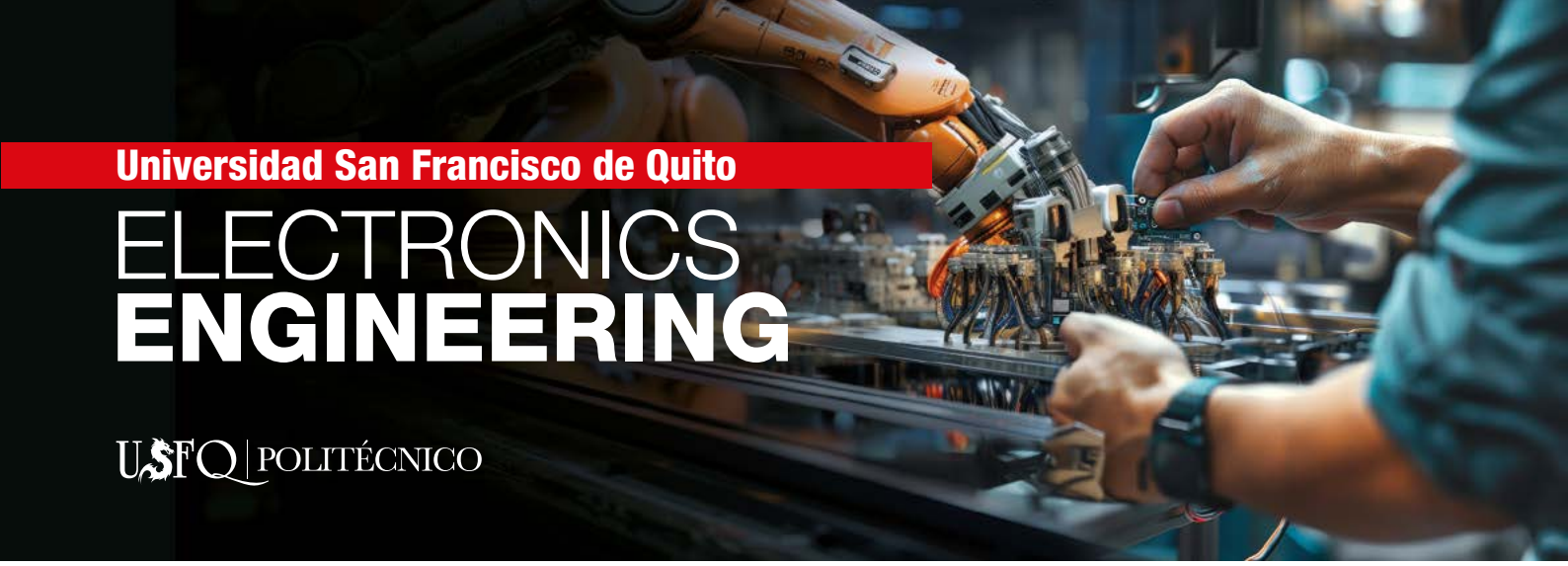

Universidad San Francisco de Quito

ELECTRONICS ENGINEERING

USFQ | POLITÉCNICO

Description of the College of Sciences and Engineering

The College of Sciences and Engineering (*Politécnico*) at Universidad San Francisco de Quito USFQ trains professionals with sharp critical thinking, excellent levels of scientific and technological preparation, a comprehensive humanistic education in the liberal arts, and solid ethical principles.

The College offers a wide variety of scientific and technical programs: Physics, Environmental Engineering, Civil Engineering, Agronomy Engineering, Food Engineering, Computer Science, Electronics Engineering, Industrial Engineering, Mechanical Engineering, Chemical Engineering, Applied Mathematics and Computing Engineering, and Mathematics. Additionally, *Politécnico* offers sub-specializations and postgraduate programs in various fields. The numerous research projects carried out by professors and students across different programs focus on both basic and applied aspects, proposing technological solutions to society's needs. The results of these projects are evidenced by the large number of specialized scientific publications, which have a high impact at the international level, as well as by the collaborations that Politécnico maintains with the local industry.

For more information, visit our website, where you can also find scholarship contests for all the programs at Politécnico to help finance your studies at the #1 University in Ecuador.

Description of the Program

The Electronics Engineering degree at USFQ focuses on studying the methods and technologies that allow the design and implementation of electronic systems and integrated devices applicable in various fields including system automation and control, signal processing and communications. The program prepares students to design, install, operate, and maintain electronic systems in multiple industries. The program also promotes continuous learning and improvement in high-demand technology areas on a global scale.

Mission

The mission of the Electronics Engineering program is to create competent, knowledgeable and skilled professionals in the fields of Electronics Engineering based on the Liberal Arts philosophy, empowering individuals to develop intelligent, innovative and ethical solutions to real world challenges by delivering a high-quality technical education that fosters creativity, critical thinking and a commitment to the welfare of society.

Vision

The Department of Electronics Engineering will be a national and international leader in the Electronics Engineering education, research, and innovation. To produce graduates who are technically proficient, creative problem solvers, ethical leaders, entrepreneurs and agents of positive change in the electronics industry, research and beyond.

UNIVERSIDAD SAN FRANCISCO DE QUITO USFQ

College of Sciences and Engineering
INGENIERÍA EN ELECTRÓNICA Y AUTOMATIZACIÓN / ELECTRONICS ENGINEERING
ON-SITE LEARNING MODALITY - 9 SEMESTERS

PRIMER AÑO / FIRST YEAR

COD	PRIMER SEMESTRE / FIRST SEMESTER	CREDITS
ESP1001	Escritura Académica *Academic Writing*	3
MAT1201	Cálculo Diferencial + Ej *Differential Calculus + Pr*	3
IEE2002	Taller Ingeniería Electrónica *Electronics Eng. Workshop*	3
QUI1003	Química General 1 +Lab/Ej *General Chemistry 1 +Lab+Pr*	3
ARL 1001	Autoconocimiento *Self-knowledge*	3
ESL 0001	Inglés Nivel 1 *English Level 1*	0
ESL 0002	Inglés Nivel 2 *English Level II*	0
	TOTAL	**15**

COD	SEGUNDO SEMESTRE/SECOND SEMESTER	CREDITS
MAT1202	Cálculo Integral + Ej *Integral Calculus +Pr*	3
ECN1001	Introducción a la Economía *Introduction to Economics*	3
MAT1401	"Álgebra Lineal 1 +Ej *Linear Algebra 1 +Pr"*	3
ARL 1002	Cosmos *The Cosmos*	3
HUM	Humanidades: LIT/FIL/ARH/ESC	3
ESL 0003	Inglés Nivel 3 *English Level III*	0
ESL 0004	Inglés Nivel 4 *English Level IV*	0
	TOTAL	15

SEGUNDO AÑO / SECOND YEAR

COD	PRIMER SEMESTRE / FIRST SEMESTER	CREDITS
MAT2002	Ecuaciones Diferenciales *Differential Equations*	3
FIS 2701	Física para Ing. 1+Lab/Ej *Physics for Eng. 1 +Lab+Pr*	3
ARL 2001	Ser y Cosmos *The Self and The Cosmos*	3
MAT2203	Cálculo Vectorial *Vector Calculus*	3
ARTE	Arte: ART/MUS/DAN/TEA	3
ESL 0005	Inglés Nivel 5 *English Level V*	0
ESL 0006	Inglés Nivel 6 *English Level VI*	0
	TOTAL	**15**

COD	SEGUNDO SEMESTRE/SECOND SEMESTER	CREDITS
CMP1101	Programación en C+++EJ *C++Programming +Pr*	3
IEE3006	Teoría Electromagnética +Lab *Electromagnetic Theory +Lab*	3
FIS 2702	Física para Ing. 2 +Lab/Ej *Physics for Eng. 2 +Lab+Pr*	3
PRC2000	Aprendizaje y Servicio PASEC *Service Learning PASEC*	3
IEE2003	Señales y Sistemas +Lab/Ej *Signals and Systems + Lab/Pr*	3
	TOTAL	**15**

TERCER AÑO / THIRD YEAR

COD	PRIMER SEMESTRE / FIRST SEMESTER	CREDITS
IEE3007	Circuitos Eléctricos +Lab/Ej *Electric Circuits +Lab/Pr*	3
ADM3002	Emprendimiento *Entrepreneurship*	3
IEE3002	Física Semiconductores +Lab *Physics of Semiconductors +Lab*	3
IEE3010	Procesos Aleator.y Estadística *RandomProcesses and Statistics*	3
CCSS	CCSS:HIS/SOC/ANT/POL/REL/PSI	3
	TOTAL	**15**

COD	SEGUNDO SEMESTRE/SECOND SEMESTER	CREDITS
GST0010	Cultura Gastronómica *Gastronomic Culture*	1
IEE3009	Teoría de Comunicaciones +Lab *Communications Theory +Lab*	3
IEE4003	Ondas Electromagnéticas +Lab *Electromagnetic Waves +Lab*	3
IEE3081	Electrónica 1 +Lab/Ej *Electronics 1 +Lab/Pr*	3
IEE3005	Semiconductores +Lab/Ej *Semiconductors +Lab/Ex*	3
ELECTIVA 1	Electiva Libre 1/2	3
	TOTAL	**16**

CUARTO AÑO / FOURTH YEAR

COD	PRIMER SEMESTRE / FIRST SEMESTER	CREDITS
IEE4007	Procesamiento Señales Digital *Digital Signal Processing*	3
IEE4006	Instalaciones Eléctricas *Electrical Installations*	3
IEE4080	Electrónica 2 +Lab/Ej *Electronics 2 +Lab/Pr*	3
IEE4001	Control de Procesos +Lab *Process Control +Lab*	3
OPT1	Optativa 1/2	3
	TOTAL	**15**

COD	SEGUNDO SEMESTRE/SECOND SEMESTER	CREDITS
DEP0010	Deportes *Sports*	1
IEE4009	Sistemas de Comunicaciones+Lab *Communication Systems +Lab*	3
IEE4011	Sistemas Digitales +Lab *Digital Systems +Lab*	3
IEE4004	Automatismos Industriales +Lab *Industrial Automation +Lab*	3
IEE4010	Electrónica de Potencia +Lab *Power Electronics +Lab*	3
ELECTIVA 2	Electiva Libre 2/2	3
	TOTAL	**16**

COD	VERANO / SUMMER	CREDITS
PAS 4000	Práctica Pre-Profesional PASEM *Professional Practicum PASEM*	5
	TOTAL	**5**

QUINTO AÑO / FIFTH YEAR

COD	PRIMER SEMESTRE / FIRST SEMESTER	CREDITS
ING0001	Coloquios *Colloquium*	1
IEE4005E	Integrated Circuits +Lab *Integrated Circuits +Lab*	3
IEE5002E	Programmable Systems +Lab *Programmable Systems +Lab*	3
OPT2	Optativa 2/2	3
IEE5991	Proyecto Integrador IEE *Senior Project*	5
	TOTAL	**15**

TOTAL DE CRÉDITOS: 142 — **3 créditos equivalen a 144 horas**

INGENIERÍA EN ELECTRÓNICA Y AUTOMATIZACIÓN/ ELECTRONICS ENGINEERING

ON-SITE LEARNING MODALITY - 9 SEMESTERS

The sequence of subjects in the curriculum from the second semester onward is a recommendation considering that some subjects are prerequisites for subsequent subjects. The system is calibrated so that students can register for the number of credits listed in the curriculum.

GENERAL EDUCATION COURSES AND GRADUATION REQUIREMENTS

Some General Education courses are fulfilled with designated courses for this purpose by each major. When a major designates a particular subject to meet the General Education requirement, that subject requires a passing grade of C.

English as a Second Language Levels ESL (B2 Common European Framework)

Students are assigned an English level (English as a Second Language ESL) based on the proficiency test taken during the admission process. Students can also validate their English knowledge with international certificates detailed in the Foreign Language Learning Proficiency: English section of the Student Handbook.

To meet the mandatory graduation requirements, all students must demonstrate English proficiency by

achieving the required score on USFQs proficiency test, presenting an international certificate of English validated by USFQ, or completing USFQs ESL levels through Level 6. To take courses in any academic area in English and courses in other languages, ESL requirements must have been formally and successfully completed.

Academic Writing (ESP 1001)

Students are encouraged to take Academic Writing early in their career. The minimum passing grade for this General Education requirement is C.

Mathematics

The General Education MATHEMATICS requirement is met with the course MAT 1201 Differential Calculus + Pr. The minimum passing grade for this General College requirement for this major is C.

Sciences

The General Education SCIENCES requirement is met with the course QUI 1003 General Chemistry 1 + Lab/Pr. The minimum passing grade for this General College requirement for this major is C.

Arts

The ART requirement is met by passing any course in the academic areas detailed below. The minimum passing grade for this General Education requirement for this major is D.
ART - Art
DAN - Dance
TEA - Theater
MUS – Music

Social Sciences

The SOCIAL SCIENCES requirement is met by passing any course in the academic areas detailed below. The minimum passing grade for this General Education requirement for this major is D.
ANT - Anthropology
EDU - Education
HIS - History
REL - International Relations
POL - Political Science
SOC - Sociology
PSI - Psychology

Humanities

The HUMANITIES requirement is met by passing any course in the academic areas detailed below. The minimum passing grade for this General Education requirement for this major is D.
LIT - Literature
FIL - Philosophy
ESC - Creative Writing
ARH - Art History
In some cases, to meet General Education requirements, students must choose a subject from various academic areas (check in the curriculum and see details below).

Community Service Learning and Service PASEC (PRC 2000)

Community service is fulfilled through the LEARNING AND SERVICE PASEC seminar. Students must attend classes and also complete community service hours.

Professional Practicum PASEM (PAS 4000)

The students can start completing PASEMs Professional Practicum requirements from the sixth semester and/or with 75 approved credits, they must complete a minimum of 240 hours. Students must enroll in PASEM in the last summer according to their curriculum, the class is approved with the internship hours and the theory component of the class. The student must ensure that the class end date coincides with his/her last semester.

Sports (DEP 0010)

Every student must choose a SPORTS class from the various options offered each semester.

Gastronomic Culture (GST 0010)

Every student must take a GASTRONOMIC CULTURE seminar from the second semester onward.

Colloquiums

The Colloquium requirement varies by major. Check with the Academic Dean of each College.

Course in English

The student must register in any course taught in English, either from their major or from the General Education. Courses with a code ending in (E), (e.g., ADM 1001E), are taught in English. Any course taught in English will have ESL 0006 English Level 6 as a prerequisite.

Writing Intensive

The student must pass any course with the Writing Intensive attribute. To register for a Writing Intensive course, students must have passed all ESL levels. Writing Intensive courses can be identified with a specific icon in the Offered Courses Catalog each semester.

Free Electives

Any subject that is not a mandatory requirement in the curriculum can serve as a Free Elective for General Education. Free Electives can be used to meet the demands of a second major or a minor.

Ser Dragón (COL 2000)

Ser Dragón is an accompaniment seminar for first-semester students that aims to facilitate the transition from high school to university life. Every student who has enrolled from semester 202210 onward must take and pass COL 2000. The passing grade for this requirement is P.

GUIDE FOR TECHNICAL ELECTIVE COURSES

*All courses offered by the College of Sciences and Engineering must be passed with a minimum grade of C.

*The list of Electronic Engineering Electives is updated each semester. Students should consult the program head for the up-to-date options.

ADDITIONAL ACTIVITIES OF THE PROGRAM

Research and other Academic initiatives

Some of the aspects associated with international research collaboration, as well as cooperation with other programs of the university and with industry, are described in this section, emphasizing when current EE students are part of the achievements.

Research and Publications

a. Commitment to Research Excellence

The EE program is deeply committed to excellence in research and has established itself as a leader in the field of Electronics Engineering in Ecuador. Despite its relatively small size, the program's faculty consistently demonstrates exceptional academic performance, reflecting the high quality and impact of its research endeavors. The EE faculty is actively engaged in research, with all full-time professors and full-time instructors dedicating significant time to advancing knowledge in their respective fields. Research efforts are primarily focused on cutting-edge technologies and analytical methods, with a strong emphasis on areas such as artificial intelligence, machine learning, image processing, and chip design at the nanometer scale. Key research topics include:

- Development and optimization of control algorithms,
- Applications of machine learning in signal and image processing to address real-world challenges,
- Utilization of neural networks for data analysis and image recognition, for robotic control and telecommunication applications,
- Design and control of power converters for renewable energy,
- Development of data acquisition systems for radiation and particle detection,
- Design and characterization of integrated circuits at the nanometer scale.

These research initiatives aim to apply advanced electronics engineering techniques to solve complex problems and drive innovation in existing technologies.

b. Research Output and Impact

Since 2021 (last 5 years), the program has produced 228 publications in peer-reviewed conferences and journals. These publications are distributed as shown in Figure 4-12. Of these publications, 61 incorporated EE students' participation in their development. All these publications are indexed in Scopus, with an average of 46 publications per year. Notably, 32 publications have appeared in Q1 journals, 16 in Q2 journals, and 2 in Q3 journals, underscoring the program's commitment to high-impact research.

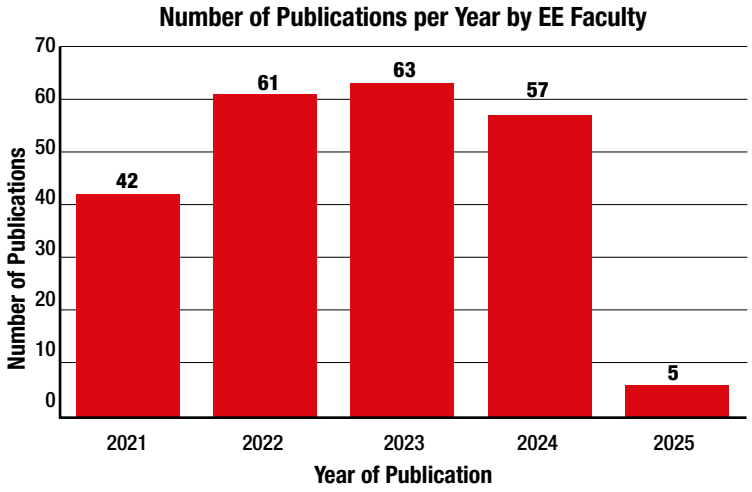

Figure 1: Number of Publications per Year by EE Faculty

A summary of the number of publications and the involvement of EE students in these research efforts is provided below:

Table 2: Summary of Journal and conference papers and EE student participation.

Year	Total # of Scopus Publications	Publications with Student Involvement	Scopus-Indexed Journals	Q1	Q2	Q3
2021	42	6	3	2	1	-
2022	61	23	13	9	4	-
2023	63	20	13	7	4	2
2024	57	12	16	12	4	-
2025	5	-	5	2	3	-

c. International Research and Academic Collaboration

The Electronics Engineering (EE) program maintains active and productive international research collaborations with several renowned universities, including Universidad de Deusto (Spain), Universidad Nacional de Colombia (Colombia), Universidad Nacional de San Juan (Argentina), Universidad Rey Juan Carlos (Spain), the University of Oklahoma (USA), Universidad Federico Santa María (Chile), Institut Supérieur d'Électronique de Paris (ISEP, France), Institut National Polytechnique de Toulouse (INPT, France), and Università della Calabria (UNICAL, Italy), among others. These partnerships enable faculty members to advance research projects in their areas of expertise, fostering innovation and global knowledge exchange.

Students are actively encouraged to participate in these collaborations through roles such as research assistants, contributing to project development, and co-authoring publications. Additionally, they are supported in engaging in paper competitions, internships, and conference presentations related to these projects. These opportunities enhance their technical, professional, and communication skills, preparing them for global engineering challenges.

Examples of activities and outcomes resulting from these international research collaborations are provided below, demonstrating the program's commitment to fostering global competencies and impactful research.

- **LA-CoNGA** Physics (Latin American Alliance for Capacity Building in Advanced Physics) is a Capacity Building project funded by the European Union (EU) through the Erasmus+ program, running from 2020 to 2023. The project established and nurtured a sustainable, dynamic, and interconnected network of Latin American and European researchers in advanced physics. Its primary goal was to provide a one-year specialization in Advanced Physics, focusing on High Energy Physics and Complex Systems, for master's students in science and engineering across the Andean region. As part of the project's academic offerings, the Electronics Engineering program delivered the *Introduction to Measurement Systems* module within the Scientific Instrumentation course. Additionally, the EE program spearheaded the implementation of a remote-access system for physics and electronics laboratories, integrating version-controlled databases (GitHub-type) and platforms for student-instructor communication and remote instrument control. This initiative involved two faculty members and four students from the EE program.

  Building on the success of LA-CoNGA Physics, a follow-up project, **EL-BONGO** (E-Latin American Digital Hub for Open Growing Communities in Physics), was funded by Erasmus+ for the period 2025–2028. In this new project, our department will lead the development of a **FAB Lab** specialized in designing and manufacturing data acquisition systems for radiation and particle detection.

  The USFQ's **Radiation, Astroparticle, and Particle Detection Lab** is also an active member of the **LAGO Collaboration** (Latin American Giant Observatory), a decentralized initiative aimed at deploying a network of astroparticle detectors across Latin America. Currently, two faculty members and two students from the EE program are engaged in developing data acquisition systems for Water Cherenkov Detectors as part of this collaboration.

  The **Institut National Polytechnique de Toulouse (INPT)** in France is a leading institution focused on research and industry collaboration across various engineering disciplines. Through a partnership with USFQ, INPT has offered internships to two EE students, enabling them to participate in cutting-edge research projects. Additionally, the **Master in Nanoelectronics** program allows students to complete their second year at INPT, where they gain access to specialized courses and state-of-the-art research facilities. This collaboration fosters academic exchange between the two institutions and creates opportunities for joint research initiatives. Furthermore, two INPT students annually complete their internship programs in USFQ's laboratories, further strengthening this academic partnership.

  The **Institut Supérieur d'Électronique de Paris (ISEP)**, a prestigious French institution specializing in digital technologies such as electronics, telecommunications, and computer science, has also partnered with USFQ. Through this collaboration, two EE students have been offered internships at ISEP, gaining valuable hands-on experience in their field. This partnership not only enhances USFQ's international presence but also opens doors for collaborative research projects between the two institutions.

  Additionally, the EE program collaborates with **Università della Calabria (UNICAL)** in Italy through joint research initiatives in the field of electronics. These projects involve both faculty and students working together on innovative research. The **Master in Nanoelectronics** program also provides students with the opportunity to complete their second year at UNICAL, where they can take specialized courses and utilize advanced research facilities. This partnership enriches the academic experience for students and promotes cross-institutional research collaboration.

In summary the EE program's international collaborations exemplify its dedication to fostering global competencies, advancing research, and providing students with unparalleled opportunities for growth. By leveraging partnerships with leading institutions, the program ensures that its graduates are well-equipped to address global engineering challenges and contribute to impactful innovations in their field.

Cooperation with other USFQ programs

Another strategy to enhance projects within the Electronics Engineering (EE) program is to foster interdisciplinary collaboration with other departments at USFQ. Currently, faculty and students from the EE program are actively collaborating with partners in Civil Engineering, Chemical Engineering, Computer Science, Mechanical Engineering, Biology, Public Health, the School of Medicine, Industrial Engineering, Physics, Mathematics, and other programs. These partnerships allow the EE program to integrate diverse perspectives, expertise, and resources, enriching the multidisciplinary nature and societal impact of its research initiatives. Through such collaborations, students gain valuable experience in addressing complex, real-world challenges that require cross-disciplinary solutions. Below is a summary of the number of collaborative projects and the students involved, demonstrating the program's commitment to fostering innovation and teamwork across disciplines.

Table 3: Summary of projects that includes cooperation with other USFQ programs.

Academic Year	Number of projects	Number of publications	Number of students involved
2022	1	1	2
2023	4	9	7
2024	2	7	4

Cooperation with Industry

Establishing alliances with industry is essential for the EE program. Through these partnerships, students gain valuable hands-on experience, working on real-world projects and challenges. Access to industry resources enhances research capabilities and enables the exploration of innovative solutions to complex engineering problems. Additionally, industry collaborations provide students with networking, internship, and job placement opportunities, facilitating their professional development and preparing them for successful careers in the field. Several notable collaborations are highlighted below.

Synopsys Inc.

- Synopsys, a global leader in electronic design automation (EDA) software and semiconductor intellectual property, delivers cutting-edge solutions for designing and verifying advanced silicon chips and systems. Through its collaboration with the Electronics Engineering (EE) program, Synopsys provides students with access to its industry-standard software suite, offering 50 licenses for academic use. These tools are seamlessly integrated into key EE courses, including Electronics 2, Integrated Circuits, and several classes within the Master's program in Nanoelectronics.

- This partnership bridges the gap between academia and industry, equipping students with the practical skills necessary for careers in integrated circuit (IC) design, fabrication, and validation. A highlight of this collaboration is an annual specialized bootcamp on digital integrated circuit design, led by a representative from Synopsys Chile at USFQ. Additionally, Synopsys has offered internships to three EE students, enabling them to gain hands-on experience in semiconductor design and verification. The company has

also funded research projects, fostering collaboration between undergraduate students and industry professionals.

Imec

- Imec (Interuniversity Microelectronics Centre), headquartered in Belgium, is a world-renowned research and development organization specializing in nanoelectronics and digital technologies. Through its partnership with the EE program, Imec has provided internships to top-performing students, allowing them to participate in advanced research projects and gain exposure to the latest innovations in semiconductor technology.

Cooperation with Professional Community

The faculty of the Electronics Engineering (EE) program actively engages with international professional and academic communities, leveraging their leadership roles to enhance the program's quality and global relevance. For instance, faculty members have held key positions such as Chair of the IEEE Ecuador Section (2014–2015 and 2018–2019), IEEE Region Director (2020–2021), and Chair of the IEEE 2023 Sections Congress. These leadership roles have enabled the program to stay at the forefront of global engineering trends and best practices, which are integrated into the curriculum and shared with students.

Additionally, faculty members have organized and chaired several international conferences held in Ecuador, including APCASE 2015, multiple editions of the Ecuador Technical Chapters Meeting (ETCM), and LASCASS 2023. Notably, the ETCM conference, a flagship event of the IEEE Ecuador Section, was initiated by our faculty to create a collaborative academic platform for Ecuadorian researchers and professionals. This initiative has not only strengthened the program's ties with industry and academia but also provided students with opportunities to engage in cutting-edge research and network with global experts.

These activities demonstrate the program's commitment to continuous improvement by fostering collaboration, integrating global engineering advancements into the curriculum, and enhancing the professional development of both faculty and students. The insights gained from these engagements are systematically used to refine course content, teaching methodologies, and program outcomes, ensuring alignment with industry needs.

Scholarships

In February 2022, the Electronics Program, with the support of the College of Sciences and Engineering at the Universidad San Francisco de Quito USFQ, organized the first scholarship contest, "Nikola Tesla," to promote research and the study of Electronics Engineering among Ecuadorian youth. The competition consists of three phases. In the first phase, participants must write and submit a short essay (maximum 3 pages) that will evaluate reasoning and expression skills related to a current technology topic. The time allotted for this essay is 60 minutes. The topic is indicated at the beginning of this stage. Next, in the second phase, candidates should make a short presentation reflecting their motivation to study in this program. Candidates who excel move on to the third phase, where they are interviewed by an evaluation panel.

The contest's prizes are highly attractive and designed to support the winners' university education significantly. The first prize consists of a full "Nikola Tesla" scholarship covering 100% of the fees for the Electronics Engineering program for four and a half years. The second prize offers a partial scholarship covering 70% of the fees under the same conditions. This opportunity not only recognizes academic merit and motivation toward Electronics Engineering but also fosters the intellectual and professional development of future leaders in the field. This contest has been regularly held

since 2022, with editions in 2023, 2024 and 2025. The Electronics Engineering program aims to equitably involve individuals of all genders, ensuring that all have equal opportunities for participation and development in the field.

Graduate Program

Master's program in Nanoelectronics

The Master's Program in Nanoelectronics is designed to provide students with advanced knowledge and skills in nanometric electronic devices and their integration into macroscopic systems for modern technological applications. The curriculum emphasizes fundamental solid-state physics, the physics of micro- and nanometric devices, integrated analog and digital design (from both full-custom and top-down perspectives), and applications in high-frequency electronics and optoelectronics.

To bridge the gap between academic learning and industry practice, the program incorporates state-of-the-art industrial Electronic Design Automation (EDA) tools from the Synopsys and Mentor Graphics platforms. Students have access to open technology libraries, enabling hands-on experience with cutting-edge design methodologies. For research projects, the program provides access to the Cadence platform and industrial technology libraries through the Europractice program. Specific libraries available include 180nm TSMC, 65nm TSMC, 130nm Skywater, and GaN imec. These resources ensure that students gain practical, industry-relevant skills that align with current technological demands.

The program fosters global engagement through established partnerships with leading institutions such as the National Polytechnic Institute of Toulouse (INP-T) and the University of Calabria (UNICAL). Students have the opportunity to complete their second year at these institutions and graduate with dual degrees from USFQ and either INP-T or UNICAL. These collaborations enhance the program's international reach and provide students with diverse perspectives and experiences, further enriching their educational journey.

The program's success is reflected in the achievements of its alumni. Approximately one-third of graduates are employed in the electronics industry in Europe, another third pursue Ph.D. programs at prestigious institutions, and the remaining third contribute to Ecuador's industry or academia.

The program encourages academic excellence and interdisciplinary learning by allowing high-achieving undergraduate students to enroll in graduate-level courses as electives, contingent upon their GPA. This opportunity not only enhances their technical knowledge but also prepares them for advanced studies and research. Additionally, the master's program regularly hosts visiting professors who deliver seminars and lectures on cutting-edge research in their respective fields. These events are open to undergraduate students, providing them with exposure to state-of-the-art developments and emerging trends in electrical engineering. Such initiatives foster a culture of continuous learning, inspire innovation, and align with the program's commitment to preparing students for lifelong professional growth.

Community Outreach

The Electronics Engineering (EE) program at USFQ is deeply committed to community outreach initiatives that align with its mission to serve society and foster technological innovation. These projects are designed to benefit local and regional communities while providing students with opportunities to apply their technical knowledge and skills to real-world challenges. Through active collaboration with faculty, students, and external stakeholders, the program has successfully implemented several impactful projects that address community needs, promote education, and support sustainable development. Below is a summary of recent outreach initiatives:

a. **Implementation of Automatic Control in the Ethanol Rectification Plant for a Community-Based Liquor Production Process (2024)**
This project focuses on improving the safety and quality of artisanal liquor production in the Pangua region by designing and implementing an automatic control system for the ethanol rectification plant. The system reduces harmful contaminants such as furfural, higher alcohols, and ethyl acetate, ensuring compliance with Ecuadorian health and safety regulations. Developed in collaboration with ASOEMPRAC (a local producer association), the project has directly benefited over 30 community members. EE students played a key role in the design and implementation phases, gaining hands-on experience in process automation and control systems. This initiative not only enhances product safety but also supports the economic and social development of the community.

b. **Engineering for Everyone (2024)**
In partnership with the "Hospital del Día Niños de la Mano de María" and the "Club Rotario Ibarra," this initiative inspires children facing health challenges to explore careers in engineering and technology. Through interactive workshops, children aged 8 and above learn basic electronics principles using circuit design kits, robots, and other hands-on projects. Guided by EE faculty and student volunteers, the program has reached over 60 children, fostering creativity, problem-solving skills, and an interest in STEM fields. This project underscores the program's commitment to inclusivity and its role in nurturing future innovators.

c. **Development of Learning Environments for Robotics Programming to Strengthen High School Students' Cognitive Skills (2025)**
This project addresses the growing need for digital literacy and computational thinking among high school students. By creating innovative learning environments focused on Python programming, robotics, Arduino, and electronics, the initiative aims to enhance logical reasoning, problem-solving, and technical skills. With the participation of EE students, the project has engaged 168 high school students, bridging the digital divide and promoting equitable access to quality education. The initiative aligns with global efforts to support lifelong learning and sustainable development.

d. **Development of Technical Skills in Basic Electronics, Robotics, and Energy at the "Unidad Educativa Fiscomisional La Inmaculada," Píllaro, Tungurahua (2020)**
This project targets students in remote areas with limited access to technical education. Through a series of workshops developed and delivered by EE students, participants gained foundational knowledge in electronics, robotics, and energy systems. The curriculum, based on IEEE Young Professionals resources, emphasized hands-on learning and practical applications. Over 25 elementary and high school students benefited from this initiative, which aimed to spark interest in technical careers and contribute to the region's long-term development.

e. **Development of Technical Skills in Office Automation in the Indigenous Community of Culatipo, Pujilí (2021–2022**)
This project addressed the technological and educational challenges faced by the Culatipo community, a remote indigenous area with limited access to resources. EE students repaired physical spaces and electrical installations, provided computers, and delivered office automation training to over 75 community members, including students and adults. By improving access to information technology, the initiative has empowered the community to enhance education, communication, and economic opportunities. The project highlights the program's commitment to social responsibility and sustainable development. (Link: https://www.instagram.com/p/CZNir2zFJ_e/?igsh=dDd6bHZoeHg3Z3My)

Summary of Community Outreach Impact

The EE program's outreach initiatives have demonstrated a strong commitment to addressing societal challenges through engineering solutions. By engaging students, faculty, and external stakeholders, these projects have directly benefited over 400 individuals across diverse communities. The program's emphasis on hands-on learning, collaboration, and measurable outcomes. Moving forward, the program will continue to expand its outreach activities, leveraging partnerships and innovative approaches to maximize its contributions to society.

Table 4: provides a summary of the community outreach projects and the number of students involved in each project.

Academic Year	Number of community outreach projects	Number of students involved
2019-2020	1	10
2021-2022	1	11
2023 - 2024	2	25
2024 - 2025	1	15

Additional Community Outreach Activities

The Electronics Engineering (EE) program actively participates in a variety of outreach initiatives designed to engage with the broader community, inspire future engineers, and showcase the program's achievements. These activities provide valuable opportunities for students to demonstrate their skills, interact with the public, and contribute to the promotion of engineering as a career path. Below is a summary of key outreach activities during the evaluation period:

1. **Engineering Fair**
   The EE program has been a consistent participant in university-wide engineering fairs, which are open to the public. During these events, EE students presented posters and prototypes of projects developed in their courses, as well as their senior design projects, there are two engineering fairs - one held each academic year. These events not only highlight the technical and creative abilities of EE students but also serve as a platform for community engagement and knowledge sharing. The fairs have attracted a diverse audience, including high school students, parents, and industry professionals, fostering interest in engineering and showcasing the program's commitment to innovation.

2. **College of Sciences and Engineering Open House**
   The EE program has actively participated in the College of Sciences and Engineering's annual open house events. During the 202310, 202320, 202410 and 202420 period, faculty and students took part in two open houses, one each academic year. These events provide an opportunity for prospective students and their families to explore the EE program's facilities, learn about its curriculum, and interact with current students and faculty. The open house also features demonstrations of student projects, laboratory tours, and discussions about career opportunities in electronics engineering, further promoting the program's visibility and appeal.

3. **TECHCamp**
   EE students and faculty instructors actively participate in the TECHCamp which is an innovative initiative designed to engage tenth, eleventh, and twelfth-grade high school students in the fields of science and

engineering. Through hands-on activities and projects conducted in the laboratories of the USFQ College of Sciences and Engineering, participants gain an immersive experience in various engineering disciplines. The camp emphasizes teamwork, creativity, and critical thinking, while also introducing students to the practical applications of engineering concepts. By providing a stimulating environment for exploration and learning, TECHCamp encourages high school students to consider careers in engineering and helps them develop skills relevant to their academic and professional futures.

4. **Talks and Vocational Guidance Activities**
   The EE program regularly organizes and participates in talks and vocational guidance activities aimed at high school and university students. These events feature faculty members and industry professionals who share insights into career paths, industry trends, and professional development opportunities in electronics engineering. Through engaging presentations and mentoring sessions, students gain a deeper understanding of the field, explore their interests, and receive practical advice for their academic and career journeys. These activities not only enrich the educational experience of participants but also strengthen the program's connections with the broader engineering community.

Summary of Impact

The EE program's involvement in these outreach activities demonstrates its commitment to community engagement, student development, and the promotion of engineering as a transformative field. By participating in engineering fairs, open houses, TECHCamp, and vocational guidance events, the program has reached a diverse audience, including high school students, parents, educators, and industry professionals. These initiatives have not only enhanced the program's visibility but also inspired the next generation of engineers and fostered a culture of innovation and collaboration. Moving forward, the program will continue to expand its outreach efforts, leveraging partnerships and innovative approaches to maximize its impact on the community.

Student Experience

This section highlights key activities in which EE students actively participate, fostering their professional growth, technical skills, and community engagement. These activities include:

a. **IEEE Student Branch**
   Students actively participate in the IEEE Student Branch at USFQ, which was established in 2014. Through this branch, they organize technical workshops, seminars, and networking events, enhancing their technical knowledge, leadership skills, and professional development. The branch provides a platform for students to engage in activities directly related to electrical and electronic engineering, fostering innovation and collaboration. Over the years, students have represented USFQ at international IEEE conferences, hackathons, and competitions, earning awards and recognition at both inter-university and international levels. In 2024, the branch's excellence was acknowledged with the prestigious title of **Best IEEE Student Branch in Ecuador,** underscoring its significant contributions to the academic and professional engineering community.

   Additionally, among all IEEE student chapters in Ecuador, one of our students was honored with the **Outstanding Student Award**, reflecting the exceptional level of excellence, dedication, and leadership within our branch. Furthermore, the **Robot and Science Challenger** project, developed by our students, was recognized as the **Best Project**, showcasing their innovation, technical expertise, and ability to address complex engineering challenges. These achievements highlight the high caliber of our students and the supportive environment provided by the EE program at USFQ.

The Student branch also hosts several specialized technical chapters activities, enabling students to explore and excel in diverse engineering fields. These chapters include:

- Computer Society (CS)
- Nuclear and Plasma Sciences Society (NPSS)
- Robotics and Automation Society (RAS)
- Aerospace and Electronic Systems Society (AESS)
- Electron Devices Society (EDS)
- Engineering in Medicine and Biology Society (EMBS)
- Women in Science and Engineering (WIE)
- Circuits and Systems Society (CASS)

Through these chapters, students engage in cutting-edge research, attend specialized conferences, and develop advanced technical skills in their areas of interest. The **WIE chapter** plays a particularly important role in promoting inclusion and diversity in STEM, encouraging the participation of women in engineering and technology. One of our students was awarded the "**Outstanding Student Member IEEE WIE Ecuador**" distinction in 2020.

By fostering a culture of innovation, collaboration, and excellence, the IEEE Student Branch at USFQ equips students with the skills, knowledge, and professional networks necessary to thrive in the engineering field.

b. Student Service Projects

EE students actively participate in outreach projects aimed at providing technological solutions to real-world challenges, particularly in vulnerable sectors. These initiatives allow students to apply their electronics knowledge to address social issues while promoting technical careers among children and young people. In recent years, students have developed and implemented community projects, as well as workshops on basic electronics and robotics.

c. Field Visits

Field visits are an integral part of the educational process, allowing students to observe real-world applications of the theoretical concepts learned in the classroom. During these visits, students gain firsthand insight into ongoing industrial projects, existing infrastructure, and specific engineering challenges within their local environment. This exposure helps them better understand the practical difficulties electronics engineers face in their daily work and provides a broader perspective on the industry. Additionally, field visits foster teamwork, problem-solving, and critical thinking, preparing students for their future careers in electronics engineering.

d. Conferences and Speeches (IEEE Branch and EE Program)

The EE Program and student chapters, organize various conferences and seminars. These events feature expert presentations (i.e. IEEE Distinguished Lecturer Program) that address contemporary topics and provide additional knowledge to professionals in the field. By attending these events, students gain valuable insights into the latest advancements, innovative techniques, and best practices in electronics engineering.

e. International Conferences, Conventions, and Competitions

Electronics Engineering (EE) students at USFQ are strongly encouraged to participate in international conferences, conventions, and competitions as part of their professional and academic development. The EE program and USFQ actively supports these endeavors by providing technical guidance, mentorship, and financial assistance for travel and registration expenses. These opportunities enable students to engage with cutting-edge advancements in electronics engineering, network with industry professionals, and gain

exposure to global perspectives. By presenting research, attending technical sessions, and competing in challenges, students deepen their understanding of contemporary engineering practices and emerging technologies. Participation in such events not only enhances students' technical and problem-solving skills but also fosters critical soft skills such as communication, teamwork, and adaptability. These experiences prepare students to excel in the global engineering landscape and contribute meaningfully to the field. Table 4-23 summarizes student participation in research projects along with the corresponding number of publications in conferences or journals, from 2022 to 2024. This demonstrates the program's commitment to fostering research and scholarly activities among students.

Table 5: Summary of student participation in conferences and journals

Year	Number of students involved	Conferences and Journals	Publications indexed in Scopus
2024	5	ETCM	3
	5	ARGENCON	4
	2	ANDESCON	1
	3	ACCA	1
	2	ICINCO	1
2023	4	AICHE	1
	5	CHILECON	5
	5	COLCACI	2
	4	ETCM	2
	4	JOURNALS	4
	2	LASCAS	1
	3	ROPEC	2
2023	1	ARGENCON	1
	1	COLCACI	1
	8	ETCM	4
	1	ISIE	1
	2	JOURNALS	1
	4	LASCAS	2
	6	ROPEC	4
Total	67	Total	41

f. Social Events (IEEE Student Branch)

The IEEE branch organize social events to promote the integration of EE program students. These events are usually held annually and include activities such as:

EE Integration: A daylong event held emphasis on networking once a year with all IEEE Chapter members. All EE program students are invited to participate in sporting activities, group meals, and an integration party.

The impact of involvement in the IEEE Student branch is significantly positive and multifaceted. Currently there are about 110 student members in the USFQ student branch. Academically, students enhance their understanding of Electrical and Electronics concepts and acquire practical skills crucial in the modern workforce. Active participation in the branch also offers valuable networking opportunities, allowing stu-

dents to build professional connections for career development. Moreover, by working on projects and participating in competitions, students develop soft skills such as leadership, effective communication, and time management, preparing them as competent technologists and potential leaders in their respective fields.

The IEEE Student branch not only enriches the academic lives of its members but also prepares students to tackle real-world challenges, ensuring they are equipped with the knowledge, skills, and networks necessary to thrive in the dynamic technology field.