

# INDUSTRIAL ENGINEERING

## 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.

Politécnico offers a wide variety of scientific and technical programs: Physics, Environmental Engineering, Civil Engineering, Agronomy Engineering, Food Engineering, Computer Science, Electronic and Automation 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 (<https://www.usfq.edu.ec/es/colegios-academicos/colegio-de-ciencias-e-ingenierias>).

## Description of the Program

The undergraduate degree in Industrial Engineering (IE) is focused on studying the optimization of processes and integrated systems, which include people, materials, information, and equipment. It includes the study of areas related to management of companies, projects, processes, and occupational safety in the industrial sector, allowing the industrial engineer to contribute to any manufacturing or service-oriented organization. Different solutions that have the potential to increase the levels of quality and productivity of organizations are thereby studied throughout the program. Additionally, the program includes courses that cover topics related to the analysis and implementation of effective proposals and strategies so that future professionals can obtain skills for their competence and responsible performance as industrial engineers.

## Mission

The Program of Industrial Engineering prepares broad-minded professionals with leadership qualities, who are committed to both life-long learning and continuous improvement of manufacturing and service-oriented systems. Our graduates will seek improvement opportunities on issues related to industrial competitiveness and will serve the community by proposing solutions that increase the quality and productivity levels of organizations.

## Vision

The Industrial Engineering Program aims to become a role model, not only in Ecuador but also in Latin America, of high-quality teaching and research that contributes to industrial competitiveness.

# UNIVERSIDAD SAN FRANCISCO DE QUITO USFQ

College of Sciences and Engineering

INGENIERÍA INDUSTRIAL / INDUSTRIAL ENGINEERING

ON-SITE LEARNING MODALITY - 9 SEMESTERS

## PRIMER AÑO / FIRST YEAR

ID	PRIMER SEMESTRE / FIRST SEMESTER	CREDITS	ID	SEGUNDO SEMESTRE / SECOND SEMESTER	CREDITS
MAT 1201	Cálculo Diferencial + Ej <i>Differential Calculus + Pr</i>	3	ESP 1001	Escritura Académica <i>Academic Writing</i>	3
QUI 1003	Química General 1 + Lab/Ej <i>General Chemistry 1 + Lab/Pr</i>	3	MAT 1202	Cálculo Integral + Ej <i>Integral Calculus + Pr</i>	3
IIN 1002	Taller Ingeniería Industrial <i>Industrial Eng. Workshop</i>	3	MAT 1401	Álgebra Lineal 1 + Ej <i>Linear Algebra 1 + Pr</i>	3
ECN 1001	Introducción a la Economía <i>Introduction to Economics</i>	3	CMP 1002	Programación en Python +Ej <i>Python Programming + Pr</i>	3
ARL 1001	Autoconocimiento <i>Self-knowledge</i>	3	ARL 1002	Cosmos <i>The Cosmos</i>	3
ESL 0001	Inglés Nivel 1 <i>English Level I</i>	0	ESL 0003	Inglés Nivel 3 <i>English Level III</i>	0
ESL 0002	Inglés Nivel 2 <i>English Level II</i>	0	ESL 0004	Inglés Nivel 4 <i>English Level IV</i>	0
<b>TOTAL</b>		<b>15</b>	<b>TOTAL</b>		<b>15</b>

## SEGUNDO AÑO / SECOND YEAR

ID	PRIMER SEMESTRE / FIRST SEMESTER	CREDITS	ID	SEGUNDO SEMESTRE / SECOND SEMESTER	CREDITS
FIS 2701	Física para Ing. 1 + Lab/Ej <i>Physics for Eng. 1 + Lab/Pr</i>	3	IIN 2001	Estadística Aplicada <i>Applied Statistics</i>	3
MAT 2008	Probabilidad y Estadística + Ej <i>Statistics and Probability + Pr</i>	3	IIN 3003	Manejo de Datos + Lab <i>Data Management + Lab</i>	3
ARL 2001	Ser y Cosmos <i>The Self and The Cosmos</i>	3	IIN 2101	Inv. de Operaciones 1 + Lab <i>Operations Research 1 + Lab</i>	3
MAT 2203	Cálculo Vectorial <i>Vector Calculus</i>	3	IIN 3002	Procesos, Métodos y Estándares <i>Processes, Methods &amp; Standards</i>	3
HUM	Humanidades: LIT/FIL/ARH/ESC <i>Humanities: LIT/FIL/ARH/ESC</i>	3	ARTE	Arte: ART/MUS/DAN/TEA <i>Art: ART/MUS/DAN/TEA</i>	3
ESL 0005	Inglés Nivel 5 <i>English Level V</i>	0	<b>TOTAL</b>		<b>15</b>
ESL 0006	Inglés Nivel 6 <i>English Level VI</i>	0	<b>TOTAL</b>		<b>15</b>

### TERCER AÑO / THIRD YEAR

ID	PRIMER SEMESTRE / FIRST SEMESTER	CREDITS	ID	SEGUNDO SEMESTRE / SECOND SEMESTER	CREDITS
DEP 0010	Deportes <i>Sports</i>	1	GST 0010	Cultura Gastronómica <i>Gastronomic Culture</i>	1
IIN 3005	Diseño de Experimentos + Lab <i>Design of Experiments + Lab</i>	3	IIN 3007	Analítica de Datos <i>Business Analytics</i>	3
IIN 3102	Investigación de Operaciones 2 <i>Operations Research 2</i>	3	ADM 3002	Emprendimiento <i>Entrepreneurship</i>	3
FIS 2702	Física para Ing. 2 + Lab/Ej <i>Physics for Eng. 2 + Lab/Pr</i>	3	IIN 3006	Ergonomía <i>Ergonomics</i>	3
IIN 3001	Control de Producción <i>Production Control</i>	3	IIN 3008	Logística y Diseño de Plantas <i>Facilities Design &amp; Logistics</i>	3
CCSS	CCSS:HIS/SOC/ANT/POL/REL/PSI	3	PRC 2000	Aprendizaje y Servicio PASEC <i>Service Learning PASEC</i>	3
<b>TOTAL</b>		<b>16</b>	<b>TOTAL</b>		<b>16</b>

### CUARTO AÑO / FOURTH YEAR

ID	PRIMER SEMESTRE / FIRST SEMESTER	CREDITS	ID	SEGUNDO SEMESTRE / SECOND SEMESTER	CREDITS
IIN 4009	Factores Humanos <i>Human Factors</i>	3	IIN 4010	Sistemas Lean <i>Lean Systems</i>	3
IIN 4002	Ingeniería de Manufacturas <i>Manufacturing Engineering</i>	3	IIN 5001	Diseño de Nuevos Productos <i>New Product Development</i>	3
IIN 4005	Simulación + Lab <i>Simulation + Lab</i>	3	IIN 4011	Proyectos: Gerencia y Análisis <i>Project Management &amp; Analysis</i>	3
ELECTIVA 1	Electiva Libre 1/2 <i>Free Elective 1/2</i>	3	IIN 4007	Ingeniería de la Calidad + Lab <i>Quality Engineering + Lab</i>	3
OPT 1	Optativa 1/3 <i>IE Elective 1/3</i>	3	ELECTIVA 2	Electiva Libre 2/2 <i>Free Elective 2/2</i>	3
<b>TOTAL</b>		<b>15</b>	<b>TOTAL</b>		<b>15</b>

ID	VERANO / SUMMER	CREDITS
PAS 4000	Práctica Pre-Profesional PASEM <i>PASEM Professional Practicum</i>	5
<b>TOTAL</b>		<b>5</b>

### QUINTO AÑO / FIFTH YEAR

ID	PRIMER SEMESTRE / FIRST SEMESTER	CREDITS
ING 0001	Coloquios <i>Colloquium</i>	1
IIN 5002	Gerencia de Operaciones <i>Operations Management</i>	3
OPT 2	Optativa 2/3 <i>IE Elective 2/3</i>	3
OPT 3	Optativa 3/3 <i>IE Elective 3/3</i>	3
IIN 5992	Proyecto Integrador IIN <i>Senior Project</i>	5
<b>TOTAL</b>		<b>15</b>

**TOTAL CREDITS: 142**

3 credits are equivalent to 144 hours

This curriculum may be subject to non-substantial changes in accordance with Article 110 of the Academic Regulations, issued by the Higher Education Council (CES). The curriculum applicable to each student will be the one in effect at the time of their graduation. Any changes that are processed will be made to this digital version published on the website of the University to which the student of USFQ must refer

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 COLLEGE COURSES AND GRADUATION REQUIREMENTS

Some General College courses are fulfilled with designated courses for this purpose by each major. When a major designates a particular subject to meet the General College 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 College requirement is C.

### Mathematics

The General College 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 College 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.

In some cases, to meet General College requirements, students must choose a subject from various academic areas (check in the curriculum and see details below).

### Arts

The ART requirement is met by passing any course in the academic areas detailed below. The minimum passing grade for this General College 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 College 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 College requirement for this major is D.

LIT - Literature  
FIL - Philosophy  
ESC - Creative Writing  
ARH - Art History

### 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 College. 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 College. 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.

Students must attend 40 Science and Engineering Colloquiums throughout the course of the program. Register at the College office.

## ADDITIONAL ACTIVITIES OF THE PROGRAM

Additional Activities Contributing to the level of Attainment to Student Outcomes.

The Industrial Engineering program at USFQ is accredited by the Engineering Accreditation Commission(s) of ABET, under the General Criteria and the Industrial Engineering and Similarly Named Engineering Programs Criteria, since 2018. The Industrial Engineering Program offers various alternatives and opportunities to enrich the learning experience and reinforce the knowledge acquired by our students. These goals are achieved through diverse activities that encompass academic, scientific, social, and technical experiences. These additional activities are integrated throughout the coursework journey and are designed to strengthen students' technical backgrounds, reinforce their knowledge, and improve their abilities and skills.

Our undergraduate students have various opportunities to enhance their education. For instance, they can participate in research projects conducted by faculty members and join one of our five student chapters affiliated with professional societies recognized and supported by ABET. During the last 9 consecutive years the IISE Student Chapter #734 at USFQ IE Program has won the Gold Award. Both student and faculty have worked together to accomplish this very important recognition.

### 1. Research

The program is committed to the planning, execution, and monitoring of research projects. Its main objective is to enhance student outcomes in applied projects, particularly for senior students. Student participation in research projects is encouraged through collaboration with other university departments, industry partnerships, and international research cooperation.

Engineering Foundations and Problem Solving: Participation in competitions such as ChemE Sports and ChemE Jeopardy challenges students to apply their foundational knowledge in chemical engineering to solve complex problems quickly and accurately.

#### International research cooperation

The IE Program at USFQ maintains international research cooperation associations with prestigious institutions worldwide, including:

- **MIT Center for Transportation & Logistics, USA**
- **Universidad Andrés Bello, Chile**
- **Universidad del Pacífico, Peru**
- **University of Auckland, New Zealand**
- **National University of Singapore**
- **Monterrey Institute of Technology and Higher Education, Mexico**
- **University of Michigan, USA**
- **Stony Brook University, USA**
- **Reutlingen University, Germany**
- **University of South Florida, USA**
- **Universitat Politècnica de Catalunya, Spain**
- **Worcester Polytechnic Institute, USA**
- **Universidade de Aveiro, Portugal**
- **York University, Canada**

These collaborations enable faculty members to develop research projects within their areas of expertise. Additionally, students are encouraged to participate as research assistants and engage in activities related to these projects, including paper competitions and conference presentations.

Notably, in the recent evaluation period spanning the 2022-2023 and 2023-2024 academic years, significant achievements were realized IE students and faculty:

- Three students, along with their faculty mentor, secured the Best Regular Paper award at the IEE International Conference on Pattern Recognition Systems 2023.
- Three students' senior projects were presented at the 12th International Symposium on Digital Forensics and Security.
- Three students' senior project was presented at the Applied Ergonomics Conference 2023.
- Three students' senior projects were selected for poster presentation at the IEA International Ergonomics Association Conference 2024

IE Faculty strives to maintain active projects and generate publications from these research associations, with the involvement of our students. During the last evaluation period, eight scientific journal or book publications have resulted from projects that involved students, in particularly senior projects.

### Cooperation with other areas/ programs of the University

Another strategy to strengthen the research projects in the IE Program is through collaboration with other areas of the University. For example, some senior projects have been undertaken in partnership with faculty from the Mechanical Engineering Program, School of Medicine, Computer Science Program and Sports. This interdisciplinary approach enhances the knowledge gained from combining several academic fields. Additionally, projects can involve cooperation with administrative departments of the University, such as students collaborating with the Continuous Improvement Department. This encourages students to develop applied projects in various professional contexts.

### Cooperation with industry

Cooperation with industry is a key component for undertaking applied senior projects. The IE Faculty continuously evaluates opportunities to implement knowledge from the IE curriculum, encouraging students to engage in projects that produce applicable results across various industrial sectors. For instance, IE students have completed senior projects involving consultancy services, such as process optimization for manufacturing companies, technical analysis of logistics and supply chain data, real jobs human factors assessments for ergonomic improvements, and other IE-related areas. The IE Faculty supports student involvement in these projects by facilitating contacts and negotiations between companies and students. This not only enhances students' networking opportunities but also provides valuable practical experience, which is crucial when seeking employment after graduation.

## 2. Community Outreach

The IE program is involved in community outreach projects. The main objective of these projects is to generate a benefit for the community, with the participation and collaboration of both students and professors of the program. These projects also represent an excellent opportunity for students to apply the knowledge they have gained in actual projects.

### Improving Workspaces

This community outreach project is part of the course project for IIN-3006 Ergonomics. The University's Business Service Office manages the collaboration with Nonprofit foundations in which students will help to solve issues related to Ergonomics and Human Factors.

### Sistema Lean: Empowering Micro and Small Businesses

This community outreach project is part of the IIN-4010 Lean Systems course. Students seek Micro and Small Businesses to help minimize waste, which generates costs that hinder their competitiveness with larger companies.

### University, College of Sciences and Engineering open house, high school visits, and others

The program is involved in additional community outreach activities. These activities involve:

- **University's open house BAD:** During this evaluation period, professors and students participated in four open houses, one each semester.
- **College of Sciences and Engineering fair:** During this evaluation period, several students presented posters and prototypes of their course and senior projects in two engineering fairs, one in each academic year.
- **High school visit:** IE Faculty receives visits from high schools of Quito, Ecuador. These visits are intended to inform high school students about the program, its characteristics, and the main opportunities related to studying Industrial Engineering.
- **Other events:** The IE Faculty conducts various community outreach activities such as Alumni Talks, Group Tutoring, IE scholarship Awardee school visit, and Summer Events. Between the 2022 and 2023 academic years, a total of three Alumni Talks, two Group Tutoring sessions, and two Summer Events were held.

## 3. Students Experience

### Institute of Industrial and Systems Engineering (IISE)

Chapter #734 of the IISE is led and coordinated by Industrial Engineering students at the University. The chapter comprises students from various academic levels, with graduating students typically occupying positions such as the presidency and vice-presidency, as well as other leadership roles. Additionally, an IE Faculty member serves in an advisory capacity for the chapter. Students from lower academic levels actively participate in the chapter, assisting with the planning and execution of its activities. Notably, our chapter has been awarded the Gold Award for the past nine years.

To attain this recognition from the Institute of Industrial and Systems Engineering (IISE), members of the IE USFQ IISE Chapter #734 diligently worked towards fulfilling the criteria outlined for the Gold Award. Student leaders within the chapter drafted a comprehensive work plan designed to execute various activities aimed at meeting the requirements for this recognition. Drawing inspiration from the best practices of other international chapters with Gold Award recognition, the plan was meticulously crafted. The execution of these activities, as well as their monitoring, was carried out directly by the dedicated members of IISE Chapter #734, under the guidance of the Chapter Advisor.

### Visits to industrial facilities

Both the IE Faculty and the IISE Chapter prioritize organizing visits to industrial facilities, considering it one of their most significant activities. These visits serve to encourage students to deepen their understanding of the practical applications of their academic curriculum and to establish direct connections with industry. Guided tours are conducted during these visits, allowing students to ask questions and gain insights into the processes, products, and management of the companies being visited. During this last evaluation period, a minimum of three visits were organized each semester to ensure ongoing engagement with industry.

### Workshops and Seminars

The IISE Chapter and IE Faculty also organize workshops and seminars featuring presentations by academic and industrial representatives. These seminars aim to address contemporary issues and provide supplementary information for all IE students and the community. Such activities contribute to a deeper understanding of current issues, advancements in various academic and research areas, and innovative topics within industrial engineering. During this last evaluation period, six seminars were organized.

### International Congresses

The IISE organizes an international congress that gathers students and faculty members from various universities. The IISE Chapter at USFQ actively encourages students to attend these congresses annually. Participation in these events offers students the opportunity to gain a deeper understanding of contemporary issues, advancements in various academic and research areas, and innovative topics within industrial engineering. During the last evaluation period, two IE students attended an IISE conference.

### International Contests

IE students are encouraged to participate in contests such as the FlexSim Latin America competition. These competitions provide outstanding students with the opportunity to showcase their work and engage in diverse academic and practical experiences. Participation in these events enriches their professional preparation and complements their curriculum.

### Social Events (IISE)

The IISE Chapter organizes different social events to promote the integration of IE program students. Different types of events are held annually. These events include:

- 1. Monthly Meetings:** Monthly meetings serve as a platform for chapter members to plan upcoming events, discuss progress, and engage in team-building activities. These meetings ensure regular communication and involvement among members, keeping everyone updated and involved in chapter activities.
  - Frequency: Monthly.
  - Purpose: Discuss monthly plans, play games, and foster interaction.
  - Format: Primarily virtual, with occasional in-person meetings.
- 2. Technical Visits:** Technical visits provide students with hands-on learning experiences by touring different industries. These visits allow students to observe real-world applications of industrial engineering concepts, understand industry operations, and explore potential career paths.
  - Frequency: Multiple visits per semester.
  - Participants: IE students.
  - Industries Visited: Corporacion GPF, Pronaca, Chaide, Nestlé, Geomil, Life, Promopesca, among others.

**3. Networking Events:** Networking events are designed to broaden students' professional connections and expose them to international perspectives. These events facilitate the exchange of ideas and experiences, helping students build a robust professional network.

- Frequency: Throughout the year.
- Purpose: Connect with international IISE chapters and professionals.
- Notable Events: "Aerologix" presentation with Alejandro Coronado; ESPOL networking event with IISE Chapter 711 from Guayaquil; "Celebrate Latinamerica" networking event with IISE Chapter 763.

**4. Mentoring Sessions:** Mentoring sessions aim to enhance students' technical skills through specialized tutoring. These sessions cover essential tools and software used in industrial engineering, helping students improve their competencies and prepare for their careers.

- Frequency: Throughout the year.
- Purpose: Provide tutoring in Python, Excel, FlexSim, AMPL to students.
- Professional Certifications: IISE Certification - Six Sigma Green Belt

**5. Special Events:**

**PARADIISE:**

Special events like PARADIISE and the Awards Gala are organized to celebrate the achievements and foster community spirit. These events provide a platform to recognize academic excellence and encourage social interaction among members.

Description: A full day of sports, traditional games, lunch, and a party aimed at uniting the community.

- Participants: All chapter members, teachers, students and faculty.
- First Industrial Engineering Awards Gala:
- Description: Awards ceremony for the best GPAs and outstanding students.
- Participants: Students and professors.

**6. Communications:** Regular communication through various mediums ensures that all chapter members are informed about upcoming events and activities. This continuous engagement helps maintain high levels of participation and fosters a sense of community among members.

- Frequency: Regular updates throughout the year.
- Medium: Social media (Instagram), emails, flyers