Electrical Energy Engineering

Duration
Ten Semesters (five years)

Degree
Electrical Energy Engineer

Occupational Field

The use of electrical energy is evident in all aspects of life, with a significant impact both socially and economically, and it imposes the need to guarantee the quality and safety of its use.

The rapid deployment of renewable energy technologies and high energy efficiency, specific to electrical energy (EE), is resulting in significant energy security, climate change mitigation, and greater economic benefits.

The trend toward an electrified world (transport, communications, home, and industry), the decentralization of the energy system (distributed generation, storage systems, digitalization of the distribution network, meters, sensors, and intelligent actuators), is quickly giving way to smart grids, while also addressing other issues related to the EE generation, EE transmission, EE distribution sectors, as well as electricity markets, economic studies, energy efficiency in industry, etc.

Thus, based on these aspects, the participation of the Electrical Energy Engineer is fundamental as a manager of innovation and the transition to the use of cleaner and more efficient energy, among other strategic issues. Therefore, the importance of the career as a driver of the Nation's development is highlighted.

Professional Profile

Graduates of the Electrical Energy Engineering program at the School of Engineering of the National University of San Juan possess solid scientific, technical, social, and professional training that enables them to identify, formulate, and solve engineering problems with an interdisciplinary approach.

They learn continuously and autonomously and work on technological developments and innovations. They possess a reflective, critical, and creative attitude for the identification and systemic resolution of problems, using techniques and tools of electrical energy engineering. They work in teams, communicate effectively, and have an entrepreneurial spirit.

They manage, plan, execute, and control electrical energy engineering projects, considering political, economic, social, environmental, and cultural aspects from a local, regional, and global perspective.
They design and develop electrical energy engineering projects, considering political, economic, social, environmental, and cultural aspects from a local, regional, and global perspective.
In all their actions, they act with ethics, professional responsibility, respecting diversity, intercultural perspectives, democratic participation, the environment, and a sense of belonging, maintaining sustainable development.
They are competent professionals to perform activities related to the generation, transmission, and distribution of electrical energy, as well as participating in industrial processes aimed at efficient energy use and the employment of clean and renewable sources.

Graduation Competencies

This curriculum includes both Generic and Specific Graduation Competencies as formulated by the CONFEDI of Argentina, as well as the Ministerial Accreditation Resolutions for Engineering programs. Graduates of Electrical Energy Engineering at UNSJ must not only know but also know how to do and know how to be; because the "knowing how to do" does not arise from the mere acquisition of knowledge, but rather from the implementation of a complex structure of knowledge, skills, abilities, attitudes, and values, which must be expressly recognized in the learning process to ensure that the pedagogical proposal includes activities that enable its development.
Consequently, the association of knowledge descriptors with competencies necessary for adequate professional training is determined.
The design thus established, integrating the competencies into the Curriculum, helps reinforce the required knowledge of knowing, doing, and being for graduates. The undergraduate education aims to develop the competencies they should possess at the beginning of their professional career. Given the continuous advancement of knowledge and technologies, the goal is also to form professionals with attitudes and skills to continue their education throughout their lives.

Technological Competencies

- Identify, formulate, and solve engineering problems.
- Conceive, design, and develop engineering projects.
- Manage, plan, execute, and control engineering projects.
- Effectively use techniques and tools applied in engineering.
- Contribute to the generation of technological developments and/or innovations.

Social, Political, and Attitudinal Competencies

• Effective teamwork.

• Effective communication.

• Ethics, professional responsibility, and social commitment, considering the economic, social, and environmental impact of their activities in the local and global context.

• Continuous and autonomous learning.

• Entrepreneurial spirit.

Specific Competencies

The following specific competencies are required to be awarded the degree of Electrical Energy Engineer at UNSJ and comply with the knowledge descriptors established in Ministerial Resolution [ME] 1565/21, Annex I.

• Develop and apply methodologies for project calculation, design, and planning of systems and installations for generation, conversion, transmission, distribution, supervision, automation, control, measurement, and use of electrical energy, respecting technical-economic, energy efficiency, and sustainability criteria.

• Develop, select, and specify equipment, devices, and components of the previously described systems, respecting technical-economic, energy efficiency, and sustainability criteria.

• Interpret and apply national and international standards and regulations for the above to ensure quality and safety standards in the generation, transmission, distribution, and application of electrical energy.

• Design, manage, direct, build, operate, maintain, and control systems and installations related to electrical energy generation, transmission, distribution, and use, applying regulatory frameworks and energy efficiency criteria.

• Investigate the development and application of emerging technologies related to electrical energy to improve and/or update systems, equipment, and processes related to electrical energy.

• Verify, diagnose, and certify the operation, condition of use, and status of equipment, installations, and systems related to electrical energy to ensure functionality and safety, applying the relevant standards.

• Develop and/or apply inspection, testing, measurement, diagnosis, and protocolization methodologies for the previously mentioned, applying the relevant standards.

• Propose, interpret, and apply technical standards related to environmental and safety aspects to minimize environmental impact in professional activities, in accordance with laws and regulations.

• Identify, quantify, and control environmental aspects and risk conditions, mitigating their adverse effects in professional activities.
• Develop energy and tariff policies related to electrical energy generation, transportation, and distribution, applying and/or developing regulatory frameworks and energy regulations to respect energy efficiency criteria and economic balance.
• Evaluate infrastructure, equipment, and service projects related to Electrical Energy Engineering to determine their economic-financial performance, risk profile, and make optimal investment decisions, considering technological and economic variables and their associated uncertainties.

Requirements

• Completed High School Education.
• Individuals over 25 years of age who have not completed high school education may access the program, subject to passing the corresponding exams and meeting the requirements established by the University.
• Foreign credits obtained in high school education, with recognition in our country.

Study Plan

N°	Year	Subject	Deployment	Weekly workload	Total hourly load
1	1	Algebra and analytical geometry	Biannual	6	84
2		Calculus I	Biannual	6	84
3		Chemistry	Biannual	5	70
4		English I	Biannual	3	42
5		Oral and Written Communication	Biannual	5	70
6		Physics I	Biannual	9	126
7		IT	Biannual	8	112
8		Computer Aided Drawing and Design	Biannual	4	56

9		Introduction to electrical energy engineering	Biannual	4	56
10	2	Calculus II	Biannual	7	98
11		Physics II	Biannual	7	98
12		Mechanics and resistance of materials	Biannual	4	56
13		English II	Biannual	3	42
14		Law and legislation	Biannual	4	56
15		Applied Mathematics	Biannual	5	70
16		Analysis of electrical circuits	Biannual	8	112
17		Optimization methods and numerical methods	Biannual	7	98
18		Statistics	Biannual	4	56
19	3	Electromagnetic field theory	Biannual	9	126
20		Measurements and electrical materials	Biannual	6	84
21		Principles of electronics and telecommunications	Biannual	6	84
22		Fluid mechanics and hydraulic machines	Biannual	4	56
23		Thermodynamics and thermal machines	Biannual	4	56
24		Hygiene, safety and environmental management	Biannual	4	56
25		Electric machines - steady state	Biannual	8	112
26		Control theory	Biannual	5	70
27		Integrated project I	Biannual	4	56

28	4	Power electronics	Biannual	6	84
29		Electrical machines - transient behavior	Biannual	5	70
30		Eectrical installations	Biannual	7	98
31		Economy and business	Biannual	6	84
32		Electric power generation	Biannual	6	84
33		Transmission and distribution of electrical energy	Biannual	7	98
34		Analysis of electrical power systems	Biannual	7	98
35		Energy economics and electricity markets	Biannual	5	70
36	5	Integration project 2	Biannual	4	56
37		Protection and control	Biannual	7	98
38		Project planning and evaluation	Biannual	7	98
39		High voltage techniques	Biannual	7	98
40		Supervised professional practice	Biannual	--	200
41		Final integration project	Biannual	--	360
Socio-educational practical requirements					30
Total hourly load of the study plan					3712