UFSC – CAMPUS ARARANGUÁ

UFSC – 55 years
117 Bachelor Degrees
63 Academic Masters Degrees
15 Professional Masters Degrees
55 Doctored Degrees

Administrative Staff 5,000
Students 45,000
(Undergraduates & Postgraduates)

Campuses:
Florianópolis
Araranguá
Blumenau
Curitibanos
Joinville

Araranguá:
Population: 61,000

Closest Capitals to Araranguá:
Florianópolis (SC): 215 km
Porto Alegre (RS): 245 km
Courses Offered in Araranguá:

Bachelor Degree:

**Energy Engineering**
Computational Engineering
Information & Communication Technology
Physiotherapy

Masters Degree:

**Energy & Sustainability**
Information & Communication Technology
Physics
Rehabilitation Sciences
UFSC – CAMPUS ARARANGUÁ

Bachelor Energy Engineering:

Beginning of activities: 2010

Professors: 28 (among them 15 Professors work in the field of energy and sustainability)

Students:
Students enrolled in 2016: 303 + 40 planned for 2016/2
First class graduated: 2014/1
Bachelor's degrees awarded: 9 + 17 planned for 2016/1

Student doing final internship in 2016/1: 20

COURSE RECOGNITION – MEC* (Ministry of Education):
Ordinance 122 April 22 of 2015

*Ministério da Educação
ENERGY ENGINEERING

OCCUPATION AREA

Original Proposal to the Federal Board of Engineering, Architecture and Agronomy - (CONFEA)*:

Generation and conversion of energy, equipment, devices and components for power generation, energy resources management and development and application of technologies relating to energy generation processes.

Transmission, distribution, conservation & energy storage, energy efficiency, all depending on the focus and course pedagogical project.

*Conselho Federal de Engenharia e Agronomia
ENERGY ENGINEERING

Other Universities with the same Major:

- PUC Minas
- Universidade Federal do ABC
- UFPR
- UFPB
- UFRGS
- UNISINOS
- UNILAB
- Unesp
- Universidade Federal de Pernambuco
- Universidade Estadual Paulista
- Universidad de Brasília
- Universidade Federal do Rio Grande do Sul
- Universidad Federal de Itajubá
- UNIARA
- Faculdades Integradas Pitangueiras
- Universidade Federal do Pampa
- Senac
- UNIPAMPA
- UNITAU
- UFMS
- UFPRDA

24 Courses
1° Course: UERGS (2003)
ENERGY ENGINEERING

PURPOSE OF THIS MAJOR

General purpose: to create capacitated graduated citizens able to work in a strategic and challenging field, the Energy field.

Specific purpose of this major:
- Stimulate the future professionals to have critical thinking and optimistic attitudes, engaging to the idea of human development and its sustainability;

- Educate the professionals, so they can have ability and knowledge to come up with solutions to the challenges related to the production, storage, distribution and rational use of energy, as well as to the impacts associated to these processes;

- Train professionals to meet the demand of companies and institutions that use energy processes, and the development of research in the area.
ENERGY ENGINEERING

UFSC’S COURSE STRUCTURE

Preparation to work with the challenges of Energy Engineering:

- Mapping of Energy Resources
- Energy Conversion and Efficiency
- Sustainable Development
- Integration with other Engineering fields
ENERGY ENGINEERING

UFSC’S COURSE STRUCTURE

Examples of areas of expertise:

- Grid-connected Small Scale Energy Projects.
- Energy Market.
ENERGY ENGINEERING

UFSC PROGRAM PROFILE

OVERALL CONTENT:

- EXACT SCIENCE (CALCULUS, PHYSICS AND CHEMISTRY)
- RENEWABLE AND NON-RENEWABLE RESOURCES
- ELECTRICAL, THERMAL, MECHANICAL AND CHEMICAL SYSTEMS
- IMPACTS ON THE ENVIRONMENT
- BIOTECHNOLOGY
- MANAGEMENT

EMPHASIS:

Conversion Systems

Bioenergy and Sustainability
ENERGY ENGINEERING

UFSC PROGRAM CURRICULUM

4320 class/hours (3600 hours)
Throughout 5 years

3240 class/hours of required courses

504 class/hours of optative courses
(post-graduate courses included)

432 class/hours of professional internship

144 class hours of extra curricular activities
## ENERGY ENGINEERING

### UFSC PROGRAM CURRICULUM

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ENERGY ENGINEERING

Curriculum for the Energy Systems Emphasis

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- Energy Efficiency Management
- Fundamental of Engineering Economics
- Thermal System Projects
- Electromechanical Energy Conversion
- Fundamentals of Control Systems

8
- Operations Research
- Energy Efficiency on Building
- Power Plant Connection to the Grid
- Industrial Electrical Installation

9
- Energy Engineering Project
- Professional Internship

10
- Final Paper
- Health and Safety at Work
Curriculum for the Bioenergy and Sustainability Emphasis

- Energy Efficiency Management
- Fundamental of Engineering Economics
- Principals of Ecology
- Residues Treatment and Management
- Fundamentals of Control Systems
- Operations Research
- Bioreactors
- Environmental Legislation
- Valuation of Environmental Impacts
- Energy Engineering Project
- Professional Internship
- Thesis
- Health and Safety at Work
ENERGY ENGINEERING

Subjects Offered as Elective

- Wind Energy
- Solar Thermal Energy
- Hydrogen and Fuel Cells
- Combustion
- Photovoltaics
- Biological Conversion of Biomass
- Fluid Machinery
- Computational Fluid Mechanics
- HVAC
- Fossil Fuels Engineering
- Production of Biofuels and Co-products
- Nuclear Energy
- Exergetic Analysis and Cogeneration
- Bioenergy and Sustainability
- Modeling and Simulation
- Electrical Circuits Laboratory
Energy Engineering Program

1st Phase

Introduction to Energy Engineering

Presentations on energy. Engineer functions in technological and social context. Presentation of the course curriculum and requirements. Visits to laboratories, companies and organizations. Energy Engineering working tools: Design, Optimization, Models, Simulation and Technological research. Innovation and Creativity. Professional ethics.

Physics A


General Chemistry

Energy Engineering Program

1st Phase

Calculus I


Analytic Geometry


Natural Resources for energy

Energy Engineering Program

2nd Phase

Fundamentals of Biotechnology


Physics B


Fundamentals of Materials Science

Energy Engineering Program

2nd Phase

Calculus II


Linear Algebra


Computer programming I

Algorithm concept. Pseudo-code and flowchart. Algorithm structure. Identifiers, reserved words, variables, constants, statement variables, command input and output, flow control structures, homogeneous structures (vectors and matrices) and heterogeneous (records) data. User-defined types. Modular programming. Introduction to a high-level programming language. Laboratory activities with the selected programming language.
Energy Engineering Program

3rd Phase

Thermodynamics I

Main concepts. Thermodynamic properties. Heat and work. First and second law of thermodynamics to a system and a control volume.

Physics C


Experimental Chemistry

Energy Engineering Program

3rd Phase

Calculus III


Renewable Energy & Sustainability


Geology

Energy Engineering Program

4th Phase

Thermodynamics II


Physics D


Experimental Physics

Energy Engineering Program

4th Phase

Calculus IV


Environmental Pollution

Biochemical processes occurring on atmosphere, water and soil. Natural processes changing caused by pollutants. Toxic organic and inorganic compounds. Remediation and / or attenuation technologies for contaminated sites.

Oceanography

Energy Engineering Program

5th Phase

Heat and Mass Transfer I


Fluid Mechanics


Introduction to Probability & Statistics

The role of statistics in engineering. Probability and statistics: probability distributions, histograms, measures of central tendency and dispersion, inferences about mean and variance, statistical dependence and independence, regression analysis and correlation.
Energy Engineering Program

5th Phase

Numerical Methods


Atmosphere

Atmospheric chemistry and physics. Meteorology, climatology and synoptic chart interpretation. Wind and solar energy potential: data collection and analysis. Teleconnections and climate change. Sun and wind as energy resource.

Electrical Circuits

Energy Engineering Program

6th Phase

Heat and Mass Transfer II


Technical Drawing


Academic Work Preparation

Brazilian Association of Technical Standards for academic work: quotations and references. Research sources. Report development, summary and review. Reading techniques, production and presentation of scientific papers.
Energy Engineering Program

6th Phase

Statics and Dynamics


Electromagnetism and Power Electronics


Energy Transmission and Distribution

Energy Engineering Program

7th Phase (Energy Systems Emphasis)

Energy Efficiency Management


Fundamentals of Engineering Economics


Thermal System Projects

Energy Engineering Program

7th Phase (Energy Systems Emphasis)

Electromechanical Energy Conversion


Fundamentals of Control Systems

Energy Engineering Program

8th Phase (Energy Systems Emphasis)

Operations Research


Energy Efficiency on Building


Power Plant Connected to the Grid


Industrial Electrical Installation

Energy Engineering Program

9th Phase (Energy Systems Emphasis)

Energy Engineering Project

Steps of scientific method. Elaboration of final graduation work project.

Professional Internship

Internship should be conducted in areas related to the graduation course. Activities are regulated by UFSC available on http://www.reitoria.ufsc.br/estagio/
Final Paper

Elaboration of Course's final paper.

Health and Safety at Work

Brazilian legislation on occupational accidents and diseases. Risks inherent to work environment: administrative, occupational, environmental and ergonomic. Physical, chemical and biological agents and their tolerance limits. Regulatory standards and their implementation to prevent work-related diseases.
Energy Engineering Program

7th Phase (Bioenergy and Sustainability Emphasis)

Energy Efficiency Management


Fundamentals of Engineering Economics


Principals of Ecology

Energy Engineering Program

7th Phase (Bioenergy and Sustainability Emphasis)

Residues Treatment and Management

Integrated urban solid waste management and energy production. Waste treatment from power generation industries. Recovery of degraded and/or contaminated areas by electricity extraction, generation, conversion and transport.

Fundamentals of Control Systems

Energy Engineering Program

8th Phase (Bioenergy and Sustainability Emphasis)

Operations Research


Bioreactors

Energy Engineering Program

8th Phase (Bioenergy and Sustainability Emphasis)

Environmental Legislation


Valuation of Environmental Impacts

Energy Engineering Program

9th Phase (Bioenergy and Sustainability Emphasis)

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Energy Engineering Program

Subjects Offered as Elective

**Wind Energy**


**Solar Thermal Energy**


**Hydrogen and Fuel Cells**

Energy Engineering Program

Subjects Offered as Elective

**Combustion**

Thermochemistry, combustion kinetics, deflagration and detonation, premixed flames and non-premixed combustion of liquids and solids, pollutant formation and environmental pollution.

**Photovoltaics**


**Biological Conversion of Biomass**

ENERGY ENGINEERING

Energy Engineering Program

Subjects Offered as Elective

Fluid Machinery
Definitions, types and applications. Rotor flow analysis. Required and available power. Selection, installation and fluid Machines operation. Cavitation.

Computational Fluid Mechanics

Heating, Ventilating and Air Conditioning - HVAC
Energy Engineering Program

Subjects Offered as Elective

Exergetics Analysis and Cogeneration


Bioenergy and Sustainability

Products, raw materials, co-products and sub-products of bioenergy. Social, economic and environmental impacts on local, national and global level. Current and emerging challenges for bioenergy development. Information about production, harvesting, aggregation and storage of bioenergy crops appropriated for certain regions, best management practices to protect soil, water and wildlife.

Modeling and Simulation


Electrical Circuits Laboratory

Development of practical activities to explore the fundamentals, concepts and techniques related to electrical and electronic circuits.
ENERGY ENGINEERING

Internships

- **Minimal hours:** 432 class/hours
- **Students can spend a semester exclusively for the internship** (without other activities)
- **Up to 8 hours daily, to comply with the National Internship Law**
Internship
Some of the companies that has had or are having Energy Engineering Interns from UFSC-Araranguá
Junior Enterprise

In 2012 it was founded the Junior enterprise (Empresa Junior de Engenharia de Energia - ENEjr) by the students. This is a consulting company in the field of energy efficiency. It offers an unique learning opportunity. Students with the help of supervisors can plan and implement energy efficiency projects in small and medium-sized enterprises. This give students the opportunity of adding practical experience to their theoretical skills and bridging the gap between academia and the business world.
Thank you for your attention!

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