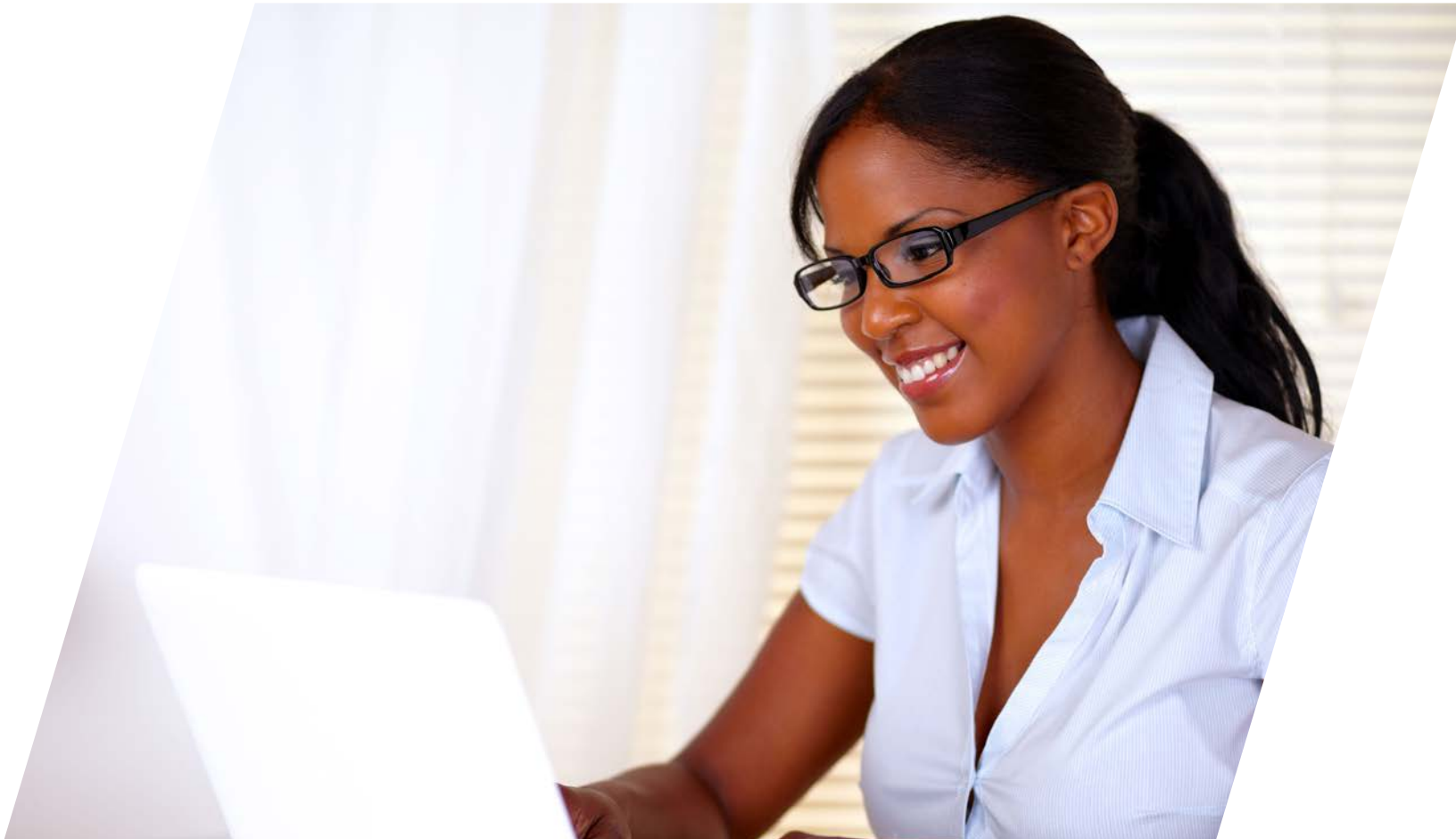
Electrical Engineering at USF

Technical Tracks Courses & Faculty

TABLE OF CONTENTS



BIOELECTRICAL SYSTEMS TRACK

Electrical engineers have played a major role in the advances made in biomedicine ranging from medical imaging to nano-biotechnology, from electrocardiography to electroencephalography to radiation therapy, and from DNA chip fabrication to DNA image analysis, and so on. Courses offered include Biomedical Image Processing, Biomedical Systems and Pattern Recognition, Bioelectricity, Bioelectronics, System on a Chip (which includes DNA chips), *Medical* Histology (offered by CoM), Integrated Circuit Technology, and many more. Also on the slate are Biomolecular Systems and Biosensors and Systems. Some of these courses are offered at dual levels, i.e., both at the UG&G levels. Research opportunities also exist.

TRACK FACULTY:

- Dr. Andrew Hoff (Graduate Program Director)
- Dr. Ashwin Parthasarathy (Track Advisor)
- Dr. Stephen Saddow

TRACK ELECTIVES:

- EEE 4260C Bioelectricity
- EEE 4271 Bioelectronics
- EEE 4506 Biomedical Image Processing
- EEL 3116L Laboratory II
- EEE 4274 MEMS I: Chemical/Biomedical Sensors and Fabrication
- Special topics courses (EEL 4935 or EEL 4936) may also available; please consult with EE Advising.

COMMUNICATION SYSTEMS TRACK

In today's complex, interconnected world, the effective creation, distribution, and use of information via technology is central to daily life. Communication systems facilitate, enable and often define the relationships between corporations and consumers, buyers and suppliers, businesses of all sizes, social networks, and citizens and their governments. The importance of communication systems to organizations and the need for well-educated professionals in the field is the basis for the EE Track in Communication Systems. Whether designing or implementing complex space, terrestrial or undersea communication systems, our graduates will fill an essential need across all sectors of society. Students graduating from the Communication Track will have the opportunity to work in any communication and signal processing company including Verizon, AT&T, Sprint, Motorola, Ericsson, Huawei, Apple, Intel, Google, Microsoft, Texas Instrument, Analog Devices, Samsung, etc.

TRACK FACULTY:

- Dr. Nasir Ghani
- Dr. Ravi Sankar
- Dr. Ismail Uysal (Primary Track Advisor & Undergraduate Program Director)
- Dr. Yasin Yilmaz
- Dr. Kwang Chang Chen
- Dr. Zhuo Lu

TRACK ELECTIVES:

- EEL 4595 Mobile and Personal Communication
- EEL 4727C Digital Signal Processing with Field Programmable Gate Arrays
- EEL 4756 Digital Signal Processing
- EEL 4936 Wireless Communications Lab
- EEL 4743L Microprocessor Lab
- EEL 4423C Wireless Circuits & Systems Design Lab
- Special topics courses (EEL 4935 or EEL 4936) may also available; please consult with EE Advising.

ENERGY, POWER, AND SUSTAINABILITY TRACK

The Energy, Power and Sustainability track prepares students for professions related to electricity energy generation and conversion, electricity transmission and distribution, as well as electric power grid operation. The potential job markets include electricity utility industry, power electronics industry, automobile industry, etc. The key technologies related to energy conversion, renewable energy integration, and power system operation are covered in the track courses Electromechanical Systems, Power Electronics, Energy Delivery Systems, Power System Analysis, Power Systems II, Power System Protection, etc.

TRACK FACULTY:

- Dr. Lingling Fan (Primary Track Advisor)
- Dr. Zhixin Miao

TRACK ELECTIVES:

- EEL 4212 Energy Delivery Systems
- EEL 4224 Electric Machines and Drives
- EEL 4241 Power Electronics
- EEL 4251 Power System Analysis
- EEL 4271 Power System Protection
- EEL 4283 Sustainable Energy
- EEL 4206L Power Lab
- Special topics courses (EEL 4935 or EEL 4936) may also available; please consult with EE Advising.

MECHATRONICS, ROBOTICS, AND EMBEDDED SYSTEMS TRACK

The Mechatronics, Robotics and Embedded Systems (MRES) track has been designed to offer electrical engineering students the opportunity to acquire and develop the necessary fundamental knowledge and the skill set complemented with experiential learning activities in order to play major roles in the design, development, integration and test of technology solutions with societal impact in areas such as Industrial Automation & Control, Energy Generation & Management, Robotics, Biomedical, Smart Cities, Cyber-physical Systems, Internet of Everything (IoE), Autonomous Vehicles, Agriculture and Consumer's Electronics among others . The MRES track designed curriculum includes courses in Mechatronics, Control Systems, Embedded Systems and tailored technical electives to effectively participate and contribute in cross disciplinary employment opportunities as an Electrical Engineer.

TRACK FACULTY:

- Dr. Sanjukta Bhanja (CoE Executive Dean)
- Dr. Robert Bishop (CoE Dean)
- Dr. Alexandro Castellanos
- Dr. Morris Chang
- Dr. Chung Seop Jeong
- Dr. Wilfrido Moreno (Track Advisor)

TRACK ELECTIVES:

- EEL 4740 Embedded Systems
- EEL 4744 Microprocessor Principles and Applications
- EEL 4680 Applied Mechatronics
- EEL 4657L Linear Control Systems Laboratory
- EEL 4743L Microprocessor Laboratory
- EEL 4663 Applied Robotics
- Special topics courses (EEL 4935 or EEL 4936) may also available; please consult with EE Advising.

MICRO AND NANO-SCALE SYSTEMS TRACK

Throughout history products derived from the field Electrical Engineering have lead the way into the future. Computers, large screen TV's, cell phones, robotics and drones are just a few examples of high level systems whose engine is Electrical Engineering based. And, the foundation upon which all of this is built is electronic materials. Guided by the evolution of Quantum Mechanics and the Band Theory of Solids Engineers and Scientists continue to advance understanding of atoms and electrons and how they determine the properties of materials and devices. Recently discovered nano-materials have opened a new frontier in the capabilities of electronic materials and are enabling the next generation of these systems.

TRACK FACULTY:

- Dr. Christos Ferekides (EE Chair)
- Dr. Andrew Hoff
- Dr. Steven Saddow
- Dr. Rudinger Schlaf
- Dr. Arash Takshi (Track Advisor)
- Dr. Sylvia Thomas (VP of Research)

TRACK ELECTIVES:

- EEE 3302 Electronics I
- EEL 4241 Power Electronics
- EEL 4567 Electro-Optics
- EEE 4274 MEMS I
- EEL 4935 MEMS II
- EEL 4935 Device Theory II
- EEL 4359 Analog CMOS/VLSI Design
- EEL 3116L Laboratory II
- EEE 4530 Flexible Electronics and Thin-Film Solar Cells
- Special topics courses (EEL 4935 or EEL 4936) may also available; please consult with EE Advising.

WIRELESS CIRCUITS AND SYSTEMS TRACK

Wireless Circuits and Systems track focuses on radio frequency devices and systems that are the backbone of wireless communications and enable diverse applications that include automotive radar, the Internet of Things and magnetic resonance imaging. In this track, students gain experience using industry- standard computer aided engineering tools for device and system design. In addition, students gain experience on state-of-the-art microwave instrumentation tools for device and system characterizations. The courses in this track provide many opportunities for students to design, fabricate and test their own designs for components such as antennas, filters and amplifiers using technologies from printed circuits to integrated circuits. Students graduating from the track will have opportunity to pursue their professional careers in research institutions and companies focused on design/fabrication/testing of commercial/military wireless communication hardware

TRACK FACULTY:

- Dr. Jing Wang (Track Advisor)
- Dr. Lawrence Dunleavy
- Dr. Gokhan Mumcu
- Dr. Stavros Vakalis

TRACK ELECTIVES:

- EEL 4420 RF & MW Measurements
- EEL 4421 RF/MW Circuits I
- EEL 4422 RF/MW Circuits II
- EEL 4461 Antenna Theory
- EEL 4935 RF/MW Power Amplifier Design
- EEL 4935 MMIC Design
- Wireless Communications Lab
- Special topics courses (EEL 4935 or EEL 4936) may also available; please consult with EE Advising.

SYSTEMS AND SECURITY TRACK

The study of systems involve complex problem-solving such as designing and managing complex systems, which requires the ability to analyze and solve problems involving multiple interacting components. Systems engineering also requires knowledge and skills from multiple engineering disciplines, such as mechanical, electrical, and software engineering and it plays a critical role in many industries, including aerospace, defense, transportation, and healthcare. Engineers in this field work on projects that have a real-world impact and can improve people's lives. Systems engineering roles often involve leadership and management responsibilities, providing opportunities for career advancement into management or executive positions and it is a broad field, with opportunities to work on a wide range of projects and technologies, such as autonomous systems, robotics, and Internet of Things (IoT) systems.

An electrical engineer should learn about systems and security in order to design and build systems that are secure and resilient against potential threats. This knowledge can help ensure that the systems they create can protect sensitive information and maintain availability, integrity, and confidentiality. Additionally, understanding of security can help engineers anticipate potential vulnerabilities and take steps to mitigate them, reducing the risk of data breaches and other security incidents.

TRACK FACULTY:

- Dr. Nasir Ghani (Track Advisor)
- Dr. Morris Chang
- Dr. Zhuo Lu
- Dr. Yasin Yilmaz
- Dr. Mia Naeni

TRACK ELECTIVES:

- EEE 4746 Wireless Mobile Computing and Security
- EEE 4748 Cryptography and Data Security
- EEE 4774 Data Analytics
- EEL 4782 Data Network Systems and Security
- EEL 4782 AI and Security in Cyber Physical Systems
- Special topics courses (EEL 4935 or EEL 4936) may also available; please consult with EE Advising.

ACADEMIC INTEGRITY

The faculty of the Electrical Engineering Department is committed to maintaining a learning environment which promotes academic integrity and the professional obligations recognized in the IEEE Code of Ethics:

(https://www.ieee.org/about/corporate/governance/p7-8.html).

Accordingly, the department adheres to a common Academic Integrity Policy (AIP) in all of its courses. This policy is to be applied uniformly in a fair and unbiased manner. University rules regarding academic integrity will be strictly enforced.

It is not acceptable to copy, plagiarize or otherwise make use of the work of others in completing homework, project, laboratory report, exam or other course assignments. Likewise, it is not acceptable to knowingly facilitate the copying or plagiarizing of one's own work by others in completing homework, project, laboratory report, exam or other course assignments. It is only acceptable to give or receive assistance from others when expressly permitted by the instructor. Unless specified otherwise, as in the case of all take-home exams, scholarly exchange regarding out-of-class assignments is encouraged. A more complete explanation of behaviors that violate academic integrity is provided at:

https://usf.app.box.com/v/usfregulation3027

- The minimum penalty for violation of the AIP stated in the preceding paragraph is *a letter grade reduction in the overall course grade*.
- Student(s) found in violation of the policy *on an exam will receive an "F" or "FF" in the course.*
- All instances of AIP violations will be recorded in a letter from the instructor that is kept in the student files held by the department; a copy of the letter will be forwarded to the Undergraduate Dean's office.
- *A second violation of the policy (see note below), irrespective of whether it was related to an exam or any other course assignment, will result in a course grade of "FF" and expulsion from the Electrical Engineering Department.*
    - NOTE: applies to all courses/semesters
- At the instructor's discretion, the penalties associated with the EE Department's AIP may be stricter.

IEEE CODE OF ETHICS

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

I. To uphold the highest standards of integrity, responsible behavior, and ethical conduct in professional activities.
   1. to hold paramount the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, to protect the privacy of others, and to disclose promptly factors that might endanger the public or the environment;
   2. to improve the understanding by individuals and society of the capabilities and societal implications of conventional and emerging technologies, including intelligent systems;
   3. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
   4. to avoid unlawful conduct in professional activities, and to reject bribery in all its forms;
   5. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, to be honest and realistic in stating claims or estimates based on available data, and to credit properly the contributions of others;
   6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;

II. To treat all persons fairly and with respect, to not engage in harassment or discrimination, and to avoid injuring others.
   7. to treat all persons fairly and with respect, and to not engage in discrimination based on characteristics such as race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;
   8. to not engage in harassment of any kind, including sexual harassment or bullying behavior;
   9. to avoid injuring others, their property, reputation, or employment by false or malicious actions, rumors or any other verbal or physical abuses;

III. To strive to ensure this code is upheld by colleagues and co-workers.
   10. to support colleagues and co-workers in following this code of ethics, to strive to ensure the code is upheld, and to not retaliate against individuals reporting a violation.