

FACULTY OF ENGINEERING

EDUCATIONAL LABORATORIES

In the Engineering Faculty there are 51 laboratories in total, 34 for educational and 17 for research purposes, as of today (Oct. 23rd, 2015). You can access to the detailed lists of equipment in the inventories of these laboratories by using faculty's internet page-laboratory section (<http://muhf.cankaya.edu.tr/course.php?page=73>). This document contains summary information about our educational laboratories.

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DEPARTMENT OF COMPUTER ENGINEERING

EDUCATIONAL LABORATORIES

Bilgisayar Mühendisliği Bölümü Ders Uygulama Laboratuvarları:

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Genel amaçlı beş adet **Bilgisayar Laboratuvarı** bulunmaktadır. Bunların dördünde 40 adet, birinde 20 adet Windows ve Linux işletim sistemleri ile çalışan yüksek performanslı bilgisayarlar vardır. Laboratuvarlarda Bilgisayar Mühendisliği Temelleri, Bilgisayar Programlama ve İleri Programlama derslerinin uygulamaları yapılmaktadır.

Bilgisayar Mühendisliği Bölümü Mikroişlemci Laboratuvarı: 65 adet hem Windows hem de Linux işletim sistemi ile çalışan masaüstü bilgisayarlar bulunmaktadır. Laboratuvarda mikro işlemci ve mikro denetleyici geliştirme kartları ile çeşitli deneyler yapmak mümkündür. Laboratuvar, daha çok Mikroişlemciler, İşletim Sistemleri, Veri Yapıları gibi derslerin uygulamalarında kullanılmaktadır.

Bilgisayar Mühendisliği Bölümü CISCO Laboratuvarları: Her biri 25 öğrenci kapasiteli CISCO bilgisayar ağ birimi (router ve switch) içeren iki CISCO laboratuvarı bulunmaktadır. Bu laboratuvarlarda, öğrenciler gerçek CISCO switch ve router'ları kullanarak bilgisayar ağları oluşturabilecek gerçek ortamda pratik yapma olanağına sahip olabilecekler. Merkez Kampüs CISCO laboratuvarı H309, Balgat Kampüsü CISCO Laboratuvarı A307 nolu mekanlarda bulunmaktadır.

DEPARTMENT OF INDUSTRIAL ENGINEERING

EDUCATIONAL LABORATORIES

Head of Department: Doç. Dr. Ferda Can ÇETİNKAYA, e-mail: cetinkaya@cankaya.edu.tr , office phone: (0312) 233 1364

Work Study and Ergonomics Laboratory: This laboratory is located in room NB01B. It serves as work study and ergonomics laboratory in which required pieces of equipment are used to measure, test, calibrate and verify certain tasks, movements, and processes. This laboratory is mainly used for the IE 202 course in the Industrial Engineering curriculum. There are several different laboratory tasks performed by students to enhance the theoretical knowledge given in class studies. By using tools such as stopwatch and environmental measurement instruments, students conduct time study activities and work environment evaluations. Students are expected to conduct assembly tasks and do the required measurements in order to calculate cycle time, productivity ratio and production rate of these tasks. Since humans are the most important resource, improving their safety and comfort during processes by good design is a concern of industrial engineers. By using tools such as audiometer, tape measure and anthropometer, students learn how to define the standards of equipment used for providing workers a better work environment. Practicing all these in the context of the IE 202 course help students analyze real life work systems and find ways to make them more productive in their future life.

Modeling and Simulation Laboratory (ModSim Laboratory): ModSim Laboratory is currently located in H338 with a system room besides it. The laboratory schedule is updated every semester based on the IE course schedule. ModSim Laboratory is open between 9:00 and 17:00 to all IE students except for the laboratory lecture hours. This lab is primarily used for conducting the applications for simulation and modelling related industrial engineering course, and also for our students to study and do their assignments such as homework and projects. The lab has 30 student desktop computers, all connected to the university network and internet. Various licensed software programs such as GAMS, Arena, Minitab, Bilişim ERP, Netsis ERP, Microsoft Office that are very important for industrial engineering curriculum are installed on computers. Also, a projector and smart board are available in this lab.

Computer Aided Design (CAD) Laboratories (I and II): Located in rooms H335 and H337, Computer Aided Design (CAD) laboratories are used mainly for engineering drawing courses. These laboratories have computers equipped with AutoCAD technical drawing software package as well as other basic software used in the Industrial Engineering courses, providing students an environment to work on their assignments and projects. There are 31 desktop computers in room H335 and 32 desktop computers in room H337. Also, a projector and a smart board are available in both of these labs.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING EDUCATIONAL LABORATORIES

Head of Department: Prof. Dr. Yahya Kemal BAYKAL, mail: y.baykal@cankaya.edu.tr, office phone: (0312) 233 1385

Elektrik-Elektronik Mühendisliği Bölümü Elektronik ve Haberleşme Bölümü ve Mekatronik Mühendisliği Bölümü bünyesinde kurulmuş olan Eğitim-Öğretim Laboratuvarlarını kullanmaktadır.

DEPARTMENT OF ELECTRONIC AND COMMUNICATION ENGINEERING EDUCATIONAL LABORATORIES

Head of Department: Prof. Dr. Yusuf Z. UMUL, mail: z.umul@cankaya.edu.tr, office phone: (0312) 23313 24

Electronics Laboratory: Students basic electronic component information and measurement of current, voltage and frequency measurement as lessons are learned our laboratory where practical. Each of our students can work independently of one analog and one digital multimeter, two power supplies, one signal generator and oscilloscope 30 units consisting of one test set is available.

Communication Laboratory Our laboratory received basic lessons of the wireless and optical communications technology, basic receiver techniques, basic transmitter technology, digital communication with modulation and demodulation techniques courses are also available. Each student works independently be one of our digital multimeters, two power supply, two signal generators and oscilloscopes 30 units consisting of one test set is available.

Digital Electronics Laboratory: Microprocessors and digital circuits that give basic training in computer technology, this is the beginning of our laboratory, students can examine the practical set up all 28 pieces of digital circuit test "all in one digital" test set is available.

Optical Communication Laboratory : One set of fiber-optic test set, three sets of fiber-optic transmitter - receiver laser module and a set of students in our laboratory where the optical spectrum analyzer, in addition to the tests in the communications laboratory of fiber-optic and communication techniques with laser technology have been performing experiments.

Microwave and Antenna Laboratory : One microwave and a broad spectrum of antenna test set, one RF spectrum analyzer, one sweep signal generator, one arbitrary signal generator, our students two oscilloscopes and our laboratory equipped with one power supply, as well as learning advanced wireless communication technologies as well, communication basically they have learned in the laboratory receiver - transmitter principle, modulation and digital communications, including the work they do try and demodulation techniques. Antennae and circuits related applications are also available.

Çankaya Electronic Community Laboratory (ÇETT Laboratory) : This lab is open 24 hours 7 days. Our students build an electronic circuit on any course or complete hobbyist can work alone or in groups when we wanted to make measurements in the lab. Engineering Graduation Project in the establishment of circuits on a breadboard, testing and verification of the materials soldered onto a printed circuit board insertion operations that are performed in our

laboratory. In addition, the establishment of the circuit in ÇETT Community activities, testing, implementation of the design on robots, production of prototypes that are made in our laboratory. In the laboratory 10 multimeters, DC power supply 10, 4 oscilloscope, signal generator are 10 and 5 soldering iron kit.

Workshop: Our workshop offers technical support to all laboratories in electronics and communication. Replacement of various materials and measurement and test equipment where a MITS Eleven Lab-type printed circuit board manufacturing machines to produce printed circuit boards looking to scrape the pertinax, a precision soldering station.

DEPARTMENT OF CIVIL ENGINEERING

EDUCATIONAL LABORATORIES

Head of Department: Prof. Dr. Serhat KÜÇÜKALİ, mail: kucukali@cankaya.edu.tr , office phone: (0312) 233 1404

The department has three laboratories in the basic civil engineering areas that have been designed and equipped to permit the students to conduct hands-on experiments in topics whose theory has been covered in the classroom. Students are required to prepare reports describing their lab activity. The overall objectives of the labs are as follows:

- To correlate theoretical background information that has been covered in the classroom with the physical test setup for better acquaintance
- To demonstrate the correlation between theory and reality in a civil engineering context
- Help develop the ability of students to conduct experiments, collect data and analyze test readings
- Improve teamwork among students
- Help students improve their ability to prepare technical reports

Fluid Mechanics and Hydraulic Laboratory: The 70 sq. m lab comprises modular test units that correspond to several curriculum courses: CE270: Fluid Mechanics, CE371: Hydraulics, CE372: Water Resources Engineering. In addition a number of experiments for departmental elective courses in the hydraulic engineering area can be carried out here. The lab is equipped to perform experiments in the following topics:

- Hydrology experiments
- A 5-m long Open Channel Test Setup
- Thin-walled channel experiment
- Measurement of friction losses in pipes
- Venturimeter
- Measurement of local energy losses in pipes
- Test setup for measurement of the Reynolds number
- Test setup for the measurement of the center of pressure
- Experiment for the equilibrium of a floating body

Structural Mechanics Laboratory: The basic experiments that can be carried out in this 114 sq. m lab that is co-located with the geotechnical engineering lab are referenced directly by CE221: Engineering Mechanics: Statics, CE224: Mechanics of Materials and CE381: Structural Analysis.

- Measurement of bending moments in beams
- Measurement of the shear force in beams
- Measurement of deflections in beams
- Measurement of bending stresses in beams
- Torsion of circular cross sections
- Torsion of non-symmetric sections and the determination of the shear center
- Buckling
- Continuous beams
- Measurement of deflections and support reactions in frames
- Simple suspension bridge
- Determination of the bending moment in frames

Geotechnical Engineering Laboratory: This lab contains all of the fundamental experiments that are part of the introductory courses for geotechnical engineering. The courses that make use of the lab directly are CE104: Engineering Geology, CE361: Geotechnical Engineering and CE362: Foundation Engineering.

- Triaxial compression test
- Uniaxial compression test

- Consolidation experiment
- Direct shear test
- Hydrometer test
- Specific weight experiment
- Sieve analysis
- Atterberg limit tests
- Proctor test
- Determination of the unit weight
- Permeability test
- Vane shear test
- Oven

DEPARTMENT OF MECHANICAL ENGINEERING

EDUCATION LABORATORIES

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Mechanical Engineering Department contains **Machine Shop, Flexible Manufacturing Laboratory, Mechanical Engineering Testing I/II Laboratories, Numerical Analysis Laboratory, Microfluidic Design and Characterization Laboratory and Welding Education Laboratory** for education and research purposes.

Machine Shop is equipped with one milling machine, two lathes, one drill press, one hydraulic press, one band-saw, one bench-top grinder, manual clamps and hand-held equipment including measurement devices. The students produce work-pieces using these machines and equipment in the “manufacturing processes” and “metal cutting” courses. They also learn how to use the measurement devices like compass, micrometer and comparator during these practices. The machine shop also serves the students for any research/educational activities which involve manufacturing of a specific part, experimental set-up, or any working device.

Flexible Manufacturing Laboratory is equipped with one CNC lathe, one CNC milling machine, one 5 axis robot and material feeding units. In the “manufacturing processes” course, after learning how to program the CNC machines, the students prepare the programs for the parts that they have already drawn in Autocad medium, observe the manufacturing simulation and then manufacture the parts at the CNC machines. In the “computer integrated manufacturing systems” course robotic manufacturing cell applications are made.

Mechanical Engineering Testing I/II Laboratories contain test and education sets for undergraduate courses. These are beam apparatus, strain gauge equipment, tension test equipment, torsion test equipment, fatigue test equipment, impact test equipment, vibration test equipment, creep test equipment, engine test and education set and heat transfer test and education set. Each laboratory has a capacity of 15 students. All test sets are integrated with data acquisition systems.

Numerical Analysis Laboratory is utilized for both education and research. The laboratory contains ANSYS (finite element analysis) and FLUENT (computational fluid dynamics) softwares and 15 high capacity work-stations. For the softwares there are both education and academic research licences. The laboratory serves to “finite element analysis”, “computational fluid dynamics”, innovative engineering analysis and design” and other undergraduate and graduate courses.

Microfluidic Design and Characterization Laboratory aims to provide an environment for analysis, design, and testing of novel microfluidic devices and structures. The workstation in the laboratory allows the researchers to simulate their designs. For characterization purposes, the laboratory contains a fluorescent microscope equipped with a high speed camera (up to approximately 300 fps) and a pressure controller capable of providing -600 mbar to 1 bar pressure. These equipment are used to provide flow within the microfluidic device being tested and to capture real-time images during the test. The laboratory is also equipped with a horizontal flow cabin, which is used to keep microfluidic devices clean. Although fabrication facilities are not included in the laboratory, designed microfluidic devices can be fabricated on PMMA substrates using micro milling and hot-embossing by using the CNC machining center and the hot press available in the department’s laboratories.

Welding Education Laboratory contains MIG/MAG (metal gas welding), TIG (tungsten gas welding) and metal arc welding machines. There are also sheet metal cutters. The laboratory has a special fume extraction arm system. The laboratory serves to undergraduate courses and is also suitable to give training to welders in the market.

DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING EDUCATIONAL LABORATORIES

Head of Department : Doç. Dr. M. Serdar KARAKAŞ, mail : skarakas@cankaya.edu.tr , office phone : (0312) 233 1396

Metalografi Laboratuvarı : Bu laboratuvar, malzemelerin metalografik incelemelerini yapmak ve bu malzemeleri karakterize etmek amacıyla kurulmuştur. Karakterizasyonu yapılacak olan malzemeler kesme, parlatma ve dağlama işlemleri uygulandıktan sonra optik mikroskop yardımıyla incelenebilmektedir. İncelenen içyapılar dijital kamera aracılığıyla bilgisayar ortamına aktarılabilir.

Bu laboratuvar MSE 206 (Malzeme Karakterizasyonu I) ve MSE 307 (Malzeme Karakterizasyonu II) dersleri kapsamında kullanılmaktadır

Laboratuvarında bulunan cihazların listesi aşağıdaki gibidir,

- Dijital kameralı optik mikroskop (x1000) (NikonEclipse LV150)
- Stereo Mikroskop
- Protherm kamara tip ısı işlem fırını (1200°C)
- Kesiciler (MetkonMetacut 250)
- Zımparalama ve parlatma cihazları (MetkonVorcipol 2V)
- Gömme cihazı (MetkonEcopres 50)
- Ultrasonik banyo

Mekanik Laboratuvarı : Bu laboratuvar, malzemelerin mekanik özelliklerinin belirlenmesi ve mekanik davranışlarına göre sınıflandırılması amacıyla kullanılmaktadır. Laboratuvarında bulunan MTS Universal mekanik test cihazı (100 kN) yardımıyla malzemelerin yük altında göstermiş olduğu tepkiler ölçülebilmektedir. Ayrıca, laboratuvarında bulunan mikro sertlik ölçüm cihazı ile mikrosertlik ölçümleri gerçekleştirilmektedir

MSE 202 (Malzeme Bilimi II), MSE 320 (Malzemelerin Mekanik Davranışları) ve MSE 225 (Malzeme Dersine Giriş) dersleri kapsamında kullanılmaktadır.

Laboratuvarında bulunan cihazlar aşağıdaki gibidir.

- MTS Universal mekanik test cihazı (100 kN)
- Innovatest universal makro sertlik cihaz

Hesaplamalı Malzeme Bilimi Laboratuvarı : Bölümümüzde bulunan Hesaplamalı Kuantum Kimyası Laboratuvarı geliştirilerek Malzeme Bilimi ve Mühendisliği alanında eğitim verebilmesi amaçlanmıştır. 21 adet SunRAY İnce İstemci (Thin Client) Oracle LINUX işletim sistemi ile sunucu makine üzerinden sanal bilgisayar olarak çalışmaktadır. Bu laboratuvarın hem eğitim (lisans) hem de araştırma (yüksek lisans) amaçlı kullanılması düşünülmektedir. Malzeme Bilimi ve Mühendisliğinde anlatılan teorik konuların laboratuvar desteğinin yanı sıra hesaplamalı yöntemlerle, modelleme ve simülasyon araçları ile desteklenmesi hedeflenmiştir.

Genel Kimya Laboratuvarı : CHEM 103-Kimya I ve CHEM 104-Kimya II derslerinin uygulamaları bu laboratuvarında yapılmaktadır. Laboratuvarların amacı teoride verilen kimyasal kavramları destekleyip örnekleyerek pekiştirmektir. Temel deney teknikleri ve çeşitli cihazların kullanımları ile uygulamalar yapılmaktadır.

Laboratuvar imkanları:

- Yüksek Sıcaklık ve Basıç Kabı, PARR 5500 Compact
- Vakumlu Etüv, Nüve, EV018
- Hassas Terazi, Precisa XB 220 A
- Manyetik karıştırıcı ve ısıtıcı, Misung, MS 300 HS
- Balon Isıtıcı ve Manyetik karıştırıcı, Termal N11715K
- Ultrasonik Temizleyici, KUDOS, SK221 OHP
- Saf Su Cihazı, SHINSAENG Sawr/FineTech

DEPARTMENT OF MECHATRONICS ENGINEERING

EDUCATIONAL LABORATORIES

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Mekatronik Mühendisliği Bölümü'nün üç laboratuvarı bulunmaktadır. Bunlar; Algılayıcılar ve Ölçme Laboratuvarı, Robotik ve Elektrik Makineleri Laboratuvarı ve Kontrol Sistemleri Laboratuvarı'dır. Söz konusu laboratuvarlar hem eğitim-öğretim hem de araştırma amaçlı olarak kullanılmaktadır. Söz konusu laboratuvarlar ilgili bilgiler aşağıda sırası ile verilecektir:

Algılayıcılar ve Ölçme Laboratuvarı: Laboratuvarda 10 adet NI Elvis deney kartı, 10 adet bunlara monte edilecek mekatronik sensörleri tasarım ve simülasyon platformu ve bunların kontrol edilmesini sağlayacak NI LABVIEW yazılımı bulunmaktadır. Söz konusu teçhizat ve yazılım ile MECE 302 Sensors and Measurement dersinin laboratuvar kısmında, öğrencilere sensör ve yazılım teknolojisini öğretmek mümkün olacaktır.

Robotik ve Elektrik Makineleri Laboratuvarı: Laboratuvarda bulunan Robot Manipatörlü Eğitim Seti; 6 eksenli endüstriyel robot kolu ile robot koluna dışarıdan erişim ve kontrol sağlayan bir yazılımdan oluşmaktadır. LLI isimli yazılım ile robot koluna istenilen her türlü hareketi yaptırmak ve hareketi kontrol etmek mümkündür. Robot kolu, ucuna takılan pnömatik tutucu ile 6 kg faydalı yükü çok yüksek hassasiyette istenilen noktaya konumlandırabilmektedir. Robot kolu kullanıcıların emniyetini sağlamak amacı ile 3x3m boyutlarında ve genişleyebilen modüler güvenlik çiti içine alınmıştır. Robot Manipatörlü Eğitim Seti; lisans öğrencilerinin MECE 102 Mekatronik Mühendisliğine Giriş, MECE 401 Robotiğe Giriş derslerinde, mezuniyet projelerinde kullanılacağı gibi, lisans üstü tezlerinde de kullanılabilir.

Kontrol Sistemleri Laboratuvarı: Laboratuvarda 2 adet Manyetik Levitasyon deney seti, 1 adet 2 Serbestlik Dereceli Top Dengeleyici deney seti, 1 adet Rotpen (dönel ters sarkaç) SRV02 ET uyumlu modül, 1 adet Ball and Beam (top askı modülü) SRV02 ET uyumlu modülü, 2 adet Modüler servo workshop (servo kontrol deney seti), 1 adet Digital Pendulum (dijital ters sarkaç) seti yer almaktadır. Söz konusu kontrol deney setleri ECE386, ECE 388, ECE 441, ECE 438, ECE 564 ve ECE 662 gibi hem lisans hem lisansüstü derslerde kontrol mühendisliği ile ilgili konuların pratik olarak anlaşılmasına katkıda bulunacakları gibi aynı zamanda lisans, master ve doktora öğrencilerimizin farklı kontrol deneylerini ve uygulamaları planlamalarına da olanak verecektir.