Engineering Faculty. There are several laboratories which are energy systems (new and renewable energy) laboratory, heat and mass transfer laboratory, and electromechanical energy conversion laboratory. The faculty also provides additional applications including programming, simulation, and analysis in several computer labs and sessions in physics and chemistry labs.

CURRICULUM

CODE	COURSE TITLE	WEEKLY HOURS and CREDITS
FIRST YEAR		
First Semester		
MATH 1051	Calculus I	(3-3)4
CHEM 1001	General Chemistry I	(3-2)4
PHYS 1001	Physics I	(3-2)4
CMPE 1401	Introduction to Programming (C)	(2-2)3
ENG 1003	Communication Skills and Academic Reporting I	(2-2)3
Second Semester		
MATH 1052	Calculus II	(3-2)4
MATH 1042	Linear Algebra with MATLAB	(2-2)3
PHYS 1002	Physics II	(3-2)4
CMPE 1900	Introduction to Information Technologies	(0-2)1
MCH 1002	Computer Aided Technical Drawing	(2-2)3
ENG 1004	Communication Skills and Academic Reporting II	(2-2)3

SECOND YEAR

Third Semester

MATH 2062	Differential Equations	(3-0)3
ESYS 2001	Energy Systems I	(3-0)3
ESYS 2004	Fundamentals of Thermodynamics	(3-0)3
MCH 2008	Engineering Mechanics	(4-0)4
TLL 2021	Turkish Language and Literature I	(2-0)2
GEP 1005	History of Civilization I	(3-0)3

Fourth Semester

ESYS 2002	Energy Systems II	(3-2)4
EEE 2190	Fundamentals of Electrical Engineering	(3-2)4
MCH 2003	Engineering Materials	(3-0)3
PHYS 2003	Modern Physics	(3-0)3
TLL 2022	Turkish Language and Literature II	(2-0)2
GEP 1006	History of Civilization II	(3-0)3

THIRD YEAR

Fifth Semester

EEE 2312	Modeling, Simulation and Analysis	(2-2)3
EEE 3406	Electromechanical Energy Conversion	(3-2)4
MATH 3082	Probability and Statistics	(3-0)3
MCH 3002	Introduction to Fluid Mechanics	(3-0)3
ESYS 3990	Summer Training I	Non-Cr
HIST 3051	History of Turkish Republic I	(2-0)2
Free Elective		(3-0)3

Sixth Semester

ESYS 3002	Fuels and Combustion	(3-0)3
ESYS 3004	Heat and Mass Transfer	(2-2)3
ESYS 3006	Nuclear Energy	(3-0)3
ESYS 3008	Energy Utility and Management	(3-0)3
HIST 3052	History of Turkish Republic II	(2-0)2
Free Elective		(3-0)3

FOURTH YEAR

Seventh Semester

ESYS 4911	Design Project I	(0-6)3
ESYS 4990	Summer Training II	Non-Cr
EEE 3304	Feedback Control Systems	(3-2)4
IE 4400	Principles of Engineering Economics	(3-0)3
Technical Elective		(3-0)3
Free Elective		(3-0)3

Eighth Semester

ESYS 4002	Hydrogen Energy Systems	(3-0)3
EEE 4331	Measurement and Instrumentation	(2-2)3
ENVR 4403	Environmental Impact of Energy Systems	(3-0)3
Technical Elective		(3-0)3
Technical Elective		(3-0)3
Free Elective		(3-0)3

LIST OF TECHNICAL ELECTIVE COURSES

ESYS 4005	Fuel Cells Technology	(3-0)3
ESYS 4006	Hydroelectric Power	(3-0)3
ESYS 4007	Solar Energy Technologies	(3-0)3
ESYS 4008	Wind Energy Technologies	(3-0)3
ESYS 4010	Bio Energy Technologies	(3-0)3
ESYS 4011	Energy Cost Analysis	(3-0)3
ESYS 4912	Design Project II	(0-6)3
ESYS 4920	Independent Study	(0-6)3
EEE 4316	Digital Control Systems	(3-0)3
EEE 4321	Industrial Automation	(3-0)3
EEE 4401	Introduction to Power Systems	(3-0)3
EEE 4412	Power Plant Engineering	(3-0)3
EEE 4422	High Voltage Techniques	(3-0)3
EEE 4441	Power Electronics	(3-0)3
MATH 3012	Numerical Analysis	(3-0)3
IE 4002	Project Management	(3-0)3
Junior or Senior Engineering or Math Course		(3-0)3
Graduate Level Engineering or Math Course		(3-0)3

MINOR PROGRAM IN ENERGY SYSTEMS ENGINEERING

The minor program in Energy Systems Engineering at Bahçeşehir University offer to undergraduate students from other engineering or science majors. 24 credits are required to get a minor in Energy Systems Engineering program.

Courses to select for minor in Energy Systems Engineering

ESYS 2001	Energy Systems I
ESYS 2002	Energy Systems II
ESYS 2004	Fundamentals of Thermodynamics
ESYS 3002	Fuels and Combustion
ESYS 3004	Heat and Mass Transfer
ESYS 3006	Nuclear Energy
ESYS 3008	Energy Utility and Management
ESYS 4002	Hydrogen Energy Systems
ESYS 4005	Fuel Cells Technology
ESYS 4006	Hydroelectric Power
ESYS 4007	Solar Energy Technologies
ESYS 4008	Wind Energy Technologies

ESYS 4010	Bio Energy Technologies
ESYS 4011	Energy Cost Analysis
EEE 2312	Modeling, Analysis and Simulation
EEE 3304	Feedback Control Systems
EEE 3406	Electromechanical Energy Conversion
ENVR 4403	Environmental Impact of Energy Systems
MCH 2008	Engineering Mechanics
MCH 3002	Introduction to Fluid Mechanics
PHYS 2003	Modern Physics

COURSE DESCRIPTIONS

ESYS 2001 Energy Systems I (3-0)3

Historical timeline of energy, future trends, basic energy principles: the three laws of thermodynamics, work, heat, temperature, energy conversion, efficiency, measuring energy, forms of energy, fossil fuels, environmental concerns, global warming.

ESYS 2002 Energy Systems II (3-2)4

Technical, economical, environmental and policy aspects of renewable and alternative energy systems to provide a comprehensive picture of their role in meeting society's needs, renewable energy sources, nuclear energy: nuclear fuels, fission.

ESYS 2004 Fundamentals of Thermodynamics (3-0)3

Basic concepts and definitions, properties of a pure substance, equations of state, work and heat, first law of thermodynamics, ideal and real gases, internal energy and enthalpy, second law of thermodynamics, Carnot cycle, entropy, thermodynamic relations.

ESYS 3002 Fuels and Combustion (3-0)3

The problem of energy, features of fuels, solid fuels, demanding features of coal in using, liquid fuels, combustion and combustion theories, the combustion of the solid, liquid and gas fuels, combustion systems of the solid, liquid and gas fuels.

ESYS 3004 Heat and Mass Transfer (2-2)3

Steady-state and transient heat conduction, analysis of forced convection in laminar and turbulent flows, natural convection in internal and external configurations; heat transfer

during phase change processes, mass transfer, evaporation and thermal radiation.

ESYS 3006 Nuclear Energy (3-0)3

Radioactive decay, nuclear reactions, binding energy, neutron interactions, fission, nuclear reactors, neutron diffusion and moderation, Fick's law, nuclear reactor theory, neutron diffusion and moderation, thermal reactors, reflected reactors.

ESYS 3008 Energy Utility and Management (3-0)3

Energy management in commercial building and industrial plants. Utility rate structures. Sources of primary energy. Energy conversion devices. Prime movers of energy. Heat. Electricity. Lighting. HVAC equipment. Building envelope. Electric motors. Estimating energy savings. Economic justification. Energy auditing.

ESYS 3990 Summer Training I Non-Cr

Minimum four weeks (20 working days) of practical work in an organization with a sizable energy operation. Special attention should be given to most but not necessarily all of the following subjects: production, operation, maintenance, management and safety. A formal report as described in the Summer Practice Guide is to be submitted.

ESYS 4002 Hydrogen Energy Systems (3-0)3

Evaluation of energy technologies and their implementation within developing countries, develops an energy strategy, hydrogen research has included design, optimization, and

simulation of stand-alone renewable hydrogen energy systems.

ESYS 4005 Fuel Cells Technology (3-0)3

Types of fuel cells, their advantages, connecting cells in series, efficiency and fuel cell voltage, the effect of pressure and gas concentration, proton exchange membrane fuel cells, alkaline electrolyte fuel cells, delivery fuel cell power, applications of fuel cells.

ESYS 4006 Hydroelectric Power (3-0)3

Evolution of hydroelectric, hydroelectric in Turkey and world, how hydroelectric works and types of hydroelectric plants: conventional, run-of-river plants, storage plants, pumped storage plants, building hydroelectric plants and potential of hydroelectric.

ESYS 4007 Solar Energy Technologies (3-0)3

Comprehensive study of solar energy, its categories and its forms. Basic principles, band theory, p-n junctions, metal-semiconductor junctions, thin-film photovoltaic modules, manufacturing technology, flat-plate modules, solar collectors and technologies.

ESYS 4008 Wind Energy Technologies (3-0)3

Engineering aspects of wind power systems including mechanical design, support structure design, aerodynamic analysis, wind field analysis, system concepts and analysis, economics and cost analysis, conversion to electric and other forms of energy.

ESYS 4010 Bio Energy Technologies (3-0)3

Photosynthesis, planting, harvesting and transporting biomass, anaerobic digestion, liquid fuels, fermentation, gasification, pyrolysis, biodiesel other bioconversions, biomass combustion for heat and power, hydrogen from biomass.

ESYS 4011 Energy Cost Analysis (3-0)3

Understanding of energy economics through an exposure to the practical analytical skills of energy economics as well as to planning

approaches that take into account the cost of environment impacts. Interrelationship between energy, economics and the environment, as well as some important issues in energy policy.

ESYS 4911 Design Project I (0-6)3

The main objective of the course is to develop an acceptable and professional design behavior of the students for energy systems applications. Students are required that fundamentals of design, project management, design tools, simulation standards, quality concepts, design experience through a team project. Solution creativity is the most emphasized design criterion in the design project evaluation.

ESYS 4912 Design Project II (0-6)3

The main objective of the course is to develop an acceptable and professional design behavior of the students for energy systems applications. Students are required that fundamentals of design, project management, design tools, simulation standards, quality concepts, design experience through a team project. Solution creativity is the most emphasized design criterion in the design project evaluation.

ESYS 4920 Independent Study (0-6)3

The unique advantage of Independent Study via written correspondence is its flexibility. Students select their own hours of study and work at their own pace in surroundings most desirable to them. In addition to providing academic credit toward educational goals, independent study is a means of improving professional skills, acquiring knowledge for upgrading job skills, or satisfying intellectual and cultural curiosity.

ESYS 4990 Summer Training II Non-Cr

Minimum four weeks (20 working days) of practical work in an organization with a sizable energy operation. Special attention should be given to most but not necessarily all of the following subjects: maintenance, production planning, management, quality control and design. A formal report as described in the Summer Practice Guide is to be submitted.

DEPARTMENT OF ENVIRONMENTAL ENGINEERING

PROFESSORS

USLU, Orhan (*Chairperson*): Dipl.-Ing., Dr.-Ing., Technische Universitaet München.

ASSOCIATE PROFESSORS

DEMİR, Göksel: B.S., M.S., Ph.D., Istanbul University.

ASSISTANT PROFESSORS

UYANIK, Ömer Lütfü: B.S., M.S., Middle East Technical University, Ph.D., Boğaziçi University.

INSTRUCTORS

AK, Namık: B.S., Karadeniz Technical University, M.S., Istanbul Technical University, Ph.D., Yıldız Technical University.

TUĞTAŞ KARNABAT, A. Evren: B.S., Marmara University, M.S., Ph.D., Georgia Institute of Technology.

TEACHING ASSISTANTS

ÇOBAN, Aslı: B.S., Yıldız Technical University.

ÖZDEMİR, Hüseyin: B.S., M.S., Marmara University.

YİĞİT, Selda: B.S., Marmara University.

GENERAL INFORMATION: Increasing burden imposed upon the nature and environment due to increasing population, rapid depletion of water and land resources, supply and infrastructure problems that get more and more intricate in our cities, pollution of the atmosphere, hydrosphere and the soils are only a few of the challenges that threaten the humanity at the present. Environmental Engineering is a relatively novel engineering discipline that is located at the intersection between the nature, society, science and technology. Its main objective is to protect the environment from the unfavorable effects of humans and to shelter humans from adverse effects of the nature. Furthermore it aims to improve the ambient conditions for the health and welfare of human societies.

The mentioned rapid developments increase the need for environmental engineers and diversify the areas of activity in this branch. To comply with the needs and to provide environmental engineering education with highest academic standards, the department has been inaugurated in the year 2006 and has started accepting students with the academic year 2006-2007. The students benefit from the department's local, national and international connections and partnerships both during and after their education at this university.

The declared mission of the department is to educate environmental engineers who can confidently apply their knowledge and expertise both at local and international platforms. Our graduates are expected to be creative and adaptable to changing conditions and technologies. The knowledge transmission in the department is enhanced by our philosophy of approach to engineering problems: critical thinking, scientifically based engineering and continuous research.

The graduates of the department will be employed both by governmental authorities and private enterprises. The enhancement of research oriented educational approach facilitates employment in research institutions. The continuously developing laboratories provide our graduates with analytical skills, whereas the application of mathematical models at every stage of their education gives them powerful predictive abilities. Lastly, the very close collaboration with the industries gives our students the best opportunities for practice during their education and excellent job opportunities after their graduation.

RESEARCH INTERESTS AND FACILITIES: Research interests in Environmental Engineering at Bahçeşehir University focus on three major areas of environmental engineering: Water management, air pollution control and wastes management. The program aims to provide its students different directions that are available in environmental engineering research domains.

Water management focuses on the quality of both surface and ground waters. The primary objective is the supply of water for the needs of the society in sufficient quantity and acceptable quality. The second objective is the management of domestic and industrial wastewaters, whereas unit operations and processes for water and wastewater treatment are main areas of study. Mathematical modeling of pollutant transport, dispersion and reactions in natural water bodies provides powerful predictive tools. In the water laboratory standard parameters describing the water quality can be determined.

Air pollution control mainly covers the emissions from pollutant sources into the atmosphere and the resulting ambient air quality. Scientific and engineering principles are applied to the design of manufacturing and combustion processes to reduce air pollutant emissions to acceptable levels. Scrubbers, electrostatic precipitators, catalytic converters, and various other processes are utilized to remove particulate matter, nitrogen oxides, sulfur oxides, volatile organic compounds (VOC), reactive organic gases (ROG) and other air pollutants from flue gases and other sources prior to allowing their emission to the atmosphere. The fully equipped Air Pollution Control Laboratory is accredited by the Ministry of Environment.

Waste management mainly covers the origins and quantities and collection, transport, processing, recycling or disposal of waste materials. It can involve solid, liquid, gaseous or hazardous substances, with different methods and fields of expertise for each.

Environmental systems analysis, environmental impact assessment, environmental risk assessment, environmental management systems, life cycle assessment, natural resource management, environmental economics and environmental law are also subjects that frame the area of interest in environmental engineering.

Environmental engineers may pursue careers in pollution monitoring and control, in design, construction and operation of waste treatment facilities, in industrial waste management and in administrative duties.

Courses are supported by applied sessions in various facilities available at Bahçeşehir University Engineering Faculty. The water and air pollution control laboratories provide our graduates with analytical skills, whereas the application of mathematical models at every stage of their education gives them powerful predictive abilities. The faculty also provides additional applications including programming, simulation and systems analysis in several computer labs.

CURRICULUM

CODE	COURSE TITLE	WEEKLY HOURS and CREDITS
FIRST YEAR		
First Semester		
MATH 1051	Calculus I	(3-2)4
CHEM 1001	General Chemistry I	(3-2)4
PHYS 1001	Physics I	(3-2)4
CMPE 1900	Introduction to Information Technologies	(0-2)1
ENVR 1001	Introduction to Environmental Engineering	(2-2)3
ENG 1003	Communication Skills and Academic Reporting I	(2-2)3
Second Semester		
MATH 1052	Calculus II	(3-2)4
PHYS 1002	Physics II	(3-2)4
ENVR 1002	Environmental Chemistry I	(3-0)3
CMPE 1403	Introduction to Programming (VB)	(2-2)3
ENG 1004	Communication Skills and Academic Reporting II	(2-2)3
GENG 1000	Critical Thinking	(2-0)2
SECOND YEAR		
Third Semester		
MATH 2043	Linear Algebra and Differential Equations	(3-2)4
ENVR 2001	Environmental Microbiology	(2-2)3
ENVR 2003	Environmental Chemistry II	(2-2)3
ENVR 2005	Statics and Strength of Materials	(3-0)3
TLL 2021	Turkish Language and Literature I	(2-0)2
GEP 1005	History of Civilization I	(3-0)3
Fourth Semester		
ENVR 2002	Environmental Ecology	(3-0)3
ENVR 2010	Material Science	(3-0)3
ENVR 2012	Fluid Mechanic and Hydraulics	(3-0)3
MCH 1002	Computer Aided Technical Drawing	(2-2)3
TLL 2022	Turkish Language and Literature II	(2-0)2
GEP 1006	History of Civilization II	(3-0)3
THIRD YEAR		
Fifth Semester		
ENVR 3001	Water Pollution Control	(2-2)3
ENVR 3003	Urban Water Systems	(2-2)3
ENVR 3005	Unit Operations and Processes	(3-0)3
ENVR 3007	Geographical Information Systems	(3-0)3
ENVR 3990	Summer Training I	Non-Cr
HIST 3051	History of Turkish Republic I	(2-0)2
GE Elective		(3-0)3

Sixth Semester

ENVR 3002	Geotechnical Engineering	(3-0)3
ENVR 3004	Wastewater Treatment	(2-2)3
ENVR 3006	Air Pollution and Control	(2-2)3
ENVR 3008	Solid Waste Management	(3-0)3
MATH 3082	Probability and Statistics	(3-0)3
HIST 3052	History of Turkish Republic II	(2-0)2

FOURTH YEAR

Seventh Semester

ENVR 4911	Design Project I	(0-6)3
ENVR 4990	Summer Training II	Non-Cr
IE 4400	Principles of Engineering Economics	(3-0)3
Restricted Elective		(3-0)3
Restricted Elective		(3-0)3
Restricted Elective		(3-0)3
GE Elective		(3-0)3

Eighth Semester

ENVR 4002	Integrated Pollution Prevention and Control	(3-0)3
ENVR 4004	Environmental Modeling	(3-0)3
Restricted Elective		(3-0)3
Restricted Elective		(3-0)3
Restricted Elective		(3-0)3

LIST OF RESTRICTED ELECTIVE COURSES

Air Pollution and Control Option

ENVR 4101	Air Pollution Monitoring	(2-2)3
ENVR 4102	Atmospheric Chemistry	(3-0)3
ENVR 4103	Air Pollution Modeling	(3-0)3
ENVR 4104	Advanced Topics in Air Pollution	(3-0)3

Solid and Hazardous Waste Option

ENVR 4201	Hazardous Waste Management	(3-0)3
ENVR 4202	Thermal Processes in Solid Waste	(3-0)3
ENVR 4203	Solids and Biosolids Treatment and Disposal	(3-0)3
ENVR 4204	Solid Wastes Analysis	(3-0)3

Water Pollution and Control Option

ENVR 4301	Advanced Wastewater Treatment	(3-0)3
ENVR 4302	Operation of Treatment Plants	(3-0)3
ENVR 4303	Industrial Wastewater Treatment	(3-0)3
ENVR 4304	Marine Pollution	(3-0)3

Common Courses:

ENVR 4400	Environmental Impact and Risk Assessment	(3-0)3
ENVR 4401	Environmental Management Systems	(3-0)3
ENVR 4402	Environmental Biotechnology	(3-0)3
ENVR 4403	Environmental Impact of Energy Systems	(3-0)3
ENVR 4404	Environmental Economy	(3-0)3
ENVR 4405	Environmental Law	(3-0)3
ENVR 4406	Noise Pollution and Control	(3-0)3
ENVR 4407	Independent Studies	(3-0)3
ENVR 4912	Design Project II	(0-6)3

MINOR PROGRAM IN ENVIRONMENTAL ENGINEERING

The minor program in Environmental Engineering at Bahçeşehir University offers courses on various aspects of Environmental Engineering to undergraduate students from other engineering or science majors. 24 credits are required to get a minor in Environmental Engineering program.

Courses to select for minor in Environmental Engineering

ENVR 1002	Environmental Chemistry I
ENVR 2001	Environmental Microbiology
ENVR 2003	Environmental Chemistry II
ENVR 2012	Fluid Mechanic and Hydraulics
ENVR 3001	Water Pollution and Control
ENVR 3003	Urban Water Systems
ENVR 3004	Wastewater Treatment
ENVR 3005	Unit Operations and Processes
ENVR 3006	Air Pollution and Control
ENVR 3008	Solid Waste Management
ENVR 4002	Integrated Pollution Prevention and Control
ENVR 4004	Environmental Modeling
ENVR 4911	Design Project I

COURSE DESCRIPTIONS

ENVR 1001 Introduction to Environmental Engineering (2-2)3

Environmental processes and environmental systems, physical, chemical, and biological processes related to environmental science and engineering. Root causes of environmental problems. Anthropogenic influences upon systems. Development of scientific understanding and engineering solutions with application to air water and soil environments.

ENVR 1002 Environmental Chemistry I

(2-2)3

Review of the chemistry fundamentals, basic principles and concepts of environmental chemistry, review of chemical equilibrium, water chemistry, nature and types of water pollutants, atmospheric chemistry, biogeochemistry, analytical techniques.

ENVR 2001 Environmental Microbiology (2-2)3

Microorganisms in natural environments, specialized techniques for sampling, culture, isolation and identification. Wastewater treatment, bioremediation, biofilm engineering, and other applications. Public health issues. Microbial processes in the agriculture, food science and industry.

ENVR 2002 Environmental Ecology (3-0)3

Flow of energy and materials through ecosystems, regulation of the distribution and abundance of organisms, productivity and biogeochemical cycles in ecosystems, trophic dynamics, community structure and stability, competition and predation, evolution and natural selection, population growth and physiological ecology, aquatic systems.

ENVR 2003 Environmental Chemistry II (2-2)3

Sampling, analysis and evaluation of analysis results. Most commonly used parameters in environmental engineering: pH, acidity-alkalinity, dissolved oxygen, biological oxygen demand, chemical oxygen demand, salinity-conductivity, hardness, particulate substances, color and turbidity.

ENVR 2005 Statics and Strength of Materials (3-0)3

Fundamental theory of statics and strength of materials, static equilibrium, stress, strain, analysis of structures (trusses and frames), thermal deformation, shear force and shear strain. Bending moment diagrams for beams, axial and shear stress in beams, beam selection, columns, torsion, rivets and welds, friction effects, combined stresses and statically indeterminate structures. Tanks and pressurized vessels.

ENVR 2010 Material Science (3-0)3

Expanding use and development of materials in today's world, properties and uses of materials, scientific theories, practical applications and technology, internal structure of materials, atomic binding force, relations between binds with material specialties.

ENVR 2012 Fluid Mechanics and Hydraulics (3-0)3

Concepts and definitions: continuum; properties of the velocity field; types of flow; streamlines and path lines; basic analysis techniques of the flow; pressure distribution in a fluid; conservation of mass; conservation of linear momentum; conservation of energy; laminar and turbulent flow. Flow in pipes, head losses; friction coefficients; open channel flow. Groundwater flow. Contaminant transport in the environment.

ENVR 3001 Water Pollution Control (2-2)3

Basic concepts and definitions. Physical, biogeochemical, morphological and biological fundamentals. Mathematical models for predicting distribution and fate of effluents discharged into lakes, reservoirs, rivers, estuaries, and oceans. The role of element cycles, such as oxygen, nitrogen, and phosphorus, as water quality indicators. Characterization of natural waters. Water resources. Water supply and treatment. Conceptual design of treatment plants.

ENVR 3002 Geotechnical Engineering (3-0)3

Application of principles of soil mechanics, the origin and nature of soils, soil classification, the effective stress principle, hydraulic conductivity and seepage, stress-strain-strength behavior of cohesion less and cohesive soils and application to lateral earth stresses, bearing capacity and slope stability.

ENVR 3003 Urban Water Systems (2-2)3

Principles of design for water supply and distribution systems, sewage collection and sewer design, sewer construction and maintenance characteristics of sewage, sewage disposal, miscellaneous wastewater treatment techniques, storm water collection systems, financial considerations.

ENVR 3004 Wastewater Treatment (2-2)3

Protecting water quality with an emphasis on fundamental principles, wastewater quantity, wastewater characterization, effluent and discharge standards, philosophy of design, theory and conceptual design of systems for treating municipal wastewater. Reactor theory, process kinetics, and models. Physical, chemical, and biological processes. Sludge

processing. Natural processes for wastewater treatment. Reuse and recycling of wastewaters.

ENVR 3005 Unit Operations and Processes (3-0)3

Classification of water pollutants; physical and chemical preliminaries; screening; flow equalization; mixing and flocculation; sedimentation; floatation; aeration and gas transfer; granular medium filtration; chemical coagulation; chemical precipitation; chemical oxidation; chemical neutralization; softening; disinfection; biochemical processes; membrane processes; activated carbon adsorption; ion exchange; management of treatment plant sludges; economical considerations.

ENVR 3006 Air Pollution and Control

(2-2)3

Basic principles of air quality, air pollution effects, pollutant generation and control strategies, air pollution measurements, air pollutant concentration models and principles of designing air pollution control technologies, their theory and practice, selection of control devices, global warming.

ENVR 3007 Geographical Information Systems (3-0)3

Introduction to GIS. Basic principles of mapping. Available software. Installation of the software. Opening projects; zoom and pan. Identify; features and attributes; tables and sorting; selection and queries, classification; symbolization; histograms; naming layers; labeling features; map tips, map projection; scale; measuring distance; overview map; exporting an image; layouts, integrating image data; saving projects; adding data; event (xy) themes; hot links; buffer; catalog, scale dependency; accessing data from servers. Remote sensing fundamentals: electromagnetic spectrum; cosmic rays; radar imaging; false color. Satellite orbits; spatial resolution; digital data; digitizing. Multispectral remote sensing; thermal infrared; Landsat thematic mapper; reflected infrared energy.

ENVR 3008 Solid Waste Management

(3-0)3

Engineering design and operational aspects of waste generation, collection, storage, transfer, processing. Composting; treatment and disposal of organic waste. Engineering evaluation of integrated waste management,

solid waste characterization and classification, reduction, reuse and recycling, resource recovery and utilization. Life cycle assessment of waste, physical and chemical treatment methods and composting. Landfill design and operation including: site selection, engineered sites, liners and covers, leachate control and treatment, gas recovery and control, and landfill monitoring and reclamation.

ENVR 3990 Summer Training I Non-Cr

Minimum four weeks (20 working days) of practical work in an organization in the field of environmental engineering design, operation or construction. A formal report as described in the Summer Practice Guide is to be submitted.

ENVR 4002 Integrated Pollution

Prevention and Control (3-0)3

Main principles for the permitting and control of installations based on an integrated approach and the application of best available techniques (BAT) which are the most effective techniques to achieve a high level of environmental protection, taking into account the costs and benefits. Integrated approach reversing the waste management hierarchy, emission limit values, key components of IPPC, the permitting process, competent authorities, monitoring (self-monitoring), enforcement and control, public access, potential benefits and constraints of IPPC.

ENVR 4004 Environmental Modeling

(3-0)3

Introduction to systems and systems dynamics, types of models, development of models applied to environmental systems, recapitulation of basic programming concepts, steady state modeling of water distribution, sewage collection and treatment systems, formulation of models for rivers and lakes, model for the oxygen dissolved in a river, models of thermal processes at the air-water interface, process modeling, optimization models, modeling and GIS.

ENVR 4101 Air Pollution Monitoring

(2-2)3

Nature of the emissions limits, legislation on emissions of air pollutants and their monitoring, gas composition calculations, collecting and processing of the data, quality assurance and control, calibration and

accuracy, safety and the management of site work.

ENVR 4102 Atmospheric Chemistry (3-0)3
Thermodynamics, kinetics, spectroscopy, and photochemistry. Atmospheric gases and particles. Global cycles of C, H, O, N, and S species. Use of laboratory and field measurements in atmospheric computer models.

ENVR 4103 Air Pollution Modeling (3-0)3
Fundamental aspects of mathematical modeling for air pollution. Practical applications of models for planning and managing air quality in various meteorological and topographical conditions. Model types, three dimensional chemical transport models, numerical solutions, emission inventories.

ENVR 4104 Advanced Topics in Air Pollution (3-0)3
Processes determining transport and diffusion of primary and secondary pollutants. Models of chemical transformation of the atmospheric boundary layer and of mesoscale wind fields, pollutant dispersion problems.

ENVR 4201 Hazardous Waste Management (3-0)3
Engineering solutions to industrial and municipal hazardous waste problems (handling, transportation, storage, disposal technologies), hazardous waste treatment technologies. Upgrading abandoned disposal sites, economic and regulatory aspects, case studies.

ENVR 4202 Thermal Processes in Solid Waste (3-0)3
Thermal processes in the energy recovery, waste management and engineering designs of solid waste. Waste incineration, advantages and disadvantages. Best available techniques for municipal solid waste incineration. Pyrolysis and gasification. Management of residues. Economics of MSW incineration.

ENVR 4203 Solids and Biosolids Treatment and Disposal (3-0)3
Solids and biosolids sources, characteristics and quantities, regulations. Physical, chemical and biological operations. Solids mass balances, application of biosolids on land, storage and disposal of biosolids.

ENVR 4204 Solid Wastes Analysis (3-0)3
Municipal solid waste (MSW) including refuse generation, source reduction, collection, transportation, recycling and resource recovery, burial in landfills, landfill capacity, feasibility of recycling and combustion.

ENVR 4301 Advanced Wastewater Treatment (3-0)3
Technologies used for removal of residual constituents in conventionally treated wastewaters to meet more stringent reuse and discharge requirements, removal of specific inorganic and organic constituents, water reclamation technologies, industrial water reuse, groundwater recharge with reclaimed water. Classification of technologies; process selection and performance. Depth filtration, surface filtration, membrane filtration processes, membrane configurations; electro dialysis. Disposal of concentrated waste streams. Adsorption: GAC and PAC systems. Gas stripping. Ion exchange. Advanced oxidation processes. Distillation.

ENVR 4302 Operation of Treatment Plants (3-0)3
Maintenance and operation of wastewater treatment plants. Sources of wastewater, wastewater treatment processes, support systems, treatment unit processes and process control, supervision and management, safety systems. Optimization of treatment performance.

ENVR 4303 Industrial Wastewater Treatment (3-0)3
Sources of industrial wastewater: agricultural waste, iron and steel industry, mines and quarries, food industry, complex organic chemicals industry, nuclear industry, water treatment. Characterization of industrial wastewaters, process studies, treatability, unit operations and processes. Treatment of industrial wastewater: solids removal, oils and grease removal, removal of biodegradable organics (activated sludge process, trickling filter process); treatment of other organics; treatment of acids and alkalis; treatment of toxic materials.

ENVR 4304 Marine Pollution (3-0)3
Origin and evolution of oceans in the earth history. Properties of sea water. Circulation and currents. Waves. Tides. The marine

biological environment. Coastal environments: estuaries, deltas, islands, rocky coasts. Open marine environments: reefs, continental shelf, outer continental margin, the pelagic environment, the floor of the ocean basins. Human impact on the marine environment. Marine pollution: measuring change; oxygen-demanding wastes; oil pollution; metals; halogenated hydrocarbons; radioactivity; dredgings, solids, plastics, and heat; the state of seas around turkey. United Nations Law of the Sea.

ENVR 4400 Environmental Impact and Risk Assessment (3-0)3

Definition and evolution of the EIA; elements of the EIA process; screening; scoping; analysis of environmental impact using technical and non-technical parameters. Environmental impact assessment legislation and regulatory framework; impact prediction; use of GIS and mathematical modeling; review process; public participation; monitoring; strategic impact assessment (SIA).

ENVR 4401 Environmental Management Systems (3-0)3

Environmental audits. Environmental management systems (EMS) ISO 14000/14001 standards and applications. Principles of sustainable development and implications of finite biosphere and complexities for engineering design and decision-making. Design of controlled environments to enhance health and protection of natural resources for sustainable development. Resource problems and design with ecological, economic, demographic and social dimensions. Techniques to integrate knowledge and define policy. Risk analysis. Life cycle analysis. Risk management.

ENVR 4402 Environmental Biotechnology (3-0)3

Prevention and clean-up of pollution in domestic and industrial waste streams. Mixed microbial culture theory and reactor technology in relation to the design and scale-up of advanced treatment processes from the laboratory to the full-scale implementation.

ENVR 4403 Environmental Impact on Energy Systems (3-0)3

Energy, where to get it from, how to use it efficiently, and how to reduce negative

environmental impacts from its production, distribution and use. Energy cycle in ecosystems, thermodynamic laws, energy resources, renewable energy, non-renewable resources. Impact of energy production on the environment, main principles of energy policy, global energy use, sustainable energy use and future energy alternatives.

ENVR 4404 Environmental Economy (3-0)3

The interface economy-environment; environmental economics; natural resources economics; ecological economics; resources, environment and population: sustainable development; basic concepts of environmental economics. Theory of externalities; pareto efficiency and market failure; the optimum level of pollution; pigouvian taxes; Coase's theorem. Environmental regulation; detailed analysis of the instruments of environmental regulation; economic evaluation of natural and environmental resources; the concept of total economic value; evaluation methodologies; national accounting systems; sustainability indicators. Natural resources economics; taxonomy and models; non-renewable resources, energy resources and recyclable resources; renewable resources, exhaustible and non-exhaustible resources. Particular cases.

ENVR 4405 Environmental Law (3-0)3

Introduction to statutes, common law, treaties, conventions, regulations and policies which operate to regulate the interaction of humanity and the rest of the biophysical or natural environment. Prevention of present and future externalities. Eco-taxes, emission trading, precautionary principle, public participation, environmental justice, and the polluter pays principle. Laws that control air quality, water quality, global climate change, agriculture, biodiversity, species protection, pesticides and hazardous chemicals, waste management, remediation of contaminated land, sustainable development, impact review, and conservation, stewardship and management of public lands and natural resources.

ENVR 4406 Noise Pollution and Control (3-0)3

Overview of environmental sources of noise and its effects on humans and the environment. Definitions, theoretical concepts. Noise

measurements. Frequency analysis: instruments, sampling. Sources of noise. Impacts of noise. Control of noise pollution: Noise control at source, control in the transmission path, using protection equipment. Documentation of noise measurements. Regulatory guidelines. Assessment (EIA) studies.

ENVR 4407 Independent Studies (3-0)3

Skilled students can choose the Independent Studies listed in the general track as one of their restricted elective subjects only with the consent of the instructor. To simplify the selection of the subject, students may opt for one of these specialization tracks, but they may also use a track as basis to design a customized program tailored to meet their individual interests and career goals.

ENVR 4911 Design Project I (0-6)3

An in-depth investigation and design about one of the environmental subjects: water pollution and control, air pollution and control, solid and hazardous waste.

ENVR 4912 Design Project II (0-6)3

Students can choose the Design Project II listed in the general track as one of their restricted elective subjects with the consent of the instructor. To simplify the selection of the subject, students may opt for one of the specialization tracks, but they may also use another track as basis to design a customized program tailored to meet their individual interests and career goals.

ENVR 4990 Summer Training II Non-Cr

Minimum four weeks (20 working days) of practical work in an organization in the field of environmental engineering design, operation or construction. A formal report as described in the Summer Practice Guide is to be submitted.

DEPARTMENT OF INDUSTRIAL ENGINEERING

ASSOCIATE PROFESSORS

BAYRAKTAR, Erkan (*Associate Dean*): B.S., M.S., Dokuz Eylül University, Ph.D., University of Iowa.

ASSISTANT PROFESSORS

BEŞKESE, Ahmet: B.S., M.S., Ph.D., Istanbul Technical University.
BOZBURA, Faik Tunç (*Chairperson*): B.S., M.S., Ph.D., Istanbul Technical University.

INSTRUCTORS

ÇORUM, Adnan: B.S., Eastern Mediterranean University, M.S., Marmara University.
ÖZGÜR ÜNLÜAKIN, Demet: B.S., M.S., Ph.D., Boğaziçi University.
YÜCEL, Mehmet Hilmi: B.S., Bilkent University, M.S., Nottingham University.

TEACHING ASSISTANTS

ERZURUM, Erdem: B.A., Kocaeli University, M.S., Bahçeşehir University.
EVECEN, Cihan: B.S., Bahçeşehir University.
KOÇ, Ayşenur: B.S., Bahçeşehir University.
ÖZER, İpek: B.S., Işık University.
ÖZGÜN, Çağrı: B.S., Galatasaray University, M.S., Bahçeşehir University.
ÜŞENMEZ, Jibd Ani Arsenyan: B.S., Galatasaray University, M.S., Institut National Polytechnique de Grenoble.

ADJUNCT PROFESSORS

BEŞKESE, Berna: B.S., M.S., Ph.D., Istanbul Technical University.
BOLAT, Ahmet: B.S., Istanbul Technical University, M.S., Stanford University, Ph.D., University of Michigan.
BÜYÜKÖZKAN, Gülçin: B.S., Istanbul Technical University, M.S., Boğaziçi University, B.S., Ph.D., Institut National Polytechnique de Grenoble.
CHOWDHURY, Raj: B.S., Sam Houston State University, M.Ed., Texas A&M University, Ed.D., West Virginia University.
KAVUŞTURUCU, Ayşe: B.S., Purdue University, M.S., Ph.D., Northeastern University.
ONUR, Levent: B.S., Aston University, M.S., Stanford University, Ph.D., Virginia Polytechnic Institute & State University.
ÖNCAN, Temel: B.S., Istanbul Technical University, M.S., Ph.D., Boğaziçi University.

GENERAL INFORMATION: Industrial Engineering is an interdisciplinary branch that develops systems for the optimal use of human and other resources in the design and distribution of products and services. The main goal of Industrial Engineering is to improve the productivity and competitiveness of organizations. Industrial engineers are, in general, employed in the sectors such as manufacturing, energy, health, finance, telecommunication, and transportation. In these sectors, contemporary performance measures of responsiveness, cost, quality, and flexibility are aimed in the implementation and management of systems.

The mission of the Industrial Engineering Department at Bahçeşehir University is to contribute the most recent technological and scientific developments on the area of Technology Management, Supply Chain Management, Intelligent Manufacturing Systems, Knowledge Management and Concurrent Engineering. The principle of education in the Industrial Engineering Program of Bahçeşehir University is to create leaders of the future who adapt to the current developments and changes on the work environment and are good at teamwork.

Bahçeşehir University offers several areas of specialization in Industrial Engineering Program with three different tracks: Engineering Management, Operations Management, and Decision and Optimization.

Industrial engineers may find employment opportunities in the fields of manufacturing, and service industries such as health services, communications, retailing, banking, finance, tourism, logistics and transportation.

RESEARCH INTERESTS AND FACILITIES: Research interests in Industrial Engineering at Bahçeşehir University focus on three major areas of industrial engineering: operations management, decision analysis and optimization, and engineering management. The program aims to provide its students different directions available in industrial engineering research domains.

Operations management, which manages the production of quality goods and services in order to ensure efficiency and effectiveness of the organization, includes topics such as enterprise resource planning, quality management, logistics and supply chain management, ergonomics, computer integrated manufacturing systems, and facilities planning.

Decision analysis and optimization, which mainly covers the topics in operations research such as linear and non-linear optimization, scheduling and sequencing, probability and statistics, system analysis, simulation; employ applied mathematics and decision tools in order to perform quantitative analysis of complex problems and attain optimal solutions.

Engineering management, another focus of industrial engineering combining industrial engineering and business administration in order to apply engineering tools with business knowledge, includes topics such as strategic management, project management, marketing, human resources, management information systems, finance, and marketing.

Industrial engineers may pursue careers as operations research analyst, system analyst, production and warehouse manager, production and operations manager, human resources manager and similar professions.

Courses are supported by applied sessions in various facilities available at Bahçeşehir University Engineering Faculty. CIM (Computer Integrated Manufacturing) laboratory offers a wide range of instructional and research activities. Manufacturing automation, advanced material processing and computer controlled/assisted manufacturing are covered through CIM lab, which assist undergraduate students in manufacturing oriented courses. The faculty also provides additional applications including programming, simulation, operations research, and statistics in several computer labs and sessions in physics and chemistry labs.

CURRICULUM

CODE	COURSE TITLE	WEEKLY HOURS and CREDITS
FIRST YEAR		
First Semester		
MATH 1051	Calculus I	(4-0)4
PHYS 1001	Physics I	(3-2)4
CMPE 1403	Introduction to Programming (VB)	(2-2)3
IE 1001	Introduction to Industrial Engineering	(3-0)3
ENG 1003	Communication Skills and Academic Reporting I	(2-2)3
GENG 1000	Critical Thinking	(2-0)3
Second Semester		
MATH 1052	Calculus II	(3-2)4
PHYS 1002	Physics II	(3-2)4
CHEM 1001	General Chemistry I	(3-2)4
CMPE 1404	Problem Solving with VB	(2-2)3
CMPE 1900	Introduction to Information Technologies	(0-2)1
ENG 1004	Communication Skills and Academic Reporting II	(2-2)3
SECOND YEAR		
Third Semester		Fourth Semester
IE 2001	Introduction to Business Management	(3-0)3
MATH 3082	Probability and Statistics	(3-0)3
MCH 2006	Manufacturing Processes	(2-2)3
ECON 2225	Principles of Economics	(3-0)3
TLL 2021	Turkish Language and Literature I	(2-0)2
GEP 1005	History of Civilization I	(3-0)3
IE 2002	Statistics in Engineering	(3-2)4
IE 2004	System Analysis	(3-0)3
IE 2006	Management Information Systems	(3-0)3
MATH 2043	Linear Algebra and Differential Equations	(3-2)4
TLL 2022	Turkish Language and Literature II	(2-0)2
GEP 1006	History of Civilization II	(3-0)3
THIRD YEAR		
Fifth Semester		
IE 3001	Operations Research I	(3-2)4
IE 3003	Engineering Economics	(2-2)3
IE 3005	Operations Management	(2-2)3
IE 3990	Summer Training I	Non-Cr
HIST 3051	History of Turkish Republic I	(2-0)2
Restricted Elective		(3-0)3
GE Elective		(3-0)3

Sixth Semester

IE	3002	Operations Research II	(3-2)4
IE	3004	Work Study and Ergonomics	(2-2)3
IE	3006	Production Planning and Control	(2-2)3
HIST	3052	History of Turkish Republic II	(2-0)2
Restricted Elective			(3-0)3
GE	Elective		(3-0)3

FOURTH YEAR

Seventh Semester

IE	4001	Quality Management	(3-0)3
IE	4003	System Simulation	(2-2)3
IE	4911	Research Project	(0-6)3
IE	4990	Summer Training II	Non-Cr
Restricted Elective			(3-0)3
Restricted Elective			(3-0)3
GE	Elective		(3-0)3

Eighth Semester

IE	4002	Project Management	(2-2)3
IE	4004	Facility Planning	(2-2)3
Restricted Elective			(3-0)3
Restricted Elective			(3-0)3
Restricted Elective			(3-0)3

LIST OF RESTRICTED ELECTIVE COURSES

Engineering Management Option

IE 3102	Enterprise Resource Planning	(2-2)3
IE 4101	Decision Support and Executive Inf. Systems	(3-0)3
IE 4102	Strategic Management	(3-0)3
IE 4103	Human Resources Management	(3-0)3
IE 4104	Productivity Management	(3-0)3
IE 4105	Advanced Engineering Economy	(3-0)3
IE 4106	Business Process Reengineering	(3-0)3
IE 4107	Work Safety	(3-0)3
IE 4912	Design Project	(3-0)3
IE 4930	Selected Topics in Industrial Engineering I	(3-0)3
IE 4931	Selected Topics in Industrial Engineering II	(3-0)3
ACC 3001	General and Cost Accounting	(3-0)3
BUS 3567	Principles of Marketing I	(3-0)3
LAW 3111	Labor Law I	(2-0)2

Operations Management Option

IE 3102	Enterprise Resource Planning	(2-2)3
IE 4201	Computer Integrated Manufacturing Systems	(2-2)3
IE 4202	Supply Chain and Logistics Management	(3-0)3
IE 4203	Design of Experiments	(3-0)3
IE 4204	Maintenance and Reliability	(3-0)3
IE 4205	Advanced Production Planning	(3-0)3
IE 4206	Service Operation Management	(3-0)3
IE 4208	Advanced Human Factors Engineering	(3-0)3
IE 4106	Business Process Reengineering	(3-0)3
IE 4912	Design Project	(3-0)3
IE 4930	Selected Topics in Industrial Engineering I	(3-0)3
IE 4931	Selected Topics in Industrial Engineering II	(3-0)3
MCH 1002	Computer Aided Technical Drawing	(2-2)3

Decision and Optimization Option

IE 3301	Introduction to Decision Analysis	(3-0)3
IE 3302	Stochastic Processes	(3-0)3
IE 4202	Supply Chain and Logistics Management	(3-0)3
IE 4203	Design of Experiments	(3-0)3
IE 4204	Maintenance and Reliability	(3-0)3
IE 4205	Advanced Production Planning	(3-0)3
IE 4301	Scheduling and Sequencing	(3-0)3
IE 4302	Combinatorial Optimization	(3-0)3
IE 4303	Nonlinear Programming	(3-0)3
IE 4304	Advanced Queuing and Simulation Systems	(3-0)3
IE 4305	System Dynamics	(3-0)3
IE 4912	Design Project	(3-0)3
IE 4930	Selected Topics in Industrial Engineering I	(3-0)3
IE 4931	Selected Topics in Industrial Engineering II	(3-0)3

MINOR PROGRAM IN INDUSTRIAL ENGINEERING

The minor programs in Industrial Engineering at Bahçeşehir University offer courses on some concentration areas of industrial engineering to undergraduate students from other engineering or science majors. Three aspects of industrial engineering are embraced with minor in engineering management, optimization, and operations management. 24 credits are required to get a minor in the aforementioned programs.

Courses to select for minor in Engineering Management

IE 2001	Introduction to Business Management
IE 2004	System analysis
IE 2006	Management Information Systems
IE 3001	Operations Research
IE 3003	Engineering Economy
IE 3004	Work Study and Ergonomics
IE 3005	Operations Management
IE 4001	Quality Management
IE 4002	Project Management
IE 4102	Strategic Management
IE 4103	Human Resources Management
IE 4107	Work Safety
ACC 3001	General and Cost Accounting

Courses to select for minor in Operations Management

IE 3001	Operations Research
IE 3002	Operations Research II
IE 3003	Engineering Economy
IE 3004	Work Study and Ergonomics
IE 3005	Operations Management
IE 3006	Production Planning and Control
IE 4001	Quality Management
IE 4002	Project Management
IE 4003	System Simulation
IE 4004	Facility Planning
IE 4106	Business Process Reengineering
IE 4201	Computer Integrated Manufacturing Systems
IE 4202	Supply Chain and Logistics Management
IE 4206	Service Operations Management

Courses to select for minor in Optimization

IE 2004	System Analysis
IE 3001	Operations Research
IE 3002	Operations Research II
IE 3003	Engineering Economy
IE 3005	Operations Management
IE 3301	Introduction to Decision Analysis
IE 4002	Project Management
IE 4003	System Simulation
IE 4203	Design of Experiment
IE 4204	Maintenance and Reliability
IE 4301	Scheduling and Sequencing
IE 4302	Combinatorial Optimization
IE 4303	Non-linear Programming
IE 4305	System Dynamics

COURSE DESCRIPTIONS

IE 1001 Introduction to Industrial Engineering (3-0)3

Basic concepts and methods of industrial engineering (IE) through team-based hands-on activities. Explorations of the profession of Industrial Engineering. A brief overview of some selected topics like: History of IE, systems approach, quality management, manufacturing engineering, operations research, engineering economy.

IE 2001 Introduction to Business Management (3-0)3

Planning a business, selecting a form of business ownership, business ethics and social responsibility, economic environment, industry environment, global environment, fundamentals of effective management,

organizational structure, production management, human resources management, product and pricing strategies, distribution and promotion strategies, managing information.

IE 2002 Statistics in Engineering (3-2)4

Collection and analysis of data regarding stochastic industrial processes, data analysis, definition of relationships, experiment modeling, sampling distribution theory, hypothesis tests, experiment with one or more factors, regression analysis. Applications with statistics program packages.

IE 2004 System Analysis (3-0)3

System concept, system analysis, feasibility study, problem definition and refining, systems modeling, system requirements, design

parameters, cost factors, implementation, follow-up work, re-evaluation, and feedback.

IE 2006 Management Information Systems (3-0)3

Information technology infrastructure, information needs of management, information technology uses by various business subsystems, and how information technology can be used as a competitive resource. Use of information technology to solve business problems.

IE 3001 Operations Research I (3-2)4

Modeling concepts; linear programming; problem formulation; graphical solution of basic linear models; simplex and dual simplex methods; duality and sensitivity analysis; transportation, applications of transshipment and assignment problems.

IE 3002 Operations Research II (3-2)4

Integer programming; traveling salesman problem, cutting plane algorithms and branch and bound techniques, decision theories, AHP, introduction to heuristic solutions, goal programming and its applications, game theory, dynamic programming.

Prerequisite: IE3001

IE 3003 Engineering Economics (2-2)3

Foundations of engineering economy, effects of time and interest rates on money, nominal and effective interest rates, present worth analysis, annual worth analysis, rate of return analysis, benefit/cost analysis, replacement and retention decisions, selection from independent projects under budget limitation, breakeven analysis.

IE 3004 Work Study and Ergonomics (2-2)3

Motion and time study for the lean environment, the importance of motion and time study, techniques of methods design: the product flow macromotion, techniques of micromotion study: operations analysis, motion study: the work station design, work sampling, indirect labor, motion and time study, performance control systems, wage payment systems. Introduction to human factors, information input and processing, visual displays, auditory and tactual displays, speech communications.

IE 3005 Operations Management (2-2)3

Strategy and competition, forecasting, production concepts and systems, strategic capacity planning, design of work systems, location planning and analysis, supply chain management, management of quality.

IE 3006 Production Planning and Control (2-2)3

Aggregate planning, inventory management and control, push and pull production control systems: MRP, ERP, JIT, Lean operations, operations and production scheduling, line balancing, waiting lines reliability and maintainability and learning curves.

IE 3102 Enterprise Resource Planning (2-2)3

Principles and computer-based applications of resource management in production systems, supply chain management, materials requirement planning, manufacturing resources planning, business process reengineering (BPR), enterprise resource planning (ERP) systems, their modules, ERP software applications and ERP software selection process.

IE 3301 Introduction to Decision Analysis (3-0)3

Maximizing expected monetary value. Maximizing expected utility. Judgmental probabilities. Value of information. Normal form of analysis. Risk sharing. Overview of modeling techniques and methods used in decision analysis, including multi attribute utility models, decision trees, and Bayesian models. Elicitation techniques for model building are emphasized. Practical applications through real world model building are described and conducted.

IE 3302 Stochastic Processes (3-0)3

Fundamental ideas in the area of modeling and analysis of real World phenomena in terms of stochastic processes. The course covers different classes of Markov processes: discrete and continuous-time Markov chains, Brownian motion and discussion processes. It also presents some aspects of stochastic calculus with emphasis on the application to real world problems.

IE 3990 Summer Training I Non-Cr
Students must do 1st Apprenticeship for 20 workdays during summer vacation. Organization for summer practice means to find an employment opportunity in the future, so it is very important to select an adequate organization and at the same time this builds an important section of your C.V. The idea behind dividing summer training into two parts is to make students experience different fields of industrial engineering.

IE 4001 Quality Management (3-0)3
Quality concept, statistical quality control (acceptance sampling, types of sampling plans, standard sampling plans, causes of variation etc.), statistical process control (control charts), managerial and organizational aspects of quality function, role of quality control in quality management, total quality concept, quality assurance systems and ISO-9000.
Prerequisite: IE2002

IE 4002 Project Management (2-2)3
Concept forming, target definition, plan development, timing, budgeting, team forming, planning with PERT and CPM, resource leveling, time and cost analyses, project implementation and control, earned value method.

IE 4003 System Simulation (2-2)3
Definition of and basic concepts in system simulation. Steps of simulation study. Statistics and probability concepts used in simulation. Design of discrete systems simulation models. Programming of simulation models. Modeling with simulation language. Validation and verification analyses. Output analysis.

IE 4004 Facility Planning (2-2)3
Basic terminology, plant design process, models and techniques of plant location selection, facility planning, systematical facility planning, models and techniques of facility planning, computer-based facility planning algorithms, facility planning in just in time and cellular manufacturing.

IE 4101 Decision Support and Executive Information Systems (3-0)3
Decision process and decision support systems (DSS); components of a DSS: data components, model components, user-interface

components, and mail components; international DSS; designing a DSS; implementation and evaluation of DSS; group decision support systems; executive information systems.

IE 4102 Strategic Management (3-0)3
Strategy development process, evaluation of external and internal factors, SWOT analysis, strategy types, competitive positioning, business development, financial targeting, value management, actions planning, business planning.

IE 4103 Human Resources Management (3-0)3
Evolution of human resources function, basic concepts and definitions in human resources management, functions of human resources management. New paradigms and approaches in human resources. Strategic human resources management. Human capital and the future of human resources activities.

IE 4104 Productivity Management (3-0)3
Basic definition, measurement and management of productivity, and efficiency, analysis of existing level, solution creation, implementation and control, some special productivity applications in important industries.

IE 4105 Advanced Engineering Economy (3-0)3
Theoretical foundations and advanced concepts in engineering projects and operations. Economic decision methods under certainty and uncertainty. Engineering economy applications in different industries, advanced investment plans.

IE 4106 Business Process Reengineering (3-0)3
Information technology for redesigning business processes and organizations, understand the assumptions embedded in changing business with information technology, evaluate problems in the planning and implementation of organizational change, assess the relationship of process reengineering to other initiatives to improve the performance of organizations, understand the behavioral issues surrounding the use of information technology in organizational change.

IE 4107 Work Safety (3-0)3
Introduction to work safety. Work accidents and occupational diseases. Basic principles of work safety. Economics of work safety. Work safety and human factors engineering. Psychology of work safety. Accident statistics and accident inspection.

IE 4201 Computer Integrated Manufacturing Systems (2-2)3
Improvement the usage of computer in production, NC, CNC and DNC systems, parts programming, introduction to CAD/CAM systems, computer aided quality (CAQ), robots, automatic guided vehicles (AGV), automated transfer lines and conveyor systems, automated material handling and storage systems, automated assembly lines and their balancing, flexible manufacturing systems.

IE 4202 Supply Chain and Logistics Management (3-0)3
Course focuses on engineering design concepts and optimization models for logistics decision making in three modules: supply chain design, planning and execution, and transportation, supply chain and logistics applications.

IE 4203 Design of Experiments (3-0)3
Principles of experimental design: randomization, blocking, transformations, fixed and random effects. Single factor experiments (The analysis of variance), Latin squares, factorial designs, response surface methods and designs.

IE 4204 Maintenance and Reliability (3-0)3
This course will cover important reliability concepts and methodology that arise in modeling, assessing and improving product reliability and in analyzing field and warranty data. Maintenance and reliability applications.

IE 4205 Advanced Production Planning (3-0)3
Introduction to basic techniques of scheduling, manufacturing planning and control, just-in-time systems, capacity planning, master production scheduling, single machine processing, constructive algorithms for flow-shops, scheduling heuristics, intelligent scheduling systems, manpower and materials

requirement planning, inventory management, maintenance planning.

IE 4206 Service Operation Management (3-0)3
The design and management of systems for services. Studying service operations management from an integrated viewpoint with a focus on customer satisfaction. It will combine operations, marketing, strategy, information technology, human resources, and organizational aspects of services using both text material and cases. Beginning with the service encounter, service managers must blend marketing, technology, people, and information to achieve a distinctive competitive advantage.

IE 4208 Advanced Human Factors Engineering (3-0)3
Advanced methodologies used in human factors engineering. Observational methods; function/task analysis; computerized human factors design methods; human reliability and error prediction; evaluation of human-machine interface; modeling techniques; questionnaire survey design; experimental design, and other selected topics.

IE 4301 Scheduling and Sequencing (3-0)3
Deterministic scheduling and sequencing problems such as single machine scheduling, parallel machine scheduling, flow shop scheduling, and job shop scheduling. An introduction to neighborhood search techniques, such as genetic algorithms, tabu search, simulated annealing, and ant systems, are also covered.

IE 4302 Combinatorial Optimization (3-0)3
Contemporary techniques for key combinatorial optimization problems such as: shortest path, maximum flow problems, and the traveling salesman problem. Techniques include problem-specific methods and general approaches such as branch-and-bound, genetic algorithms, simulated annealing, and neural networks.

IE 4303 Nonlinear Programming (3-0)3
Modeling, alternative theorems, convex sets, general convex functions, required and sufficient optimality conditions, duality theory,

quadratic programming algorithms, linear completion problems, constant point calculations. Direct scanning, Newton and quasi-Newton gradient projection, decreased gradient methods.

IE 4304 Advanced Queuing and Simulation Systems (3-0)3

Simulation methodology and its comparison with other techniques. Random number generation, random variety generation, selecting input distributions, Design of simulation experiments. Statistical analysis of output. Selected applications of simulation. Markovian queues and Jackson networks. Steady- state behavior of general service time queues. Priority queues. Approximation methods and algorithms for complex queues.

IE 4305 Systems Dynamics (3-0)3

History of system dynamics, definition of system dynamics approach, study of methods and application areas. Influence and flow diagrams. Preparation of Dynamo equations. Behaviors of positive and negative feedback loops, and S-curve. A system dynamics approach to industrial systems.

IE 4400 Principles of Engineering Economics (3-0)3

What economics is about, microeconomics and macroeconomics, demand and supply, foundations of engineering economy, effects of time and interest rates on money, nominal and effective interest rates, present worth analysis, annual worth analysis, rate of return analysis, breakeven analysis, replacement and retention decisions.

IE 4911 Research Project (0-6)3

Applications of an industrial engineering subjects with a large literature survey. Subjects should be selected from quality, production, manufacturing, optimization, decision

sciences, supply chain, advanced statistics, human factors, engineering economics, and human resource management areas.

IE 4912 Design Project (0-6)3

Applications of an industrial engineering subjects with a specific problem solution technique. Subjects should be selected from quality, production, manufacturing, optimization, decision sciences, supply chain, advanced statistics, human factors, engineering economics, and human resource management areas.

IE 4930 Selected Topics in Industrial Engineering I (3-0)3

Study of various topics, like advanced optimization techniques, with current technical developments in industrial engineering. Applications in industrial engineering concepts with large-scale modeling and their solution techniques.

IE 4931 Selected Topics in Industrial Engineering II (3-0)3

Study of various topics, like advanced optimization techniques, with current technical developments in industrial engineering. Applications in industrial engineering concepts with large-scale modeling and their solution techniques.

IE 4990 Summer Training II Non-Cr

Students must do 2nd Apprenticeship for 20 workdays during summer vacation. Organization for summer practice means to find an employment opportunity in the future, so it is very important to select an adequate organization and at the same time this builds an important section of your C.V. The idea behind dividing summer training into two part is make students to experience different fields of industrial engineering.

DEPARTMENT OF MECHATRONICS ENGINEERING

PROFESSORS

SEZER, Erol (*Dean/Chairperson*): B.S., M.S., Ph.D., Middle East Technical University.
ALNIAK, M. Oktay: B.S., Ege University, M.S., Boğaziçi University, Ph.D., Gazi University.

ASSISTANT PROFESSORS

ÇEKİÇ, Yalçın: B.S., M.S., Ph.D., Istanbul University.
KADIPAŞAOĞLU, Kamuran: B.S., M.S., Boğaziçi University, Ph.D., Clemson University.

INSTRUCTORS

GÜR, Berke: B.S., Middle East Technical University, M.S., University of Southern California, Ph.D.,
University of Massachusetts-Lowell.
ŞAHİN, Haydar: B.S., Istanbul Technical University, M.S., Rochester Institute of Technology.

TEACHING ASSISTANTS

ELİBOL, Taha: B.S., Sabancı University.
KAZMA, Coşkun: B.S., Bahçeşehir University.
SERBES, Görkem: B.S., Bahçeşehir University.

ADJUNCT PROFESSORS

ERTÜRK, Ercan: B.S., M.S., Middle East Technical University, Ph.D., Illinois Institute of
Technology.
KURŞUN, Ümit: B.S., M.S., Boğaziçi University, Ph.D., University of Central Florida.
ÖNÖZ, Bihrat: B.S., Ege University, M.S., Ph.D., Istanbul Technical University.

GENERAL INFORMATION: Mechatronics Engineering is a modern discipline that integrates mechanical, electrical and electronics, control, and software engineering. It focuses on the design and control of advanced electro-mechanical devices and systems, ranging from ordinary consumer goods such as digital cameras and photocopiers to complex devices such as precision robots used in surgical operations and automated machines used in manufacturing.

Mechatronics engineers may perform the following tasks:

- Design, develop, maintain and manage high-technology engineering systems for the automation of industrial tasks.
- Apply automated solutions to the transfer of material, components or finished goods.
- Design advanced computer-driven electronic control systems.
- Design and assist in the manufacture of consumer products.
- Apply electronic and mechanical processes and computers to tasks where the use of human labor may be dangerous.
- Carry out studies into the feasibility, cost implications and performance benefits of new mechatronic equipment.

Thus, mechatronics engineers are not only qualified to work in many of the traditional areas of electrical, mechanical, computer, and software engineering, but also, and more importantly, in those growing industries and job markets where there is a need for engineers who understand and can work across various engineering domains. Among the largest sectors that employ mechatronics engineers are the manufacturing, automotive, and medical industries.

The main objective of our Mechatronics Engineering Department of is to produce engineers who have the knowledge and skills needed to create modern mechatronic devices, can communicate effectively and work with engineers from other disciplines, and can adapt themselves to rapidly shifting technologies. For this purpose, the department offers a program that includes various engineering science courses from the relevant fields in addition to a strong foundation in basic sciences and mathematics. A large number of elective courses enable the students to develop in specific directions of their choice. Our graduates will not only help satisfy the existing need for mechatronics engineers in Turkey, but also create engineers that make a difference in the industry going forward.

RESEARCH INTERESTS AND FACILITIES: The Department of Mechatronics Engineering is a young department with a rapidly growing research profile. Mechatronics research within our Department spans a wide range of exciting and new engineering areas such as Biomedical Engineering, Robotics and Mechatronics in Medicine, Micro-Electro-Mechanical-Systems.

CURRICULUM

CODE	COURSE TITLE	WEEKLY HOURS and CREDITS
FIRST YEAR		
First Semester		
MATH 1051	Calculus I	(3-2)4
PHYS 1001	Physics I	(3-2)4
CMPE 1401	Introduction to Programming (C)	(2-2)3
MCH 1002	Computer Aided Technical Drawing	(2-2)3
ENG 1003	Communication Skills and Academic Reporting I	(2-2)3
GENG 1000	Critical Thinking	(2-0)2
Second Semester		
MATH 1052	Calculus II	(3-2)4
PHYS 1002	Physics II	(3-2)4
CHEM 1001	General Chemistry I	(3-2)4
MCH 1001	Introduction to Mechatronics	(2-2)3
CMPE 1900	Introduction to Information Technologies	(0-2)1
ENG 1004	Communication Skills and Academic Reporting II	(2-2)3

SECOND YEAR

Third Semester

MCH 2003	Engineering Materials	(3-0)3
MATH 1042	Linear Algebra with MATLAB	(3-0)3
EEE 2180	Electronic Devices and Circuits	(3-2)4
CMPE 2013	Data Structures and Algorithms (C)	(3-2)4
TLL 2021	Turkish Language and Literature I	(2-0)2
GEP 1005	History of Civilization I	(3-0)3

Fourth Semester

MCH 2006	Manufacturing Processes	(2-2)3
MCH 2008	Engineering Mechanics	(4-0)4
ESYS 2004	Fundamentals of Thermodynamics	(3-0)3
MATH 2062	Differential Equations	(3-0)3
TLL 2022	Turkish Language and Literature II	(2-0)2
GEP 1006	History of Civilization II	(3-0)3

THIRD YEAR

Fifth Semester

MCH 3007	Mechanical Components and Systems	(2-2)3
EEE 2204	Introduction to Digital Design	(3-2)4
EEE 2312	Modeling, Analysis and Simulation	(2-2)3
EEE 3406	Electromechanical Energy Conversion	(3-2)4
MCH 3990	Summer Training I	Non-Cr
HIST 3051	History of Turkish Republic I	(2-0)2
Free Elective		(3-0)3

Sixth Semester

MCH 3002	Introduction to Fluid Mechanics	(3-0)3
EEE 3205	Microprocessors	(3-2)4
EEE 3304	Feedback Control Systems	(3-2)4
MATH 3083	Probability and Random Variables	(3-0)3
IE 4400	Principles of Engineering Economics	(3-0)3
HIST 3052	History of Turkish Republic II	(2-0)2

FOURTH YEAR

Seventh Semester

MCH 4911	Design Project I	(0-6)3
MCH 4990	Summer Training II	Non-Cr
EEE 4331	Measurement and Instrumentation	(2-2)3
Technical Elective		(3-0)3
Technical Elective		(3-2)4
Free Elective		(3-0)3

Eighth Semester

MCH 4001	Fundamentals of Robotics	(2-2)3
EEE 4204	Introduction to Embedded Systems	(3-0)3
Technical Elective		(3-0)0
Technical Elective		(3-0)3
Free Elective		(3-0)3

LIST OF ELECTIVE COURSES

MCH 4103	Introduction to Microelectromechanical Systems	(3-0)3
MCH 4202	Autonomous Robotics	(1-4)3
MCH 4912	Design Project II	(0-6)3
MCH 4920	Independent Study	(0-6)3
MCH 4931	Selected Topics I	(3-0)3
MCH 4932	Selected Topics II	(3-0)3
CMPE 4001	Computer Communication Networks	(3-0)3
CMPE 4501	Introduction to Artificial Intelligence and Expert Systems	(3-0)3
EEE 4010	Optimization	(3-0)3
EEE 4012	Computational Programming for Engineers	(2-2)3
EEE 4314	Nonlinear Control Systems	(3-0)3
EEE 4321	Industrial Automation	(3-2)4
EEE 4340	Fuzzy Systems and Neural Networks	(3-0)3
EEE 4441	Power Electronics	(3-2)4
EEE 4442	Electrical Drives	(3-2)4
IE 4002	Project Management	(2-2)3
SE 3006	Software Architecture	(2-2)3
SE 3301	Computer Graphics and Animation	(2-2)3
SE 4221	Concurrent and Real Time Software Development	(3-0)3
MATH 3012	Numerical Analysis	(2-2)3
Junior or Senior Engineering or Math Course		(3-0)3
Graduate Level Engineering or Math Course		(3-0)3

MINOR PROGRAM IN MECHATRONICS ENGINEERING

Undergraduate students from other engineering and science majors of Bahçeşehir University may pursue a minor degree in Mechatronics Engineering. Students are required to complete 24 credits to get a minor in the program.

Courses to select for minor in Mechatronics Engineering

MCH 1001	Introduction to Mechatronics
MCH 1002	Computer-Aided Technical Drawing
MCH 2003	Engineering Materials
MCH 2008	Engineering Mechanics
MCH 3002	Introduction to Fluid Mechanics
MCH 3007	Mechanical Components and Systems
MCH 4001	Fundamentals of Robotics
MCH 4103	Introduction to Microelectromechanical Systems
EEE 2180	Electronic Devices and Circuits
EEE 3205	Microprocessors
EEE 3304	Feedback Control Systems
EEE 4331	Measurement and Instrumentation

COURSE DESCRIPTIONS

MCH 1001 Introduction to Mechatronics (2-2)3

Introduction to mechatronics class is introduced with an emphasis on analog electronics, digital electronics, sensors and transducers, actuators, and microcontrollers. Basic mechanics and electrical circuits will be introduced, since the mechatronics is the integration of the mechanical and electronic components. Additionally, the controls feedback theory will be introduced to integrate the system of the mechatronics. Finally, robots will be discussed as case study of the mechatronics.

MCH 1002 Computer Aided Technical Drawing (2-2)3

This course is designed to equip the student with basic engineering theoretical background as well as thorough practical experience and mainly covers; basic drawing instruments, hand drawing, scaling, orthographic/multi-view projection, hidden geometry representation, sectional views, geometric construction of surface modeling, 3D solid modeling, dimensioning fundamentals with surface texture quality, tolerances, fits, screw threads.

MCH 2003 Engineering Materials (3-0)3

This course introduces the student to theory and application of engineering materials. While particular emphasis is placed on traditional structural materials, emerging materials technology is also discussed. Topics explore the physical and mechanical properties of metals, polymers, ceramics, and composite materials. Useful applications and limitations of those materials are presented, and means of modifying their properties are discussed at length.

MCH 2006 Manufacturing Processes (3-0)3

The purpose of this course is to give design, mechatronics and manufacturing engineers basic information on materials and processing. Summary of material production, behaviors and application places with safety usage principles. Basic manufacturing principles, tools, and operations on manufacturing machines.

MCH 2008 Engineering Mechanics (4-0)4

Concept of force and power moment; friction; equilibrium condition; static of rigid bodies. Basics of kinematics; concepts of force, power moment, work, power, impulse, angular momentum; Newton's laws and torque term; elastic and non-elastic collision; dynamics of rigid bodies; theory of vibrations: free and forced oscillations, resonance, damping; dynamic stability.

MCH 3002 Introduction to Fluid Mechanics (3-0)3

To gain a basic understanding of the fundamental principles of fluid mechanics and acquire experience in some applications to engineering practice. Hydrostatic; fluid dynamics; dynamics of compressible fluids; potential, turbulent and boundary limit flow; tube flow; Navier-Stoke-Equation and its applications.

MCH 3007 Mechanical Components and Systems (2-2)3

Springs, dampers, mechanical capacitance elements, mechanical transformers, mechanical gyrators. Four-bar mechanisms, slider-crank mechanisms, cam-follower systems, gear trains, belt and chain drives. Geneva and star-wheel mechanisms, screw mechanisms, clamping mechanisms, snap-action switching mechanisms, detent and ratchet mechanisms, couplings and joints.

MCH 3990 Summer Training I Non-Cr

Minimum four weeks (20 working days) of practical work in an organization with a sizable mechatronics or electrical or electronics operation. Special attention should be given to most but not necessarily all of the following subjects: production, operation, maintenance, management and safety. A formal report as described in the Summer Practice Guide is to be submitted.

MCH 4001 Fundamentals of Robotics (2-2)3

Robot types and their characteristics. Forms and characteristics of robot elements. Position and orientation of rigid body. Denavit-Hartenberg convention. Kinematics and inverse kinematics. Modeling of robot

dynamics. Lagrange-Euler and Newton-Euler methods. Trajectory planning. Interpolation methods. Hierarchical robot control. Algorithms for control of coordinates of robot joint servo-systems (position, speed, torque and force). Robots with artificial intelligence.

MCH 4103 Introduction to Microelectromechanical Systems (3-0)3

MEMS (Microelectromechanical Systems) is one of the most important high technologies developed in 20th century. This course covers the fundamentals of MEMS. It includes the introduction to MEMS, basic microfabrication techniques, MEMS materials and their properties, MEMS device design and simulation, working principle analysis, MEMS device fabrication sequence, MEMS packaging and assembly, signal testing, MEMS device case study.

MCH 4202 Autonomous Robotics (1-4)3

Introduce students to the variety of mechanical, electronic and control issues raised by the design and construction of autonomous mobile robots. Each group will receive a complete robot kit consisting of a controller board, miscellaneous sensors and motors, and a variety of LEGO parts. Students

will perform a series of focused exercises that will incrementally introduce them to design issues related to mechanics, sensors, motors and control of an autonomous mobile robot.

MCH 4911 Design Project I (0-6)3

The main objective of the course is to develop an acceptable and professional design behavior of the students for mechatronic applications. Students are required to design, manufacture and test performance of a mechatronic machine. Mechatronic creativity is the most emphasized design criterion in the design project evaluation.

MCH 4912 Design Project II (0-6)3

This course is a continuation of MCH 4911 Design Project I.

MCH 4990 Summer Training II Non-Cr

Minimum four weeks (20 working days) of practical work in an organization with a sizable mechatronics or electrical or electronics operation. Special attention should be given to most but not necessarily all of the following subjects: maintenance, production planning, management, quality control and design. A formal report as described in the Summer Practice Guide is to be submitted.

DEPARTMENT OF SOFTWARE ENGINEERING

PROFESSORS

AYDIN, Nizamettin: B.S., M.S., Yıldız Technical University, Ph.D., Leicester University.

ASSOCIATE PROFESSORS

KARAOCA, Adem (*Chairperson*): B.S., Istanbul Technical University, M.S., Ph.D., Istanbul University.

ASSISTANT PROFESSORS

TEMEL, Turgay: B.S., Uludağ University, M.S., Istanbul Technical University, Ph.D., Boğaziçi University.

TUNGA, Mehmet Alper: B.S., M.S., Ph.D., Istanbul Technical University.

ÜNAL, Mehmet: B.S., Ankara University, M.S., Ph.D., University of Missouri-Columbia.

INSTRUCTORS

KARAOCA, Dilek: B.S., M.S., Istanbul University.

TEACHING ASSISTANTS

ARİFOĞLU, Evren: B.S., Bahçeşehir University.

ÇAKIR, Duygu: B.S., Bahçeşehir University.

GÜLLÜOĞLU, Batuhan: B.S., Bahçeşehir University.

MUSTAPAŞA, Oğuz: B.S., Bahçeşehir University.

SALMAN, Yücel Batu: B.S., M.S., Bahçeşehir University.

UÇAR, Tamer: B.S., Bahcesehir University.

ADJUNCT PROFESSORS

KURNAZ, Sefer: B.S., Turkish Air Force Academy, M.S., Ege University, Ph.D., Istanbul University.

PINAR, İbrahim: B.S., Istanbul Technical University, M.S., Ph.D., Istanbul University.

ÖZTURAN, Meltem: B.S., Boğaziçi University, M.S., Ph.D., Istanbul University.

UZUNBOYLU, Hüseyin: B.S., Anadolu University, M.S., Ph.D., Ankara University.

GENERAL INFORMATION: Software plays an increasingly important and central role in all aspects of our daily lives. It is one of the most critical components in the management of critical systems such as metros, airports, energy, military defense, hospital, and banks. Parallel to this, the number, size, complexity, and application domains of programs being developed will grow dramatically. There are serious problems in the cost, timeliness, and quality in development of many software products. As a result, there is an increasing demand for software engineers who have professional education and preparation for the practice of software engineering. The Software Engineering Department of Bahçeşehir University is aiming to educate students to be engineers who will develop software that meets the demands of industry and society. Department curriculum contains math, physics, social sciences (psychology, sociology, and economics) in addition to technical courses like data structures, database management systems, human computer interaction, and computer graphics and animation. The graduates will have high communication skills and they will be able to keep up and to lead in software development.

Graduates of Software Engineering Program will be able to find jobs virtually in any field involving software in government, banking and finance, education, transportation, telecommunication, entertainment, medicine, agriculture, industry, law, etc. Graduates are strongly encouraged to build their own businesses.

RESEARCH INTERESTS AND FACILITIES: Research interests in Software Engineering at Bahçeşehir University focus on three major areas of software engineering: information systems, internet and programming, and artificial intelligence. The program aims to provide its students different directions available in software engineering research domains.

Information systems mainly cover the information systems design and development, software architecture, database systems, web and application services and sort of the related IS components.

Internet and Programming, one of the focus area of the SE, which includes Internet technologies, advanced web programming, software ergonomics, software project management, web services, game programming, computer graphics and animation.

Artificial intelligence minor program includes artificial neural networks, fuzzy systems and fuzzy databases, data mining and web mining, natural language processing, concurrent and real time software development.

Software engineers may continue their careers as information system analyst, software architect, database administrator, software programmer, systems engineer, network operator and similar professions.

Courses are supported by applied sessions in various facilities available at Bahçeşehir University Engineering Faculty. Smart Class laboratories offer a wide range of instructional and research activities. Laboratory section supports theoretical information with practical experiences.

CURRICULUM

CODE	COURSE TITLE	WEEKLY HOURS and CREDITS
FIRST YEAR		
First Semester		
MATH 1051	Calculus I	(3-2)4
MATH 2033	Discrete Mathematics	(3-0)3
PHYS 1001	Physics I	(3-2)4
SE 1001	Introduction to Programming (Java)	(2-2)3
CMPE 1900	Introduction to Information Technologies	(0-2)1
ENG 1003	Communication Skills and Academic Reporting I	(2-2)3
Second Semester		
MATH 1052	Calculus II	(3-2)4
PHYS 1002	Physics II	(3-2)4
CHEM 1001	General Chemistry I	(3-2)4
SE 1002	Object Oriented Programming (Java)	(2-2)3
ENG 1004	Communication Skills and Academic Reporting II	(2-2)3

SECOND YEAR

Third Semester

SE 2101	Database Management Systems	(3-2)4
SE 2201	Computing Systems	(3-0)3
SE 2211	Data Structures and Algorithms I	(2-2)3
MATH 1042	Linear Algebra with MATLAB	(2-2)3
TLL 2021	Turkish Language and Literature I	(2-0)2
GEP 1005	History of Civilization I	(3-0)3

Fourth Semester

SE 2002	Programming Languages	(3-0)3
SE 2006	Software Laboratory	(1-2)2
SE 2102	Database Programming	(2-2)3
SE 2212	Data Structures and Algorithms II	(2-2)3
TLL 2022	Turkish Language and Literature II	(2-0)2
GEP 1006	History of Civilization II	(3-0)3
Math/Science Elective		(3-0)3

THIRD YEAR

Fifth Semester

SE 3001	Software Engineering Analysis and Design	(3-0)3
SE 3003	Software Project Management	(3-0)3
SE 3301	Computer Graphics and Animation	(2-2)3
MATH 3082	Probability and Statistics	(3-0)3
CMPE 3001	Operating Systems	(3-0)3
SE 3990	Summer Training I	Non-Cr
HIST 3051	History of Turkish Republic I	(2-0)2

Sixth Semester

SE 3002	Software Measurement and Testing	(3-0)3
SE 3004	Web Programming	(2-2)3
SE 3006	Software Architecture	(2-2)3
SE 3302	Human Computer Interface Design	(3-0)3
HIST 3052	History of Turkish Republic II	(2-0)2
Math/Science Elective		(3-0)3

FOURTH YEAR

Seventh Semester

SE 4911	Design Project I	(0-6)3
SE 4990	Summer Training II	Non-Cr
MATH 3012	Numerical Analysis	(2-2)3
Restricted Elective		(3-0)3
Restricted Elective		(3-0)3
Restricted Elective		(3-0)3
Free Elective		(3-0)3

Eighth Semester

IE 4400	Principles of Engineering Economics	(3-0)3
Restricted Elective		(3-0)3
Restricted Elective		(3-0)3
Free Elective		(3-0)3
Free Elective		(3-0)3

LIST OF RESTRICTED ELECTIVE COURSES

Information Systems Option

SE 4504	Management Information Systems	(3-0)3
CMPE 4001	Computer Communication Networks	(3-0)3
CMPE 4321	Introduction to Network Security and Cryptography	(3-0)3
CMPE 4410	Information Security Management	(3-0)3

Internet and Programming Option

SE 4221	Concurrent and Real time Software Development	(3-0)3
SE 4406	Advances in Web Programming	(3-0)3
SE 4422	Scripting Languages	(2-2)3
SE 4515	Introduction to Game Programming	(2-2)3
CMPE 4220	Multimedia Systems and Communications	(3-0)3

Artificial Intelligence and Expert Systems Option

CMPE 3005	Analysis of Algorithms	(3-0)3
CMPE 4003	Formal Languages and Automata Theory	(3-0)3
CMPE 4336	Introduction to Data Mining	(3-0)3
CMPE 4409	Real time Operating Systems	(3-0)3
CMPE 4501	Introduction to Artificial Intelligence	(3-0)3
EEE 4340	Fuzzy Systems and Neural Networks	(3-0)3

Common Courses:

SE 4912	Design Project II	(0-6)3
SE 4920	Independent Study	(0-6)3
SE 4931	Special Topics in Software Engineering I	(3-0)3
SE 4932	Special Topics in Software Engineering II	(3-0)3
Junior or Senior Engineering or Math Course		(3-0)3
Graduate Level Engineering or Math Course		(3-0)3

MINOR PROGRAMS IN SOFTWARE ENGINEERING

The minor programs in Software Engineering at Bahçeşehir University offer courses on some concentration areas of software engineering to undergraduate students from other engineering or science majors. Three aspects of software engineering are embraced with minor in information systems management, internet and programming. 24 credits are required to get a minor in the aforementioned programs.

Courses to select for minor in Information Systems

SE 2101	Database Management Systems
SE 2102	Database Programming
SE 3001	Software Engineering Analysis and Design
SE 3002	Software Measurement and Testing
SE 3003	Software Project Management
SE 3004	Web Programming
SE 3006	Software Architecture
SE 3302	Human Computer Interface Design
SE 4504	Management Information Systems
CMPE 3001	Operating Systems
CMPE 4001	Computer Communication Networks
CMPE 4321	Introduction to Network Security and Cryptography
CMPE 4410	Information Security Management
CMPE 4220	Multimedia Systems and Communications

Courses to select for minor in Internet and Programming

SE 2101	Database Management Systems
SE 2102	Database Programming
SE 3001	Software Engineering Analysis and Design
SE 3003	Software Project Management
SE 3004	Web Programming
SE 3006	Software Architecture
SE 3301	Computer Graphics and Animation
SE 3302	Human Computer Interface Design
SE 4221	Concurrent and Real time Software Development
SE 4406	Advances in Web Programming
SE 4422	Scripting Languages
SE 4504	Management Information Systems
SE 4515	Introduction to Game Programming
CMPE 4409	Real time Operating Systems

Courses to select for minor in Artificial Intelligence

SE 4221	Concurrent and Real time Software Development
SE 4515	Introduction to Game Programming
CMPE 4003	Formal Languages and Automata Theory
CMPE 4336	Introduction to Data Mining
CMPE 4409	Real time Operating Systems
CMPE 4501	Introduction to Artificial Intelligence and Expert Systems
EEE 4340	Fuzzy Systems and Neural Networks
MATH 3082	Probability and Statistics

COURSE DESCRIPTIONS

SE 1001 Introduction to Programming (Java) (2-2)3

Object-oriented, event-driven strategies are emphasized to prepare students for more advanced programming studies in subsequent classes. Students are also introduced to programming best practices including comment to code and naming conventions. Introduction to object oriented programming concepts with Java, classes, inheritance, polymorphism, essential java objects for data structures, simple graphical development using JAVA, exception handling structures.

SE 1002 Object Oriented Programming (Java) (2-2)3

Object-oriented, event-driven strategies are emphasized to prepare students for more advanced programming studies in subsequent classes. Students are also introduced to programming best practices including comment to code and naming conventions. Introduction to object oriented programming concepts with Java, classes, inheritance, polymorphism, essential java objects for data structures, simple graphical development using JAVA, exception handling structures.

SE 2002 Programming Languages (3-0)3

The course covers topics such as scope, binding, types, subroutines, classes, and so on to master some of the fundamental concepts that underlie programming language syntax and semantics through a comparative study of several languages and their features; to learn several new programming language features and paradigms; to gain the ability to study general conceptual linguistic issues to gain insight into the problem of designing new languages and compilers.

SE 2006 Software Laboratory (C#) (1-2)2

.NET framework, object oriented programming overview, collections, interfaces, namespaces, exceptions, working with files, windows applications, user controls, dynamic controls, panels, simple database connections, using common .NET libraries.

SE 2101 Database Management Systems (3-2)4

Main objective is to understand the Database Management Systems and creating more efficient database schemas according to the normalization theories by using SQL and PL/SQL. The course covers Database Design and the E-R Model, relational databases, SQL, other relational languages, query optimization, and XML.

SE 2102 Database Programming (2-2)3

Main objective is to understand the database programming methods with advances in SQL and PL/SQL, and dynamic web programming techniques focusing on databases. The course covers SQL, Advanced SQL, PL/SQL, and Architectural Design by using DBMS.

SE 2201 Computing Systems (3-0)3

Bits, data types, and operations, digital logic structures, the Von Neumann model, programming, assembly language, I/O, TRAP routines and subroutines, the stack, introduction to programming in C, variables and operators, control structures, functions, testing and debugging, pointers and arrays, recursion, I/O in C, data structures.

SE 2211 Data Structures and Algorithms I (2-2)3

Introducing basic data organizations, data structures, algorithms, and algorithms complexity, time-space tradeoff. Mathematical preliminaries, algorithm analysis; best, worst and average cases. Calculating the running time of a program. Analyzing problems; space and time bounds. Theta and big O notations. Flow chart. Linear arrays. Sorting algorithms; searching algorithms; memory allocation, garbage collection. Stacks.

SE 2212 Data Structures and Algorithms II (2-2)3

The course covers analysis of time and space requirements of important algorithms. Techniques include order-notation, recurrence relations, information-theoretic lower bounds, adversary arguments. Analysis of the key data structures: trees, hash tables, balanced tree schemes, priority queues, Fibonacci and binomial heaps. Algorithmic paradigms such

as divide and conquer, dynamic programming, union-find with path compression, augmenting paths.

SE 3001 Software Engineering Analysis and Design (3-0)3

The course covers system analysis and design in terms of the software engineering perspective. Course starts with fundamentals of system analysis, project management, process modeling, feasibility analysis and application architecture and modeling.

SE 3002 Software Measurement and Testing (3-0)3

Development of software that needs to meet specific external goals, where these goals need to be expressible in measurable terms. It covers the principles of software measurement, and the ways in which they are used in planning software projects, and in monitoring how well projects are being carried out. It also examines the methods used for software testing in more detail than previous courses, and discusses the application of software measurement techniques to these testing methods.

SE 3003 Software Project Management (3-0)3

Main objective is to understand the software project lifecycle and define the usual stages of a software project management. Using a variety of cost-benefit evaluation techniques for choosing among competing project proposals and evaluating the risk. The course covers project planning, program management, project evaluation, software effort estimation, activity planning, risk management, monitoring and control, managing contracts, managing people and organizing team, and software quality.

SE 3004 Web Programming (2-2)3

This course introduces essential topics of Internet Programming. Topics include: protocols, client-server model, html forms programming, scripting, Java programming and applications development over the net, Java class methods, using the jdk/Javac, Java events, Java AWT, Java applets, layout managers, image animation, Java threads, Java beans, and VRML applications development. Creating executable content on the web will be the main focus of the course.

SE 3006 Software Architecture (2-2)3

This course addresses the role of software architectures in the development of enterprise application systems. Topics include: web-based architectures, application architectures, data architectures, middleware technologies, and architectural view types and styles.

SE 3301 Computer Graphics and Animation (2-2)3

This course provides an introduction to Computer Graphics and Animation and mathematical aspects. By successfully completing this course, students will learn fundamental graphics and animation algorithms and be able to develop substantial graphics/animation applications under C++ by using popular OpenGL API.

SE 3302 Human Computer Interface Design (3-0)3

The course covers an introduction to HCI, interactive systems natural, user modeling in user-centered system design, user-centered system design process, task analysis, requirements gathering, storyboarding and prototyping, psychology: memory, cognitive psychology: perception, and evaluation.

SE 3990 Summer Training I Non-Cr

Minimum four weeks (20 working days) of practical internship should have been completed at information technologies related departments of an organization. Special attention should be given to most but not necessarily all of the following subjects: web programming, databases, information technologies service management. A formal report as described in the Summer Practice Guide is to be submitted.

SE 4221 Concurrent and Real Time S/w Development (3-0)3

The course covers an introduction to systems theory and the software life cycle; requirements analysis including project initiation, feasibility study, cost/benefit considerations and specification; real time software development; languages and implementations; concurrency; structured analysis; system design, hardware-software trade-off, application to distributed systems; software management, software maintenance, and version and configuration control.

SE 4406 Advances in Web Programming (3-0)3

The course covers XML basics, namespaces, document type definitions, cascading style sheets, XPath expressions, XML stylesheet language transformations, XML schemas, XML query language, XForms, XLink, XPointer, XML document object model, SQL/XML.

SE 4422 Scripting Languages (2-2)3

This course is a study of a class of programming languages and tools known as scripting languages. Topics include: writing scripts to control and connect other programs, strengths and weaknesses of interpreted languages, extending scripting languages to include new functionality, embedding functions of a scripting language in other tools, syntax and usage of regular expressions, and the role of open-source software. Programming projects in multiple languages will be required.

SE 4503 Introduction to IT Services Management (3-0)3

This course addresses issues such as services, quality, organization, policy and process management. These concepts provide the backdrop for the development of a systematic approach to IT Service Management.

SE 4504 Management Information Systems (3-0)3

The objective of the course is to motivate students to teach them the role of Information Systems in organizations. MIS topics related with computer technologies, information development, and impact of information systems on business organization for organization information architectures. Course covers both technical and managerial issues.

SE 4515 Introduction to Game Programming (3-0)3

This course provides students with an introduction to the technologies and software engineering practices used in the video game industry today. Students will learn the basics of creating a PC game based on Microsoft DirectX, through lecture material, hands-on labs, and a final project in which the students will actually build a simple game from the ground up.

SE 4911 Design Project I (0-6)3

The main objective of the course is to develop an acceptable and professional design behavior of the students for software applications. Students are required to design, develop and test performance of a software product. Software applications originality is the most emphasized design criterion in the design project evaluation.

SE 4912 Design Project II (0-6)3

The main objective of the course is to develop an acceptable and professional design behavior of the students for software applications. Students are required to design, develop and test performance of a software product. Software applications originality is the most emphasized design criterion in the design project evaluation.

SE 4920 Independent Study (0-6)3

The unique advantage of Independent Study via written correspondence is its flexibility. Students select their own hours of study and work at their own pace in surroundings most desirable to them. In addition to providing academic credit toward educational goals, independent study is a means of improving professional skills, acquiring knowledge for upgrading job skills, or satisfying intellectual and cultural curiosity.

SE 4931 Special Topics in Software Engineering I (3-0)3

Study of various topics, like advanced design patterns with current technical developments in software engineering. Applications in software engineering concepts with enterprise systems and their solution techniques.

SE 4932 Special Topics in Software Engineering II (3-0)3

Study of various topics, like advanced design in web based application architectures with current technical developments in software engineering. Applications in software engineering concepts with enterprise systems and their solution techniques.

SE 4990 Summer Training II Non-Cr
Minimum four weeks (20 working days) of practical internship should have been completed at information technologies related departments of an organization. Special attention should be given to most but not

necessarily all of the following subjects: web programming, databases, information technologies service management. A formal

report as described in the Summer Practice Guide is to be submitted.