SCIENCE, TECHNOLOGY, HEALTH

Industrial and Territorial Ecology Engineering Degree

Level of qualification: Master's degree

ECTS 180 credits

Duration 3 years, 6 semesters

Overview

The Industrial and Territorial Ecology program enables students to

students to acquire specific skills in the field of energy systems engineering, particularly renewable energies; the treatment of liquid and gaseous effluents and waste; energy efficiency; and control of the environmental footprint of industrial activities throughout their life cycle.

Objectives

The objective of this training program is to graduate industrial ecology engineers who are qualified to perform engineering tasks inherent to the various phases of creation, development, or operation of industrial sites, business parks, or integrated neighborhoods. The objectives of these engineering tasks are to minimize and optimize the use of energy and natural resources, and to manage and minimize solid, liquid, and gaseous waste and effluents, in particular by creating synergies between local stakeholders in the following areas:

- energy systems engineering, particularly renewable energies;

- treatment of liquid, gaseous, and solid effluents and waste;

- reducing and controlling the environmental footprint of industrial activities throughout their life cycle;

- the creation, development, and facilitation of exchange networks and synergies in order to minimize both resource consumption and waste.

International dimension

100% of students go abroad

- either by spending a semester studying at a foreign university under inter-institutional agreements
- or by doing an internship abroad, in a company or laboratory, thanks to the School's network of partners

https://www.polytech.univ-smb.fr/international/ mobilite.html

The advantages of the program

This training program responds to a need identified by professionals (private or public) in the context of the circular economy. Improved waste management and energy use are now major economic and environmental challenges for every company and require managers in emerging professions in the fields of energy efficiency, waste recovery, and efficient waste treatment with a view to improving environmental performance.

Organization

Expected enrollment

24 places

Study arrangements

The Disability Mission and the High-Level Sports (SHN) / High-Level Artist (AHN) program offer study accommodations.

Learn more

Admission

Who is the program for?

- Integrated preparatory class
- CPGE students,
- Undergraduate students (L2, DUT, or equivalent)

http://www.polytech-reseau.org/postuler-a-polytech/cycle-ingenieur/

Apply and register

Apply / Register

And after

Further studies at USMB

- Master's in Business Management and Administration
- Doctorate

Targeted professions and career opportunities

- Industrial environment consultant, project manager, project leader, business manager, research manager in

Industrial and Territorial Ecology, Environment, Energy

- Research and development engineer;
- Industrial environment consultant, carbon footprint consultant/expert,
- Engineer responsible for eco-industrial sites, local authority development, unions or local renewable energy production structures, waste collection and treatment, industrial risk management,

heating networks, quality control and assurance.

Practical information

Contact

Admission to Polytech Annecy-Chambéry

admission@polytech-annecy-chambery.fr

Partner laboratories

Laboratory for Design Optimization and Environmental Engineering (LOCIE)

https://www.locie.univ-smb.fr/

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Learn more

Become an Industrial and Territorial Ecology Engineer

https://www.polytech.univ-smb.fr/formation/ecologie-industrielle-et-territoriale/ingenieur-ecologie-industrielle.html

Program

IGE3 - Industrial and Territorial Ecology

Semester 5

	Nature	Lecture	Tutorial	Practical	Credits
UE501 Gateway to the professional environment	UE				8 credits
English S5 Sports	MODULE		40.5		
Business Management Simulation	MODULE		21		
Skills development support Optional internship S5	MODULE		12		
Support (every Thursday afternoon)	MODULE				
	MODULE	3 hours			
	MODULE				
	MODULE				
UE502 Engineering Sciences and Tools	UE				9 credits
Sustainable Development	MODULE	3 p.m.	12		
Algorithms and Python Programming	MODULE	3	hours	12	
		a.m.	6		
			hours		
Databases (business information management basics) MAraTHon: Support/Refresher course	MODULE	6	4.5	12	
Mathematics Core Curriculum	MODULE				
	MODULE	16.5	37.5		
UE503 Management of flows at the regional level	UE				13 credits
APP Territorial dynamics and waste management Macroscopic balances and chemical	MODULE			40	
reactors Innovation and creativity	MODULE			hours	
Territorial Organization	MODULE	28.5	45	12	
	MODULE			hours	
		16.5		24	
				hours	
				3	
				hours	

Semester 6

	Type	Lectures	Tutorial	Practical	Credits
UE601 Gateway to the professional environment	UE				8 credits
Professional experience Financial	MODULE				
management	MODULE	10.5	9		
Introduction to law	MODULE	15	4.5		
Issues in artificial intelligence	MODULE	hours			
Project management techniques, business-oriented Optional internship S6	MODULE	6			
Support (every Thursday afternoon when FISA staff are present) English (TOEIC level not achieved) S6	MODULE	hours	9		
Modern languages (TOEIC level achieved) English S6	MODULE				
Modern language 2	MODULE				
Italian TD	MODULE				
	SUBJECT CHOICE		40.5		
	Tutorial		3 p.m.		
			8 p.m.		
German TD	Tutorial		8 p.m.		

Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD	Tutorial		8 p.m.		
Advanced English S6	SUBJECT		21		
UE602 Natural Resources and Sustainable Systems Engineering	EU				8 credits
Natural Resources	MODULE	34.5 hours	16.5	8	
APP Mass and Energy Transfers	MODULE				
UE603 Mass and Energy Transfers	UE				14 credits
Thermodynamics Fluid Mechanics Heat	MODULE	10.5	24 15	24h	
Transfer Electricity	MODULE	12h	31.5	20h	
	MODULE	24h	9		
	MODULE	9h		8	

IGE4 - Industrial and Territorial Ecology

Semester 7

	Nature	Lecture	Tutorial	Practical	Credits
UE701 Gateway to the professional environment	UE				6 credits
Professional resources and dynamics Creativity and innovation management	MODULE		13.5	3.5	
English (TOEIC level not achieved) S7 Modern languages (TOEIC level achieved)	MODULE		25.5		
	MODULE		40.5		
English S7 Modern	MODULE				
Language 2	SUBJECT				
Italian TD German	CHOICE TD		15		
TD Spanish TD	Tutor ial				
Japanese TD	Tutor ial		20 20		
Intercomprehension of Romance Languages TD Advanced English S7					
Optional internship S7	Tutor ial		20 20		
Support (half of Thursday afternoons when FISA staff are present)	Tutor ial		20 21		
	Tutor ial				
	SUBJECT				
	MODULE				
	MODULE				
UE702 Energy and gas treatment	UE				15 credits
Energy vectors, quality, and energy conversion Air pollution and filtration processes	MODULE	37.5	36	12	
	MODULE	33			
UE703 Industrial and Territorial Ecology	UE				9 credits
APP: Waste collection and incineration Multi-criteria analysis	MODULE	7.5	6	40	
Sustainable development	MODULE	15		hours	
	MODULE	hours		18	
		13.5	21	hours	
		hours			

Semester 8

	Nature	Lectures	Tutorial	Practical	Credits

UE801 Gateway to the professional environment	UE				6 credits
Integrated QSE (Quality, Safety, Environment) Management System Management Techniques	MODULE	9	10.5		
English (TOEIC level not achieved) S8 Modern languages (TOEIC level achieved)	MODULE	a.m. 6 p.m.	7.5		
	MODULE		40.5		
English S8 Modern	MODULE				
Language 2	SUBJECT				
Italian TD German	CHOICE TD		3 p.m.		
TD Spanish TD	Tutor ial				
Japanese TD	Tutor ial		8 p.m.		
Intercomprehension of Romance languages TD Advanced English S8	Tutor ial		8 p.m.		
Optional internship S8	Tutor ial		8 p.m.		
Support (half of the Thursdays when FISA is present)	Tutor ial		8 p.m.		
	Tutor ial		9 p.m.		
	SUBJECT				
	MODULE				
	MODULE				
UE802 Internship	UE				6 credits
Internship Assistant Engineer S8	MODULE				
UE803 Process Engineering and Energy	EU				11 credits
Optimization of Energy Storage and Transfer Unit Operations in Effluent Treatment	MODULE	28.5	31.5		
	MODULE	30	31.5	24	
UE804 Effluent treatment	UE				7 credits
Water treatment and reuse, new challenges APP: Effluent treatment	MODULE	31.5	16.5		
	MODULE	6		48	

IGE5 - Industrial and Territorial Ecology

Semester 9

	Nature	Lecture	Tutorial	Practical	Credits
UE901 Gateway to the professional world	UE				10 credits
Research and Development Project English (TOEIC level not achieved) S9 Modern Languages (TOEIC level achieved)	MODULE				
English S9 Modern	MODULE		40.5		
Language 2	MODULE				
Italian TD	SUBJECT		15h		
	CHOICE TD				
			20h		
German TD	Tutorial		20		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD Advanced English S9	Tutorial		20		
Optional internship S9	SUBJECT		hours		
	MODULE		21 hours		
UE902 Process Engineering and Energy	UE				10 credits

Renewable energies	MODULE	30 hours	27	40	
Treatment of gaseous pollution	MODULE	21	21	24	
UE903 Renewable Energy Development	UE				10 credits
APP: Industrial and Territorial Ecology	MODULE			48	
Energy, Environmental, and Public Procurement Law	MODULE	15	15		
Networks and storage	MODULE	24 hours	24 hours		
Organic waste recovery: Methanization and Composting	MODULE	12 hours	9 hours		

Semester 10

	Nature	Lecture	Tutorial	Practical	Credits
UE001 Engineering internship	UE				30 credits
Engineering internship S10	MODULE				

UE501 Bridge to the professional world

ECTS
8 credits

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
English S5 Sports	MODULE		40.5 hours		
Business management simulation	MODULE		21 hours		
Skills development support	MODULE		19.5 hours		
	MODULE	3 hours	12		

	Nature	CM	Tutorial	Practical	Credits
Optional internship S5	MODULE				
Support (every Thursday afternoon)	MODULE				

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

English S5 (LANG501_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Open to exchange students:** Yes
ERASMUS reference: Languages

Presentation

Description

This course prepares students for the TOEIC ("Test of English for International Communication") exam, specifically to achieve a minimum score of 785 points (out of 990).

With the aim of developing all four skills, this course also serves as an introduction to public speaking through presentations given by students in groups or individually on topics illustrated by press articles or video materials (VTD: Video, Talk and Debate, as well as written work). Depending on the location (Annecy or Chambéry), some will be seen at different times during the semester, the year, or even the three years of training.

Students are assessed throughout each semester. The final assessment consists of a 1-hour, 1.5-hour, or 2-hour exam, depending on the semester, and accounts for 33% of the total continuous assessment.

Objectives

Specific objectives: at the end of this course, students will be able to:

revise grammar on: the correct reflexes of common structures; the verb group and tenses (except the conditional tense); the noun group and all its constituent elements; logical links (connecting words)

improve their grammatical and lexical knowledge (general English and TOEIC-specific vocabulary) in class and independently, validating their progress through regular assessment tests.

Teaching hours

Tutorials	Tutorials	40.5

Mandatory prerequisites

CEFR level B1

Course outline

1. Oral
   1. Elements of phonology
   2. Grammar (tenses, questions, adjectives.....)
   3. Reinforcement of structures and vocabulary
   4. Interactive oral communication
   5. Introduction to and practice for the TOEIC (listening section)
2. Writing
   1. Review of grammatical elements (tenses, questioning, adjectives. .....)
   2. Review of lexical elements (TOEIC-specific vocabulary)
   3. Comprehension of authentic texts
   4. Introduction to and practice for the TOEIC (reading section)

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

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Campus

Le Bourget-du-Lac / Savoie Technolac campus

Sports (SHES501_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Teaching format: Tutorials **Open to exchange students:** Yes
ERASMUS reference: Services to individuals

Presentation

Description

This course is based on physical and sports activities and focuses on two main areas.

On the other hand, the aim is to enable engineering students to acquire collective skills in project implementation and group management, but also to develop their individual abilities to adapt and regulate themselves. This focus will be reflected in the collective organization and implementation of a sporting event over the course of one session.

It also aims to enable students to acquire skills related to sporting activities and to highlight their interpersonal skills, which are essential for their integration and professional success. This focus will be based on the work carried out around the values conveyed by the various sporting activities and their diverse modes of practice.

Objectives

Objective 1: Work as a team to prepare, organize, and manage a sporting event within a constrained framework.

Objective 2: Engage in a new physical activity in an intense, lucid, reasoned, and critical manner

Teaching hours

Tutorials	Tutorials	21

Mandatory prerequisites

No mandatory prerequisites

Course outline

7 three-hour practical sessions.

Additional information

Classes are held at the Dassault gymnasium, avenue des îles in Metz-Tessy. Bus transportation (round trip) is provided from the Annecy campus.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Francoise Ducoeur
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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Business Management Simulation (SHES505_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** Hybrid
Teaching format: Tutorials **Open to exchange students:** Yes

Presentation

Description

Business games, also known as serious games or business management simulations, are educational tools that offer a different way of learning. They are simulations that aim to demonstrate the complexity of businesses while relying on a simplified model. In a business game, time is accelerated and participants play out several years in the life of a company over a condensed period (two days in this case). This business simulation is carried out using a computer program. The program incorporates an algorithm to calculate the performance of each competing team (each team representing a company in the market) at the end of each decision.

Objectives

1. Analyze the general context to communicate more effectively.
2. Learn about the main communication tools, media/non-media,
3. Understand the process of developing a communication strategy,
4. Provide comprehensive, practical, and effective training in business management,
5. Raise awareness of the interdependence of business functions through decision-making and results analysis.

Teaching hours

Tutorials	Tutorials	19.5

Mandatory prerequisites

None

Course outline

Focused on a cross-functional approach to business management issues, this game combines various constraints specific to different business functions (marketing, production, finance, and financial resources) and allows students to learn the basics of both oral and written communication. Through simulation, students will address person-to-person, face-to-face communication. External communication mainly involves communication for the purposes of company marketing: developing a strategy, overview of tools, etc.

Targeted skills

- Be able to design the basics of a business strategy.
- Know how to support the development and implementation of a communication plan,
- Be able to work in a team,
- Know how to communicate and make decisions as part of a team

Bibliography

- Sophie Delerm, Jean-Pierre Helfer, and Jacques Orsoni. Les bases du marketing (The Basics of Marketing), Vuibert, 2006 (Part 2, Chapters 1 and 2, and Part 3, Chapter 2).
- Jacques Lendrevie, Julien Levy, "Mercator, Theory and New Practices in Marketing (9th Edition)," Dunod, Paris, 2009 (Chapter 15)
- Jean Barreau, Jacqueline Delahaye, "Financial Management DECF Test 4," Dunod, 2006 (Chapters 7 and 8)
- Christian Goujet, Christian Raulet & Christiane Raulet, "Management Accounting," Dunod, Paris, 2007. (Chapters 1, 17, and 18)
- Maurice Pillet, Chantal Martin-Bonnefous, Pascal Bonnefous, Alain Courtois, "Production Management: Fundamentals and Best Practices," Eyrolles, 2011. (Read: Chapters 4, 6, and 8)

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Elodie Gardet

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Course coordinator Elodie Gardet

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Campus

Le Bourget-du-Lac / Savoie Technolac campus

Skills Development Support (ADCO501_PCHY)

Polytech Annecy-Chambéry
component

In brief

Teaching methods: In person

Open to exchange students: Yes

Presentation

Description

As the school is committed to a skills-based approach, this course aims to introduce students to this approach, familiarize them with the skills framework for their training, and present them with the various documents and tools they will need to use throughout their training.

Teaching hours

CM	Lecture	3
Tutorial	Tutorials	12

Course outline

Content elements for all specializations

- Understanding the APC approach and its relevance to engineering education (link to professions, RNCP)
- Understanding the main concepts and learning the terminology used by the school
- Find resources related to APC (reference documents, RNCP files, cross-referenced matrices, AMS mapping, portfolio, etc.)
- Reading a training reference document (templates and examples)
- Understanding what a portfolio is

- Write a skills assessment (KAPC+ example)

Specific content elements for each specialty

- Get to grips with the reference framework for your specialty
- Link the reference guide to job characteristics
- Assessing your position in your training program
- Identify the contribution of resources to the skills in the reference framework (cross-referenced matrices)
- Identify the situational activities (AMS) in your training and the skills they involve
- Use the portfolio to self-assess the skills in your training program

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Ilham Alloui

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Places

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Optional internship S5 (PROJ500_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

Overview

Description

The optional internship aims to enrich students' academic and professional experience by offering them a practical opportunity to apply their knowledge and acquire new skills. An optional internship can be carried out **in France or abroad**. It must comply with the same general conditions as compulsory internships.

Objectives

- **Acquisition of** specific skills related to the specialization;
- **Refining career goals and/or** gaining confidence and independence through the completion of a project or specific tasks;
- Establish valuable professional contacts that can help in future job searches.

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator

Polytech-Bourget Corporate Relations

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Campus

Le Bourget-du-Lac / Savoie Technolac campus

Support (every Thursday afternoon) (ACCO501_PCHY)

Polytech Annecy-Chambéry
component

In brief

Teaching methods: In person **Teaching format:** Tutored project **Open to exchange students:** Yes

Presentation

Description

This support is open to all students at the school: students, apprentices, and Continuing Education employees. It is not mandatory, as it is primarily intended for students who need it to succeed in their training. This semester, it is scheduled into the timetable for each course, with a total of 64 hours.

Support may take the form of refresher courses, upgrading courses, or support in the main areas of the training programs.

Peer tutoring is encouraged and the educational resources of the Polytech Network are used (https://eplanet.polytech-reseau.org/).

Objectives

To promote the success of all students in their educational journey.

Teaching hours

PTUT	Tutored project	64

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Director of Polytech Training

Locations

Le Bourget-du-Lac (73)

UE502 Engineering Sciences and Tools

ECTS
9 credits

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Sustainable Development	MODULE	3 p.m.	12 hours		
Algorithms and Python Programming	MODULE	3 hours	6 hours	12 hours	
Databases (business management information database) MAraTHon: Support/Refresher courses	MODULE	6	4.5	12	
Mathematics Core Curriculum	MODULE				
	MODULE				
		16.5	37.5		

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Sustainable Development (DDRS501_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

ERASMUS reference: Engineering and related techniques

Overview

Description

This course trains engineering students in the issues surrounding sustainable development and its integration into businesses. The aim is to enable them to consider and integrate the challenges of ecological and energy transition into their professional work.

Objectives

Students will learn to define the various challenges of ecological and societal transition, as well as energy issues. They will be introduced to the tools available to engineers to limit the ecological impact of a product or service.

Teaching hours

Lectures	Lecture	15
Tutorial	Tutorials	12

Course outline

1. Introduction to sustainable development (3 hours of lectures)

1. 1. Planetary boundaries
    2. Concept of sustainable development and ecological and societal transition
2. Carbon footprint (3 hours of lectures)
    1. The concept of climate
    2. Climate change - Greenhouse gases
    3. Carbon footprint method (6 hours of tutorials)
3. Energy (3 hours of lectures)
    1. Concepts of power and energy
    2. Global energy situation
    3. Practical exercises and case studies (3 hours of tutorials)
4. The ecological transition in business (1.5 hours lecture)
5. Product life cycle analysis, eco-design (3 hours of lectures, 3 hours of tutorials)

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator David Gibus

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Campus

Le Bourget-du-Lac / Savoie Technolac campus

Algorithms and Python Programming (INFO501_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person

Open to exchange students: Yes

ERASMUS reference: Information and Communication Technologies (ICT)

Overview

Description

This is an introductory course on the use of programming to solve problems related to engineering. It will introduce concepts of algorithms and data representation in a computer. In practice, students will also learn how to program in Python.

Objectives

This course aims to provide students with basic knowledge of how information is represented in computers, while also introducing them to traditional data structures. The module also aims to teach students the basics of algorithms and programming. The goal is to enable students to use IT tools to solve problems encountered in engineering.

Teaching hours

Lectures	Lecture	3
Tutorial	Tutorials	6
Lab	Practical work	12

Mandatory prerequisites

None

Course outline

The course is divided into:

- Lectures (CMs), where concepts related to algorithms and data structures will be introduced
- Tutorials (TDs), where concrete examples will be put into practice in a programming language
- Practical work (PW) where we will explore concepts and skills in depth to solve concrete problems. The program is as follows:

1. Machine architecture, data representation
2. Introduction to Python programming
    1. The basics of the language
    2. Basics of the language
    3. Control structures
    4. Loops
    5. Functions and procedures
    6. Classic data structures
3. Algorithmic concepts and implementation in Python
    1. Calculation of mathematical functions
    2. Sorting and selection
4. Object-oriented programming
5. Problem solving using libraries

Targeted skills

At the end of this module, students should be able to:

- model a concrete problem using an appropriate data structure
- solve the problem by implementing an algorithmic approach
- program the solution on a computer

Bibliography

- Learning to program with Python 3, Gérard Swinnen

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course leader Ammar Mian
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Campus

Le Bourget-du-Lac / Savoie Technolac campus

Databases (business information management) (INFO502_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Information and Communication Technologies (ICT)

Overview

Description

This course aims to provide students with the basic skills needed to model, implement, and manipulate a relational database. The course focuses on general and business-related problems.

Objectives

1. Designing a simple relational database (< 10 entities, linked only by 1-n or n-m links)
2. Implementation of a simple DB in a relational DBMS
3. Use of a relational DB through simple queries

Teaching hours

Lectures	Lecture	6
Tutorial	Tutorials	4.5
Lab	Practical work	12

Mandatory prerequisites

None

Course outline

1. Introduction to Databases (30 min CM 1)
2. Entity/Association (EA) modeling in UML standard (1 hour CM 1)
3. Relational modeling & transition from EA to relational modeling (1.5 hours CM 2)
    1. Tutorial 1: EA and relational models
4. Relational algebra (1.5 hours, lecture 2)
    1. Tutorial 2: Relational algebra
    2. Tutorial 3: Extended relational algebra
    3. Lab 1: Manipulating a database in SQL
    4. Lab 2: Modifying a database in SQL
    5. Lab 3: Database lab exam in SQL

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

MAraTHon: Support/Refresher Course (MATH500_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

ERASMUS reference: Mathematics and statistics

Overview

Description

This course aims to strengthen students' foundations in mathematics.

Teaching hours

PTUT	Tutored project	15

Course outline

1. Plane geometry and geometry in space
2. Complex numbers, polynomials, rational fractions: decomposition into simple elements on R
3. Linear systems, matrices, determinants
4. Differential calculus of functions of a real variable, applications: Taylor's formula, limited developments, equivalents
5. Basic integral calculus (including variable substitution), definition and examples of generalized integrals
6. Basic differential equations: first-order linear equations, variation of the constant, second-order linear equations with constant coefficients.

Bibliography

- J-P. Truc, Précis de Mathématiques, Nathan, 1997
- G Chauvat, A. Chollet, Y.Bouteiller, Mathématiques, Ediscience, 2005
- S Ferrigno, D Marx, A Muller-Gueudin, Mathématiques pour les sciences de l'ingénieur, Dunod, 2013

Skills acquired

Macro-skill	Micro-skills

Practical information

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Mathematics Core Curriculum (MATH501_PCHY)

Polytech Annecy-Chambéry
Component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Mathematics and Statistics

Presentation

Description

This course aims to provide the fundamentals of analysis necessary for engineering sciences.

Teaching hours

Lectures	Lecture	16.5
Tutorial	Tutorials	37.5

Mandatory prerequisites

MATH500: Mathematics refresher course or otherwise solid foundation in mathematics equivalent to two years of post-secondary education

Course outline

1. Differential calculus: functions of several variables, differentiation, examples of partial differential equations
2. Vector analysis (Part 1): differential operators, scalar potentials, vector potentials,
3. Curves and surfaces, point motions

4. Multiple integrals

5. Vector analysis (Part 2): line integrals, surface integrals

Bibliography

Books:

- J-P. Truc, Précis de Mathématiques, Nathan, 1997 (for MATH500)
- J. Stewart, Analysis, Concepts and Contexts, vol. 2, De Boeck, 2001
- B. Dacorogna, Advanced Analysis for Engineers, Presses polytechniques et universitaires romandes, 2002
- E. Azoulay, J. Avignant, G. Auliac. Mathematics in the Bachelor's Degree (2nd year, volume 1), Ediscience, 2003
- F. Cottet-Emard, Analysis 2, De Boeck, 2006
- P. Pilibossian, J-P. Lecoutre, Analysis, 1998
- P. Pilibossian, J-P. Lecoutre, Algebra, 1998
- P. Thuillier, J.C. Belloc, Mathematics (2 volumes), 2004 Websites:
- https://fr.wikiversity.org/wiki/Facult%C3%A9:Math%C3%A9matiques
- https://uel.unisciel.fr/uel/co/Uel.html

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Adeline Berthier

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

UE503 Regional Flow Management

ECTS
13 credits

Polytech Annecy-Chambéry
Component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
APP Territorial dynamics and waste management Macroscopic assessments and chemical	MODULE MODULE 28.5			40h	
reactors Innovation and creativity	hours MODULE			12h	
Territorial Organization	MODULE 16.5 hours		45	24h	
				3	
			13.5		

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

APP Regional dynamics and waste management (PROJ522_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Teaching methods: In person

Teaching format: Learning and assessment situation

Open to exchange students: Yes

Presentation

Description

This course uses a problem-based learning approach to introduce the fundamentals of EIT through the example of waste collection and recovery. It examines territorial dynamics and interactions between actors through a systemic approach, in connection with economic and social transformations. It explores the emergence of new modes of regulation and practices in a context marked by ecological awareness and variable transition processes.
This course comprises two complementary parts: one more specifically dedicated to territorial issues and the other aimed at designing an organic matter treatment sector, carried out in partnership with L3 students in AES (Economic and Social Administration), thus promoting a transdisciplinary approach.

Objectives

- Conduct a qualitative and quantitative analysis of waste production
- Carry out a carbon assessment of waste transport and propose energy recovery from waste
- Choose a facility based on local needs and specificities (location, local economy, agriculture, tourism, climate, etc.)

Teaching hours

Practical work	Practical work	40
PROJ	Project	12

Mandatory prerequisites

DDRS501_PCHY Sustainable Development

SHES521_EIT Territorial Organization

Course outline

Part I. Territorial dynamics and stakeholder interactions

Part II. Waste collection at the departmental level

Targeted skills

This Problem-Based Learning module assesses the acquisition of skill EIT1, level 1: Designing an integrative strategy for issues related to industrial and territorial ecology.
This course contributes to the acquisition of skill EIT3, level 1: Lead a project in a context of industrial and territorial ecology

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Evelyne Gonze
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Evelyne.Gonze@univ-savoie.fr

Locations

Le Bourget-du-Lac (73)

Macroscopic Balances and Chemical Reactors (GEDP521_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Engineering and related techniques

Presentation

Description

This course presents a methodology for establishing a macroscopic balance of matter and/or energy in a system involving mass and energy transfers. It also introduces the basics of chemical reaction engineering, with a view to their future applications, particularly in the treatment of liquid and gaseous effluents.

Objectives

- Analyze a system and the associated quantities in order to perform a macroscopic mass and/or energy balance by identifying and analyzing the flows
- Establish and solve the macroscopic mass and/or energy balance
- Provide the fundamental concepts and methodology of chemical reaction engineering

Teaching hours

Lectures	Lecture	28.5
Tutorial	Tutorials	45
Lab	Practical work	12

Mandatory prerequisites

None

Course outline

1. **Conducting an assessment**
   a. Systems and quantities
   b. Kinetic laws
   c. Balance methodology
2. **Macroscopic material balances**
   a. Material balance terms
   b. Simplification and resolution of material balances
3. **Macroscopic energy balances**
   a. Different forms of energy
   b. Energy exchanges
   c. Energy balance
4. **Chemical kinetics**
   a. Theory and principles of reaction kinetics: reaction order, mechanisms
   b. Rate law and reactions in closed reactors
   c. Catalysis
5. **Chemical reactors**
   a. Ideal reactors
   b. Special case of expandable media
   c. Reactor combinations and recycling
   d. Non-ideal reactors

Targeted skills

This course contributes to the acquisition of skill EIT1, level 1: Designing an integrative strategy for issues related to industrial and territorial ecology

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Julien Ramousse

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Innovation and creativity (SHES522_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Business and administration

Overview

Description

This course offers immersion from the outset of the EIT program through a challenge. Students discover and experiment with various creativity tools, methods, and techniques to tackle a concrete challenge related to industrial and territorial ecology.

Objectives

Be able to cite:

- the main stages of a creative process,
- some of the major issues in industrial and territorial ecology,
- the attitudes and qualities conducive to collaborative work.

Teaching hours

Practical work	Practical work	24

Mandatory prerequisites

None

Course outline

1. Ice breaking
2. Appropriation - interpretation
3. Divergence
4. Convergence
5. Materialization
6. Presentation

Targeted skills

This course contributes to the acquisition of skill EIT1, level 1: Designing an integrative strategy for issues related to industrial and territorial ecology.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Evelyne Gonze
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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Territorial Organization (SHES521_EIT)

Polytech Annecy-Chambéry
Component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Social and behavioral sciences

Presentation

Description

The course presents the hierarchy of decision-making and responsibility levels, from the European to the municipal level, with a particular focus on organizations dedicated to waste, water, sanitation, and energy management. In addition to general aspects related to water, sanitation, and energy, specific attention is paid to the management of hazardous waste and bio-waste.

Objectives

- Understand the hierarchy of decision-making and responsibility levels within collective organizations
- Know the scope of responsibilities of each level of collective organization
- Master the processes for putting together financial and administrative files

Teaching hours

Lectures	Lecture	16.5
Tutorial	Tutorials	13.5
Lab	Practical work	3

Mandatory prerequisites

None

Course outline

1. **General Organization**
   1. Europe, France, Regions, Departments, Municipalities, Communities of Municipalities
   2. The community council (mandatory powers/optional powers)
   3. The urban community (mandatory powers/optional powers)
   4. The Urban Community (mandatory powers/optional powers)
   5. The metropolitan area (mandatory powers/optional powers)
2. **Local organizations responsible for waste, water and sanitation, and energy**
   1. Local authorities responsible for public waste disposal services and methods of financing these services
   2. TEOM/REOM
   3. RS/RI
   4. SPANC
   5. Powers delegated to inter-municipal structures
   6. SIVU/SIVOM, other unions
3. **Waste collection and management**
   1. Waste and hazardous waste collection - EPR channels: Extended producer responsibility.
   2. Biowaste: Introduction to the issue, regulations, legislation, financing.

Targeted skills

This course contributes to the acquisition of skill EIT1, level 1: Designing an integrative strategy for issues related to industrial and territorial ecology.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

UE601 Bridge to the professional world

ECTS
8 credits

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Professional experience	MODULE				
Financial management	MODULE	10.5 hours	9		
Introduction to law	MODULE	15	4.5		
Issues in artificial intelligence	MODULE	6			
Business-oriented project management techniques	MODULE		9		

	Nature	Lecture	Tutorial	Practical	Credits
Optional internship S6	MODULE				
Support (every Thursday afternoon when FISA staff are present)	MODULE				

	Nature	CM	Tutorial	Practical	Credits
English (TOEIC level not achieved) S6	MODULE		40.5		
Modern languages (TOEIC level achieved)	MODULE				
English S6 Modern language 2	CHOICE		15		
Italian TD	SUBJECT TD		8 p.m.		
German TD	Tutorial		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD	Tutorial		8 p.m.		
Advanced English S6	SUBJECT		9 p.m.		

Practical information

Venue

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Professional experience (PROJ601_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

Presentation

Description

The "worker" professional experience allows students to discover the practical aspects of blue-collar work and to understand the hierarchies, methods, and techniques used in companies. This experience should preferably take place in an industrial or construction company related to the student's area of expertise and likely to hire engineers. Teleworking is not permitted.

Objectives

- Gain experience in a professional environment as an operator (worker, unskilled person, etc.);
- Integrate into and participate in a professional organization;
- Observe how the company operates;
- Identify the roles of employees (engineers, technicians, workers, etc.);
- Analyze working conditions, risks, and work organization;
- Reflect on sustainable development and social/environmental responsibility;
- Draw conclusions from the internship for your own training, career plans, and management methods.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator

Polytech-Bourget Business Relations

Relations-Entreprises.Polytech-Bourget@univ-savoie.fr

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Financial Management (SHES601_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Business and administration

Overview

Description

This course aims to familiarize students with the fundamental principles of financial management and corporate finance. It is structured in such a way as to facilitate understanding of the interactions between key concepts, practical tools, and key players, with a view to rapid and effective application in a professional context.

Objectives

- Understand the key concepts of entrepreneurship and business start-ups/takeovers.
- Acquire the skills necessary to develop a business strategy.
- Explore financing and growth strategies for businesses.
- Develop an understanding of the challenges and opportunities faced by entrepreneurs.

Teaching hours

Lectures		Lecture	10.5
Tutorial		Tutorials	9

Mandatory prerequisites

None

Course outline

The main topics covered are:

- The fundamentals of financial accounting
- Interpretation of financial statements (income statement, statement of changes in equity, balance sheet, cash flow statement, etc.)
- Sources of short- and long-term financing, both on and off balance sheet, as well as stakeholders, financial structures, etc.
- Key players in the financing process (banks, venture capital/private equity, etc.)
- Aspects related to valuation and exit scenarios
- The correlation between strategy and financial control, as well as the role of the business plan
- Cost and revenue analysis techniques
- Designing a performance management system (indicators, dashboard, financial and non-financial criteria, etc.)

Targeted skills

- Understanding key points in a company's financial statements, knowing how to look at a balance sheet from a financing perspective, analyzing a company's situation
- Knowing how to build an economic performance management system.
- Understanding the different sources of financing and their impact on capital structure.
- Ability to identify and manage financial risks in a technological context.

Bibliography

Brealey, Richard A., and Stewart C. Myers. *Principles of Corporate Finance*. New York, McGraw-Hill Education, 2017.

Ross, Stephen A., Randolph W. Westerfield, and Bradford D. Jordan. *Corporate Finance*. New York, McGraw-Hill Education, 2018. Brigham, Eugene F., and Michael C. Ehrhardt. *Financial Management: Theory & Practice*. Mason, Cengage Learning, 2017.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Elodie Gardet

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Campus

Le Bourget-du-Lac / Savoie Technolac campus

Introduction to Law (SHES602_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes **ERASMUS reference:** Law

Presentation

Description

This introductory course in law aims to familiarize students with fundamental legal concepts. It explores the basic principles of law, with an emphasis on legal aspects related to the practice of engineering, such as contracts, civil liability, intellectual property, and industrial regulations.

Objectives

- Understand the general principles of law
- Acquire the knowledge necessary to interpret and draft contracts related to engineering projects.
- Explore the concepts of civil liability and intellectual property protection in the context of technology projects.
- Develop legal and ethical awareness in the practice of engineering.

Teaching hours

Lectures		Lecture	15
Tutorial		Tutorials	4.5

Mandatory prerequisites

none

Course outline

1. Judicial Institutions, Fundamental Principles, and Key Players in the Justice System
2. Criminal Procedure and Criminal Law
3. Contracts, Contractual Liability, and Intellectual Property Rights
4. Labor Law

Targeted skills

- Ability to understand and apply fundamental legal principles
- Ability to analyze the legal implications of decisions and actions in a professional context.
- Skills in interpreting engineering contracts.
- Knowledge of civil liability and intellectual property concepts related to engineering.

Bibliography

J.-B. Blaise and R. Desgorces, Business Law, 8th ed., LGDJ, 2015.

F. Dekeuwer-Défossez and E. Blary-Clément, Commercial Law, 11th ed., Montchrestien, 2015.

P. and Ph. Didier, Commercial Law, vol. I, Economica, coll. "Corpus droit privé," 2005.

D. Houtcieff, Commercial Law, 4th ed., Sirey, 2016.

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

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Campus

Le Bourget-du-Lac / Savoie Technolac campus

Issues in Artificial Intelligence (DATA601_PCHY)

Polytech Annecy-Chambéry
component

Presentation

Description

In the era of large language models, it is no longer enough to know how to use a chatbot: it is crucial to understand the underlying mechanisms in order to discern where AI brings real value and where it reaches its limits. As future engineers and citizens, engineering students will be called upon to observe the profound impact of these technologies on society—transforming professions, redefining social interactions, and disrupting decision-making processes. At the same time, the massive emergence of AI-dedicated computing centers raises major environmental issues: the energy consumption and carbon footprint of model training continue to grow and call for responsible technical and organizational choices. Finally, behind every AI application lie ethical challenges: copyright protection, privacy, and prevention of malicious use are all issues that require critical and informed consideration.

Objectives

By the end of the module, students will be able to:

- Describe the basic functioning of a neural network (perceptron, backpropagation) and explain the role of attention in a transformer.
- Explain what a language model is and give concrete examples of applications.
- Identify at least three types of bias in LLMs and propose a simple method for detecting them.
- Estimate the energy impact of an LLM model and list two best practices for reducing it (choice of infrastructure, work splitting).
- Write and test a clear prompt to generate useful text (summary, code, explanations).
- Recognize copyright and privacy issues related to the use of an LLM.

Teaching hours

Lectures	Lecture	6
AUTO	Independent study	4
PROJ	Project	10

Mandatory prerequisites

None

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course leader Ammar Mian

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Locations

Le Bourget-du-Lac (73)

Business-oriented project management techniques (PROJ602_PCHY)

Polytech Annecy-Chambéry
component

Presentation

Description

Project management requires methods and techniques that all engineers must know. However, depending on the profession, the stages and tools used to manage a project may differ. This course is differentiated according to the program.
With the help of the Corporate Relations Department and the Business Club, stakeholders from the socio-economic world come to present their daily experiences and how they evolve in project mode to control objectives, deadlines, costs, and associated resources.

Objectives

Acquire a project management methodology

Understand the necessary relationships between all project stakeholders Master the stages and tools of project management

Teaching hours

Tutorials	Tutorials	9

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Director of Training, Polytech

Locations

Le Bourget-du-Lac (73)

Optional internship S6 (PROJ600_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

Overview

Description

The optional internship aims to enrich students' academic and professional experience by offering them a practical opportunity to apply their knowledge and acquire new skills. An optional internship can be carried out **in France or abroad**. It must comply with the same general conditions as compulsory internships.

Objectives

- **Acquisition of** specific skills related to the specialization;
- **Refining career goals and/or** gaining confidence and independence through the completion of a project or specific tasks;
- Establish valuable professional contacts that can help in future job searches.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator

Polytech-Bourget Business Relations

Relations-Entreprises.Polytech-Bourget@univ-savoie.fr

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Support (every Thursday afternoon when FISA staff are present) (ACCO601_PCHY)

Polytech Annecy-Chambéry
component

In brief

Teaching methods: In person **Teaching format:** Tutored project **Open to exchange students:** Yes

Presentation

Description

This support is open to all students at the school: students, apprentices, and Continuing Education employees. It is not mandatory, as it is primarily intended for students who need it to succeed in their training. This semester, it is scheduled into the timetable for each training program, with a total of 32 hours.

Support may take the form of refresher courses, upgrading courses, or assistance in the main areas of training.

Peer tutoring is encouraged, and the educational resources of the Polytech Network are utilized (https://eplanet.polytech-reseau.org/).

Objectives

To promote the success of all students in their educational journey.

Teaching hours

PTUT	Tutored project	32

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Director of Polytech Training

Locations

Le Bourget-du-Lac (73)

English (TOEIC level not achieved) S6 (LANG601_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Open to exchange students:** Yes
ERASMUS reference: Languages

Presentation

Description

This course prepares students for the TOEIC test ("Test of English for International Communication") and, more specifically, for obtaining a minimum score of 785 points (out of 990).

With the aim of developing all four skills, this course also serves as an introduction to public speaking through presentations given by students in groups or individually on topics illustrated by press articles or video materials (VTD: Video, Talk and Debate, as well as written work). Depending on the location (Annecy or Chambéry), some will be seen at different times during the semester, the year, or even the three years of training.

Students are assessed throughout each semester. The final assessment consists of a 1-hour, 1.5-hour, or 2-hour exam, depending on the semester, and accounts for 33% of the total continuous assessment.

Objectives

Specific objectives: at the end of this course, students will be able to:

revise grammar on: the correct reflexes of common structures; the verb group and tenses (except the conditional tense); the noun group and all its constituent elements; logical links (connecting words)

improve their grammatical and lexical knowledge (general English and TOEIC-specific vocabulary) in class and independently, validating their progress through regular assessment tests.

Teaching hours

Tutorials	Tutorials	40.5

Mandatory prerequisites

CEFR level B1

Course outline

1. Oral
   1. Elements of phonology
   2. Grammar (tenses, questions, adjectives.....)
   3. Reinforcement of structures and vocabulary
   4. Interactive oral communication
   5. Introduction to and practice for the TOEIC (listening section)
2. Writing
   1. Review of grammatical elements (tenses, questioning, adjectives. .....)
   2. Translation (theme/version)
   3. Reading comprehension in authentic language
   4. Curriculum vitae (in S5, S6, or S7 at the latest)
   5. Cover letter/letter of motivation (in S5, S6, or S7 at the latest)
   6. Introduction and training for the TOEIC (reading section)

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Christophe Lambert
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Christophe.Lambert@univ-savoie.fr

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Modern Languages (TOEIC Level Achieved) (LANG602_PCHY)

Polytech Annecy-Chambéry
component

In brief

Teaching methods: In person **Teaching format:** Tutorials **Open to exchange students:** Yes

Presentation

Description

This course aims to enable students to communicate authentically with linguistic and cultural autonomy.

Objectives

Communicate orally in professional situations, master business English in a professional context and in the technical fields studied during the program.

Mandatory prerequisites

Have achieved level B2 in an official TOEIC or Linguaskill certification (see study regulations for details).

Course outline

A variety of communication activities, focusing on professional English and the engineering fields covered during the training. Emphasis is placed on oral communication activities.

Skills acquired

Macro-skill	Micro-skills

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
English S6	SUBJECT		15		
Modern Language 2	CHOICE				
Italian TD	Tutorial		8 p.m.		
German TD	TD		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD	Tutorial		8 p.m.		
Advanced English S6	SUBJECT		9 p.m.		

Practical information

Location

Le Bourget-du-Lac (73)

English S6 (LANG602_PCHYM1)

Polytech Annecy-Chambéry

Presentation

Teaching hours

Tutorial	Tutorials	15

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Christophe Lambert
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Places

Le Bourget-du-Lac (73)

Modern Language 2

Polytech Annecy-Chambéry component

List of courses

	Subject	Lectures	Tutorial	Practical	Credits
Italian TD	Tutorial		20		
German TD	Tutorial		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD	Tutorial		8 p.m.		
Advanced English S6	SUBJECT		9 p.m.		

Practical information

Location

Le Bourget-du-Lac (73)

Italian TD

Chambéry
University Institute
of Technology

In brief

Languages of instruction: Italian

Open to exchange students: Yes

Overview

Teaching hours

Italian TD - TD	Tutorials	20

Skills acquired

Macro-skills	Micro-skills

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

German TD

Polytech Annecy-Chambéry

Overview

Teaching hours

Tutorial	Tutorials	20

Skills acquired

Macro-skills	Micro-skills

Spanish TD

Polytech Annecy-Chambéry
Component

Presentation

Teaching hours

Tutorial	Tutorials	20

Skills acquired

Macro-skills	Micro-skills

Japanese TD

Polytech Annecy-Chambéry component

Presentation

Teaching hours

Tutorial	Tutorials	20

Skills acquired

Macro-skills	Micro-skills

Intercomprehension of Romance Languages TD

ACCENTS
component

Presentation

Teaching hours

Intercomprehension of Romance languages TD - TD	Tutorials	20

Skills acquired

Macro-skill	Micro-skills

Advanced English S6 (ENGL602_PCHY)

Polytech Annecy-Chambéry component

Presentation

Teaching hours

Tutorial	Tutorials	21

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Christophe Lambert
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Locations

Le Bourget-du-Lac (73)

UE602 Natural Resources and Sustainable Systems Engineering

ECTS
8 credits

Polytech Annecy-Chambéry
Component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Natural resources	MODULE	34.5 hours	16.5 hours	8	
APP Mass and energy transfers	MODULE			40	

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Natural Resources (SCVT621_EIT)

Polytech Annecy-Chambéry component

In brief

Languages of instruction: French **Teaching methods:** In person **Open to exchange students:** Yes **ERASMUS reference:** Physical sciences

Presentation

Description

This course presents the main natural resources and associated biogeochemical cycles (carbon, water, nitrogen, phosphorus) in order to understand the availability, transport, and transformation mechanisms of matter and energy in the biosphere. The concepts of resource accessibility (stock/flow resources, reserves, variability, quality, potential for use, market pressure) and their evolution/depletion will be addressed for the main exploitable resources.

Objectives

- Understand the main natural biogeochemical cycles
- Understand the mechanisms of chemical redistribution in a natural, anthropized, or preserved ecosystem
- Assess the quantities (stock/flow) of resources available and exploitable from a sustainable development perspective
- Assess the quality (energy, environmental, economic) of resources
- Assess the potential for exploiting available resources
- Conduct a critical analysis of the exploitation of available resources
- Select one resource among others to meet a given need
- Make technical and economic recommendations regarding the management and exploitation of resources

Teaching hours

Lectures	Lecture	34.5
Tutorial	Tutorials	16.5
Lab	Practical work	8

Mandatory prerequisites

DDRS501: Sustainable Development

Course outline

1. Biogeochemical cycles
   a. Introduction to biogeochemical cycles
   b. The carbon cycle
   c. The water cycle
   d. The nitrogen and phosphorus cycles
2. General concepts of resource accessibility
   a. Stock resources / Flow resources
   b. Temporal and spatial variability
   c. Quality and potential for use
   d. Economic factors
   e. Trend outlook
3. Main resources
   a. Fossil fuels: gas, oil, coal
   b. Renewable energy sources: solar, wind, geothermal, tidal, outdoor air
   c. Water resources: surface water, groundwater, rainwater
   d. Wood resources: wood energy, timber (forest management)
   e. Precious materials: metals, rare earths, etc.
4. Water as a raw material
   a. Characteristics of aquatic environments
   b. Chemical balances in water – Application to network water

Targeted skills

This course contributes to the acquisition of EIT1 competency, level 1: Designing an integrative strategy for issues related to industrial and territorial ecology

This course contributes to the acquisition of skill EIT2, level 1: Propose and implement engineering methods with a global strategic vision

Bibliography

Biogeochemical cycles and continental ecosystems (2007), Académie des Sciences, EDP Sciences. JUPIN H. - (1996) - The carbon cycle, Ed Hachette

JACQUES G. - (1996) - The water cycle, The fundamentals, Ed Hachette. Energy futures 2050, RTE: https://rte-futursenergetiques2050.com/

Key energy figures, DATALAB, https://www.statistiques.developpement-durable.gouv.fr/edition-numerique/chiffres-cles-energie/

FRONTIER S., PICHOD-VIALE D., LEPRETRE A., DAVOULT D., LUCZAK C. – (2008) - Ecosystem, structure, functioning, evolution, 4th edition Sciences Sup, Dunod.

RODIER J., LEGUBE B., MERLET N et al. - (2009) - Water Analysis Dunod, 9^th edition, Ed Dunod, 1526p. SIGG L., BEHRA P. and STUMM W. - (2014) - Chemistry of Aquatic Environments, 5^th edition, Ed Dunod, 509p.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Julien Ramousse

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Julien.Ramousse@univ-savoie.fr

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

APP Mass and Energy Transfers (PROJ621_EIT)

Polytech Annecy-Chambéry
component

In brief

- **Languages of instruction:** French
- **Teaching methods:** In person
- **Teaching format:** Learning and assessment situation
- **Open to exchange students:** Yes

Presentation

Description

This course is based on a problem-based learning approach in which students are required to perform the energy and hydraulic design of a heating network powered by solar thermal energy and a heat pump.

Objectives

- Propose and implement engineering methods for a heating network
- Predict and analyze the performance of a heating network
- Propose solutions to reduce environmental impacts

Teaching hours

Practical work	Practical work	40
PROJ	Project	40

Mandatory prerequisites

GEDP521_EIT Macroscopic balances and chemical reactors GEDP621_EIT Fluid mechanics
ENER621_EIT Thermodynamics ENER622_EIT Heat Transfer

Targeted skills

This problem-based learning allows for the assessment of the acquisition of skill EIT2, level 1: Propose and implement engineering methods with a global strategic vision
This course contributes to the acquisition of skill EIT3, level 1: Lead a project in a context of industrial and territorial ecology

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

UE603 Mass and Energy Transfers

ECTS
14 credits

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Thermodynamics	MODULE	10.5 hours	24	24	
Fluid Mechanics Heat Transfer	MODULE	12	15h	20	
Electricity	MODULE	hours	31.5h		
	MODULE	24	9		
		hours		8	
		9			

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Thermodynamics (ENER621_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Engineering and related techniques

Presentation

Description

This course introduces the fundamental concepts of thermodynamics through the study of open and closed systems involving exchanges of work, heat, and energy. It draws on practical applications from engineering and provides an understanding of how diathermic systems work to convert thermal energy into work (and vice versa).

Objectives

- Determine the thermodynamic state of matter
- Perform a 1st and 2nd law analysis on an open or closed system
- Study a ditherme thermodynamic cycle
- Describe and analyze the phenomena involved in different technological components

Teaching hours

Lectures	Lecture	10.5
Tutorial	Tutorials	24
Lab	Practical work	24

Mandatory prerequisites

GEDP521_EIT Macroscopic balances and chemical reactors

Course outline

1. **General**
   a. Thermodynamic systems, thermodynamic equilibrium, and state variables (intensive and extensive)
   b. Thermodynamic transformations and state functions/path functions
2. **Thermodynamic quantities and relationships**
   a. Internal energy
   b. Potential and kinetic energy
   c. Work
   d. Heat
3. **Fundamental principles**
   a. Zero principle and the concept of thermal equilibrium
   b. First principle and the conservative nature of energy
   c. Second principle and the concept of irreversibility
   d. Third principle and the properties of matter near absolute zero
4. **Dithermic systems**
   a. Thermal energy/work conversion
   b. Operating modes
   c. Efficiency and coefficient of performance

Practical work:

i. Measuring the thermal properties of materials
ii. Coupled heat transfer
iii. Heat exchangers iv. Tubular heat exchangers
v. Heat pumps

Targeted skills

This course contributes to the acquisition of skill EIT2, level 1: Propose and implement engineering methods with a global strategic vision

Bibliography

- L. Borel, D. Favrat, Thermodynamics and Energy, from Energy to Exergy, Vol. 1. Lausanne: EPFL Press, 2010.
- J.-P. Pérez, Thermodynamics: Fundamentals and Applications, Vol. 1, 3rd Ed. Paris: Dunod, 2001.
- M. Feidt, Thermodynamics and Energy Optimization of Systems and Processes. Paris: Lavoisier, 2016.
- A. Bejan, Advanced Engineering Thermodynamics, 4th Ed. Hoboken: Wiley, 2016.
- M. Moran, H. Shapiro, Fundamentals of Engineering Thermodynamics, 6th Ed. USA: John Wiley & Sons, Inc., 2008.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Julien Ramousse

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Fluid Mechanics (GEDP621_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In-person
Open to exchange students: Yes
ERASMUS reference: Engineering and related techniques

Overview

Description

This course covers hydraulics and the mechanics of incompressible fluids.
It covers the local equations of fluid mechanics. It provides the basic tools for analyzing and designing hydraulic circuits.

Objectives

- Solve local fluid mechanics equations in simple cases
- Calculate pressure losses in hydraulic circuits
- Choose a pumping system
- Determine and modify the operating point of a hydraulic circuit

Teaching hours

Lectures	Lecture	12
Tutorial	Tutorials	3 p.m.
Lab	Practical Work	8 p.m.

Mandatory prerequisites

GEDP521_EIT Macroscopic balances and chemical reactors general concepts of mechanics

Course outline

1. Fluid characteristics
2. Fluid statics
3. Fluid kinematics
4. Local equations
5. Bernoulli's equations
6. Pipe flow and pressure losses
7. Pumps

Practical work: pressure losses, flow measurement, centrifugal pumps

Targeted skills

This course contributes to the acquisition of EIT2 competency, level 1: Propose and implement engineering methods with a global strategic vision.

Bibliography

- Étienne Guyon, Jean-Pierre Hulin, and Luc Petit, Hydrodynamique physique, EDP Sciences, 2012
- Donald F. Young, Bruce Roy Munson, and Theodore H. Okiishi, Introduction to Fluid Mechanics, John Wiley & Sons, 2003
- Engineering techniques: fluid mechanics; fluid flow - flow in pipes. Networks; hydraulic pumps

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Benoit Stutz
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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Heat Transfer (ENER622_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Engineering and related techniques

Overview

Description

This course covers the three modes of heat transfer: conduction, convection, and radiation. It addresses the physics of these phenomena, their modeling using local equations, and the main correlations used to quantify heat transfer in engineering applications. The various heat exchanger technologies are also presented, along with methods for sizing and evaluating their performance.

Objectives

- Describe the initial and boundary conditions of a heat transfer problem
- Solve an engineering problem in steady-state and transient conduction
- Determine convective heat transfer in simple configurations
- Determine radiative heat transfer in simple configurations
- Specify the characteristics of an exchanger and predict the performance of an exchanger based on operating conditions

Teaching hours

Lectures		Lecture	24
Tutorial		Tutorials	31.5

Mandatory prerequisites

GEDP521_EIT Macroscopic Balances and Chemical Reactors GEDP621_EIT Fluid Mechanics
ENER621_EIT Thermodynamics

Course outline

1. Local Equations in Heat Transfer
2. Conduction
3. Radiation
4. Convection
5. Exchangers

Practical work on heat transfer

Targeted skills

This course contributes to the acquisition of skill EIT2, level 1: Propose and implement engineering methods with a global strategic vision.

Bibliography

- J.F. Sacadura, Introduction to Heat Transfer, Technique et Documentation. 1980, 445 pages
- Incropera, Fundamentals of Heat and Mass Transfer

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Electrical Engineering (ELEC621_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes

Presentation

Description

This course provides students with a basic understanding of electricity. It covers single-phase/three-phase circuits in continuous/sinusoidal mode, as well as electrical hazards in installations (grounding diagrams).

Objectives

- Calculate and measure electrical quantities such as currents and voltages in a linear circuit, in continuous, single-phase or three-phase sinusoidal mode.
- Calculate and measure the power and energy consumed in a linear circuit, in continuous, single-phase or three-phase sinusoidal mode.
- Secure an electrical installation by selecting and implementing an appropriate grounding system (SLT) to protect property and people from electrical hazards.

Teaching hours

Lectures	Lecture	9
Tutorial	Tutorials	9
Lab	Practical Work	8

Mandatory prerequisites

Mathematics: trigonometry, complex numbers, basic derivatives and integrals, solving linear equations and simple systems of equations.

Instrumentation: operation and use of measuring devices: multimeter, oscilloscope, etc.

Course outline

1. **Continuous circuit**
   a. General laws of electrokinetics: Kirchhoff's laws, operating laws applied to basic dipoles
   b. Study of continuous operation - General theorems: Thévenin's theorem, Norton's theorem, superposition theorem, Millman's theorem
2. **Single-phase and three-phase circuits - Electrical energy and protection**
   a. Sinusoidal quantities and complex notation
   b. Linear circuits in single-phase sinusoidal mode: active, reactive, and apparent power
   c. Production Transport Consumption of electrical energy
   d. Three-phase sinusoidal regime
   e. Grounding diagrams – electrical protection

Targeted skills

- This course contributes to the acquisition of skill EIT2, level 1: Propose and implement engineering methods with a global strategic vision.

Bibliography

- Précis d'électrotechnique, lectures and corrected exercises by Christophe Palermo, published by Dunod
- General Electricity: Circuit Analysis and Synthesis, lectures and corrected exercises by Tahar Neffati, published by Dunod
- Manuel d'électricité, l'essentiel du cours et exercices corrigés (Electricity Manual: Course Essentials and Corrected Exercises) by Christophe Palermo & Jérémie Torres, published by Dunod

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

UE701 Bridge to the professional world

ECTS
6 credits

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Professional resources and dynamics	MODULE		13.5 hours	3.5	
Creativity and Innovation Management	MODULE		25.5		

	Nature	Lecture	Tutorial	Practical	Credits
English (TOEIC level not achieved) S7	MODULE		40.5		
Modern languages (TOEIC level achieved)	MODULE				
English S7 Modern language 2	CHOICE		15		
Italian TD	SUBJECT TD		8 p.m.		
German TD	Tutorial		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD Advanced English S7	Tutorial SUBJECT		8 p.m. 9 p.m.		

	Nature	Lecture	Tutorial	Practical	Credits
Optional internship S7	MODULE				
Support (half of Thursday afternoons when FISA staff are present)	MODULE				

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Resources and Professional Dynamics (SHES703_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person

Open to exchange students: Yes

ERASMUS Reference Framework: Information and Communication Technologies (ICT)

Overview

Description

Professional integration module designed and implemented in collaboration with the Business Club and the Professional Integration Assistance Office of the University of Savoie Mont Blanc, involving a network of qualified professionals.

Objectives

The aim of the module is to help students gain a better understanding of themselves in order to define a career plan in line with their motivation and skills, develop a targeted internship and/or job search strategy, present themselves effectively in an interview, and promote their career path.

Teaching hours

Tutorials	Tutorials	13.5
Lab	Practical work	0.5
TP	Practical work	3

Mandatory prerequisites

No mandatory prerequisites

Course outline

- Introduction: preparing for my future today
- Identify my professional environment, map out the possibilities
- Defining my career plan
- Boost my internship search efforts
- Create and optimize my LinkedIn profile
- Adapt my application tools, respond to a job posting
- Prepare for the interview

-Highlighting my work experience – Assessment

- Mock interview with professionals – Evaluation

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Creativity and Innovation Management (SHES704_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Teaching format: Tutorials **Open to exchange students:** Yes
ERASMUS reference: Business and administration

Presentation

Description

How can innovation and creativity be leveraged to enhance an organization? How can innovation be initiated based on the latest technological advances? In both cases, this requires a thorough understanding of the creativity and innovation process, as well as the ability to manage an innovative project in a complex and uncertain environment. It also involves adopting an entrepreneurial or intrapreneurial approach to mobilize and motivate interdisciplinary teams (several specialties per team) in the implementation of innovation. This fully online program offers you the opportunity to acquire the methodologies and attitudes necessary to achieve these objectives.

Objectives

- Structure, organize, and manage a highly exploratory process with a consistent approach
- Find resources or make do with available resources
- Adapting in real time to changes in context and constraints
- Manage the challenges of each phase of the project
- Act as a leader in an uncertain environment
- Mobilize stakeholders

- Master new technologies

Teaching hours

Tutorials	Tutorials	25.5

Mandatory prerequisites

None

Course outline

Part 1: Innovation management: theoretical foundations

Part 2: Creativity - Design thinking approach (different creativity tools depending on the stages of the process). Part 3: Role-playing

Targeted skills

- Recognize and seize internal and external development opportunities
- Develop and formalize opportunities to transform them into innovative projects
- Know how to lead a design thinking-type creative process
- Develop management and leadership skills for innovative projects: challenge preconceived ideas, mobilize stakeholders, lead with flexibility, and seize opportunities with agility

Bibliography

Tidd, Joe, and John Bessant. *Managing Innovation: Integrating Technological, Commercial, and Organizational Change*. Paris, Pearson, 2018.

Kim, W. Chan, and Renée Mauborgne. *Blue Ocean Strategy: How to Create New Strategic Spaces*. Paris, Pearson, 2006.

Christensen, Clayton M. *The Innovator's Dilemma: How Technology Leaders Fail When They Don't Think Like Innovators*. Paris, Village Mondial, 2003.

Lockwood, Thomas, and Thomas Walton. *Design Thinking: Integrating Innovation, User Experience, and Brand Value.*
Paris, Dunod, 2013.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Elodie Gardet
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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

English (TOEIC level not achieved) S7 (LANG701_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Open to exchange students:** Yes
ERASMUS reference: Languages

Presentation

Description

This course prepares students for the TOEIC ("Test of English for International Communication") exam, specifically to obtain a minimum score of 785 points (out of 990).

With the aim of developing all four skills, this course also serves as an introduction to public speaking through presentations given by students in groups or individually on topics illustrated by press articles or video materials (VTD: Video, Talk and Debate, as well as written work). Depending on the location (Annecy or Chambéry), some will be seen at different times during the semester, the year, or even the three years of training.

Students are assessed throughout each semester. The final assessment consists of a 1-hour, 1.5-hour, or 2-hour exam, depending on the semester, and accounts for 33% of the total continuous assessment.

Objectives

Specific objectives: at the end of this course, students will be able to:

revise grammar on: the correct reflexes of common structures; the verb group and tenses (except the conditional tense); the noun group and all its constituent elements; logical links (connecting words)

improve their grammatical and lexical knowledge (general English and TOEIC-specific vocabulary) in class and independently, validating their progress through regular assessment tests.

Teaching hours

Tutorials	Tutorials	40.5

Mandatory prerequisites

CEFR level B1

Course outline

1. **Oral**
    1. Elements of phonology
    2. Grammar (tenses, questions, adjectives.....)
    3. Reinforcement of structures and vocabulary
    4. Interactive oral communication
    5. Introduction to and practice for the TOEIC (listening section)
2. **Writing**
    1. Review of grammatical elements (tenses, questioning, adjectives. .....)
    2. Translation (theme/version)
    3. Reading comprehension in authentic language
    4. Curriculum vitae (in S5, S6, or S7 at the latest)
    5. Cover letter/motivation letter (in S5, S6, or S7 at the latest)
    6. Introduction and training for the TOEIC (reading section)

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

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Campus

Le Bourget-du-Lac / Savoie Technolac campus

Modern Languages (TOEIC Level Achieved) (LANG702_PCHY)

Polytech Annecy-Chambéry

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
English S7	SUBJECT		3 p.m.		
Modern Language 2	CHOICE				
Italian TD	Tutorial		8 p.m.		
German TD	TD		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD	Tutorial		8 p.m.		
Advanced English S7	SUBJECT		9 p.m.		

Practical information

Location

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

English S7 (LANG702_PCHYM1)

Polytech Annecy-Chambéry component

In brief

Languages of instruction: French **Open to exchange students:** Yes
ERASMUS reference: Languages

Presentation

Teaching hours

Tutorial	Tutorials	15

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Christophe Lambert
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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Modern language 2

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Italian TD	Tutorial		20		
German TD	Tutorial		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD	Tutorial		8 p.m.		
Advanced English S7	SUBJECT		9 p.m.		

Practical information

Venue

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

German TD

Polytech Annecy-Chambéry

Overview

Teaching hours

Tutorial	Tutorials	20

Skills acquired

Macro-skills	Micro-skills

Spanish TD

Polytech Annecy-Chambéry component

Presentation

Teaching hours

Tutorial	Tutorials	20

Skills acquired

Macro-skills	Micro-skills

Japanese TD

Polytech Annecy-Chambéry component

Presentation

Teaching hours

Tutorials	Tutorials	20

Skills acquired

Macro-skills	Micro-skills

Advanced English S7 (ENGL702_PCHY)

Polytech Annecy-Chambéry component

Presentation

Teaching hours

Tutorial	Tutorials	21

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

Optional internship S7 (PROJ700_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

Overview

Description

The optional internship aims to enrich students' academic and professional experience by offering them a practical opportunity to apply their knowledge and acquire new skills. An optional internship can be carried out **in France or abroad**. It must comply with the same general conditions as compulsory internships.

Objectives

- **Acquisition of** specific skills related to the specialization;
- **Refining career goals and/or** gaining confidence and independence through the completion of a project or specific tasks;
- Establish valuable professional contacts that can help in future job searches.

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Support (half of Thursday afternoons when FISA staff are present) (ACCO701_PCHY)

Polytech Annecy-Chambéry
component

In brief

Teaching methods: In person **Teaching format:** Tutored project **Open to exchange students:** Yes

Presentation

Description

This support is open to all students at the school: students, apprentices, and Continuing Education employees. It is not mandatory, as it is primarily intended for students who need it to succeed in their training. This semester, it is scheduled into the timetable for each course, with a total of 16 hours.

Support may take the form of refresher courses, upgrading courses, or support in the main areas of the training programs.

Peer tutoring is encouraged and the educational resources of the Polytech Network are used (https://eplanet.polytech-reseau.org/).

Objectives

Promoting success for all students in their educational journey

Teaching hours

PTUT	Tutored project	16

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Director of Training, Polytech

Locations

Le Bourget-du-Lac (73)

UE702 Energy and gas treatment

ECTS
15 credits

Polytech Annecy-Chambéry component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Energy vectors, quality, and energy conversion	MODULE	37.5 hours	36	12	
Air pollution and filtration processes	MODULE	33	33	36	

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Energy vectors, quality, and energy conversion (ENER721_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In-person
Open to exchange students: Yes
ERASMUS reference: Engineering and related techniques

Overview

Description

The course covers the distinction and classification of different forms of energy (electrical, mechanical, hydraulic, chemical, thermal, radiant, etc.) as well as an understanding of the possibilities and limitations of energy conversion systems.

Objectives

- Differentiate between different forms of energy
- Assess the potential of an energy source for a specific need
- Select the most appropriate energy to use to meet a specific need
- Propose different technological solutions to meet an energy need based on the different energy resources available
- Evaluate the performance of different conversion systems

Teaching hours

Lectures	Lecture	37.5
Tutorial	Tutorials	36
Lab	Practical work	12

Mandatory prerequisites

- SCVT621_EIT Natural Resources
- ENER621_EIT Thermodynamics
- GEDP621_EIT Fluid Mechanics
- ENER622_EIT Heat Transfer

Course outline

1. **Forms of Energy and Energy Conversions**
   a. Energy Sources and Energy Vectors
   b. Energy quality
   c. General principles of energy conversion
2. **Conversion of chemical energy into thermal energy**
   a. Combustion of fossil fuels
   b. Waste incineration
3. **Thermal systems**
   a. Thermal engines
   b. Heat Pump
   c. Cogeneration
4. **Conversion of chemical energy into electrical energy**
   a. Hydrogen Vector
   b. Fuel Cells

Practical Work: ThermOptim Project

Targeted skills

This course contributes to the acquisition of EIT1 skill, level 2: Designing an integrative strategy for issues related to industrial and territorial ecology
This course contributes to the acquisition of skill EIT2, level 2: Propose and implement engineering methods with a global strategic vision

Bibliography

- L. Borel, D. Favrat, Thermodynamics and Energy, from Energy to Exergy, Vol. 1. Lausanne: EPFL Press, 2010.
- J.-P. Pérez, Thermodynamics: Fundamentals and Applications, Vol. 1, 3rd Ed. Paris: Dunod, 2001.
- M. Feidt, Thermodynamics and Energy Optimization of Systems and Processes. Paris: Lavoisier, 2016.
- A. Bejan, Advanced Engineering Thermodynamics, 4th Ed. Hoboken: Wiley, 2016.
- M. Moran, H. Shapiro, Fundamentals of Engineering Thermodynamics, 6th Ed. USA: John Wiley & Sons, Inc., 2008.

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Julien Ramousse

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Air Pollution and Filtration Processes (GEDP721_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person

Open to exchange students: Yes

ERASMUS reference: Engineering and related techniques

Presentation

Description

This course provides students with the necessary foundations for understanding gaseous and particulate pollution and the issues associated with it. It will also include an introduction to geomatics, with practical applications for representing pollution at different territorial scales, particularly in the context of atmospheric dispersion studies. The second part of the course will be devoted to the fundamental knowledge required to implement particulate pollution treatment processes.

Objectives

- Understand the different atmospheric pollutants and the issues related to air pollution.
- Master the methods and tools used to model atmospheric dispersion.
- Become familiar with geographic information systems (GIS) and their use via QGIS software to represent pollution phenomena.
- Acquire the knowledge necessary to select and scale the associated treatment processes.

Teaching hours

Lectures	Lectures	33
Tutorial	Tutorials	33
Lab	Practical work	36

Mandatory prerequisites

GEDP521_EIT Macroscopic balances and chemical reactors

Prerequisites also include basic chemistry concepts.

Course outline

I. **Air pollution**
1. The atmosphere and atmospheric pollutants
   a. General information: Atmospheric dynamics, concept of mixing time
   b. Definition of an atmospheric pollutant and characteristics (sources, sinks, lifetime, impact, residence time; concept of photolysis)
   c. The main air pollutants and their sources
   d. The atmospheric box model
2. Major issues of atmospheric pollution on an urban to regional scale.
   a. Ozone pollution and photooxidants
   b. Study of NOx/VOC coupling on O3 formation/urban pollution
   c. Atmospheric acidification/sulfur pollution
   d. Particulate pollution
3. Air quality monitoring in France and Europe
   a. Air quality monitoring stakeholders
   b. Air quality index concepts

II. **Filtration processes**
1. Counting, particle size analysis, sedimentation
2. Gas-particle separator technology
   a. Cyclones
   b. Filter media
   c. Electrofiltration
   d. Scrubber
3. Criteria for choosing a technology and examples of treatment processes

Targeted skills

This course contributes to the acquisition of EIT1 skill, level 2: Designing an integrative strategy for issues related to industrial and territorial ecology
This course contributes to the acquisition of skill EIT2, level 2: Propose and implement engineering methods with a global strategic vision

Bibliography

- Bruno Sportisse, Air Pollution, from Processes to Modeling, Springer
- Claus Blierfert and Robert Perraud, Environmental Chemistry, 2001, 1st edition, DeBoeck Université.
- Report by the French Academy of Sciences, Ozone and Oxidizing Properties of the Troposphere, 1993, report no. 30, published by Techniques et Documentation Lavoisier.
- Pierre le Cloirec, Volatile Organic Compounds in the Environment, 1998, Techniques et Documentation Lavoisier edition

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Jean-Luc Besombes +33 4 79 75 81 09
Jean-Luc.Besombes@univ-savoie.fr

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

UE703 Industrial and Territorial Ecology

ECTS
9 credits

Polytech Annecy-Chambéry component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
APP: Waste collection and incineration Multi-criteria analysis	MODULE	7.5 hours	6	40 hours	
Sustainable development	MODULE	15 hours	21	18 hours	
	MODULE	13.5 hours			

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

APP: Waste collection and incineration (PROJ721_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Teaching methods: In person

Teaching format: Learning and assessment situation

Open to exchange students: Yes

Presentation

Description

This course is based on a problem-based learning approach applied to the study of an Energy Recovery and Waste Treatment Unit (UVETD). Through analysis of the Chambéry site, students put into practice the theoretical knowledge acquired during the semester. The study of this real-life case allows them to address the operational, environmental, and technical aspects of waste management, while developing their thinking on the implementation of an industrial and territorial ecology policy.

Objectives

- Apply theoretical knowledge to concrete issues of waste treatment and recovery.
- Analyze the operational, environmental, and technical dimensions of a UVETD.
- Understand the challenges and drivers of industrial and territorial ecology based on a real-life case study.
- Develop diagnostic and proposal skills for optimizing regional waste management systems.

Teaching hours

Lectures		Lecture	7.5
Tutorial		Tutorials	6
Lab		Practical work	40
PROJ		Project	40

Mandatory prerequisites

SHES521_EIT Territorial Organization
ENER721_EIT Energy Vectors, Quality, and Conversion GEDP721_EIT Air Pollution and Filtration Processes DDRS721_EIT Sustainable Development

Course outline

1. Assessment of incoming flows and analysis of collection and sorting systems in the Chambéry basin
2. Material and energy balances for the incinerator
3. Flue gas treatment
   a. Acid gas treatment
   b. NOx treatment
   c. Gas-solid separation
4. Atmospheric emissions
   a. Study of atmospheric dispersion of emissions and comparison with regulatory air quality data.
   b. Analysis of emission scenarios based on emission standards and meteorological conditions.
5. Disposal of combustion residues (clinker and ash)

Targeted skills

This problem-based learning allows for the assessment of the acquisition of skill EIT1, level 2: Design an integrative strategy for issues related to industrial and territorial ecology.
This course contributes to the acquisition of EIT3 competency, level 2: Leading a project in an industrial and territorial ecology context

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Multi-criteria analysis (GPRO722_EIT)

Polytech Annecy-Chambéry

Time of year Fall

In brief

Languages of instruction: French **Teaching methods:** In person

Open to exchange students: Yes

Presentation

Description

The course aims to introduce the main notions and concepts related to decision support, addressing in particular the issues involved in this approach, the construction of a decision support problem with the notions of actions, criteria, and preferences, as well as Electre-type ranking methods.

Objectives

- Use the concepts of multi-criteria decision support and create graphs to perform an initial analysis.
- Apply the principle of the aggregation method, identifying its advantages, limitations, and disadvantages, and using this method appropriately.
- Choose the Electre method best suited to a given problem and apply this method in a practical manner.

Teaching hours

Lectures	Lecture	15
Lab	Practical work	6 p.m.

Mandatory prerequisites

None

Course outline

1. Introduction, issues associated with multi-criteria analysis and basic concepts
2. Examples of multi-criteria methods and implementation of ELECTRE-type methods
3. Application to decision support in socio-economic, ecological, and industrial contexts

Targeted skills

This course contributes to the acquisition of EIT2 competency, level 2: Propose and implement engineering methods with a global strategic vision.

Bibliography

Maystre, Pictet, ELECTRE multi-criteria methods, SymosPresses Polytechniques et Universitaires Rom

Skills acquired

Macro-skill	Micro-skills

Practical

Contact

Course coordinator Nirina Chhay
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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Sustainable Development (DDRS721_EIT)

Polytech Annecy-Chambéry component

In brief

Languages of instruction: French **Teaching methods:** In person

Open to exchange students: Yes

Presentation

Description

This course builds on DDRS501 with:

1. an economic approach to sustainable development, particularly the social and solidarity economy (SSE)
2. the foundations and deployment of a circular economy
3. an in-depth look at life cycle analysis applied to an industrial approach

Objectives

- To deepen the concepts covered in the DDRS501 Sustainable Development module
- Addressing the concepts of Social and Solidarity Economy: how can we transform a linear economy into a circular economy?
- Performing an LCA on a product through a project

Teaching hours

Lectures	Lecture	13.5
Tutorial	Tutorials	21

Mandatory prerequisites

DDRS501 Sustainable Development

Course outline

1. **Social and Solidarity Economy (SSE)**
   a. Some definitions
   b. SSE enterprises and solidarity finance
   c. Local exchange systems (SEL) and complementary local currencies
   d. Commons, community, and identities
2. **Circular economy**
   a. Why take action?
   b. How should we act?
   c. With whom?
   d. Examples of circular economy projects
3. **Life cycle analysis**
   a. Objectives and scope of the study
   b. Life cycle inventory (LCI)
   c. Impact assessment
   d. Interpretation

Targeted skills

This course contributes to the acquisition of skill EIT1, level 2: Designing an integrative strategy for issues related to industrial and territorial ecology

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

UE801 Bridge to the professional world

ECTS
6 credits

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Integrated QSE (Quality, Safety, Environment) Management System	MODULE	9 hours	10.5		
Management techniques	MODULE	18 hours	7.5		

	Nature	Lecture	Tutorial	Practical	Credits
English (TOEIC level not achieved) S8	MODULE		40.5		
Modern languages (TOEIC level achieved)	MODULE				
English S8 Modern language 2	CHOICE		15		
Italian TD	SUBJECT TD		8 p.m.		
German TD	Tutorial		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD Advanced English S8	Tutorial SUBJECT		8 p.m. 9 p.m.		

	Nature	CM	Tutorial	Practical	Credits
Optional internship S8	MODULE				
Support (half of the Thursdays when FISA is present)	MODULE				

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Integrated QSE (Quality, Safety, Environment) Management System (SHES802_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Engineering and related techniques

Presentation

Description

Students must be aware that quality, environmental, and occupational health and safety management systems are now essential in business. They must therefore have sufficient knowledge of these systems in order to take them into account and integrate them into their engineering work.

Objectives

- Understand the concepts and requirements of quality management (ISO 9001), safety (ISO 45001), and environmental (ISO 14001) standards.
- Learn how to implement an integrated QSE management system tailored to the specific structure and needs of an organization.
- Acquire the skills necessary to identify, assess, and manage risks related to quality, safety, and the environment.
- Explore auditing and monitoring techniques to ensure compliance and continuously improve the integrated management system.

Teaching hours

CM		Lecture	9
Tutorial		Tutorials	10.5

Mandatory prerequisites

None

Course outline

Topic 1: Quality Management

1. Introduction to quality management;
2. Standards: definition and history of quality, principles of certification;
3. Continuous Improvement: Kaizen, 5S, Lean, Six Sigma;
4. Process Approach;
5. Tutorial: Computer modeling of a process, BPM, web publishing. Theme 2: Environmental Management

1. The environment, sustainable development, carbon footprint;
2. What is an EMS?
3. Standards, challenges;
4. The ISO 14001 standard;
5. The EMAS standard;
6. Implementing an EMS;
7. Tutorial: Audit of a company's EMS, proposal for eco-cards. Theme 3: Health and Safety at Work:

1. General information and challenges;
2. Stakeholders;
3. Legislation and OHS management system standards;
4. OHS and CSR

Targeted skills

- Ability to interpret and apply quality, safety, and environmental management standards.
- Ability to design and implement an integrated QSE management system within an organization.
- Skills in risk management and QSE performance assessment.
- Mastery of audit and monitoring techniques to ensure compliance and continuous improvement.

Bibliography

Charvet, Denis. *Integration of management systems: Quality, Safety, Environment.* Paris, AFNOR, 2019. Pignal, François, and Pierre-Emmanuel Bardin. *The QSE manual: Quality, Safety, Environment.* Paris, Dunod, 2020. Bourgoin, Alain. *The ISO 9001 standard version 2015 in 50 questions.* Paris, AFNOR, 2018.

Baril, Pierre. *ISO 14001:2015 - Understanding and implementing an environmental management system.* Paris, AFNOR, 2017.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Elodie Gardet

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Management Techniques (SHES803_PCHY)

Polytech Annecy-Chambéry component

In brief

Teaching methods: In person

Open to exchange students: Yes

Presentation

Description

This component of SHES is divided into two independent courses: Management and Ethics. The aim of this module is to understand the human and communicational dimensions of management and to develop students' managerial assertiveness.

Objectives

- Develop managerial assertiveness
- Manage a team responsible for implementing a project
- Understand the tasks and professional skills involved in implementing the project
- Know how to take a step back from complex situations and arbitrate conflicting needs related to project design
- Adopt an ethical and responsible management style

Teaching hours

Lectures		Lecture	18
Tutorial		Tutorials	7.5

Mandatory prerequisites

None

Course outline

Topic 1: Team management

- Understanding - The human dimension of management
- Communicate - The relational dimension of management

Topic 2: Ethics and psychosocial risks (PSRs)

- Mental load and information overload
- Stress at work and burnout
- Harassment (psychological and sexual)

To supplement this topic on psychosocial risks, students also have access to an e-learning training platform provided by INRS. This leads to the award of a certificate of completion if 66% of the students' answers are correct.

Targeted skills

- Be able to express expectations and needs. Know how to communicate ideas clearly.
- Adopt active listening and establish positive professional relationships.
- Ability to analyze complex situations, evaluate available options, and make informed decisions based on organizational objectives.
- Know how to recruit, train, and develop team members, mobilize them around common goals, and foster a collaborative and productive work environment.
- Be able to identify, analyze, and solve problems encountered in the workplace using appropriate methods and tools.

Bibliography

Peretti, Jean-Marie, and Patrick Gilbert. *Management Styles: Choosing, Developing, and Implementing.* Paris, Dunod, 2014. Blanchard, Kenneth H., and Spencer Johnson. *The Management of Happiness.* Paris,

Éditions d'Organisation, 2019.

Goleman, Daniel. *Leadership: The Power of Emotional Intelligence.* Paris, Harvard Business Review Press, 2017.

Lecomte, Jacques. *Benevolent Management: What We Gain by Recognizing the Value of Others.* Paris, Odile Jacob, 2017.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Elodie Gardet

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Places

Le Bourget-du-Lac (73)

English (TOEIC level not achieved) S8 (LANG801_PCHY)

Polytech Annecy-Chambéry

In brief

Languages of instruction: French **Open to exchange students:** Yes
ERASMUS reference: Languages

Presentation

Description

This course prepares students for the TOEIC ("Test of English for International Communication") exam, specifically to obtain a minimum score of 785 points (out of 990).

With the aim of developing all four skills, this course also serves as an introduction to public speaking through presentations given by students in groups or individually on topics illustrated by press articles or video materials (VTD: Video, Talk and Debate, as well as written work). Depending on the location (Annecy or Chambéry), some will be seen at different times during the semester, the year, or even the three years of training.

Students are assessed throughout each semester. The final assessment consists of a 1-hour, 1.5-hour, or 2-hour exam, depending on the semester, and accounts for 33% of the total continuous assessment.

Objectives

Specific objectives: at the end of this course, students will be able to:

revise grammar on: the correct reflexes of common structures; the verb group and tenses (except the conditional tense); the noun group and all its constituent elements; logical links (connecting words)

improve their grammar and vocabulary (general English and TOEIC-specific vocabulary) in class and independently, validating their progress through regular assessment tests

Teaching hours

Tutorials	Tutorials	40.5

Mandatory prerequisites

CEFR level B1

Course outline

1. **Oral**
    1. Elements of phonology
    2. Grammar (tenses, questions, adjectives.....)
    3. Reinforcement of structures and vocabulary
    4. Interactive oral communication
    5. Introduction to and practice for the TOEIC (listening section)
2. **Writing**
    1. Review of grammatical elements (tenses, questioning, adjectives. .....)
    2. Translation (theme/version)
    3. Reading comprehension in authentic language
    4. Curriculum vitae (in S5, S6, or S7 at the latest)
    5. Cover letter/letter of motivation (in S5, S6, or S7 at the latest)
    6. Introduction and training for the TOEIC (reading section)

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Christophe Lambert
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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Modern Languages (TOEIC Level Achieved) (LANG802_PCHY)

Polytech Annecy-Chambéry

List of courses

	Nature	Lecture	Tutorial	Practical	Credits
English S8	SUBJECT		15		
Modern Language 2	CHOICE				
Italian TD	Tutorial		8 p.m.		
German TD	Tutorial		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD	Tutorial		8 p.m.		
Advanced English S8	SUBJECT		9 p.m.		

Practical information

Location

Le Bourget-du-Lac (73)

English S8 (LANG802_PCHYM1)

Polytech Annecy-Chambéry

In brief

Languages of instruction: French **Open to exchange students:** Yes
ERASMUS reference: Languages

Presentation

Teaching hours

Tutorial	Tutorials	15

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Christophe Lambert
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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Modern language 2

Polytech Annecy-Chambéry
Component

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Italian TD	Tutorial		20		
German TD	Tutorial		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD	Tutorial		8 p.m.		
Advanced English S8	SUBJECT		9 p.m.		

Practical information

Location

Le Bourget-du-Lac (73)

Italian TD

Chambéry
University Institute
of Technology

In brief

Languages of instruction: Italian

Open to exchange students: Yes

Overview

Teaching hours

Italian TD - TD	Tutorials	20

Skills acquired

Macro-skills	Micro-skills

Practical information

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Intercomprehension of Romance Languages TD

ACCENTS
component

Overview

Teaching hours

Intercomprehension of Romance Languages TD - TD	Tutorials	20

Skills acquired

Macro-skill	Micro-skills

Advanced English S8 (ENGL802_PCHY)

Polytech Annecy-Chambéry component

Presentation

Teaching hours

Tutorials	Tutorials	21

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Christophe Lambert
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Locations

Le Bourget-du-Lac (73)

Optional internship S8 (PROJ800_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

Overview

Description

The optional internship aims to enrich students' academic and professional experience by offering them a practical opportunity to apply their knowledge and acquire new skills. An optional internship can be carried out **in France or abroad**. It must comply with the same general conditions as compulsory internships.

Objectives

- **Acquisition of** specific skills related to the specialization;
- **Refining career goals and/or** gaining confidence and independence through the completion of a project or specific tasks;
- Establish valuable professional contacts that can help in future job searches.

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator

Polytech-Bourget Business Relations

Relations-Entreprises.Polytech-Bourget@univ-savoie.fr

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Support (half of the Thursdays when FISA is present) (ACCO801_PCHY)

Polytech Annecy-Chambéry
component

In brief

Teaching methods: In person **Teaching format:** Tutored project **Open to exchange students:** Yes

Presentation

Description

This support is open to all students at the school: students, apprentices, and Continuing Education employees. It is not mandatory, as it is primarily intended for students who need it to succeed in their training. This semester, it is scheduled into the timetable for each course, with a total of 16 hours.

Support may take the form of refresher courses, upgrading courses, or support in the main areas of the training programs.

Peer tutoring is encouraged and the educational resources of the Polytech Network are used (https://eplanet.polytech-reseau.org/).

Objectives

To promote the success of all students in their educational journey.

Teaching hours

PTUT	Tutored project	16

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Director of Training, Polytech

Locations

Le Bourget-du-Lac (73)

UE802 Internship

ECTS
6 credits

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Internship Assistant Engineer S8	MODULE				

Practical

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

S8 Assistant Engineer Internship (PROJ801_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

Overview

Description

This is a professional internship as a technician or assistant engineer. The internship is to be carried out in a company or research organization on a topic closely related to the student's area of expertise, on a full-time basis and with a **maximum of 50% teleworking**.

Objectives

This internship, carried out within a company or organization whose activity is representative of the specialty chosen at the school, should enable students to:

- Integrate and participate in a professional organization;
- Discover professional methods and practices;
- Apply the student's theoretical and practical knowledge;
- Carry out tasks similar to those of technicians or assistant engineers.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator

Polytech-Bourget Business Relations

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

UE803 Process Engineering and Energy

ECTS
11 credits

Polytech Annecy-Chambéry component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Optimization of energy storage and transfer	MODULE	28.5 hours	31.5		
Unit operations for effluent treatment	MODULE	30	31.5 hours	24 hours	

Practical information

Location

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Optimization of Energy Storage and Transfer (ENER821_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Engineering and related techniques

Overview

Description

This course provides tools for optimizing energy transfers and systems, particularly by integrating storage solutions. It also introduces exergo-economic analysis with a view to optimizing systems from a technical and economic perspective.

Objectives

- Propose different technological solutions to reduce energy consumption related to an energy system or process
- Evaluate the exergy performance of the selected solutions
- Select the most relevant technological solution
- Take into account the economic criteria related to the implementation of an energy system or process
- Evaluate the economic relevance of the various technological solutions

Teaching hours

Lectures		Lecture	28.5
Tutorial		Tutorials	31.5

Mandatory prerequisites

- ENER721_EIT Energy vectors, quality, and conversion
- SCVT621_EIT Natural Resources
- ENER621_EIT Thermodynamics
- ENER622_EIT Heat Transfer

Course outline

1. **Exergy analysis of systems and processes**
   a. Exergy balances and performance (analysis of exergy destruction)
   b. Pinch method
2. **Technical and economic analysis**
   a. Introduction to the approach (exergy costs, financial costs, investment amortization costs, etc.)
   b. Applications to simple engineering cases

Targeted skills

This course contributes to the acquisition of skill EIT1, level 2: Designing an integrative strategy for issues related to industrial and territorial ecology.
This course contributes to the acquisition of EIT2 competency, level 2: Propose and implement engineering methods with a global strategic vision.

Bibliography

- L. Borel, D. Favrat, Thermodynamics and Energy, from Energy to Exergy, Vol. 1. Lausanne: EPFL Press, 2010.
- M. Feidt, Thermodynamics and Energy Optimization of Systems and Processes. Paris: Lavoisier, 2016.
- A. Bejan, Advanced Engineering Thermodynamics, 4th. Ed. Hoboken: Wiley, 2016.
- A. Bejan, G. Tsatsaronis, M. Moran, Thermal Design & Optimization, Wiley, 1996.

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Unit operations in wastewater treatment (GEDP821_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes
ERASMUS reference: Engineering and related techniques

Presentation

Description

This course covers the fundamental principles and industrial applications of fluid-particle separation processes used in water treatment. It combines theoretical approaches (physical and physicochemical mechanisms) with practical equipment design.

Objectives

In the context of wastewater and industrial water treatment:

- Be able to select and size unit operations for fluid-particle separation, identifying the operating parameters that determine their effectiveness.
- Know how to critically analyze a single fluid-particle separation operation, evaluate its optimal functioning, and make recommendations for improvement.

Teaching hours

Lectures	Lecture	30
Tutorial	Tutorials	31.5
Lab	Practical work	24

Mandatory prerequisites

GEDP521_EIT Macroscopic Balances and Chemical Reactors

GEDP621_EIT Fluid Mechanics

Course outline

1. Decantation, centrifugation, flotation
2. Flow through porous media
3. Homogeneous and heterogeneous fluidization
4. Mass filtration
5. Support filtration
6. Membrane filtration

Targeted skills

This course contributes to the acquisition of EIT2 competency, level 2: Propose and implement engineering methods with a global strategic vision

Bibliography

- Introduction to Process Engineering by D. Ronze (Editions Tec et Doc, 2008), ISBN: 978-2-7430-1066-9
- Separation Process Principles by E.J. Henley, J.D. Seader, D.K. Roper (Wiley, 2011) ISBN: 978-0-470-64611-3
- Procédés de séparation (Separation Processes) by J.P. Wauquier (Editions Technip, 1998) ISBN: 2-7108-0671-1
- Technical Handbook on Water by DEGRÉMONT, Degrémont-Suez (ISBN: 2-7430-0717-6)
- Darby, Ron, and R. P. Chhabra (2017). Chemical engineering fluid mechanics: Ron Darby, Texas A&M University College Station, Texas, and Raj P. Chhabra, Indian Institute of Technology, Kanpur, India. Third edition. Boca Raton: CRC Press, Taylor & Francis Group. 555 p.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Evelyne Gonze
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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

UE804 Effluent Treatment

ECTS
7 credits

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
Water treatment and reuse, new challenges	MODULE 31.5 hours		16.5		
APP: Effluent treatment	MODULE	6		48	

Practical information

Location

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Water treatment and reuse, new challenges (DDRS821_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person

Open to exchange students: Yes

ERASMUS reference: Engineering and related techniques

Presentation

Description

This course addresses key issues in urban and industrial wastewater treatment, including regulations, management, collection and sewerage networks, and treatment processes. In addition, opening lectures complement this course with a presentation on the evolution of the Urban Wastewater Directive (UWD) (issues and deadlines), such as the monitoring of pathogens, micropollutants, REUT, energy neutrality, etc.

Objectives

- Acquire scientific and technical knowledge applied to the management and treatment of urban wastewater
- Take into account regulatory requirements and developments related to water treatment

Teaching hours

Lectures		Lectures	31.5
Tutorial		Tutorials	16.5

Mandatory prerequisites

GEDP521_EIT Macroscopic balances and chemical reactors SCVT621_EIT Natural resources

GEDP821_EIT Unit Operations in Effluent Treatment

Course outline

1. **Characteristic parameters and discharge standards**
   a. Pollution criteria
   b. Wastewater characteristics - Discharge standards
   c. Analysis of urban wastewater
2. **Sewerage systems**
   a. Collection
   b. Public utilities
   c. Project management
3. **Urban wastewater treatment processes**
   a. Pre-treatment
   b. Primary treatment
   c. Secondary treatment and bioreactors
   d. Sludge treatment
4. **New requirements of the Urban Wastewater Directive (UWD 2)**
   a. Micropollutants
   b. Reuse of treated water
   c. Energy neutrality

Targeted skills

This course contributes to the acquisition of EIT1 skill, level 2: Designing an integrative strategy for issues related to industrial and territorial ecology
This course contributes to the acquisition of skill EIT2, level 2: Propose and implement engineering methods with a global strategic vision

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Sylvie Guittonneau-Cotton +33 4 79 75 86 06
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Places

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

APP: Effluent treatment (PROJ821_EIT)

Polytech Annecy-Chambéry
component

In brief

- **Languages of instruction:** French
- **Teaching methods:** In person
- **Teaching format:** Learning and assessment situation
- **Open to exchange students:** Yes
- **ERASMUS reference:** Engineering and related techniques

Presentation

Description

This course is based on a problem-based learning approach in which engineering students are divided into design offices specializing in the study, design, and implementation of urban and industrial wastewater treatment facilities. The objective is to design and size a reliable solution tailored to the needs of an urban area. The design offices will be required to draft and defend a preliminary project that meets the project owner's requirements.

Objectives

- Addressing wastewater and industrial effluent treatment chains as a whole
- Select a water treatment process in accordance with the legislative framework governing water and sludge treatment
- Dimension the system
- Draft and defend a preliminary project report

Teaching hours

Lectures	Lecture	6
Lab	Practical work	48
PROJ	Project	40

Mandatory prerequisites

GEDP521_EIT Macroscopic Balances and Chemical Reactors

GEDP821_EIT Unit Operations in Effluent Treatment

DDRS821_EIT Water Treatment and Reuse, New Challenges

Course outline

The different stages of the project are:

1. Estimate the discharges and flows acceptable to the watercourse and analyze the impact of the treatment plant on the watercourse.
2. Define and size a water treatment system.
3. Define and size a sludge treatment system.
4. Defend your project before a jury.

Targeted skills

This problem-based learning allows for the assessment of the acquisition of skill EIT2, level 2: Propose and implement engineering methods with a global strategic vision.
This course contributes to the acquisition of skill EIT3, level 2: Lead a project in an industrial and territorial ecology context.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Evelyne Gonze
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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

UE901 Bridge to the professional world

ECTS
10 credits

Polytech Annecy-Chambéry
component

List of courses

	Type	Lectures	Tutorial	Practical	Credits
Research and Development Project	MODULE				

	Type	CM	Tutorial	Practical	Credits
English (TOEIC level not achieved) S9	MODULE		40.5		
Modern languages (TOEIC level achieved)	MODULE				
English S9 Modern language 2	CHOICE		15		
Italian TD	SUBJECT TD		8 p.m.		
German TD	Tutorial		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	TD		8 p.m.		
Intercomprehension of Romance Languages TD Advanced English S9	Tutorial SUBJECT		8 p.m. 9 p.m.		

	Nature	Lecture	Tutorial	Practical	Credits
Optional internship S9	MODULE				

Practical information

Locations

Le Bourget-du-Lac (73)

Research and Development Project (PROJ901_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

Overview

Description

The Research and Development Project (PRD) is an educational activity involving a partnership between the PAC School and a professional organization or research laboratory.
This activity allows students to acquire (or strengthen) their experience in research and development.

Objectives

The PRD aims to strengthen engineering students' R&D skills by enabling them to

- carry out and manage a research and development project in an industrial or research context,
- apply and expand the skills acquired during their training in their specializations
- solve problems while taking into account constraints such as cost, deadlines, quality, etc.
- interact within a team,
- organize themselves to achieve set objectives by planning the various stages,
- effectively monitor progress.

Teaching hours

PTUT	Tutored project	15
PROJ	Project	125 hours

Mandatory prerequisites

First year of engineering studies (FI3) for all specializations

Course outline

The first sessions are supervised by teaching and scientific tutors.

Students carry out bibliographic research, analysis, and synthesis work, partly independently.

Supervisors agree on regular meetings to review progress and provide the best possible support for students in completing their projects.

Bibliography

Depends on the R&D topic

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Nirina Chhay

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Locations

Le Bourget-du-Lac (73)

English (TOEIC level not achieved) S9 (LANG901_PCHY)

Polytech Annecy-Chambéry

Presentation

Description

This course prepares students for the TOEIC ("Test of English for International Communication") exam, specifically to achieve a minimum score of 785 points (out of 990).

With the aim of developing all four skills, this course also serves as an introduction to public speaking through presentations given by students in groups or individually on topics illustrated by press articles or video materials (VTD: Video, Talk and Debate, as well as written work). Depending on the location (Annecy or Chambéry), some will be seen at different times during the semester, the year, or even the three years of training.

Students are assessed throughout each semester. The final assessment consists of a 1-hour, 1.5-hour, or 2-hour exam, depending on the semester, and accounts for 33% of the total continuous assessment.

Objectives

Specific objectives: at the end of this course, students will be able to:

revise grammar on: the correct reflexes of common structures; the verb group and tenses (except the conditional tense); the noun group and all its constituent elements; logical links (connecting words)

improve their grammatical and lexical knowledge (general English and TOEIC-specific vocabulary) in class and independently, validating their progress through regular assessment tests.

Teaching hours

Tutorials	Tutorials	40.5

Mandatory prerequisites

CEFR level B1

Course outline

1. **Oral**
    1. Elements of phonology
    2. Grammar (tenses, questions, adjectives.....)
    3. Reinforcement of structures and vocabulary
    4. Interactive oral communication
    5. Introduction to and practice for the TOEIC (listening section)
2. **Writing**
    1. Review of grammatical elements (tenses, questioning, adjectives. .....)
    2. Translation (theme/version)
    3. Reading comprehension in authentic language
    4. Curriculum vitae (in S5, S6, or S7 at the latest)
    5. Cover letter/letter of motivation (in S5, S6, or S7 at the latest)
    6. Introduction and training for the TOEIC (reading section)

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Christophe Lambert
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Locations

Le Bourget-du-Lac (73)

Modern languages (TOEIC level achieved) (LANG902_PCHY)

Polytech Annecy-Chambéry

List of courses

	Nature	Lecture	Tutorial	Practical	Credits
English S9	SUBJECT		15		
Modern Language 2	CHOICE				
Italian TD	Tutorial		8 p.m.		
German TD	TD		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD	Tutorial		8 p.m.		
Advanced English S9	SUBJECT		9 p.m.		

Practical information

Location

Le Bourget-du-Lac (73)

English S9 (LANG902_PCHYM1)

Polytech Annecy-Chambéry

Presentation

Teaching hours

Tutorial	Tutorials	15

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator Christophe Lambert
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Christophe.Lambert@univ-savoie.fr

Locations

Le Bourget-du-Lac (73)

Modern Language 2

Polytech Annecy-Chambéry
component

List of courses

	Subject	Lectures	Tutorial	Practical	Credits
Italian TD	Tutorial		20		
German TD	Tutorial		8 p.m.		
Spanish TD	Tutorial		8 p.m.		
Japanese TD	Tutorial		8 p.m.		
Intercomprehension of Romance Languages TD	Tutorial		8 p.m.		
Advanced English S9	SUBJECT		9 p.m.		

Practical information

Location

Le Bourget-du-Lac (73)

Advanced English S9 (ENGL902_PCHY)

Polytech Annecy-Chambéry

Presentation

Teaching hours

Tutorial	Tutorials	21

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

Optional internship S9 (PROJ900_PCHY)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French

Open to exchange students: Yes

Overview

Description

The optional internship aims to enrich students' academic and professional experience by offering them a practical opportunity to apply their knowledge and acquire new skills. An optional internship can be carried out **in France or abroad**. It must comply with the same general conditions as compulsory internships.

Objectives

- **Acquisition of** specific skills related to the specialization;
- **Refining career goals and/or** gaining confidence and independence through the completion of a project or specific tasks;
- Establish valuable professional contacts that can help in future job searches.

Skills acquired

Macro-skills	Micro-skills

Practical information

Contact

Course coordinator

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Relations-Entreprises.Polytech-Bourget@univ-savoie.fr

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

UE902 Process Engineering and Energy

ECTS
10 credits

Polytech Annecy-Chambéry component

List of courses

	Nature	CM	Tutorial	Practical work	Credits
Renewable energies	MODULE	30	27	40	
Treatment of gaseous pollution	MODULE	21	21	24	

Practical information

Locations

Le Bourget-du-Lac (73)

Renewable energies (ENER921_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes

Presentation

Description

This course aims to train students in the use of renewable energies (solar, hydraulic, geothermal, wind) to meet regional needs. It covers available resources, their exploitation, as well as energy conversion and storage.

Objectives

- Identify renewable energy potential in a given area.
- Propose solutions for the exploitation of renewable energies.
- Describe the various components of renewable energy capture and conversion systems, as well as how the installations work.
- Describe the various means of energy storage, explain how they work, and be able to carry out their preliminary dimensioning.

Teaching hours

Lectures	Lecture	30
Tutorial	Tutorials	27
Lab	Practical Work	40

Mandatory prerequisites

GEDP521_EIT Macroscopic Balances and Chemical Reactors ENER621_EIT Thermodynamics
GEDP621_EIT Fluid Mechanics ENER622_EIT Heat Transfer

Course outline

1. Solar thermal
2. Solar photovoltaics
3. Wind Energy
4. Hydropower
5. Geothermal

Targeted skills

This course contributes to the acquisition of skill EIT1, level 3: Designing an integrative strategy for issues related to industrial and territorial ecology.
This course contributes to the acquisition of EIT2 competency, level 3: Propose and implement engineering methods with a global strategic vision.

Bibliography

- Bartow K. Hodge, B. K. Hodge, Robert P. Taylor, Analysis and Design of Energy Systems, Prentice-Hall Inc. Englewood Cliffs, New Jersey
- Raymond Comolet, Experimental Fluid Mechanics - Volume 2 Dynamics of Real Fluids, Turbomachinery, Dunod
- Guide to setting up small hydroelectric projects, ADEME, March 2003
- Paul Gipe, The Big Book of Wind Power, Le Moniteur, 2004
- CIVEL Y.B, Guide to Wind Energy - Wind Turbines for Sustainable Development, IEPF, 1998
- BRGM Editions: Technical Guide - Geothermal Heat Pumps on Probe Fields - 2012; ISBN: 978-2-7159-25311
- BRGM Editions: Technical Guide - Geothermal Heat Pumps Using Aquifer Boreholes - 2012; ISBN: 978-2-7159-25328

- Karl OSCHNER - Geothermal Heat Pumps, A guide for planning and installing - 2007; EAN: 978-1-84407-406-8
- P. Odru, Energy Storage, Dunod Universcience 2010

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator Nirina Chhay
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Nirina.Chhay@univ-savoie.fr

Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Treatment of gaseous pollution (GEDP921_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes

Presentation

Description

This course aims to study gas pollution treatment processes, particularly those related to waste treatment and recovery and combustion phenomena. The basics of their design will be described.

Objectives

Understand, describe, and pre-dimension a gas treatment process using absorption, adsorption, and catalysis.

Teaching hours

Lectures	Lecture	21
Tutorial	Tutorials	9 p.m.
Lab	Practical Work	24

Mandatory prerequisites

GEDP521_EIT Macroscopic Balances and Chemical Reactors

Course outline

1. **Matter transfer between two phases**
   a. Fick's law and diffusivity
   b. Equilibrium relations and mass transfer between two phases
   c. Individual and overall transfer coefficients
   d. Transfer in flow conditions
2. **Absorption**
   a. Characteristics of columns and packings
   b. Hydrodynamics of a column
   c. Application to absorption or desorption
3. **Adsorption**
   a. Adsorption phenomenon and adsorbents
   b. Gas adsorption
   c. Sizing of fixed-bed adsorbers
   d. Sizing of moving bed adsorbers
4. **Catalysis**
   a. Fundamental principles
   b. Transformation kinetics and material balance
   c. Choice of catalyst
   d. Example of a process: NOx removal
5. Example of a process: pre-upgrade and upgrade of biogas before injection into the network

Practical work:

i. Adsorption column
ii. Absorption column

Targeted skills

This course contributes to the acquisition of EIT2 skill, level 3: Propose and implement engineering methods with a global strategic vision

Bibliography

- P. Le Cloirec, Smoke Treatment, Engineering Techniques, be8856
- J. Villermaux, Chemical Reaction Engineering, Reactor Design and Operation, Paris: Tec et doc, 1993

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

UE903 Renewable Energy Development

ECTS
10 credits

Polytech Annecy-Chambéry
component

List of courses

	Nature	Lectures	Tutorial	Practical	Credits
APP: Industrial and Territorial Ecology	MODULE			48	
Energy, Environmental, and Public Procurement Law	MODULE	3 p.m.	15		
Networks and storage	MODULE	24 hours	24		
Organic waste recovery: Anaerobic digestion and composting	MODULE	12	9 hours		

Practical information

Locations

Le Bourget-du-Lac (73)

APP: Industrial and Territorial Ecology (PROJ921_EIT)

Polytech Annecy-Chambéry
component

In brief

- **Languages of instruction:** French
- **Teaching methods:** In person
- **Teaching format:** Learning and assessment situations
- **Open to exchange students:** Yes

Presentation

Description

This course uses a problem-based learning approach to address the environmental challenges facing a community through a circular economy approach, quantifying and interconnecting flows of various types and origins. The case study focuses on the Bissy industrial zone (Chambéry), which includes, among other things, a methane digester, biomethane injection, an urban heating network, and a wood-fired boiler.

Objectives

Students must conduct a study of an industrial zone using their knowledge of EIT to promote the circular economy and the recovery of materials and energy.

- Identification and quantification of recoverable flows.
- Existing network and potential material and energy recovery
- Feasibility study and implementation
- Profitability study and mass/energy balances

Teaching hours

Practical work	Practical work	48
PROJ	Project	40

Mandatory prerequisites

GEDP922_EIT Organic waste recovery

GEDP921_EIT Treatment of gaseous pollution

SHES921_EIT Energy, Environmental, and Public Procurement Law

ENER922_EIT Networks and Storage

ENER921_EIT Energy processes

Course outline

1. Part A: Study of synergies and opportunities for industrial ecology within an industrial zone
2. Part B: Methanization and multi-stakeholder coupling
3. Part C: Biogas filtration and purification
4. Part D: Recovery and network connection (production, injection, recovery)

Targeted skills

This problem-based learning allows for the assessment of the acquisition of skill EIT2, level 3: Propose and implement engineering methods with a global strategic vision
This course contributes to the acquisition of skill EIT3, level 3: Lead a project in an industrial and territorial ecology context

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

Energy, Environmental, and Public Procurement Law (SHES921_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes

Presentation

Description

This module aims to provide students with an in-depth understanding of the legal frameworks governing environmental protection, ecosystem management, and the regulations governing activities related to energy production, distribution, and use. Part of the module focuses on understanding the regulatory basis of public procurement in order to comprehend how it works, how it is structured, and how the execution of these contracts is monitored for public entities such as local authorities.

Objectives

- Understand the fundamental principles of environmental law, including the protection of future generations, the fight against pollution, and the management of natural spaces and landscapes.
- Acquire the knowledge necessary to implement environmental management tools, such as eco-auditing and environmental assessments, and understand the role of NGOs and associations in environmental protection.
- Master the basics of public procurement law, including formalized procedures, contract preparation, and bid analysis.
- Understand the international aspects of environmental law and their application in the context of public procurement and environmental protection.

Teaching hours

Lectures	Lecture	15
Tutorial	Tutorials	3 p.m.

Mandatory prerequisites

None

Course outline

Part I. Environmental law

1. Introduction to environmental law and its fundamental principles
2. Protecting future generations and sustainable development
3. Protection of living organisms, natural areas, and landscapes (ZNIEF, NATURA 2000)
4. Combating pollution and nuisances, the principle of prevention
5. Eco-auditing, environmental management, and environmental assessment
6. Role of advocacy groups and NGOs
7. Sanctions and compensation for environmental damage
8. International aspects of environmental law

Part II. Public procurement law

1. Introduction to public procurement law and public procurement
2. General provisions and preliminary phase
3. Market preparation and formalized procedures
4. Negotiated procedure without advertising or competition
5. Analysis of bids and variants

Targeted skills

This course contributes to the acquisition of EIT2 competency, level 3: Propose and implement engineering methods with a global strategic vision

Bibliography

- S. Braconnier, Précis du droit des marchés publics (A Guide to Public Procurement Law), Editions Le Moniteur 2012 - EAN: 9782281128826
- Le Grenelle II commenté, Editions Le Moniteur 2012 - EAN: 9782281128420

- M. Prieur, Environmental Law, Ed. Dalloz 2016 - ISBN 978 2 247 15236 0, Savoie University Library reference 320 pre 22 ND 40345
- T. Garancher, Environmental Impact Studies, Editions Le Moniteur 2013 - EAN: 9782281129359, Savoie University Library reference number 624 GAR NS 43769
- R. Romi, Environmental Law and Sustainable Development, Ed. LGDJ Lextenso, ISBN 978 2 275 05483 4, BU Savoie reference number 344.046 ROM ND 42453
- R. Romi, International and European Environmental Law, Ed; LGDJ 2017, ISBN 978 2 275 04749 2, Savoie University Library Reference Number 344.046 ROM ND 41703
- D. Mabin, Public Procurement: Concept, Procedures, Controls, and Remedies, Ed. Studyrama, ISBN 978 2 7590 3691 2, BU Savoie call number 346.023 MAB NA34211
- F. Allaire, The essentials of public procurement law, Ed. Gualino lextenso, 2018, ISBN 978 2 297 06855 0, BU Savoie reference number 346.023 ALL NA35321
- O.Ortega, Les contrats de performance énergétique (Energy Performance Contracts), Ed. lexiNexis, 2017, ISBN978 2 7110 2651 7, BU Savoie reference number 343.07 ORT NS47842

Skills acquired

Macro-skill	Micro-skills

Practical

Contact

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Location

Le Bourget-du-Lac (73)

Networks and Storage (ENER922_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes

Presentation

Description

This course provides an overview of regional energy networks (electricity, heat, and gas), addressing their specific characteristics, management, connection conditions, and interconnection.

Objectives

- Analyze the functioning of heating networks and describe their specific characteristics.
- Explain the principles of gas and electricity network regulation.
- Identify the conditions for connecting to a network.

Teaching hours

Lectures	Lecture	24
Tutorial	Tutorials	24

Mandatory prerequisites

GEDP621_EIT Fluid Mechanics

Course outline

1. Heat networks
2. Gas Networks
3. Electricity networks
4. Connection between networks

Targeted skills

This course contributes to the acquisition of EIT1 competency, level 3: Designing an integrative strategy for issues related to industrial and territorial ecology
This course contributes to the acquisition of skill EIT2, level 3: Propose and implement engineering methods with a global strategic vision

Bibliography

- AMORCE website (12-11-2013): http://www.amorce.asso.fr/
- Association Technique Energie Environnement website (12-11-2013):

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

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Locations

Le Bourget-du-Lac (73)

Campus

Le Bourget-du-Lac / Savoie Technolac campus

Organic waste recovery: Methanization and Composting (GEDP922_EIT)

Polytech Annecy-Chambéry
component

In brief

Languages of instruction: French **Teaching methods:** In person
Open to exchange students: Yes

Presentation

Description

This course introduces the recovery of organic matter through anaerobic digestion (methanization) or aerobic digestion (composting). The first part deals with understanding the main processes involved in anaerobic digestion and the inhibiting factors in order to understand how the material degrades and to be able to diagnose the origin of certain problems (odors, NH_3, SO_2) in methanizers. The implementation of anaerobic digestion in the main bioreactors is presented, along with some principles for sizing gasometers. The second part describes aerobic digestion and its implementation for bio-waste management. It provides general knowledge about bio-waste, its composition, and its recovery on a regional scale.

Objectives

- Acquire knowledge about bio-waste, its composition, and its recovery at the regional level.
- Understand the main processes of anaerobic digestion.
- Learn the principles of implementing anaerobic digestion and sizing methanizers.
- Understand how aerobic digestion works and its application to bio-waste management.

Teaching hours

Lectures		Lecture	12 p.m.
Tutorial		Tutorials	9

Mandatory prerequisites

DDRS821_EIT Water treatment and reuse, new challenges

Course outline

Part I. Methanization

1. Transforming organic matter into energy
   a. Anaerobic digestion process of organic matter
   b. Characterization of organic matter as a substrate for methanization
2. Implementation of anaerobic digestion
   a. Performance parameters of anaerobic digestion
   b. Classification of methanization reactor operation
   c. The main methanization reactors
   d. Waste streams from methanization units

Part II. Composting

1. Principles, biological aspects, ecosystem
2. Green waste platform
3. Co-composting
4. Individual composting, building foot
5. Compost quality
6. Accelerated composting, electromechanical composters

Targeted skills

This course contributes to the acquisition of skill EIT1, level 3: Designing an integrative strategy for issues related to industrial and territorial ecology
This course contributes to the acquisition of skill EIT2, level 3: Propose and implement engineering methods with a global strategic vision

Bibliography

- Aguado, D., Noriega-Hevia, G., Ferrer, J., Seco, A., Serralta, J., 2022. PLS-based soft-sensor to predict ammonium concentration evolution in hollow fiber membrane contactors for nitrogen recovery. J. Water Process Eng. 47, 102735.

- Béline, F., Girault, R., Peu, P., Trémier, A., Téglia, C., Dabert, P., 2012. Challenges and prospects for the development of agricultural methanization in France. Sci. Eaux Territ. Issue 7, 34–43.
- Moletta, R., 2015. Methane production (2nd ed.), 3rd edition. ed. Lavoisier.
- Rajendran, K., Aslanzadeh, S., Taherzadeh, M.J., 2012. Household Biogas Digesters—A Review. Energies 5, 2911–2942. Tessier, L., 2018. Industrial bioprocess technologies. College Center for the Development of Teaching Materials (CCDMD).
- Wang, S., Ma, F., Ma, W., Wang, P., Zhao, G., Lu, X., 2019. Influence of Temperature on Biogas Production Efficiency and Microbial Community in a Two-Phase Anaerobic Digestion System. Water 11, 133.
- Rynk, R., Black, G., Gilbert, J., Biala, J., Bonhotal, J., Schwarz, M., & Cooperband, L. (Eds.). (2021). The composting handbook: a how-to and why manual for farm, municipal, institutional and commercial composters. Academic Press.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

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Places

Le Bourget-du-Lac (73)

UE001 Engineering internship

ECTS
30 credits

Polytech Annecy-Chambéry component

List of courses

	Type	Lecture	Tutorial	Practical	Credits
S10 engineering internship	MODULE				

Practical information

Locations

Le Bourget-du-Lac (73)

Engineering internship S10 (PROJ001_PCHY)

Polytech Annecy-Chambéry

Presentation

Description

The internship must be carried out in a company or research organization related to the student's area of expertise, on a full-time basis and with a **maximum of 50% teleworking**.

Objectives

This is an internship carried out within a company or research laboratory, department, or organization whose activity is representative of the student's specialty. This internship should enable students to:

- the student to apply their theoretical and practical knowledge;
- verify their aptitude for engineering work.

Skills acquired

Macro-skill	Micro-skills

Practical information

Contact

Course coordinator

Polytech-Bourget Business Relations

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