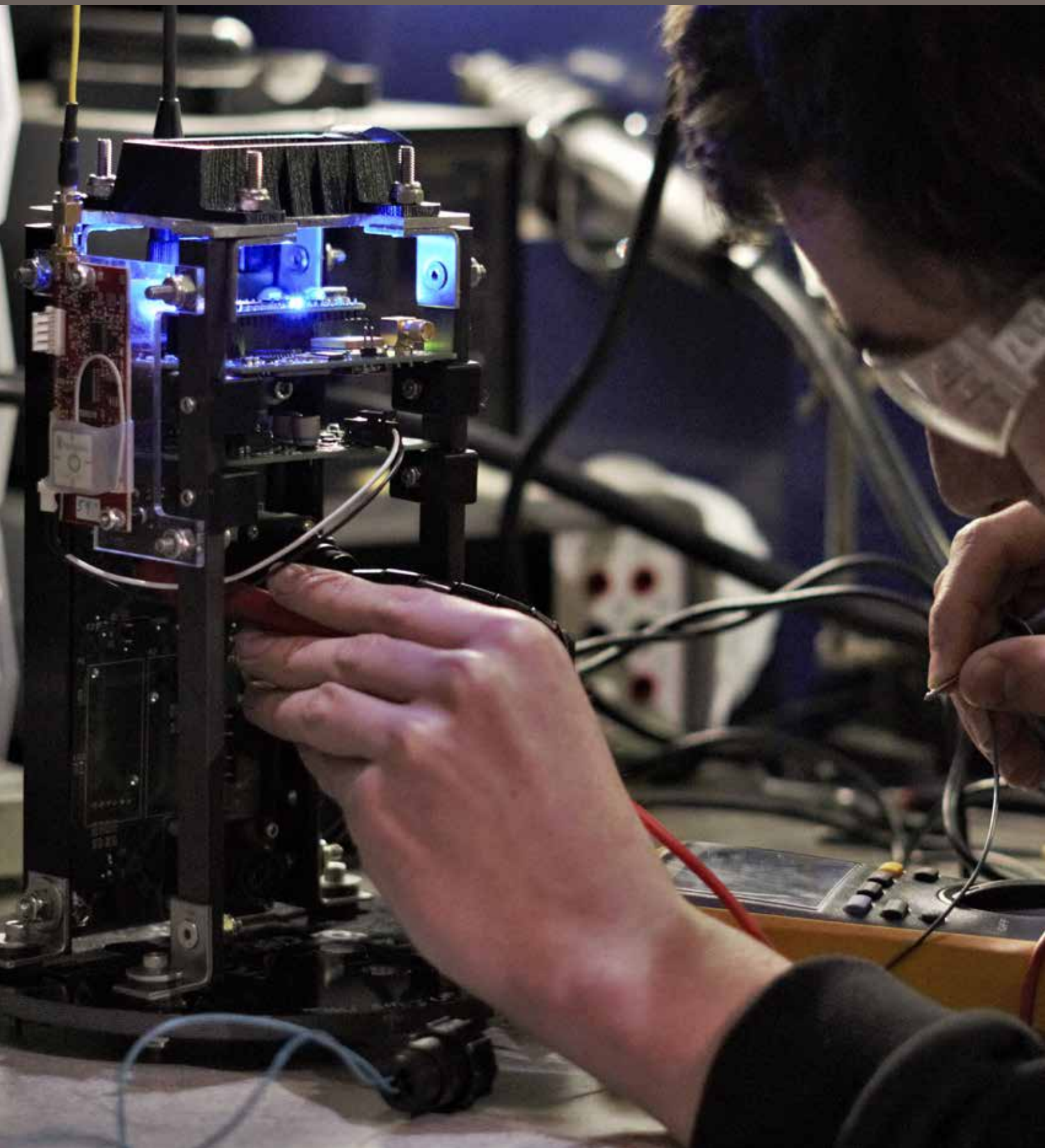
Electrical & Computer Engineering

THE MING HSIEH DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING



Electrical and Computer Engineers are inventing the technology that powers the modern world - from computing and mobile communications platforms through biomedical devices and solar energy conversion. Our graduates are a diverse group of engineers who design hardware from nanodevices through embedded computing systems and develop innovative approaches to imaging, communications, control and network design problems, and much more.

MAJORS & AREAS OF EMPHASIS

- Electrical & Computer Engineering
  Areas of Specialization: Circuits, Systems, And Signals, Computer Engineering, Energy & Electrical Sciences
- Computer Engineering & Computer Science
  (jointly administered by the Electrical & Computer Engineering Department)

AREAS OF SPECIALIZATION

The department offers an exciting, diverse curriculum that prepares students with significant breadth and depth. Core sets of classes prepare students for one of three areas of emphasis: Circuits, Signals, and Systems; Computer Engineering; and Energy and Electrical Sciences. In your first two years you will be introduced to the concepts of digital and analog electronics, electronics, computer programming, embedded systems and the internet of things, as well as core courses in math and physics. You will then choose courses that pertain to a chosen area of specialization.

Circuits, Signals, and Systems covers areas in signal processing, media and audio systems, wireless communications, adaptive control, and mixed-signal integrated circuits.

Computer Engineering contains courses that focus on digital hardware, embedded systems, and VLSI design.

Courses in the Energy and Electrical Sciences area cover nanoelectronics, integrated-circuit technology, energy sources and management, mixed-signal integrated circuits, and communications hardware.

The Computer Engineering & Computer Science program (CECS) trains students to integrate hardware and software processes to design solutions to problems arising in complex domains such as atomic reactors, guidance systems and manufacturing systems. These students graduate ready to design and build complex systems of hardware, software and networks.

Design courses permeate the class schedule allowing students to apply the knowledge they have gained as well as prepare them to address the specific needs of industry when they graduate. One ECE senior design course recently challenged students to design “smart” surfing equipment. Design options included a new “sustainable surfboard,” a “wireless lifejacket” and a programmable “interactive surfboard.”

RESEARCH

Research in the Ming Hsieh Department of Electrical and Computer Engineering is revolutionizing nanoelectronics, information processing, telecommunications, medical diagnosis and treatment, energy and green initiatives, computer systems, and new media, among other areas. Partnerships with off-campus research institutes like the Information Sciences Institute (ISI) and the Institute for Creative Technologies (ICT) create unparalleled opportunities for students to work at the cutting-edge of technology.

FACILITIES

The department’s instructional laboratories have been integrated into “studio” learning environments that combine traditional lectures with hands-on activities so that students learn by doing, not just by listening. State-of-the-art instrumentation and computers support classes involving analog and digital electronics, microprocessor systems, and radio-frequency communications. Undergraduate students also engage in research with faculty in leading laboratories as well as regional and national research centers, including the Center for Energy Informatics (CEI), Center for Cyber-Physical Systems and the Internet of Things (CCI), Center for Advanced Software Technologies (CAST), Southern California Center for Advanced Transportation Technologies (SC-CATT), and Center for Quantum Information Science and Technology (CQIST).

COMPANIES HIRING YOU

3Com Corporation, Accenture, Apple, BAE Systems, The Boeing Co., CapGemini, Disney, Edwards Lifesciences, Garmin, General Electric, Google, HP, IBM, Intel Corporation, Microsoft, Northop Grumman, Nvidia, Qualcomm, Raytheon, SpaceX, Teradata, Teradyne, TI, Verizon... And many more!

CAREER OPTIONS

- Develop alternative energy and green power sources
- Develop semiconductors and consumer electronics
- Develop wireless communication systems
- Design new media and imaging systems (HDTV, satellite radio, etc.)
- Design robots and other embedded systems
- Build lasers used for medical, manufacturing and military purposes
- Develop airborne and satellite electronic systems
- Develop new biomedical imaging devices

FACULTY HIGHLIGHTS

Dr. Maryam Shanechi is an assistant professor and the Viterbi Early Career Chair in Electrical Engineering. Her research focuses on applying the principles of information and control theories and statistical signal processing to develop effective solutions for basic and clinical neuroscience problems. Dr. Shanechi recently won a 5-year, $11.25 million grant to lead an international team developing brain-machine interfaces to enhance human decision-making.

Dr. Bhaskar Krishnamachari is Director of the Center for Physical Systems and the Internet of Things (IoT). As a leader in the field of IoT, his research involves work with next generation wireless networks, connected vehicles, robotic networks, cognitive radio networks, underwater networks, and green cellular networks.

Dr. Michelle Povinelli pursues research whose aim is to control light-matter interactions for practical applications that include creation of superefficient photovoltaic solar cells for sustainable electricity production, smart thermal control materials for satellites and temperature-responsive clothes, and novel nanophotonic particle traps and sorters.

Dr. Han Wang's research is the subject of emerging nanoscale materials and devices for electronic and photonic applications that includes novel electronics technology for brain-inspired computing and unique infrared sensing devices for high-performance night vision, thermal imaging, and free space communications. He works with novel circuit applications for two-dimensional (2D) materials including black phosphorus, graphene, hBN, MoS_2, and WS_2.

Dr. Mike Chen's research in VLSI design has resulted in record-setting high-performance analog mixed-signal silicon integrated electronics. He has designed circuits used in high-end high volume smartphones and he invented the asynchronous SAR ADC, a high-performance low-power circuit now in widespread commercial use.

ALUMNI HIGHLIGHTS

Jose Ruiz | B.S. Electrical Engineering '19 joined our department as a transfer student from East Los Angeles Community College. A native of South Los Angeles, Jose served as treasurer of the USC Viterbi chapter of the Society of Hispanic Professional Engineers. After graduation, he began work at Boeing as an Antenna RF and Array engineer. This year, he started a new job at Northrop Grumman as a Communications Systems Engineer

Yutong Gu | M.S. Electrical and Computer Engineering '20 B.S. Electrical and Computer Engineering '19 is a firmware engineer at Zoox - an autonomous vehicle company partnered with Amazon. Yutong graduated from USC Viterbi's Progressive Degree Program, in which students can achieve a B.S. and M.S. degree in five years. During his time in the department, Yutong helped found the Makers Club, which promotes interest and innovation in electronics on campus.

Roxanna Pakkar | B.S. Electrical and Computer Engineering '20 started her career as an embedded control systems engineer with the Aerospace Corporation in Los Angeles immediately after graduation. While at USC Viterbi, Roxanna and four fellow female Viterbi engineering students founded Marlink - a technology that improves underwater communication technology. She and her team represented the United States at the Global Grand Challenges Summit student competition finals in London in 2019.

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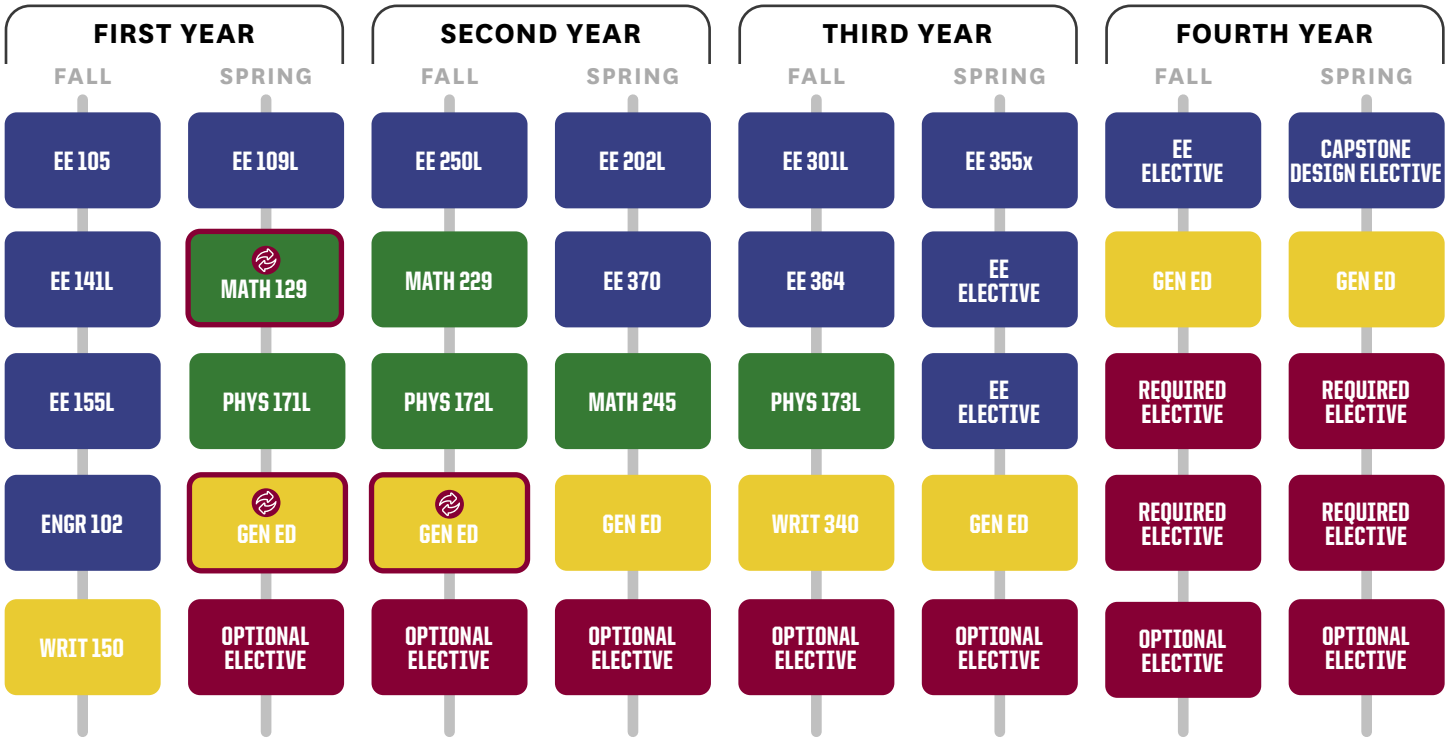

ENGINEERING

EE 105: Introduction to Electrical Engineering
EE 109L: Introduction to Embedded Systems
EE 141L: Applied Linear Algebra for Engineering
EE 155L: Intro to Comp. Prog. for Electrical Engrs.
EE 202L: Linear Circuits
EE 250L: Dist. Systems for the Internet of Things
EE 301L: Linear Systems
EE 355x: Software Design for Electrical Engineers
EE 364: Intro to Probability & Statistics for EE & CS
EE 370: Electromagnetics for Engineering Systems
ENGR 102: Engineering Freshman Academy
CAPSTONE DESIGN ELECTIVE

EE ELECTIVES

A minimum 12 units from the following:

Circuits, Signals, & Systems
EE 322: Introduction to Digital Audio
EE 348L: Electronic Circuits
EE 448L: Communication Electronics
EE 467: Introduction to Communication Systems
EE 479: Analog Integrated Circuit Design
EE 482: Linear Control Systems
EE 483: Introduction to Digital Signal Processing

Computer Engineering
CSCI 360: Introduction to Artificial Intelligence
CSCI 445: Introduction to Robotics
EE 354L: Introduction to Digital Circuits
EE 450: Introduction to Computer Networks
EE 451: Parallel & Distributed Computation
EE 453: Computing Platforms & Paradigms
EE 454L: Introduction to System-on-Chip
EE 457: Computer Systems Organization
EE 477L: MOS VLSI Circuit Design

Electrical Sciences
EE 337L: Engineering Nano-Systems
EE 338: Physical Electronics
EE 443: Introduction to Power Systems
EE 444: Power Systems Technology
EE 470: Electromagnetics II
EE 471: Applied Quantum Mechanics for Engineers
EE 472: Introduction to Lasers & Laser Systems
EE 473: Lasers & Optics Laboratory
EE 474: Introduction to Photonics
EE 475: Wireless Communication Technology
AME 415: Turbine Design & Analysis

MATHEMATICS

MATH 129: Calculus II
MATH 229: Calculus III
MATH 245: Mathematics of Phys. and Engr.

SCIENCE

PHYS 171L: Applied Physics I: Mechanics
PHYS 172L: Applied Physics II: Electricity, Magnetism & Optics
PHYS 173L: Applied Physics III: Modern Physics

GENERAL EDUCATION

As a USC Viterbi student your General Education (Gen Ed) curriculum will include courses in the Arts, Humanistic Inquiry and Social Analysis.

WRITING

WRIT 150: Writing & Critical Reasoning
WRIT 340: Advanced Writing

ELECTIVES

Your optional electives are one way to build engineering+ into your curriculum by choosing classes of interest to you.

Courses with this symbol may be satisfied with certain AP, IB or A-Level exams. With each requirement you replace with prior credit, you increase your optional electives, creating more flexibility for you to pursue additional electives and increase your engineering+ education.

This is a simplified version of a complex curriculum with options and choices made between advisor and student. Course choices can vary by semester and adjust to include relevant topics and materials. Although every attempt has been made to ensure accuracy, the program requirements listed in the USC Catalogue supersede any information which may be contained in this or any other publication of any school or department. The information found in this document is not intended for advising purposes. The University reserves the right to change its policies, rules, regulations, requirements and course offerings at any time.

USC Viterbi
School of Engineering