



# Syllabus

## Génie Biologique & Santé



**POLYTECH**  
ANGERS

# 3A - Semestre 5

 <b>GBS</b>	<i>English</i>	
	3A / Semester 5	
	28h TD	General Skill

**Keywords:** Communication skills, Cross-cultural skills, Professional Environment

**Prerequisites:** Level B2 / CEFR

**Objectives:**

- Meeting the requirements of the CEFR (Common European Framework of Reference for Languages): oral and written comprehension, oral and written expression, interaction to achieve proficiency in everyday and professional situations.
- Cross-cultural skills: knowledge of international environment

Organization of Language proficiency levels groups based on TOEIC practice scores from the TOEIC. A base TOEIC score is required in the final year to graduate as an Engineer.

**Programme:**

Oral and written communication skills

Looking for a mandatory training experience abroad, writing a cover letter, a CV

Communication skills in companies (letters, memos, emails, phone conversations, interviews, etc.)



Current political, economic and social and professional issues

Speech and presentation techniques.

Regular pronunciation and accent work.

**Bibliography:**

Communicated by teachers

 <b>GBS</b>	<i>Foreign Languages: German or Spanish</i>	 <b>POLYTECH</b> ANGERS
	3A / Semester 5	
	12h TD	General Skill

**Keywords:** Communication skills, Cross-cultural skills, Professional Environment

**Prerequisites:** Basic oral and written communication skills

**Objectives:**

- Meeting the requirements of the CEFR (Common European Framework of Reference for Languages): oral and written comprehension, oral and written expression, interaction
- Cross-cultural skills: knowledge of international environment

Organization of Language proficiency levels whenever it is possible.

The target for the advanced group is CEFR B2 or C1; A2 or B1 for the intermediate group,

A certification in German/Spanish is recommended for advanced students in final year.

**Programme:**

Looking for a training experience abroad, writing a cover letter, a CV, an abstract

Oral and written communication skills

Communication skills in Companies

Political, economic and social news

**Learning outcomes:**

Intermediate groups



- The student can write a CV in German/Spanish
- The student can speak for a few minutes on a topical issue or a topic of personal interest.
- The student can take part in a conversation on simple topics that can be related to his/her personal interests.

Advanced groups

- The student can write a cover letter in German/Spanish
- The student can read an article or listen to a program in a standard language and comment on it

**Bibliography:**

Communicated by teachers

 <b>GBS</b>	<i><b>Economics and Accounting</b></i>	
	3A / Semester 5 20h TD	

## **ECONOMICS (12H)**

**Key words :** economic circuit, market mechanisms, market economy, economic growth, capitalist enterprises, social economy, ecological transition, circular economy.

**Prerequisites:** Economic and societal transition (course S5)

### **Objectives :**

- Understanding how our economic model works
- Understanding the contradictions between our economic model and the ecological issue
- Discovering the diversity of companies, their goals, the opportunities of the circular economy
- Interesting students in economic news

### **Program : Economic fundamentals (12h)**

#### **Introduction: Overview of the economy**

- a. Economic actors
- b. Economic circuit

#### **1- The market economy**

- a. Market mechanisms: law of supply and demand, resource allocation
- b. Principles of the market economy: freedom, private property, competition, individual interest, cost
- c. *Ecological transition: Why does the market economy have difficulty taking ecology into account? Is the carbon market an efficient solution?*

#### **2- Economic growth**

- a. Measurement and evolution
- b. Why are we always looking for economic growth?
- c. *Ecological transition: How will the ecological transition impact economic growth?*

#### **3- Companies**

- a. Capitalist companies
- b. Social economy companies
- c. *Ecological transition: What are the opportunities of the circular economy for companies?*

#### **4- Economic news**

The topics covered in this last part vary according to the economic news.

**Evaluation:** 100% Continuous assessment

**Bibliography:** Communicated by the teachers

## ACCOUNTING (8h)

**Specific skills:** Integrate the accounting and financial aspects into the operational activity of the company.

**Key words :** Flows, Stocks, Uses, Resources, Balance sheet, Assets, Liabilities, Income statement, Expenses, Income, Financial performance

**Prerequisites:** Notions of system equilibrium, notions of system dynamics, differential calculus

### Objectives :

The Accounting course covers the fundamentals of accounting and financial management:

- o Understand why and how accounting information is produced
- o Know how to analyse the financial situation of the company

### Program : "fundamentals of accounting and financial management3

#### I- Why do we need accounting information ?

The purposes of a company's financial information (needs of stakeholders)

#### II- How is accounting information constructed ?

- a. The double entry, flows and stocks, uses and resources
- b. The balance sheet and the functional breakdown of the balance sheet
- c. The profit and loss account and the « intermediate management balances »

#### III- How to evaluate the performance of a company ?



- a. Analysis of profitability: capacity to generate a result (EBITDA, EBIT) or a resource (Cash Flows)
- b. Analysis of profitability: level of return on capital employed in the business: capital invested from an economic point of view, equity from a financial point of view
- c. Allocation of profit : Reserves and retained earnings, investment, R&D, salary increment, profit distribution (dividends).

### Assessment :

100% Continuous assessment (asynchronous remote assessment)

### Bibliography :

Les fondements de la comptabilité, Bernard Colasse, Ed. La Découvertes / Repères, 2012  
Comptabilité générale et gestion des entreprises, Jean-Jacques Friedrich, Ed. Hachette Supérieur, 2021

 <b>GBS</b>	<i>Ecological and Societal transition</i>	
	3A / Semester 5	
	12h TD	
		UE 5-1 General Skill

**Key words:** planetary limits, energy, water resources, climate change, rebound effect, ecological sufficiency, social justice.

**Prerequisites:** none

**Objectives:** Provide any student entering the engineering cycle, regardless of their major, with the knowledge necessary to understand the complexity of the ecological transition and societal issues.

**Program :**

**Fresco climate workshop (3h)**

Understand the functioning, scale and complexity of issues related to climate change

**TD1: Energy issues and challenges**

- Availability and use of energy, fossil and renewable resources, in France and around the world
- Key figures on energy consumption
- Links between energy and climate

**TD2: Water issues and challenges**

- Issue of resource availability for different uses (food, energy, industry, etc.)
- Unequal distribution on the planet
- Pollution of the resource...

**TD3: Planetary limits**

**TD4: Can technology solve environmental problems?**

- Technological innovation is necessary but not sufficient to solve environmental problems.
- Limits of “green” technologies: material footprint, energy dependence, deployment cost and time, rebound effect, etc.

**TD5-TD6: How to transform our societies towards “sufficiency”?**



- Sufficiency, an essential lever for the ecological transition
- The benefits of sufficiency
- The implementation of sufficiency
  - How to promote behavioral change and the passage to action of individuals?
  - What government measures for equal and effective transition?

**Bibliography:** communicated by teachers.

**Assessment :**

100% Continuous assessment



 <b>GBS</b>	<i><b>Integration challenge</b></i>		
	3A / Semester 5		UE 5-1
	16h TD		General Skill

**Keywords:** Integration, school, collaboration

**Prerequisites:** None, except interest and curiosity

**Objectives:**

- 1-Sensitize the students to the missions of an engineer
  - Engineering approach (problem, solution, context)
  - Multi-skills techniques
  - Project management (requirements, organization, teamwork ...)
  - Creativity & information retrieval
  - Highlighting the work done (report & defence)
- 2-Understanding Polytech Angers training in project mode
  - Playful introduction to lessons in project mode
  - Importance of the multidisciplinary of Polytech training
- 3-Integrate students and create a dynamic of work
  - Teach students to know quickly
  - Boost the beginning of the year with a unifying event



**Programme:**

The students are divided into groups of 5 or plus (coming from all places and enrolled in all specialties: mixed teams). A specification is given to them on Monday or Tuesday : a project must be made and functional for Friday (challenge, competition on Friday). Other events may punctuate the week:

- Presentation of the team of their team
- Product promotion poster
- Cooking Tournament
- Integration quizzes

**Bibliography:**

Communicated by teachers

 <b>GBS</b>	<i>Sport or scholastic sponsorship</i>	
	3A / Semester 5	
	12h TD	
		UE 5-1 General Skill

**Keywords:** Teamwork, self-confidence, stress management

**Prerequisites:** None

**Objectives:**

Physical and sports education courses help train future engineers, promote their physical and mental balance, facilitate their integration, strengthen the team spirit and the dynamics of the school. Being able to work as a team, communicate, build relationships of trust, be healthy and resist stress are qualities that are required of future engineers.

The proposed sports activities involve new motor acquisitions, individual and collective strategies, and an adaptation to the effort. These elements contribute to development and are additional assets for their training.

Our missions are to participate in the training of future engineers, to promote the physical and psychic balance of the students, to facilitate the integration of the students of the school, to strengthen the team spirit.



Instead of sport, students who wish to do so can invest in scientific mediation or digital creation programmes in partnership with other schools or universities.

**Programme:**

These objectives will be developed by practice of collective and individual sports

**Bibliography:**

Communicated by teachers

 <b>GBS</b>	<i>Quality approach</i>	 <b>POLYTECH</b> ANGERS
	3A / Semester 5	
	10h40CM / 12HTD / 5h20TP	Basic Engineer Training

**Keywords:** Quality, Standards, Research and document monitoring

**Prerequisites:** none

**Objectives:**

- ↳ To introduce the field of quality to the students, to lay the foundations of the understanding of the standards in the various possible fields of application, to transmit the basic methodologies
- ↳ To enable students to highlight the role of information in understanding external events and making decisions, to characterize information and to appreciate its quality, and to conduct effective and relevant documentary research

**Programme:**

- **Basics of quality**

- ✓ Evolution of quality: history and different approaches (quality control, quality assurance, total quality, etc.)
- ✓ Quality Spirit: principles, concepts and definitions, authors
- ✓ Continuous improvement of quality

- **Introduction to the main quality methodologies**

Learning of specific vocabulary

- **Introduction to the Process Approach**

Introduction to labels and product quality standards (NF, CE etc.) as well as the quality assurance approach (standards, standards and certification).

- **Research and document monitoring**

- ✓ Nature and type of searched information: identification of the need for information with the technical, financial and temporal objectives and constraints
- ✓ Characteristics of the sources of information and their access: documents and files internal to the organization, libraries, documentation centres, data banks, websites
- ✓ Criteria for selecting a document source: relevance, reliability, cost; delay in obtaining information
- ✓ Documentary search tools: indexing engines, thematic directories, meta-engines, logical expression, logical operators



**Bibliography:**

- DOUCET Christian *La qualité, que sais-je n°2779*, Collection que sais-je ?, PUF , 2013
- COESTIER Bénédicte, MARETTE Stephan, *Economie de la qualité*, Collection Repères, La Découverte, 2004
- LEVEQUE, L, *La gestion documentaire selon l'ISO 9001*, AFNOR, 1<sup>ère</sup> édition, 2003
- NAOUS Benoît, *Construire le système documentaire*, AFNOR, 1<sup>ère</sup> édition, 2004
- GILLET GOINARD Florence, SENO Bernard, *Réussir une démarche qualité*, Paris, Eyrolles, 2009

JUSE, *Comment lancer les cercles de qualité*, AFNOR GESTION, 1ère édition, 1989

VANDEVILLE Pierre, *Gestion et contrôle de la qualité*, AFNOR, 2009

ALLAIS Marie-Charlotte, *La qualité dans l'entreprise*, collection Plein Pot FOUCHER

 <b>GBS</b>	<b><i>Quality methodology and tools – Part 1</i></b>	 <b>POLYTECH</b> ANGERS	
	3A / Semester 5		UE 5-2
	4h CM / 6h40 TD / 4h TP		Basic Engineer Training

**Keywords:** Tools of the quality manager, performance checking, continuous improvement

**Prerequisites:** Quality approach

**Goals:**

- To know the fundamental tools regarding quality management
- To treat and master these tools

**Programme:**

**1) Basic tools of the quality management**

- Procedures, recordings, indicators, action plan
- PDCA, Problems solving

**2) Tools of piloting and animation of the quality**

- Identify and analyse situations (SORA, tree of causes 5M, 5P, brainstorming / creativity, QOOQCP, mind maps, functional analysis)
- Plan / pilot: action plan, 8D, PERT, flowchart, communication, visual management
- Decision-making support: PARETO, SWOT vote balanced, matrix of decision,
- Follow / pilot: maps of controls, visual management, action plan, GANT, TRS
- Warn / anticipate: HACCP, AMDEC (seen in the part 2 in the second half-year)
- Research for ideas and improvement: brainstorming, creativity, etc.

**3) Control of the quality - Quality control**

- Model of process (CROSBY), theory and applications
- Measure and steering tools: indicators (of results and process), followed by performance, evaluation, inspection, check, test, auto control ... (Objective 0 defect)
- Control of the skills: training, staking, authorization ...  
Piloting quality: action/reaction (finishing), communication quality (written, visual ...)

**4) Insurance of the quality**

- Notions of system of Quality assurance: defined systematic rules
- Documentary Management, reference documents (quality handbook, procedures, index, forms of instructions) and recordings (sheets of statements, reports)
- Plans quality, simulation quality and reliability,



**Bibliography:**

CHAUVEL A-M, *Méthodes et outils pour résoudre un problème, 30 outils pour améliorer la qualité dans votre organisation*, Dunod, Paris, 1996

GILLET GOINARD Florence, SENO Bernard, *La boîte à outils du responsable qualité*, Dunod, Paris, 2012

ISHIKAWA K, *La gestion de la qualité : outils et applications pratiques*, Dunod, Paris, 2007

CHAPEAUCOU Robert *Techniques d'amélioration continu en production*, Dunod Parsi 2003

 <b>GBS</b>	<i><b>IT tools and software</b></i>	 <b>POLYTECH</b> ANGERS
	3A / Semester 5	
	6h40 CM / 4h TD / 20h TP	Basic Engineer Training

**Keywords:** Office, telephony, oral, written and / or visual communication, expression and information, IT, Information System, MERISE, DBMS, ACCESS, entity association model, MCD, MLD, SAT

**Prerequisites:** The computer bases acquired during the preparatory cycle

**Objectives:**



- A presentation of the various communication tools, articulated around the advantages, disadvantages and context of use for each of the tools presented, should enable each student to:
  - o Know how to use the main means of communication
  - o Know how to manage the relationship with the different parties, depending on the type of medium and the level of information to be transmitted.
  - o Know how to structure your message in conditions
  - o Know how to design & implement an Access Information System using the MERISE method on a concrete example

**Programme:**

- Word in situation (mail, CV, cover letter, reports, ...)
  - Basic functions of the word processing software
  - Formatting of texts and editorial and layout techniques
- Excel (Spreadsheets, databases, ...)
  - Getting Familiar with Excel - Basic Features - Using macros (initiation) - Sheet protection - Using PivotTables - etc.
- Power point
  - Basic features and design rules for a slideshow - Formatting and animations
- Access
  - Familiarization with a Relational Database Management System under a Windows environment (ACCESS) by applying the MERISE method (MCD, MCT, MOT, MOD, MLD, MLT, MPD, MPT) - Requests, forms

**Bibliography:**

Le guide de l'influence. Communication, Média, Internet, Opinion, par V. DUCREY, Ed Eyrolles, 2010  
Introduction à Perl : Schwartz R., Phoenix T. et Foy B., Ed O'Reilly, 4<sup>ème</sup> édition, mars 2006  
Introduction pratique aux bases de données relationnelles : A. Meier, 2006, Springer 2<sup>ème</sup> édition  
Comprendre Merise : Outils conceptuels et organisationnels de Jean-Patrick Matheron  
Exercices et cas pour comprendre MERISE de Jean-Patrick Matheron

 <b>GBS</b>	<i>Analytical control: rheology and mass spectrometry</i>	 <b>POLYTECH</b> ANGERS
	3A / Semester 5	
	9h20 CM /1h20TD/ 9h20 TP	Hygiene and biological risks

**Keywords:** Control of health products, rheology, mass spectrometry.

**Prerequisites:** Chemical engineering, mechanics.

**Objectives:** This training should allow the acquisition of basic knowledge in the field of rheological controls as well as providing an indispensable complement in the field of mass spectrometry. Its objective is to train future managers in the control of health, food and cosmetic products.

**Programme:**

Mass spectrometry:



- ionization methods,
- ion separation methods,
- detection methods,
- determination of raw formulas,
- coupled techniques.

Rheology:

- generalities on the basics of rheology (laminar shear motion, shear stress, strain and shear rate, equation of state and rheograms, viscosities, laminar regime limit and Reynolds number);
- introduction to linear viscoelasticity (elementary models);
- flow behaviour (Newtonian and non-Newtonian liquids, permanent flow deformations in solids, influence of time);
- description of the main rheometers (steady state and transient).

**Bibliography:**

Initiation à la rhéologie : Bases théoriques et applications expérimentales. G. COUARRAZE, J.L. GROSSIORD, N. HUANG, Edition Lavoisier, 2

 <b>GBS</b>	<i>Immunological detection tools</i>	 <b>POLYTECH</b> ANGERS
	3A / Semester 5	
	12h CM / 2h40 TD / 2h40 TP	Hygiene and biological risks

**Keywords:** Antigens, Epitopes, Immunoglobulines, Antibody, Paratopes, cross reactivity, immunoassay.

**Prerequisites:** Knowledge about immune response (primary and secondary) and Immunoglobulins structure.

**Objectives:** know the main immunological techniques for the detection of antigens and micro-organisms, and for the antibody detection particularly in the context of infectious diseases. At the end of the course, student must be able to validate and analyze results from immunological test, taking into account physical-chemistry parameters concerning antigen-antibody interaction.

**Programme:**

- **Course and exercise course**

Antigen-antibody reaction

Force, affinity-avidity, immunogenicity-antigenicity, valence, linear and conformational antigens.

Monoclonal and polyclonal antibodies.

Obtention, clonality, specificity and purity (immune sera, immunoglobulin fraction, antibody fraction), cross reaction and antigenic community, specificity et selectivity.

Main immunological techniques for the detection and quantification of antigens and antibodies: techniques, use and limitation.

Gel immunodiffusion, agglutination, lateral flow cell, Immunofluorescence, Enzyme-Linked Immunosorbent-Assay (ELISA), Immunoblot, counter immunoelectrophoresis. Direct and indirect techniques (signal amplification), sandwich, competition or inhibition. Metabolite antigens, somatic antigens, particular antigens, repetitive or non-repetitive antigen, matrix and artefacts. Natural antibodies, recent and longtime immunity, passive immunity.

False positive, false negative (masking, steric effect, zone effect, competition, non-specific interaction), sensitivity, cut-off.

- **Practical course**

Do and analyse lateral flow cell, agglutination test and ELISA.

**Bibliography:**

Hématologie et Immunologie, Afonso A, Crdp d'Aquitaine, 2006



Principes des méthodes d'analyse biochimique, Audigie C, Dupont G and Zonszain F, Doin, 1992

Immunologie, Kindt TJ, Goldsby R et Osborne B, Sciences sup, Dunod, 2008

CEZARD D, Biotechnologies, Dosages immunologiques: modélisation et interference statistique, Huet S, Ed Immunologie : aide-mémoire illustré, Male D, DE Boeck supérieur, 2005

Immunologie, Male D, Roitt Y, Brostoff J and Roth DB, (7ème edition), Elsevier, 2007



 <b>GBS</b>	<b><i>Physico-chemical basis of cleaning and disinfection</i></b>		
	3A / Semester 5		UE 5-3
	5h20 CM /5h20 TD / 9h20 TP		Hygiene and biological risks

**Keywords:** cleaning, disinfection, surface active agents, detergents, antiseptics and disinfectants

**Prerequisites:** Organic chemistry, fat biochemistry

**Objectives:** Cleaning aims to eliminate macroscopic or microscopic soils from a surface. This is done by using adequate detergents chosen in function of the soil and substrate. It must help the general hygiene of a sanitary establishment, to control the level of microbiological contamination of the environment, materials in a sustainable way.

**Programme:**

Cleaning and disinfection plan: surfactants, soaps, and detergents

Solubilisation, hydrophilic, lipophilic, amphiphilic

Cleaning solvents

Principle of detergent activity

Evidence of superficial tension and the effect of detergents on this physical parameter

Notion of tensioactivity

Application of surface active agents

Evidence of emulsifying and wetting effects

Water hardness and its influence on surface active agent effects

pH and salinity effects on surface active agent effects

Antiseptics, disinfectants

Action mode

Bacteria and resistance



Choices for efficient disinfectants

Main classes of disinfectants and their applications

**Bibliography:**

Les antiseptiques et les désinfectants : A.Dauphin, C.H Mazin, Edition Arnette, Paris, 1994

Antiseptie et désinfection : J.Fleurette, J.Freney, M.E Reverdy Editions ESKA 1995

 <b>GBS</b>	<i>Applied Microbiology</i>	 <b>POLYTECH</b> ANGERS
	3A / Semester 5	UE 5-3
	13h20 CM / 9h20 TP	Hygiene and biological risks

**Keywords:** food microbiology, hospital hygiene, Microbiology of cosmetics and pharmaceutical products

**Prerequisites:** General Microbiology, systematic microbiology

**Objectives:**

This program is based on three main items. The first one concerns food microbiology, microbial contamination of foods, food poisoning and laboratory tests used in food microbiology. The second part of the program is linked to hospital infections and methods used to prevent transmission in healthcare centres.



The contamination of cosmetics or pharmaceutical products and techniques used in routine to guarantee their safety are the third target of the program.

**Programme:**

- Food microbiology, food poisoning, Microbiological analysis of foods.
- Hospital infections: infections linked to healthcare activities and their prevention.
- Microbiology of cosmetics and pharmaceutical products: challenge test; detection of endotoxins,...

**Bibliography:**

Microbiologie alimentaire par C.M. Bourgeois et coll. Ed Lavoisier/ Tec et DOC 1996  
Microbiologie alimentaire par Joseph Pierre Guiraud – Ed DUNOD 2012  
Hygiène hospitalière : Nicole Maty et coll. 2010

 <b>GBS</b>	<b><i>Risks and infectious agents</i></b>	 <b>POLYTECH</b> ANGERS
	3A / Semester 5	
	9h20 CM / 9h20 TP	Hygiene and biological risks

**Keywords:** systematic bacteriology, Gram positive and negative cocci, Enterobacteriaceae, Campylobacter, Pseudomonas, Listeria, Spore forming gram positive bacilli

**Prerequisites:** knowledges in General Microbiology

**Objectives:** This teaching is focused on the study of bacteriological properties and the physiopathology of some microorganisms found in healthcare centres, in agri-food, cosmetic or in pharmaceuticals industries.

Practical laboratory techniques will complete the program by training the students on how to take samples, choose the best analytic methods for the identification of bacteria

**Programme:**

Systematic bacteriology



Identification of bacteria

Methods in microbiological analysis: from sampling to identification

**Bibliography:**

Microbiologie générale et appliquée par jean FIGARELLA et coll. Edition LT Jacques Lanore  
Bactériologie médicale : Techniques usuelles par François Denis, Ed : ELSEVIER/Masson  
2016

Microbiologie Luciano Paolozzi et coll. Ed DUNOD 2015

 <b>GBS</b>	<i><b>DNA Technology</b></i>	 <b>POLYTECH</b> ANGERS
	3A / Semester 5	
	12h CM / 10h40 TD / 12h TP	Hygiene and biological risks

**Keywords:** DNA, cloning, Restriction enzymes, hybridization

**Prerequisites:** Knowledge of the structure and function of the nucleic acids

**Objectives:** To acquire a theoretical knowledge and practical basic tools allowing to manipulate and to analyse nucleic acids

**Programme:**

- **Lectures:**

Restriction enzymes

Modification enzymes

Cloning vectors and molecular cloning methods

cDNA and genomic libraries

Hybridization technologies (Southern blot, northern blot)



- **Practical:**

Cloning of a DNA fragment, analysis of recombinant plasmids by restriction and/or PCR

**Bibliography:**

Molecular Biology of the Cell (4th edition) de B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts et P. Walter. Garland Science, 2002

Molecular Cell Biology (4th edition) de H. Lodish, A. Berk, S L. Zipursky, P. Matsudaira, D. Baltimore, and J. Darnell. Editons W. H. Freeman, 2000

 <b>GBS</b>	<i>Applied studies (Project)</i>	
	3A / Semester 5	
	40 h TD	
		UE 5-4 Project

**Keywords:** Quality management, project management, teamwork

**Prerequisites:** Project management methodology, quality approach and quality tools

**Objectives:**

Have students work in small groups (3-5 people) on case studies with a practical, mostly professional, scope.

Implement a quality approach

Using project management tools

This project allows the student, over a period of several months:

- To get involved in group work
- To discover the world of the company (contact, visit of companies, etc.)
- To use his knowledge and skills in a transversal way
- To implement methodologies adapted to the problem of the project
- To use his analytical and synthesis capacities, in particular in the writing of the report and during oral defence
- To deepen a topic or better know a sector of activity
- To meet specific objectives to each year during the curriculum

Each specific objective is in addition to the objectives of previous years.

**Programme:**

The project runs during the first semester (september to december – fall semester).

In the first year of the engineering cycle, the applied study project deals specifically with an issue related to quality, hygiene, safety or the environment.

During this project, the group should use the tools of quality management and project management in order to carry out its study. It is invited to implement a quality approach.

These projects lead students to propose ways of improvement, most of them organizational, in order to optimize the functioning of a service or the effectiveness of an action in one of the aforementioned fields.



Each group is accompanied by a university tutor and possibly by a professional tutor.

Topics are given by teachers.

The project leads to the writing of a report as well as an oral defence

**Bibliography:**

Specific to each topic

 <b>GBS</b>	<b><i>Project knowledge and management</i></b>	 <b>POLYTECH</b> ANGERS
	3A / Semester 5 10h40 CM / 20h TP	

**Keywords:** Project management, team management, expense plan, deadlines, needs expression, survey, sampling, counting

**Prerequisites:** Methods of documentary research

**Objectives:**

Accompany students to carry out their applied study project.

To present the means of acquisition of the primary information taking into account the nature of the sought information and the context in which the information is search.

At the end of the training, the student must be able to:

- ✓ master the methods and tools of project management
- ✓ take into account the organizational and human aspects of the project/production or project/company relationship
- ✓ recognize the different techniques of data collection and know how to use them wisely
- ✓ carry out a questionnaire survey: he must know the different forms of interviews and their rules of implementation



**Programme:**

- Organization and representation of a project: method of Work Breakdown Structure
- Processing and scheduling of a project: PERT method; Planning and management of time and delays: GANTT chart; Planning and Resource Management
- Managing the Resource / Delay Relationship
- Project / business relationship
- Computer tools associated with previous methods: project management software
- Management of budgets associated with projects
- Team management - group dynamics
- Typology of surveys and techniques for collecting primary data (questionnaire, interviews)
- Sampling methods
- Development and administration of a questionnaire or interview guide
- Use of data collected during the survey (Counting - using a survey analysis software (SPHINX) Analysis - Reporting)
- Use of survey processing software (SPHINX)

**Bibliography:**

GIARD Vincent *Gestion de projet*, Economica, 2004 ; MOINE Jean-Yves, *Manuel de gestion de projet*, AFNOR, 2008

# 3A - Semestre 6

 <b>GBS</b>	<i>English</i>	
	3A / Semester 6	
	16h TD	General Skill

**Keywords:** Communication skills, Cross-cultural skills, Professional Environment

**Prerequisites:** Level B2 / CEFR

**Objectives:**

- Meeting the requirements of the CEFR (Common European Framework of Reference for Languages): oral and written comprehension, oral and written expression, interaction to achieve proficiency in everyday and professional situations.
- Cross-cultural skills: knowledge of international environment

Organization of Language proficiency levels groups based on ToEIC practice scores from the TOEIC. A base TOEIC score is required in the final year to graduate as an Engineer.

**Programme:**

Oral and written communication skills

Looking for a mandatory training experience abroad, writing a cover letter, a CV

Communication skills in companies (letters, memos, emails, phone conversations, interviews, etc.)

Current political, economic and social and professional issues



Speech and technical presentation.

Regular pronunciation and accent work.

**Bibliography:**

Communicated by teachers



 GBS	<i>Foreign Languages: German or Spanish</i>	
	3A / Semester 6	
	12h TD	General Skill

**Keywords:** Communication skills, Cross-cultural skills, Professional Environment

**Prerequisites:** Basic oral and written communication skills

**Objectives:**

- Meeting the requirements of the CEFR (Common European Framework of Reference for Languages): oral and written comprehension, oral and written expression, interaction
- Cross-cultural skills: knowledge of international environment

Organization of Language proficiency levels whenever it is possible.

The target for the advanced group is CEFR B2 or C1; A2 or B1 for the intermediate group, A certification in German/Spanish is recommended for advanced students in final year.

**Programme:**

Looking for a training experience abroad, writing a cover letter, a CV, an abstract

Oral and written communication skills

Communication skills in Companies

Political, economic and social news

**Learning outcomes:**

Intermediate groups



- The student can write a CV in German/Spanish
- The student can speak for a few minutes on a topical issue or a topic of personal interest.
- The student can take part in a conversation on simple topics that can be related to his/her personal interests.

Advanced groups

- The student can write a cover letter in German/Spanish
- The student can read an article or listen to a program in a standard language and comment on it.

**Bibliography:**

Communicated by teachers

 <b>GBS</b>	<b>Communication</b>	 <b>POLYTECH</b> ANGERS	
	3A / Semester 6		UE 6-1
	20h TD		General Skill

**Keywords :** presentation, Internship report, poster

**Prerequisites :** none

**Objectives :**

- Discover the competency-based approach and frameworks
- Present a synthetic work experience
- Write an internship report
- Create a poster
- Stakes of the intercultural

**Program:** "Communicating with effective tools

Specify the student's professional and personal project

Targeting a professional profile in line with the student's project

Interview the professional, particularly with his or her skills

Summarize and affirm the student's professional project

Design and write an internship report:

Observe good internship reports, note and synthesize the criteria of effectiveness

From less successful reports from previous years: reformulate a problematic, search for information, rebalance a plan, recall recurrent spelling errors, revise grammar rules and reintroduce presentation rules

Present a team work using a power point

Design and create a poster:

Observe, record, and synthesize the criteria for effective posters

Identify the defects of posters

Design a poster

Create a poster

Make a presentation using a poster as a communication support



Discover and understand cultural differences between countries

**Examination :** oral presentation and poster

**Bibliography :**

- L. Bellenger, *Etre constructif dans les négociations et les discussions*, Entreprise Moderne d'Édition, 1984.
- C. Camilleri, La culture et l'identité culturelle: champ notionnel et devenir. *Chocs de cultures: concepts et enjeux pratiques de l'interculturel*, 1989, p. 21-76.
- A. Da-Silva, *Savoir se présenter efficacement*, Kindle, 2012.
- R. Frank, *Les relations culturelles internationales au XXe siècle: de la diplomatie culturelle à l'acculturation* (Vol. 10). Peter Lang. 2010.
- M.I. Laborde, *Ecrire un rapport de stage*, Mémo 122, Seuil, 2012.
- B. Lebelle, *L'art des présentations power point*, Broché, 2012.
- P. Morin, *Organisation et motivations*, les éditions d'organisation, 1989.

- P. Oléron, *L'argumentation*, Presses universitaires de France, 1987.
- W. Ury, *Négociateur avec des gens difficiles*, Paris, Le Seuil, 1990.
- <https://www.pantheonsorbonne.fr/decouvrir-diplomes-autrement-fiches-rncp>

 GBS	<b>Management</b>	 POLYTECH ANGERS	
	3A / Semester 6		UE 6-1
	20h		General Skill

**Key words:** management styles, recognition at work, conflicts, diversity and inclusion, group behaviors

**Prerequisites:** none

**Objectives:**

Engineers are brought during their professional career to exercise managerial functions. This introductory course provides theoretical concepts, tools and best practices for the manager. It is largely based on concrete cases and scenarios.

The theme “Diversity & Inclusion” is treated in the form of a workshop *The Fresco of Diversity* and is part, beyond the management course, of the school’s approach to social responsibility.

**Program:**

**Introduction:**

- Why a management course in an engineering school?
- Feedback on management experience (as a manager and/or managed person)

**1- Management styles**

Hersey&Blanchard model, situational management

**2- Recognition at work**

Levers of recognition, benefits, daily practices...

**3- Managing tense situations**

Giving negative feed back, asserting oneself, managing conflicts (DESC tool)

**4- Diversity and Inclusion**



Fresco of diversity workshop : discriminations, unconscious biases, stereotypes and prejudices, levers for action...

**5- Group behaviors**

Laziness and social facilitation, normalization and conformism, obedience to authority

**Assessment :** 100% Continuous monitoring

100% Continuous assessment

 <b>GBS</b>	<i>Sport or scholastic sponsorship</i>	
	3A / Semester 5	
	12h TD	General Skill

**Keywords:** Teamwork, self-confidence, stress management

**Prerequisites:** None

**Objectives:**

Physical and sports education courses help train future engineers, promote their physical and mental balance, facilitate their integration, strengthen the team spirit and the dynamics of the school. Being able to work as a team, communicate, build relationships of trust, be healthy and resist stress are qualities that are required of future engineers.

The proposed sports activities involve new motor acquisitions, individual and collective strategies, and an adaptation to the effort. These elements contribute to development and are additional assets for their training.

Our missions are to participate in the training of future engineers, to promote the physical and psychic balance of the students, to facilitate the integration of the students of the school, to strengthen the team spirit.



Instead of sport, students who wish to do so can invest in scientific mediation or digital creation programmes in partnership with other schools or universities.

**Programme:**

These objectives will be developed by practice of collective and individual sports

**Bibliography:**

Communicated by teachers

 <b>GBS</b>	<b><i>Evolution of health system and socio-medical cares</i></b>	 <b>POLYTECH</b> ANGERS
	3A / Semester 6 10h40 CM / 9h20 TD	

**Keywords:** Social security system, Health economics, Functioning of Health system

**Prerequisites:** none

**Objectives:**

Provide students with a general understanding of healthcare and medico-social institutions in France, as well as the major European and EU systems, to help them understand healthcare management.



Acquire the basic knowledge needed to understand the management of public health establishments, and to optimize participation during internships and when taking up a position in healthcare establishments.

**Programme:**

- Evolution of the healthcare system :
  - o The French healthcare system
  - o Comparative healthcare systems
  - o Organization and management of healthcare, social and medico-social establishments
- Clinical research :
  - o Regulatory introduction and clinical research players
  - o Consent
  - o Oncology CRO
  - o Clinical research in nutrition and scientific coordination aspects

**Bibliography:**

- BARBIER J.C., *Le nouveau système français de protection sociale*, La Découverte, Paris. 2006
- FARGEON V., *Introduction à l'économie de la santé*, Presses Universitaires de Grenoble, 2009
- MAJNONI d'INTIGNANO B., *Santé et Économie en Europe*, Que sais-je ? n°3620, 5<sup>ème</sup> édition, Collection Que sais-je ? PUF, 2009
- PALIER B., *Gouverner la sécurité sociale*, Collection Quadrige, PUF 2005
- PALIER B., *La réforme des systèmes de santé*, Que sais-je ? n°3710, 5<sup>ème</sup> édition, Collection Que sais-je ?, PUF, 2010
- PALIER B., *La réforme des retraites*, Que sais-je ? n°3667, 4<sup>ème</sup> édition, Collection Que sais-je ?, PUF, 2012
- POURCEL P., *la Protection sociale*, Bréal, Paris, 2006
- ROCHAIX L, LE PEN C, GRIGNON M, OR Z, PERRONNIN M, PARIS V, LANCRY P-J et al. *Traité d'économie et de gestion de la santé*. Éditions de Santé ; Sciences Po Les Presses, Paris, 2009

 <b>GBS</b>	<i>Quality methodology and tools – Part 2</i>	
	3A / Semester 6	
	5h20 CM / 5h20 TD / 12h TP	Engineer Training

**Keywords:** Tools of the quality manager, performance checking, continuous improvement, HACCP, DMAIC

**Prerequisites:** Quality approach, Quality methodology and tools – Part 1

**Objectives:**

- To know the fundamental tools regarding quality management
- To treat and master these tools
- Be able to choose the best quality tools in different contexts

**Programme:**

Discovery and implementation of new tools: HACCP, DMAIC.

Using Excel as part of Quality: Pivot Tables



**Bibliography:**

CHAUVEL A-M, *Méthodes et outils pour résoudre un problème, 30 outils pour améliorer la qualité dans votre organisation*, Dunod, Paris, 1996

GILLET GOINARD Florence, SENO Bernard, *La boîte à outils du responsable qualité*, Dunod, Paris, 2012

ISHIKAWA K, *La gestion de la qualité : outils et applications pratiques*, Dunod, Paris, 2007

CHAPEAUCOU Robert *Techniques d'amélioration continu en production*, Dunod Paris 2003

 <b>GBS</b>	<b><i>Experimental design</i></b>	 <b>POLYTECH</b> ANGERS	
	3A / Semester 6		UE 6-2
	13h20 CM / 13h20 TD / 4h TP		Engineer Training

**Keywords:** optimisation, industrial studies, research-development, manufacturing process, quality implementation

**Prerequisites:** statistical knowledge, statistical process control, quality courses, process approach

**Objectives:**



- To solve problems of process improvement using experimental and Taguchi design
- To choose an experimental design adapted to a problem

**Programme:**

Introduction to process improvement  
Completely randomized design  
Taguchi design

**Bibliography:**

GOUPY Jacques, *Plans d'expériences*, Techniques de l'ingénieur Traité. Analyse et Caractérisation, 1997  
GOUPY Jacques, CREIGHTON Lee, *Introduction aux plans d'expériences*, Dunod, 2006  
SADO Gilles, SADO Marie-Christine *Les plans d'expériences : de l'expérimentation à l'assurance qualité*, AFNOR 1991  
PILLET Maurice *Les plans d'expérience par la méthode Taguchi*, Les Editions d'Organisation, 2001

 <b>GBS</b>	<i><b>Health and environment</b></i>	 <b>UE 6-2</b> <b>Engineer Training</b>
	3A / Semester 6	
	13h20 CM / 6h40 TD / 4h TP	

**Keywords:** Hazard/risk, waste, pollution/pollutants, discharges, toxicology/toxicity, carbon footprint, environmental analysis

**Prerequisites:** basics in physic, chemical, biology

**Objectives:** Analyse, understand and provide solutions to the impact of a company's business on the environment.



**Programme:**

- ✓ Basics of toxicology, assessment of toxicity
- ✓ Hazards and Risk
- ✓ Environment/Health Links
- ✓ Main indoor air pollutants
- ✓ Atmospheric Pollution
- ✓ Risk assessment and rehabilitation of polluted sites
- ✓ Wastes
- ✓ Environmental diagnosis
- ✓ ISO 14001 and OHSAS 18001 certifications
- ✓ ICPE Regulations
- ✓ Environmental impact analysis: carbon footprint, water footprint, etc.

**Bibliography:**

Communicated by each teacher



 <b>GBS</b>	<i><b>Bioinformatics</b></i>	 <b>UE 6-3</b> Bio-product technologies
	3A / Semester 6 8h CM / 9h20 TP	

**Keywords:** Molecular biology, computer tools

**Prerequisites:** Knowledge of tools used in molecular biology (DNA technology module)

**Objectives:** This training is intended to give a concrete overview of the computer tool in the field of biology.

- Manage the most used software in bioinformatics
- Compare sequences
- Understand phylogenetic analyses

**Programme:**

Lectures:



- Presentation of sequences analysis tools
- Presentation of the main sequence comparison and molecular phylogeny programs
- The process of recording a sequence on a database

Practical:

- Manipulations of simple programs (restriction maps, pattern search, etc.)
- Comparison between two sequences, between a sequence and a database
- Manipulation of alignment programs (global or local), and multi-alignment
- Manipulation of phylogeny software.

**Bibliography:**

Communicated by teachers

 <b>GBS</b>	<b><i>Biological markers</i></b>	
	3A / Semester 6 12h CM / 4h TD	

**Keywords:** cell signalling, oncogene, tumour suppressor genes, biomarkers.

**Prerequisites:** cell structure, cell organization and gene expression mechanisms must be known prior to enrolment in the subsequent course to ensure adequate preparation.

**Objectives:** Analyse and understand the scientific process. Understand the molecular and physiological mechanisms of the cell in pathological context. Analyse scientific and clinical studies to understand the new concepts of the modern biology.

**Programme:**



There are different kinds of measurable biological characteristics, such as genetic, proteomic, metabolomic, physiologic, in blood or in biopsies. All of them can play a role of indicator of the current statute during biological processes (normal, pathogenic or in response to therapeutic treatment). Since a quarter of century, the progresses in molecular biology encourage scientists to dissect mechanisms initiating disease development. This work allows identifying the emerging of new biomarkers of diagnosis, of toxicity, of monitoring and of anti-cancer treatment efficiency. Therefore, the combination of these markets may determine a target population which responds to a specific therapy and may optimize the treatment evolution until the personal cancer therapy.

The course provides a broad overview of:

- What is the cancer?
- The different mechanisms of carcinogenesis
- What are the conventional treatments against cancer?
- The development of new therapies/biomarkers
- Personal cancer treatments

**Bibliography:**

Communicated by teachers

 <b>GBS</b>	<i>Conservation processes</i>	
	3A / Semester 6	
	13h20 CM / 9h20 TD	Bio-product technologies

**Keywords:** Conservation, Stabilization, Degradation, Hygiene, Alimentary security

**Prerequisites:** Conservation part I; Food engineering; Hygiene and microbiological risks, Chemical engineering

**Objectives:**

- ✓ To comprehend the thermal treatment processes for conservation and stabilization of bioproducts
- ✓ To apply the chemical and food engineering knowledge
- ✓ To master techniques allowing to evaluate the antioxidative properties
- ✓ To comprehend the quantification techniques of preservatives in a bioproduct



**Programme:**

Strategies and techniques of conservation of bioproducts:

- Reduction of water availability
- Heat exchanger technologies: theoretical and technological approaches
- Heat treatment
- Cold treatment
- Effect of cold treatment on the conservation of bioproduct

**Bibliography:**

Communicated by teachers

 <b>GBS</b>	<i>Molecular detection</i>	
	3A / Semester 6	
	10h40 CM / 10h40 TD / 9h20 TP	Bio-product technologies

**Keywords:** PCR, qPCR, sequencing, pyrosequencing

**Prerequisites:** Knowledge of transcription, genome structure, micro-organisms, DNA technology (UE5.3)

**Objectives:** At the end of the training, the student should have a perfect knowledge of the various techniques of molecular identification of microorganisms and to be able to set a PCR experiment by himself.

**Programme:**

- **Lectures:**

PCR: history et principe

Classical PCR and Real-Time Quantitative PCR

Various sequencing methods (Sanger, Edman) and their applications

DNA fingerprinting



- **Practical:**

PCR detection of food contamination, frauds, human DNA fingerprinting

**Bibliography:**

Molecular Cell Biology (4th edition) de H. Lodish, A. Berk, S L. Zipursky, P. Matsudaira, D. Baltimore, and J. Darnell. Editions W. H. Freeman, 2000.

An Introduction to Genetic Analysis (7th edition) de A. JF Griffiths, J. H Miller, D.T Suzuki, R. C Lewontin, and W. M Gelbart. Editions W. H. Freeman, 2000. <http://pedagogie.ac-aix-marseille.fr/geniebio/biomol/docs/pcr.html> <http://frodo.wi.mit.edu/>

 <b>GBS</b>	<i>Extraction and purification processes</i>	
	3A / Semester 6	
	17h20 CM / 4h TD / 10h40 TP	Bio-product technologies

**Keywords:** Frontal filtration, Tangential filtration, Distillation

**Prerequisites:** Process engineering, Chemical engineering

**Objectives:**

- Acquire the fundamental and practical basics on separation techniques by filtration and change of state,
- Acquire the practical basics of extraction and dosage of biomolecules by chromatography.

**Programme:**

Separation techniques:

- by change of state: Distillation, Steam drive
- by filtration: frontal and tangential
- Chromatographic methods for the determination of biomolecules

Applications, presentation of dies:

- Blood derivatives
- The aromatic and medicinal plant sector

Extraction Technologies:



- pressure extraction
- solvent-based extraction

Practical work:

Obtaining different extracts and assaying biomolecules of interest from a complex matrix.

**Bibliography:**

Communicated by teachers

 <b>GBS</b>	<i><b>Immunotechnologies</b></i>	 <b>POLYTECH</b> ANGERS
	3A / Semester 6	
	12h CM – 10h40 TD	Bio-product technologies

**Keywords:** Monoclonal antibodies, polyclonal antibodies, coupling/labelling, immunoassay conception

**Prerequisites:** antigen-antibody interactions, immunoassay tests.



**Objectives:** Know monoclonal and polyclonal antibodies production methods, (glyco)protein coupling/labelling and particle coupling/labelling.  
Expanding Knowledge from UE5.3 concerning immunoassay and complementary techniques.  
At the end of the course, student must be able to design immunoassay to detect antigen or antibody, taking into account each model specificity.

**Programme:**

Animal experimentation/testing  
Immunisation (T dependent and T-independent, hapten and carrier, synthetic peptid, adjuvants, immunization control)  
Monoclonal and polyclonal antibodies (production, screening, amplification, purification, preservation)  
Coupling/labelling antigens and antibodies (radioisotopes, biotine, enzymes and fluorochromes, particle/gold/latex/red blood cells-coupling/labelling)  
Proteins analysis (electrophoresis), blotting (Western, dot, slot) counterimmuno-electrophoresis, immunoprecipitation  
Enzyme Linked Immunosorbent Assay (competitive and non-competitive, homogeneous and heterogeneous phases)  
Agglutination active, passive, indirect  
Epitope mapping  
Immunoassay design: ELISA, agglutination, lateral flow cell

**Bibliography:**

Making and Using Antibodies: A Practical Handbook. Howard Matthews GC, Kaser R. CRC Press, 2007  
The protein protocols handbook, 2<sup>nd</sup> edition, Walker JM., Humana Press, 2002  
The immunoassay handbook, 3<sup>rd</sup> edition, Wild D., Elsevier 2005.  
Monoclonal Antibody Production. National Research Council (US) Committee on Methods of Producing Monoclonal Antibodies. Washington (DC): National Academies Press (US); 1999.  
Antibodies, a laboratory manual, Barlow Ed and Lane D (ed), Cold Spring Harbor Laboratory Press, NY, 1988  
Guide for the Care and Use of Laboratory Animals. 8th edition. National Research Council (US) Committee for the Update of the Guide for the Care and Use of Laboratory Animals. Washington (DC): National Academies Press (US); 2011.  
Immunological techniques made easy, Cochet O, Teillaud JL, Sautès C (Eds), Johna Wiley and Sons Ltd, 1998, Chichester, England

 <b>GBS</b>	<i>Internship abroad</i>	
	3A / Semester 6	
	20 weeks (17 minimum)	Internship

**Keywords:** internship, business situation, operational position

**Prerequisites:** Analysis of the PPPE and preparation for the internship

**Objectives:**

The objective of the worker's internship is to allow the student:

- to understand the global functioning of a company or an organization and its environment (social, structural, historical, hierarchical ...),
- to understand the concept of sector and career path,
- to discover the world of work, with real participation in the work of the company or the host organization.

It is important for a future engineer to live on the ground with operators in order to better understand their life in the company, the problems they encounter and how they solve them.

**Programme:**



- Observation of business life in all its aspects: operational and participating situation
- Pay particular attention to health and safety issues at the workplace as well as environmental aspects where appropriate.

**Bibliography:**

Specific to each topic

# 4A - Semestre 7



 <b>GBS</b>	<i>English</i>	
	4A / Semester 7	
	24h TD	
		UE 7-1 General skills

**Keywords:** Communication skills, Cross-cultural skills, Professional Environment

**Prerequisites:** Level B2 from the CEFR

**Objectives:**

- Validating TOEIC minimum score to graduate as an Engineer.
- Meeting the requirements of the CEFR (Common European Framework of Reference for Languages): oral and written comprehension, oral and written expression, interaction
- Cross-cultural skills: knowledge of international environment



A practice TOEIC test is organized at the beginning of term 7 to set up language proficiency groups for TOEIC Preparation.

**Programme:**

- Understanding the TOEIC test format and requirements.
- Practising oral and written communication skills.
- Reviewing and Strengthening English grammar skills.
- Regular practise of pronunciation and word stress.
- In company communication situations.
- Current political, economic and social issues.
- Oral proficiency practice.

**Learning outcomes:**

- The student can speak about a technical issue related to his/her field of expertise.
- The student can infer and understand gist, purpose and details in a spoken document related to a general or technical topic.
- The student can infer and understand gist, purpose and details in a written document related to a general or technical topic.
- The student can speak and write in a clear and fairly complex language

 <b>GBS</b>	<i>Foreign Languages: German or Spanish</i>	
	4A / Semester 7 16h TD	

**Keywords:** Communication skills, Cross-cultural skills, Professional Environment

**Prerequisites:** Basic oral and written communication skills

**Objectives:**

- Meeting the requirements of the CEFR (Common European Framework of Reference for Languages): oral and written comprehension, oral and written expression, interaction
- Cross-cultural skills: knowledge of international environment

Organization of Language proficiency levels whenever it is possible.

The target for the advanced group is CEFR B2 or C1; A2 or B1 for the intermediate group.

A certification in German/Spanish is recommended for advanced students in final year.

**Programme:**

- Oral and written communication skills
- Communication skills in Companies
- Political, economic and social news



**Learning outcomes:**

Intermediate groups

- The student can speak for a few minutes on a topical issue or a topic of personal interest.
- The student can take part in a conversation on simple topics that can be related to his/her personal interests.

Advanced groups

- The student can read an article or listen to a programme in a standard language and comment on it.
- The student can write an abstract and a report in German/Spanish
- The student can make an oral presentation on professional topics
- The student can argue and justify his/her point of view fluently

 <b>GBS</b>	<b><i>Global responsibility and occupational health and safety prevention</i></b>	 <b>UE 7-1</b> <b>General skills</b>
	4A / Semester 7	
	12h TD	

**Key Words:** occupational health and safety, risk analysis, musculoskeletal disorders, psychosocial risks, “document unique”, performance

**Prerequisite:** Business organization, law and regulation, continuous improvement

**Objectives:** This module is built on the basis of the BES&ST reference system “Essential Bases in Occupational Health and Safety” formalized by Inrs. It aims to provide the essential skills to any engineer allowing him/her to integrate health and safety at work within the framework of his future professional practices.



- **Contribute to the improvement of the company's work situations**
  - o A prevention approach centered on work: issues, indicators, players, multidisciplinary approach, risk analysis
- **Manage projects integrating a prevention approach**
  - o A project management-oriented approach: integration of prevention in policy, decision-making, design and methods
- **Manage by associating health at work and overall performance**
  - o A team management approach: adopt management practices that promote health and well-being at work, manage overall performance by integrating health and QVT, culture of prevention

**Program:** tutorial sessions

- Session 1: Context and challenges of OHS in business – regulatory framework, actors, responsibilities
- Session 2: Serious Game “Prevention Sup” proposed by Inrs: remotely
- Session 3: Approaches to risk analysis a priori and a posteriori, principles of prevention
- Session 4: Analysis of a company's managerial maturity using the Inrs "Global Market" case study - global approach to taking occupational health into account
- Session 5: Prevention and overall performance of the company, OHS culture – Inrs case study “Prevention and performance”

**Bibliography:**

- Sources d'information en santé et sécurité au travail, L. Laborde, B. Berlioz, M. Ferreira, *Techniques de l'ingénieur, collection Santé et sécurité au poste de travail, article se3950*, octobre 2008.
- Le guide de la sécurité au travail - Les outils du responsable, B. Péribère, *Ed. AFNOR*, 218 p., 2013.
- [www.inrs.fr](http://www.inrs.fr); [www.anact.fr](http://www.anact.fr); [www.travail-et-securite.fr](http://www.travail-et-securite.fr)

 GBS	<i>Professional communication</i>	
	4A / Semester 7 20h TP	

**Keywords:** Professional project, curriculum vitae, cover letter, meeting animation

**Prerequisites:** French language written and spoken

**Objectives:**

- Preparing for job search
- Business skills
- Meeting and group animation

**Program: “Become an operational strategist”**

- Preparation for the recruitment interview

Working on your professional project and your motivations

The curriculum vitae

Deciphering an internship/job offer

Writing a cover letter

Being efficient during a "human resources" recruitment interview

- Facilitating a meeting

Organizing a meeting



Leading a meeting

Knowing and choosing methods of facilitation

Know how to react according to the profile of the participants

**Bibliography:**

- L. Bellenger, *Etre constructif dans les négociations et les discussions*, Entreprise Moderne d’Edition, 1984.
- V. Billaudeau, *Le recrutement : quelles pratiques actuelles ?*, [Julhiet Editions](#), 2012.
- M.J Chalvin, *Prévenir conflit et violence*, Paris, Nathan, 1996.
- S. Milgram, *Soumission à l’autorité*, Calman Lévy, 1974.
- R. Mucchielli, *La conduite des réunions: Les fondamentaux du travail en groupe*, ESF éditeur, réédité, janvier 2016.
- P. Morin, *Organisation et motivations*, les éditions d’organisation, 1989.
- P. Oléron, *L’argumentation*, Presses universitaires de France, 1987.
- [C.Papetti](#), [B. Dogor Di Nuzzo](#), *Un CV réussi !*, Ellipses, 2016.
- [D. Pérez](#), *Le guide du CV et de la lettre de motivation*, Solar, 2014.
- W. Ury, *Négocier avec des gens difficiles*, Paris, Le Seuil, 1990.

 <b>GBS</b>	<i><b>Entrepreneurship</b></i>	
	4A / Semester 7 5h20 CM / 12h40 TD	

**Keywords:** Entrepreneurship, intellectual property, intrapreneurship, valorization

**Prerequisites:** Interest in the life of companies and more broadly in economic life

**Objectives:**

- Discern the entrepreneurial spirit, the passion of entrepreneurs, their need to create and innovate, and their action orientation
- Identify and envision entrepreneurial projects
- Build a CANVAS business model
- Master the basics of industrial property

**Program:**

This introductory entrepreneurship course is designed to enable students to characterize entrepreneurship and develop a sense of initiative in order to introduce them to the characteristics of entrepreneurship so that, where appropriate, their entrepreneurial potential can be highlighted.

The program covers the entrepreneurial process. Students are introduced to the process of creating a company: from the spirit that drives entrepreneurs to the creation of a company, through the identification of the different components of entrepreneurship: creativity and innovation, investment and value creation, industrial property (notion of intangible capital, brands and models, patents), the innovation ecosystem, financing methods and aid for innovation. The concepts are addressed through a course composed of six modules, illustrated by examples and reading tracks. The course allows students to build a business model canvas, which constitutes the knowledge control.

Presentation of the issues surrounding patents and patent search techniques (Espacenet).

**Bibliography:**

Maître, Bernard et Aladjidi, Gégouire, Les business models de la nouvelle économie, Eyrolles, 1999.



Goodin, Mickael et Burr, Dan : Economix, Adams Comix, 2013.

Perrin, Jacques, Concevoir l'innovation industrielle, CNRS Éditions, 2021.

Boly, Vincent, Ingénierie de l'innovation, Hermès Sciences, 2016.

Druel François et Gombert, Guillaume : Gafanomics, Eyrolles, 2020.

Titre de la presse quotidienne (régionale et nationale) : au choix de l'étudiant

 <b>GBS</b>	<i>Statistics and Statistical process control</i>	
	4A / Semester 7 10h40 CM / 9h20 TD	

**Keyword:** Statistics, Quality diagnosis, continuous improvement, SPC tools, control charts

**Prerequisites:** Statistical tools

**Objectives:**

- To know statistical tools dedicated to biology
- To know SPC basics and tools and measure technical and human aspects
- To use SPC as a tool to monitor the performance of a process and improve quality

**Programme:**

- **Statistics dedicated to biologi**
- **SCP**

**Introduction**

**Organisation**

Methods, Process selection, product, variable data

Measure the performance of a process : Supply chain capabilities



**Monitoring and management of industrial process**

Control charts

Self-control approach

**Bibliography:**

PILLET Maurice, *Appliquer la maîtrise statistique des processus MSP/SPC*, Editions d'Organisation 2005

 <b>GBS</b>	<i>Conditioning and packaging</i>	 <b>UE 7-2</b> <b>Engineering training</b>
	4A / Semester 7 10h40 CM / 9h20 TD	

**Keywords:** conditionning, packaging, regulation, sustainable development, packaging conception

**Prerequisites:** Basic notions on chemistry and biology, on conservation and conditioning, basic notions on design, innovation and creativity techniques

**Objectives :**

- To be able to define all the functions expected for a product packaging
- To be able to purpose solutions to improve packaging

**Programme:**

- **Packaging: functions and design**

Functions of packaging and consumer expectations regarding the parckaging  
Specifications of a packaging

- **Packaging / product compatibility**

The different types of exchanges and the associated risks. Regulatory aspects  
Tests and measurements

- **Technological aspects of packaging**

The different packaging solutions and materials (plastics, paper, cardboard, glass, metals, other)



Presentation of the various packaging processes

- **Packaging and environment**

Clean packaging: how? Regulatory aspects

**Bibliography:**

POTHET Jean-Paul, *Emballage et conditionnement. Marketing. Techniques. Mise en œuvre. Qualité. Réglementation*, Paris, Dunod, collection Les Référentiels, 2004  
Publications du Conseil National de l'Emballage [www.conseil-emballage.org](http://www.conseil-emballage.org)

 <b>GBS</b>	<b><i>R&amp;D, production</i></b>	 <b>UE 7-2</b> <b>Engineering training</b>
	4A / Semester 7	
	17h20 CM / 8h TD / 18h40 TP	

**Keywords:** Bioproduction, Bioreactor, industrial transposition, production

**Prerequisites:** None

**Objectives:**

- To know the various production systems (algae, plants, insect and mammalian cells)
- To be able to conduct fertilizer bioprocesses
- To be able to understand the problems inherent in scale changes and industrial transposition

**Programme:**

Production in bioreactors

Management of fermentation parameters

Types of bioreactors

Sterility

Biomass production

Production of recombinant proteins in different production systems (algae, plants, insect cells and mammalian cells)



*Practical course:*

Production of recombinant proteins in prokaryotes and eukaryotes cells and analysis of these productions by immunotechnologies

**Bibliography:**

BioTechnologies, BioProduction, BioMédicaments : Eric Levacher, Institut des Métiers et des Technologies, 2011



 <b>GBS</b>	<i><b>Processing - Formulation</b></i>	
	4A / Semester 7	
	13h20 CM / 13h20 TD / 4h TP	Engineering training

**Keywords:** Galenic formulation, cosmetic formulation, food technology, flow chart analysis

**Prerequisites:** Preservation and stabilisation, Extraction-separation, Controls

**Objectives:**

- Basic skills on physicochemical in order to understand general rules of formulation
- Understanding the different galenic forms such as liquids, solids, semi-solids and new formulations, which can be developed in different applications
- Be able to define a strategy of formulation, based on the ingredient physicochemical properties and the aim in term of product development
- Integrated approach of the different health product sectors: be able to combine different skills related to product quality control
- Visit several industrial plants and meet engineers and professionals in different fields of health products

**Programme:**

Lectures:

Galenic formulation and methods of control of health products



Tutorials and practical works:

Visit of food, cosmetic and pharmaceutical plants

- Preliminary work for information search on products and process
- Active visits of plants with professionals concerning various aspects
- Analysis within the group to prepare a report and an oral presentation in order to emphasize some key points.

**Bibliography:**

Supplied by the teachers

 <b>GBS</b>	<i>Conception and Innovation</i>		
	4A / Semester 7		UE 7-2
	8h CM / 5h20 TD / 2h40 TP		Engineering training

**Keywords:** Conception, innovation process, Creativity tools, business, eco-design and sustainable development

**Prerequisites:** None

**Objectives:**

- To know and understand creativity process and design of innovative products and services.
- To know the main approaches and the implementation of the engineering tools (analysis of the value, functional analysis, method TRIZ).
- To know the basics of eco-design and sustainable development

**Programme:**

Design an innovative product or service: main stages

Principles and techniques of creativity, positioning of creativity in design / innovation

Creativity tools: Brainstorming, crashing ...

Group animation in creativity

Scenario using case studies, role-playing



The problem of innovation in design

Innovation Methodology TRIZ

Eco-design and sustainable development

**Bibliography:**

Supplied by the teachers

 <b>GBS</b>	<i>Flow management</i>		
	4A / Semester 7		UE 7-2
	9h20 CM / 9h20 TP		Engineering training

**Keywords:** logistic, production flow, inventory management, value chain, production management

**Prerequisites:** Knowledge of the company (organization, main functions), main notions of production management, project management (project scheduling, control of costs and deadlines, etc.)

**Objectives:**

Awareness and basic notions on management of logistical flow

- To have notions on the fundamental concepts of management of industrial logistics flows
- To imagine these concepts in different contexts, industrial and sanitary

**Programme:**

**Basic notions and issues that lead companies to manage their flows**



Organization of logistical flows, financials issues.

**Knowledge and application on inventory management**

**The flow management in various sectors and processes**

**Bibliography:**

Supplied by the teacher

 <b>GBS</b>	<i><b>Interpersonal communication</b></i>	
	4A / Semester 7 8h TD / 8h TP	

**Keywords:** Interpersonal communication, group communication, written and visual communication, oral communication, expression and behavior

**Prerequisites:** Communication tools, communication methodologies

**Objectives:**

- To Manage the relationship to the Other, to the body, speaking out and listening. To understand basics and issues of an effective communication
- Take a step back regarding his personal attitude
- To adapt to his interlocutor and his communication profile

**Programme:**

- **Interpersonal communication**

Basics of interpersonal communication

Sense-making through communication means and standards (registers of language, verbal and non-verbal signs, standards and rituals)

Sense-making through the actors identity, contexts, influences

Behavior and place in communication: applications and training

- **Group communication**

Role of facilitator: Objectives, methods, group management



*No graduation*

**Bibliography :**

Méthodes de communication écrite et orale – DUNOD, 4ème édition 2013- *Michelle*

*Fayet, Jean- Denis Commeignes*

Theories et pratiques de la communication\_ L'HARAMATAN- 2011- Patrice Mbianda, Pierre Mouandjo Lewis

 <b>GBS</b>	<i><b>Human resources management</b></i>		
	4A / Semester 7		UE 7-3
	5h20 CM / 9h20 TD		Management course

**Keywords:** Mobilization of human resources, qualification, jobs, skills, post, GPEC, social assessment, training

**Prerequisites:** Knowledge of company, organizational management

### **Objectifs**

Awareness on the issues and missions of HR function in companies.

- To know the main issues associated with the mobilization of human resources
- To understand the evolution of the analysis of human resources in a company
- To evaluate the human resources needs

### **Programme:**

#### **The human resources function**

Emergence and development of the HR function

Objectives, challenges and missions of HRM

Organization of the HR function

#### **Mission Overview**

Acquisition of HR

Managing jobs and skills

Recruitment and integration

HR Stimulation

Salary

Safety, health and well-being at work

HR Development



Promotion and Career Management

Training and skills development

Information and communication, social dialogue

### **Bibliography:**

Supplied by teacher

 <b>GBS</b>	<i>Corporate strategy and decision support tools</i>	
	4A / Semester 7 12h CM / 10h40 TD	

**Keywords:** strategic business management, environment, competitive advantage, strategic marketing

**Prerequisites:** knowledge of company, organizational management, economic and financial management

**Objectives:**

- To understand the basics of strategy implementation and control
- To learn how to create an innovative company
- To identify strategic areas of activity (DAS) and strategic segmentation criteria
- To perform external and internal analyses for companies (PESTEL, competitive forces analysis, SWOT, barriers to entry, MacKinsey, ADL, BCG matrices) and to evaluate the dynamic competition

**Programme:**

**Strategic business management**

Basics and main concepts of strategic business management

**External and internal analyses**

**Strategic tools**

PESTEL, Dynamic competition (PORTER), SWOT matrix, BCG matrix, MacKinsey matrix, Value chain (PORTER), CANVASdes projets

**Bibliography:**

CHANAL Valérie (dir.), *Business Models dans l'innovation, pratiques et méthodes*, Presses Universitaires de Grenoble, 2011

GARRETTE Bernard, DUSSAUGE Pierre et alii. *Strategor*, 6<sup>ème</sup> édition, Dunod, 2013

JOHNSON Gerry, SCHOLLES Kevan et alii. *Stratégie*, 9<sup>ème</sup> édition, Pearson Education, 2011

KIM W. Chan, MAUBORGNE Renée, *Stratégie océan bleu : Comment créer de nouveaux espaces stratégiques*, 2<sup>ème</sup> édition Pearson Education, 2010



KOTLER Philip, KELLER Kevin, MANCEAU Delphine, *Marketing Management*, 15<sup>ème</sup> édition, Pearson Education, 2015

LENDREVIE Jacques, LEVY Julien, *Mercator*, 11<sup>ème</sup> édition, Dunod, 2014

OSTERWALDER Alexander, PIGNEUR Yves, *Business Model nouvelle génération : Un guide pour visionnaires, révolutionnaires et challengers*, Pearson, 2011

PORTER Michaël, « How Competitive Forces Shape Strategy », *Harvard Business Review*, mars-avril 1979

PORTER Michaël, « The Five Competitive Forces That Shape Strategy », *Harvard Business Review*, janvier 2008, p. 78-93

 <b>GBS</b>	<i>Risks assessment</i>	 <b>POLYTECH</b> <b>ANGERS</b>
	4A / Semester 7	
	22h40 CM / 8h TD	
		<b>UE 7-3</b> <b>Management course</b>

**Keywords:** Risks assessment, Health information system

**Prerequisites:** None

**Objectives:**

- To know the health information systems and be aware of the associated
- To be able to identify biological and chemical hazards

**Programme:**

**Risk assessment in health**

A priori tools, a posteriori tools, risks mapping

Prevention programs in health care

**Biological and chemical hazards**

Hazards identification, risk assessment methods, prevention and protection approaches



**Health Information System**

Presentation

Associated risks

**Bibliography:**

Supplied by teachers

 <b>GBS</b>	<i><b>Audit and quality management</b></i>	
	4A / Semester 7 10h40 CM / 10h40 TD	

**Keywords:** Audit, standard, non-compliance

**Prerequisites:** Quality courses (EI3)

**Objectives:**

- To interpret standard to prepare an internal audit
- To conduct quality audits

**Programme:**

**Audit and its fundamentals**

Definition and related concepts (action plan, non-compliance, indicators...)

Role of the auditor

Preparation of an audit

Audit visite (opening meeting, collect informations, ...)

Report (rédaction d'un compte-rendu,...)

**Audit in various sectors**

Audit and IFS/BRC standards, audit in industrie cosmetic companies, audit and certification



audit in clinical research,

*Practical lessons*

**Bibliography:**

Supplied by teacher



 <b>GBS</b>	<b><i>Applied studies and Professional and Personal Student Project</i></b>	 <b>UE 7-4</b> <b>Projects : PEA and PPPE</b>
	<b>4A / Semester 7</b> <b>40h Project / 1h20 TD / 6h40 TP</b>	

**Keywords:** quality approach, project management, teamwork, personal and professional project of the student (PPPE)

**Prerequisites:** project management methodology, quality approach and tools, PPPE phase 1 in 3rd year and feedback from the 3Y internship

**Objectives:**

- Have students work in small groups (3 to 5 people) on case studies with a practical, mostly professional, scope.
- Use project management tools
- To carry out an innovative approach
- Use knowledge and skills in a transversal way
- Implement methodologies adapted to the project's problematic
- Use one's analytical and synthesis skills, particularly in writing the report and during the presentation of the results
- To deepen the prefiguration of their choice of pathway (for S8 and S9)
- Take stock of their career path, their skills, their knowledge and personal characteristics, their professional project and their life project
- Validate and confront their choices with the socio-economic reality

**Programme:**

PEA

The project takes place throughout the year and is a sort of common thread. It allows the student to study in depth a theme related to a field or sector of activity towards which he or she plans to move. This project is an opportunity for the student to deepen his or her knowledge of the sector, field or area related to the subject. The project must be innovative. An entrepreneurial approach is favored. The objective is to go through all the stages of conception and realization of a product or a service, from the idea to the turnkey project: the constitution and the choice of the subjects are left to the students' initiative. Students are invited to take into account economic and regulatory constraints.

Students are invited to participate in various entrepreneurship competitions, such as the Entrepreneuriales challenge, the Agricultural Initiative prize, etc.

The project leads to the writing of a report and an oral presentation.

PPPE



**Identify one's profile** (Analysis of one's career path, Identification of skills and personal characteristics, Confirmation of professional aspirations and interests)

**Refine your professional project** (Continue targeted professional meetings, Analyze internships, Clarify and explain your motivations, Valorize your skills, Decide on your choices for the last year of study)

**Anticipate professional integration**

**Bibliography :**

Related to each project

 <b>GBS</b>	<i>English</i>	
	4A / Semester 8	
	24h TD	
		UE 8-1 General skills

**Keywords:** Communication skills, Cross-cultural skills, Professional Environment

**Prerequisites:** Level B2 from the CEFR

**Objectives:**

- Validating TOEIC minimum score to graduate as an Engineer.
- Meeting the requirements of the CEFR (Common European Framework of Reference for Languages): oral and written comprehension, oral and written expression, interaction
- Cross-cultural skills: knowledge of international environment

Language proficiency level groups are reorganized according to the TOEIC test scores.



**Programme:**

- Practising oral and written communication skills.
- Strengthening grammar skills.
- Regular practise of pronunciation and word stress.
- Communication skills in companies.
- Political, economic and social news
- Presenting industrial projects.

**Learning outcomes:**

- The student can speak about a technical issue related to his/her field of expertise.
- The student can infer and understand gist, purpose and details in a spoken document related to a general or technical topic.
- The student can infer and understand gist, purpose and details in a written document related to a general or technical topic.
- The student can speak and write in a clear and fairly complex language.

# 4A - Semestre 8

 <b>GBS</b>	<i>Foreign Languages: German or Spanish</i>	
	4A / Semester 8 12h TD	

**Keywords:** Communication skills, Cross-cultural skills, Professional Environment

**Prerequisites:** Basic oral and written communication skills

**Objectives:**

- Meeting the requirements of the CEFR (Common European Framework of Reference for Languages): oral and written comprehension, oral and written expression, interaction
- Cross-cultural skills: knowledge of international environment

Organization of Language proficiency levels whenever it is possible.

The target for the advanced group is CEFR B2 or C1; A2 or B1 for the intermediate group.

A certification in German/Spanish is recommended for advanced students in final year.

**Programme:**

Oral and written communication skills

Communication skills in Companies

Political, economic and social news



**Learning outcomes:**

Intermediate groups

- The student can speak for a few minutes on a topical issue or a topic of personal interest.
- The student can take part in a conversation on simple topics that can be related to his/her personal interests.

Advanced groups

- The student can read an article or listen to a programme in a standard language and comment on it.
- The student can write an abstract and a report in German/Spanish
- The student can make an oral presentation on professional topics
- The student can argue and justify his/her point of view fluently

 <b>GBS</b>	<i><b>Business Games</b></i>	
	4A / Semester 8 24h TD	

**Keywords:** Team challenges, Financial balance, Cash flow, Profitability, Financial performance, Global performance, Multidisciplinarity, Complementarity of core and cross-disciplinary skills

**Prerequisites:** Basics in accounting and management, financial analysis, marketing, HR, R&D, business strategies, inventory management, project management and corporate finance, SD and CSR.

### **Objectives:**

In the continuity of the financial analysis course, through the practice of a pedagogical game, develop the understanding of the operational and financial management of a large international industrial group in a globalized and constantly changing competitive environment. Know how to make technical, operational and strategic decisions in a complex, risky and unstable environment. Be able to understand global performance. Know how to mobilize transversal skills.

### **Developed skills:**

- Integrating organisational, personal and cultural requirements (undertaking and innovating, working in an international and multicultural context, knowing oneself, self-evaluation, managing one's skills);
- Adapt to the specific requirements of the company and society (economic, societal, ecological);
- Integrate the operational and financial aspects of business management;
- Identify and process strategic information; Know how to manage knowledge;
- Analyse and take into account feedback;
- Take responsibility for your company and its social, economic and ethical environment.

### **Program:**

#### **Financial analysis** (prerequisite module) :

- Structural analysis of the balance sheet and functional analysis of the income statement
- Operational analysis of the financial impact of activities
- Forecast analysis of value creation through investment or expenditure
- Analytical synthesis through indicators and ratios (analysis indicators of the Cesim Game)

#### **Business game:**

- Constitution of the teams and division into competitive universes
- Presentation of the game - QUIZ to understand the parameters
- 1 training round for the operation of the virtual company
- 3 rounds of on-site operation with consultations with the instructors
- 1 round of remote operation
- 4 on-site operating rounds with instructor consultations
- 4 intermediate SWOT analysis and strategic orientation
- 1 Final Activity Report

**Assessment:** Continuous assessment on the financial analysis module (asynchronous remote assessment), then collective and individual assessments throughout the game via team tests and

challenges, the results of which are reported on the platform.

Participants' performance is measured and compared by both operational and financial indicators, including net profit, market share, return on capital, productivity, earnings per share, outsourcing and capacity utilization rates.

The overall performance of the teams is measured by the return to shareholders, which consolidates all the key success factors into a summary indicator that can be used to compare the teams.

In addition to competitive and financial requirements, it is the overall performance that is assessed, including CSR and ethical aspects.

-Oral presentations (consultations with instructors)



-Results returned by the platform (financial returns, team rankings, etc.)

-Outputs (Diagnostics, Final Activity Report)

**Resources and bibliography:**

- Les tableaux de bord du manager innovant - Alain Fernandez - Ed. Eyrolles - 2018

- Cesim Global Challenge platform

 <b>GBS</b>	<b><i>Team Management and operational planning of projects</i></b>	
	4A / Semester 8 4h CM / 24h TD	

**Keywords:** Team management, leadership, project management, needs analysis, planning, project management, project closure and evaluation

**Prerequisites:** Management course S5

### **Objectives:**

#### **Team Management**

- Understand the challenges of «team management».
- Acquire the relational fundamentals within a team.
- Know and develop leadership skills.

#### **Operational planning of projects**

The objective of this part is to make the students aware of the concepts and tools of project management by putting them in situations, permanent exchanges with the teacher from the definition and the framing of a project, its planning and its piloting, until the closing and the evaluation of the project.

At the end of this course, students will have a better knowledge to:

- Meet project deadlines
- Manage time, quality and resources effectively
- Achieve set objectives
- Manage the human factor and the different categories of actors involved
- Facilitate teamwork through appropriate communication and common frames of reference
- Identify and take into account constraints and risks
- Measure the success of the project

### **Programme:**

#### **Team Management**

- Leadership - Role of the manager - Mission- Objectives - Values.
- Human and managerial skills of the manager - Styles and types of authority
- Motivation - Assertiveness.
- Conflict management.

#### **Operational planning of projects**



- Needs analysis and project launch  
Tools: QQQCCP, Brainstorming, Ishikawa diagram, SWOT, project mapping, SMART objectives...
- Build and plan  
Tools: WBS, OBS, RACI, planning, decision matrix, retroplanning, Gantt, Pert, Eisenhower matrix, risk matrix
- Lead and manage  
Tools: dashboards, decision matrix, mind mapping, PDCA
- Close and evaluate  
Tools: closing report (post mortem), Deming wheel

## Situational exercises

### **Bibliography :**

- « Le guide du manager d'équipe » - Jean Louis VIARGUES - Ed. d'Organisation - 2001
- « Encadrer et motiver une équipe » - Arthur PELL - Ed. les Echos - 2000
- « Autodiagnostic des styles de management » - Dominique CHALVIN - Ed. ESF-EME -1990
- « Management situationnel » - Dominique TISSIER - Ed. INSEP - 2011
- « Motiver ses collaborateurs » - Anne BRUCE, James S.PEPITONE - Ed. Maxima - 2002
- « La dynamique des équipes » - Olivier DEVILLARD - Ed. d'Organisation - 2000
- « Les responsables porteurs de sens » - Vincent LEENHARDT - Ed. INSEP - 1992
- « Le kit du manager opérationnel » - Pierre THEPAUT - Ed. d'Organisation - 1998
- « Le manager est un psy » - Eric ALBERT, Jean Luc EMERY - Ed. d'Organisation - 1998
- « Comment manager son équipe » - Denis RIBIERRE - Ed. Masson - 2002
- « Etre leader » - François LAVOIE - Ed. SKF -2004



 <b>GBS</b>	<i>Contract Law</i>	
	4A / Semester 8 10h40 CM / 6h40 TD	

**Keywords:** work contracts, evidence, effects, European law

**Prerequisites:** None

**Objectives:**

- To introduce the main principles of contract law with a comparative perspective between French and European law.
- Highlight the issues associated with the European framework and the implications in terms of French contract law

**Programme:**

Work Contract: Definition, Classification

Perform a work contract

Evidence of the contract

Contractual clauses

Effects of a work contract

Effets généraux, Responsabilité contractuelle, Particularisme du contrat synallagmatique

European contract law

**Bibliography :**

CABRILLAC Rémy, *Droit européen comparé des contrats*, Lextenso, 2012

COLLECTIF, *Droit de l'entreprise*, (remis à jour chaque année) Lamy,

HAUSER Jean, *Les contrats*, Que sais-je ? n°1677, Collection Que sais-je ?, PU F, 1992 (1<sup>ère</sup> édition)



HESS-FALLON B, SIMON A-M, *Droit Civil*, 23<sup>ème</sup> édition, Aide Mémoire Sirey, 2013

PRIETO Catherine (dir.) *Regards croisés sur les principes du droit européen du contrat et sur le droit français*, Presses Universitaires d'Aix-Marseille, 2003

ROUHETTE Georges (dir. Pour la version française) *Principes du droit européen des contrats*, Société de législation comparée, 2003

VAREILLES-SOMMIERES P (dir.), *Le droit privé européen*, 2<sup>ème</sup> édition, Economica, 2013

WICKER Guillaume, (dir.) *Droit européen du contrat et droits du contrat en Europe – Quelles perspectives pour quel équilibre ?*, Lexis-Nexis, Collection Colloques et débats, 2008

 <b>GBS</b>	<b>Marketing</b>		
	4A / Semester 8		UE 8-2
	14h40 CM / 1h20 TD / 9h20 TP		Engineering training

**Keywords:** strategic development, strategic marketing, operational marketing, mix marketing, commercial policy, segmentation, target, positioning, plan of marketing, customer relationship, market survey

**Prerequisites:** None

**Objectives:**

The course aims to sensitize students to the « marketing » spirit and its contemporary stakes, and to familiarize them with the approach of marketing including the study of marketing, both strategic and operational.

The course proposed will allow students:

- To understand the basic concepts of marketing,
- To understand the importance of the marketing for companies and consumers,
- To know how to integrate the marketing orientation of a company with its strategic, objectives and its organizational structure
- To be capable of developing a marketing plan.

**Programme:**

**Discovery of the marketing and knowledge of the market**

Definitions, history, marketing approach

Introduction to the concepts of marketing

The market (Levels of analysis of the market, couple market-product, the market and the consumers, the measure of the market, market survey)

**The strategic marketing**

External diagnosis

Internal diagnosis

Segmentation, product positioning and targeting

Marketing strategies

**The operational marketing (mix marketing)**

The product policy

The price policy

The communication policy

The distributive policy

**Bibliography :**

DUBOIS Pierre-Louis, JOLIBERT Alain, *Le marketing, fondements et pratique*, 4<sup>ème</sup> édition, Economica, 2005



GARRETTE Bernard, DUSSAUGE Pierre et alii. *Strategor*, 6<sup>ème</sup> édition, Dunod, 2013

JOHNSON Gerry, SCHOLLES Kevan et alii. *Stratégique*, 9<sup>ème</sup> édition, Pearson Education, 2011

KIM W. Chan, MAUBORGNE Renée, *Stratégie océan bleu : Comment créer de nouveaux espaces stratégiques*, 2<sup>ème</sup> édition Pearson Education, 2010

KOTLER Philip, KELLER Kevin, MANCEAU Delphine, *Marketing Management*, 14<sup>ème</sup> édition, Pearson Education, 2012

LENDREVIE Jacques, LEVY Julien, *Mercator*, 11<sup>ème</sup> édition, Dunod 2014

 <b>GBS</b>	<b><i>GMP, GLP, qualification and validation</i></b>	 <b>UE 8-2</b> <b>Engineering training</b>
	4A / Semester 8	
	10h40 CM / 9h20 TD	

**Keywords:** Good practices, Manufacturing process, regulatory requirements, compliance, qualification and validation

**Prerequisites:** Quality courses (EI3)

### Objectives

- To understand GMP and GLP-regulation requirements in Europe and in USA
- To understand the different levels of involvement in the organization of Good Practices: the role of the Study Director, the Management system, the Quality Assurance department...
- To be able to implement a quality system in compliance with the Good practices applied in the industries of the health products.
- To master the qualification and validation rules in the various sectors related to bioproducts (pharmaceutical industries, cosmetics, medical devices ...)

### Programme :

#### **GMP (Good manufacturing practices)**

GMP in manufacturing and quality assurance  
 Design, conception, qualification, validation, maintenance  
 Specific risks related to manufacturing activities  
 5M, traceability

Deviation, change, documentation

#### **GLP (Good Laboratories practices)**



GLP principles : definition, vocabulary  
 GLP and quality assurance  
 Role and responsibilities  
 GLP studies : « short term », « multi-site », « in vitro »  
 Inspection / inspection report  
 documentation

#### **Qualification and validation**

Qualification and validation : process qualifications, systems and equipment qualifications, personal qualification, industrial validation, process validation, IT validation...  
 Regulatory requirements  
 Validation Master Plan  
 Performance of validation and validation protocol  
 Risk Analysis  
 DQ, IQ, OQ, PQ and traceability  
 Change Management

### **Bibliography :**

GLP, Edition OCDE 2006.  
 GMP

 <b>GBS</b>	<i>Automated systems</i>	
	4A / Semester 8 4h CM / 2h40 TD / 7h TP	

**Keywords:** Production tools, Automatism, Quality management

**Prerequisites:** None

**Objectives:**

- To perform and apply technical notions (mechanics, automatism, electricity)
- To be able to perform a functional analysis of an automated production system
- To know how to carry out a quality diagnosis on a production chain
- To be able to discuss with operators and propose feasible technical solutions

**Programme:**

**Technological bases:**



Electricity, Mecanic, Automatism

**Practical courses (Performed at Lycée Chevrollier):**

- Packaging workshop:
- Maintenance workshop

**Bibliography:**

Supplied by teachers

 <b>GBS</b>	<i><b>Water and environment</b></i>	
	4A / Semester 8 12h CM / 12h TD	

**Keywords:** energy, industrial water, pure water, purification, pollution

**Prerequisites:** basic physics, chemistry and biology

**Objectives:**

Understand the main water-related issues: competing uses, treatment processes, pollution, etc.

**Program:**

The course will be divided into two parts.

Part 1 led by the teachers:



- Reminder of the physico-chemical properties of water and the water cycle
- Water and people
- Different levels of water quality
- Water uses (including case studies)
- Water treatment and decontamination processes

Part 2 led by the students:

- In groups, students will choose an issue related to water in a company or healthcare establishment (water in a sunscreen production plant, in a rehabilitation pool, in a space station...) and then present their work to the other groups in the form of a poster, a lecture and/or a TD session.

**Bibliography:**

Supplied by teachers

 <b>GBS</b>	<i>Health environments and associated risks</i>	
	4A / Semester 8 22h40 CM / 28h TD	

**Keywords:** hygiene, safety, risk management, Health information systems

**Prerequisites:** Risks management (4Y-S7)

**Objectives:**

- To analyse problems overall related to occupational and environmental risks, hygiene and safety, in particular in the health and social medical sectors
- To understand specificities of health information systems and identify associated risks

**Programme:**

**Health risk management**

Main risks and Risk prevention in hospitals

Hospital hygiene

Sterilization

Legionella risk management

**Health information system and associated risks**



Managing health information system

Security management of health information system

Security techniques and cybercrime

**Bibliography:**

Supplied by teachers

 <b>GBS</b>	<i>Built environments and associated risks</i>	 <b>POLYTECH</b> ANGERS	
	4A / Semester 8		UE 8-3.1
	25h20 CM / 5h20 TD / 10h40 TP		PPSP training courses

**Keywords:** Bulding, construction

**Prerequisites:** None

**Objectives:**

- To know and identify the actors, the context and the issues of the construction sector
- To know regulations for a construction project (accessibility, thermal of the building, airtightness ...)
- To be able to identify various risks in built environments

**Programme:**

Buiding and Health

Lead and emerging risks

Noise

Indoor air

Radon

Abestos: risks and client responsibility

High Environmental Quality

Accessibility and security of persons



Legionellosis

Technological risks

**Bibliography:**

Supplied by teachers.



 <b>GBS</b>	<b><i>Biotechnology engineering</i></b>		
	4A / Semester 8		UE 8-3.2
	26h40 CM / 9h20 TD / 4h TP		PPSP training courses

**Keywords:** transcriptomic, proteomic, metabolomic, Mass spectrometry, Chip (DNA or protein), biomarkers

**Prerequisites:** Bases of mass spectrometry, Biochemistry (Nucleic acid and protein structure)

**Objectives:**

The aim is to provide a global view of complex problems by addressing large-scale techniques from the "omic" era: from transcriptomics to metabolomics

**Programme:**

- Large-scale or "omic" analyses and their inter-relationship.
- Data processing and data analysis
- Study of the variation of gene expression: transcriptomics and DNA chips
- Mass spectrometry and proteomics
- Protein chips: Principle, development and applications
- Metabolomics

*Practical courses :*

Platform visit: Protein chips and Surface plasmon resonance

Use of data analysis software for proteomics



**Bibliography:**

Interplay of transcriptomics and proteomics, de P. S. Hegde, I. R. White et X. Debouck, Curr. Opin. Biotech, 2003, 14(1) : 647-651.

Operomics : molecular analysis of tissue from DNA to RNA to protein, de S. M. Hanash, Clin Chem Lab Med., 2000, 38(3) : 805-813.

Transcriptomics, proteomics and interactomics : unique approach to track the insights of bioremediation, de O. V. Singh et N. S. Nagaraj, Brief Funct Genomic, Proteomic, 2006, 4(4) : 355-362.

DNA microarrays, de F. F. Bier, M. von Nickisch-Rosenegk, E. Ehrentreich-Förster, E. Reiss, J. Henkel, R. Strhlow et D. Andersen., Mass spectrometry-based proteomics : basic principles and emerging technologies and directions, de S. K. Van Riper, E. P. de Jong, J. V. Carlis et T. J. Griffin, Adv Exp Med Biol, 2013

 <b>GBS</b>	<i><b>Process engineering</b></i>		
	4A / Semester 8		UE 8-3.2
	18h40 CM / 14h40 TD / 20h TP		PPSP training courses

**Keywords:** Biochemistry and Food Sciences, Process engineering, Formulation of health products

**Prerequisites:** Processing-formulation, Preservation, Controles, Automated systems

**Objectives:**

- To understand the role of ingredients and additives in food formulation.
- To understand beneficial or detrimental interactions or chemical reactions occurring in food products.
- To understand interactions and beneficial or harmful chemical reactions which are involved in food
- To establish relationships between physicochemical properties of constituents and their main sensory, technological and nutritional propoerties.
- To acquire some expertise on physicochemical structure and stability of food products
- To apply formulation and process engineering knowledge in practical work

**Programme:**

Lectures and tutorials:



- The food constituents
- Food ultrastructure
- Flavours and fragrances and coloring (
- Food formulation - case studies and practice
- Process engineering

Practical work:

- Formulation of Hygiene and cosmetics products
- Food formulation
- Process engineering

**Bibliography:**

Supplied by teachers

 <b>GBS</b>	<i>Clinical research project management</i>	 <b>UE 8-3.3</b> <b>PPSP training courses</b>
	4A / Semester 8	
	12h CM / 18h40 TD / 4h TP	

**Keywords:** Good Clinical Practice, Clinical research regulation, data management, monitoring

**Prerequisites:** basic concepts of clinical studies

**Objectives:**

- To understand regulatory requirement for clinical trials
- To be able to set up (SIV) and conduct a clinical trial (monitoring)
- To master the clinical research tools (Protocol, TMF, data management)

**Programme:**

**Regulatory environment for clinical trials**

Regulations  
 Safety in clinical trials  
 Case studies



**Management of clinical studies**

Clinical research stakeholders  
 Clinical research implementation: Site Initiation Visit, Monitoring, closeout visit,  
 TMF  
 Data management  
 Pharmaceutical development and new types of monitoring

**GPC certification**

**Bibliography:**

Supplied by the teachers.

 <b>GBS</b>	<i>Management: flow, process and Healthcare facilities</i>	 UE 8-3.3 PPSP training courses
	4A / Semester 8	
	22h40 CM / 18h40 TD / 13h20 TP	

**Keywords:** Flow management, Supply chain and logistic Quality management, continuous improvement

**Prerequisites:** Flow management (S7 4A)

**Objectives:**

- To be able to organize and support the logistics function
- To know how to optimize production and / or distribution logistics
- To implement a process of continuous improvement
- To understand the specificities of private health institutions and to understand health cooperation

**Programme:**

**Flow management tools**

Industrial and business plan, production plan

Cold chain, the way forward

Complexity of the supply chain and logistic

**Quality management in industry**

Direction and quality management

Le lean management and RCA

**Quality management in healthcare facilities**

Health care system organization



Management of Hospitalization at home (HAH), health cooperation

User rights

Manage the restoration function and HACCP

**Bibliography:**

Supplied by teachers.

 <b>GBS</b>	<i>Applied studies</i>		
	4A / Semester 8		UE 8-4
	8h TD / 40h project		Project

**Keywords:** quality approach, project management, teamwork

**Prerequisites:** project management methodology, quality approach and tools

**Objectives:**

Have students work in small groups (3 to 6 people) on case studies with a practical, mostly professional scope.

Use project management tools

To carry out an innovative approach

This project allows the student, over a period of several months, to

- To get involved in a group work
- To use their knowledge and skills in a transversal way
- To implement methodologies adapted to the project's problematic
- To use their analytical and synthesis skills, particularly in writing the report and in the presentation of the results
- To deepen a theme or to better understand a sector of activity
- To meet specific objectives specific to each year of the program.

**Programme:**

The project takes place throughout the year (S7 and S8) and is a sort of common thread throughout the second year of engineering school.

The second year project allows the student to study in depth a theme related to a field or a sector of activity towards which he/she plans to move. This project is therefore an opportunity for the student to deepen his or her knowledge of the sector, field or area related to the subject.

The project must be innovative. The entrepreneurial approach is favored. The objective is to go through all the stages of designing and producing a product or service, from the idea to the turnkey project. This is why the constitution and choice of subjects are left to the students' initiative.



The topics are most often related to the marketing of a new product or to the creation, evaluation or improvement of an action, a service or a service structure. In both cases, students are asked to take into account economic and regulatory constraints.

Students are invited to participate in various entrepreneurship competitions, such as the Entrepreneuriales challenge; the Agricultural Initiative prize, etc.

The project leads to the writing of a report and an oral presentation.

**Bibliography:**

Related to each project

 <b>GBS</b>	<i>Training period</i>	
	4A / Semester 8	
	3-4 months	
		UE 8-5 Training courses

**Keywords:** professional experience, training period

**Prerequisites:** courses of study, previous professional experience

**Objectives:**

First experience as engineer in the specialty domain

- Deepen the knowledge of the professional environment
- Refine the student's professional project
- Apply the knowledge acquired
- Develop new professional skills
- Have a field experience

**Programme:**



This training period of minimum three months aims at applying the technical abilities of the student (industrial process, quality, hygiene and security, logistic, clinical research, etc.) considering economic, human and organizational aspects. The student chooses the theme of his or her internship within the scope of the school formation.

The mission confided to the student is comparable to the one of a young engineer.

**Bibliography:**

Related to each project

# 5A - Semestre 9

 <b>GBS</b>	<i>English</i>	
	5A / Semester 9 20h TD	

**Keywords :**

Communication skills, Cross-cultural skills, Professional Environment

**Required :**

TOEIC validation

**Objectives :**

- Meeting the requirements of the CEFR (Common European Framework of Reference for Languages): oral and written comprehension, oral and written expression, interaction
- Cross-cultural skills: knowledge of international environment
- Good command of oral techniques

Groups of levels are formed from a mock TOEIC test.

Validation of a minimum TOEIC score is required in the last year of school to obtain the

**Program :**

- Team work skills
- Presenting techniques for the final industrial project presentation (focusing on pronunciation, fluency, idiomatic expressions, etc...)
- Job/internship interview training
- Abstract writing

**Evaluation :**

100% continuous assessment (Written and spoken)



**Learning outcomes :**

The student can carry out a job/internship interview.

The student can make a professional oral presentation on a long-term project (5<sup>th</sup> year industrial project)

The student can write a professional report, an abstract, a professional e-mail and a personal profile.



 <b>GBS</b>	<i>Foreign Languages : German or Spanish</i>	
	5A / Semester 9 12h TD	

**Keywords :**

Communication skills, Cross-cultural skills, Professional Environment, Certification

**Prerequisites :**

B1-B2 level on listening and comprehension skills

**Objectives :**

- Meeting the requirements of the CEFRL (Common European Framework of Reference for Languages): oral and written comprehension, oral and written expression, interaction
- Cross-cultural skills: knowledge of German-speaking countries
- Preparation to an external certification

**Program :**



Training placement tests  
Professional writing (abstract, report, e-mail)  
Advanced grammar review

**Evaluation :**

100% continuous assessment  
Self assessment with placement tests

**Learning outcomes :**

Running meetings  
Advanced grammar skills

 <b>GBS</b>	<i>Employability</i>	
	5A / Semester 9	
	16h TD	General Skills

**Keywords:**

Job, employability, hiring, integration, professional watch

**Prerequisites:**

Professional communication

**Objectives:**

- Provide keys to facilitate the professional integration of students upon graduation
- Define your use profile
- Knowing how to value yourself

**Program:**

1. Prospective method
  - a. . positioning of Polytech Angers students with regard to evolving trends
  - b. . projections
  
2. Professional posture : keys to integration in a team :
  - a. . image and self-confidence
  - b. . exchange of experiences on the fundamentals (codes, social life...)
  
3. Focus on skills and salary negotiation
  - a. . Evaluation of individual skills in one's specialty based on CTI expectations
  - b. . Reality of the market and skills to be acquired to present oneself on the job market
  
4. The digital identity to visibility
  - a. . LinkedIn : professional social network
  - b. . Auditing your online presence to rank high in the search results
  
5. Convince in 3 minutes for an integration (professional or project)
  - a. Choose clear objectives to communicate
  - b. Know how to present yourself and captivate in a given time
  - c. Evaluate your performance and reflect on areas for improvement



**Examination:** 100% continuous assessment

**Bibliography:**

- Stéphanie Assante, Les 16 grands types de personnalité - Le MBTI, Dangle Editions, 17 octobre 2012.
- Christophe BLAZQUEZ, Samir ZAMOUM , Développez votre identité numérique, GERESO ÉDITION, 2019. Françoise KOURILSKY, Du désir au plaisir de changer, DUNOD 2014.
- Axelle Larroumet, « Quels talents ! », Ed. Diagonart, 2012.
- Richard BANDLER et John GRINGER, Les secrets de la communication, J'ai lu 2011.

Pierson, Marie-Louise. *L'image de soi*. Eyrolles, 2005.

- Isabelle Rouhan en collaboration avec Clara-Doïna Schmelck, *Les métiers du futur*, First éditions. 2019.
- Judy Weiser, *Phototherapy Techniques: Exploring the Secrets of Personal Snapshots and Family Albums*, Phototherapy Center. 2019

 <b>GBS</b>	<b><i>Project control and Employment law</i></b>	
	5A / Semester 9	
	12h CM / 16h TD	General Skills

**Keywords :**

Market, investment, budget, cost, Labour code, employment contract, Collective Agreements, justice

**Prerequisites :**

Financial analysis

**Objectives :**

***Project control***

- Be able to calculate the financial profitability of an industrial project and to monitor and control the costs of this project.

***Employment Law***

- Knowing labour law is essential; either you are worker or employer. Nobody can ignore it.
- Labour legislation is in constant discussion. It is therefore important to understand the legal, economic and social issues

**Program :**

***Project control***

- Part 1 : Analysis and diagnosis
  - external environment : the PESTLE model
  - industry : the PORTER strenghts
  - market : the SWOT and the success factors analysis
  - firm : the SBU and the BCG matrix
- Part 2 : Investment
  - fundamentals
  - actualization
    - NPV
    - IRR
- Part 3 : Budget and financing plan
  - budget
    - definition and utility
    - building
    - operations vs cash flow
  - financing plan
    - operational cash flows
    - funding
- Part 4 : Costs and profitability
  - full costs
  - partial costs
    - variable costs
    - fixed costs
  - break even

***Employment Law***

- Introduction to labor law

- Justice in labor law
- Labor Inspections
- Job offer and maintenance
- The employment contract (from the signature to the termination of the employment contract)
- The rights and duties of the parties (employee / employers)
- Union representatives
- Payroll and exam preparation
- The 2020 novelties

**Evaluation :**

100% continuous assessment



Table examination with practical case

**Learning outcomes :**

The student has understood the meaning of law and is able to read and understand a court decision

**Bibliography :**

- Stratégique – Gerry JOHNSON, Kevan SCHOLES, Frédéric FRERY – Ed. PEARSON (10<sup>ème</sup> édition) – 2017
- Contrôle de gestion DCG 11 Manuel & applications – Ed. Dunod 2017
- Décision d'investissement (incertitude et information) – P. PIGET – Ed. Economica 2019
- Construire et défendre son budget – C. SELMER – Ed. Dunod 2014
- Code du travail , ed.Dalloz
- RAY Jean-Emmanuel, « Droit du travail, Droit vivant 2017 », Ed Liaisons, 25<sup>ème</sup> édition 2016

 <b>GBS</b>	<i><b>RSE and Ethics</b></i>	
	5A / Semester 9 12h TD	

**Key words :**

Social responsibility, environnement, impact measurement, societal issues, business, trades, compétences, ethics, dilemma, values

**Prerequisite :**

none

**Objectives:**

- Integrate the impacts of corporate social responsibility (CSR) internally and externally
- Think about his position as a future engineer
- Knowing how to value oneself

**Program :**

**1. Corporate social responsibility-CSR and impact measurement = an imperative.**

CSR to give more meaning to work and innovate

<https://fr.slideshare.net/Amorosx/lb-emergence-croissancedurablexavier-amoros>

. tools to involve employees and stakeholders in a CSR approach.

. CSR and impact measurement : case study

**2. Have an ethical approach in a complex world.**

Keys to understanding the complexity of the world

. Positioning as future professionals in a complex world

. IESF Engineering Charter of Ethics: the engineer in society, the engineer and his skills, the engineer and his profession, the engineer and his missions

. <https://www.fabi.be/1-ingenieur-charte>

**3. Fresco of digital**

. Become aware of the environmental issues of digital tools

**4. Daily ethics**

Position oneself as future engineers:



- A. The commitment of the engineer-citizen in society: carry out an "honest engineer" project (organize a blood donation, promote artistic skills with children in difficulty, set up an artistic week and cultural event on the theme of "art and science", meeting sick children, running to collect doses of vaccine)
- B. To be a creative scientist with an open mind and knowing how to question himself: through the history of technologies, the sociology of work and geopolitics, the student is led to weave links between his future profession of engineering and associated activities, considered in their historical, sociological and geopolitical context.
- C. Being a relevant, honest, tolerant and fair professional: zetetic workshop (art of rational doubt). The student is led to rub shoulders with critical analysis in a concrete way, by seeking to distinguish scientific content from pseudoscientific content, to detect lies for commercial or propaganda purposes, or to prevent intrusion into the method science of ideologies such as racism or creationism.
- D. Be an efficient, vigilant, far-sighted, rigorous and responsive manager: on the basis of examples experienced or observed in companies, propose lines of action

or levers to strengthen the commitment to CSR  
<https://www.innovation-pedagogique.fr/article245.html>

**Evaluation** : 100% continuous assessment

**Bibliography** :

- NF ISO 26000 Novembre 2010, AFNOR.
- Billaudeau, V., Bioteau, E., Vérité, O., Grémy-Gros, C., & Christofol, H. (2022). Vers une conception d'évaluation plurielle et collective de la mesure d'impacts de projets en ESS. Inscire territoires et durabilité au cœur de la démarche. *Ann Public Coop Econ*, 93, 435– 455. <https://doi.org/10.1111/apce.12372>
- Dessine-moi l'éco : Comment les entreprises financent-elles leurs projets ? <https://youtu.be/g8UVk7EvgqM>
- Le défi de la complexité - Edgar Morin, à l'USI <https://youtu.be/6UT57Jm371w>
- La place de l'éthique dans nos vies individuelle et collective - Cynthia Fleury, à l'USI [https://youtu.be/x3u8xl\\_fxwk](https://youtu.be/x3u8xl_fxwk)
- Vidéo Marie José Avenier : le cadre épistémologique de la recherche [https://www.youtube.com/watch?v=R\\_jP0LP6cOg](https://www.youtube.com/watch?v=R_jP0LP6cOg)

 GBS	<i>Management and performance evaluation</i>	
	5A / Semester 9 13h20 CM / 18h40 TD	

**Keywords:**

Cost, performance, lean, piloting, evaluation.

**Prerequisites:**

Project costs mastering module (UE9-1)

**Objectives:**

The objective of this module is to provide the principles, tools and methods for monitoring and evaluating performance in health sectors and health product industries.

**Program:**

Cost of production and management,  
 Improved performance,  
 The tools of monitoring,  
 Lean and visual management  
 Driving health facility performance  
 Medico-economic evaluation in health



**Examination:**

Continuous assessment (100%)

**Bibliography:**

Given by teachers



 <b>GBS</b>	<i>Communication, crisis management, conflict management</i>	
	5A / Semester 9 9h20 CM /18h40 TD	

**Keywords :**

Communication, crisis, interpersonal conflict

**Prerequisites :** Lessons from previous years related to management, communication, interpersonal relations...

**Objectives :**

- Acquire all the organizational methods, techniques and means that enable an organization to prepare itself and to face the occurrence of a crisis and then to learn the lessons of the event in order to improve the procedures and Structures in a forward-looking perspective.
- Knowing how to deal with interpersonal conflicts in a professional situation

**Program :**

Conflict management

- Conflicts in groups: definition, types of conflicts, sources, attitudes
- Conflict resolution
- Conflict prevention

Prevention and management of health crisis - study of various emergency plans

- Health crisis management
- RNBC Risk
- White Plan, Blue Plan
- Management of industrial crises

Internal and external communication during a crisis



- Internal communication
- External communication plans and strategies
- Relations with stakeholders

**Examination:**

100% Continuous assessment

**Bibliography:**

Given by teachers

 <b>GBS</b>	<i>Change management</i>	
	5A / Semester 9 6h40 TD / 4h TP	

**Keywords :**

Management and change management, planning, accompaniment, resistance

**Prerequisites :**

Lessons from previous years related to management, communication, interpersonal relations...

**Objectives :**

- Acquire all organizational methods, techniques and means that allow an organization to prepare for and cope with change
- Know how to pilot all the dimensions of this change, as manager or project manager
- Understand the stakes and importance of stakeholder involvement in the success of change

**Program :**



- Definition, qualification and importance of change in organizations
- Steps for Change
- Human and organizational aspects of change management
- Resistance to change
- Analysis and Case Studies

**Examination :**

100% Continuous assessment

**Bibliography :**

Given by teachers

 <b>GBS</b>	<i>Conected objects and digitization in health</i>	
	5A / Semester 9 8h CM / 1h20 TD / 2h40 TP	

**Keywords :**

Connected objects, health, habitat.

**Prerequisites :**

**Objectives :**

Acquire basic knowledge about connected objects and their applications in the areas of health and / or habitat.

**Program :**



- Market and use of connected objects,
- Function and technical components of the connected objects (sensors, networks, data processing ...)
- Industrial protection of connected objects
- Application of connected objects in health / habitat

**Examination :**

100% Continuous assessment

**Bibliography :**

Given by teachers

 <b>GBS</b>	<i>Legal and regulatory specificities in health</i>	
	5A / Semester 9 26h40 CM, 20h TD, 4h TP	

**Keywords :**

Regulations, healthcare, medical devices, health / building, budget, purchase

**Prerequisites :**

Lessons from previous years

**Objectives :**

Acquiring legal and regulatory specificities related to : the management of a health sector establishment or service; the production and distribution of medical devices; the health in the built environment

**Program :**



- Legal and Institutional Framework for Health
- Responsibility of health institutions and professionals
- Purchasing regulations in healthcare institutions
- Health Ethics
- Regulation of medical devices
- Medical device risk management
- Regulation in Health / Building
- Development of a drug
- Regulation of pharmaceutical products
- Analysis and case studies

**Examination :**

100% Continuous assessment

**Bibliography :**

Given by teachers

 <b>GBS</b>	<b><i>Health Products Quality Management and Regulatory Approach</i></b>	
	5A / Semester 9	
	9h20 CM / 21h20 TD	Deepening training: IIPS

**Keywords :**

Regulations standards, regulations, product development

**Prerequisites :**

Quality approach & methodology, quality tools  
 Legal and regulatory specifications in the health sector

**Objectives :**

Lead projects for developing new products abiding by the specific requirements set out in the health sector

**Program :**



- ✓ To analyse health-related reference documents that ensure the management of risks for consumers.
- ✓ To acquire knowledge of the tools used for quality management tools and risk analysis in terms of health products design.
- ✓ To have knowledge of specific regulations for different health sectors
  - food products
  - beauty products
  - dietary supplements
  - novel foods
  - herbs decree
- ✓ To know labelling rules (to understand and calculate products' nutritional values)

**Examination :**

Continuous assessment (100%)

**Bibliography :**

Given by teachers

 GBS	<i>R&amp;D and Innovation for health products</i>	
	5A / Semester 9	
	5h20 CM / 55h20 TD / 33h TP	Deepening training: IIPS

**Keywords :**

Innovation, Formulation, Physico-chemical characterization, Sensory analysis

**Prerequisites :**

Processing-Formulation, Process engineering, Control

**Objectives :**

- ✓ To understand the innovative formulation technologies and the rules of formulation applied to development of health products
- ✓ To understand the methodologies and techniques for sensory analysis, analytical and physico-chemical characterization
- ✓ To put the formulation technologies into practice

**Program :**

Lectures and tutorials:

- Formulation of solid dosage forms
- Microencapsulation
- Supercritical fluids technologies
- Microfluidic technologies and applications
- Characterization methods of dispersed systems: Scanning probe microscopy, Granulometric and surface potential analyses, stability and spectroscopy
- Interfacial tensiometry and rheology
- Statistical data processing techniques applied to R&D
- Business innovation

Practical work:



- Microencapsulation
- Spray Drying and Gelation
- Microemulsion
- Foam formulation

**Examination :**

Continuous assessment (100%)

**Bibliography :**

Given by teachers

 GBS	<i>Design and production of health products</i>	
	5A / Semester 9	
	6h40 CM / 29h20 TD / 16h TP	Deepening training : IIPS

**Keywords :**

Nutrition, Biochemistry, Food-Health, Dietary supplement, Immunology, Molecular biology, *In vitro* diagnostic

**Prerequisites:**

Bioproducts technologies, Hygiene and biological hazards, R&D production, Biotchnology engineering, Process engineering, Processing-Formulation, Health Products Quality Management and Regulatory Approach

**Objectives :**

From the scientific and technological knowledge previously acquired, to be able to mobilize them in order to manage an innovation project and the development of health product in accordance with applicable regulations

**Program :**

From a concrete problematic, students must:



- To analyze the objectives and the complexity of development project
- To identify scientific and technological barriers, and the associated regulations in the design phase of a product
- To propose plans for developments, improvements and innovation
- To design and manage an action plan
- To put the action plan into practice in order to check the technical feasibility
- To reflect upon the limits of the development project

**Examination :**

Continuous assessment (100%)

**Bibliography :**

Given by teachers

 <b>GBS</b>	<i>The risks in health</i>	
	5A / Semestre 9	
	16h CM, 18h40 TD, 26h40 TP	

**Keywords :**

Sanitary risk, building, health product, chemical risk

**Prerequisites :**

Module8-3.1 4A GBS : environments of health, built environments and associated risks.

**Objectives :**

The student has to acquire the necessary knowledge regarding sanitary risks in buildings, in accommodation, in the establishment of health, and the risks connected to the products of health. He has to master the diverse categories of risks, the associated regulations and the state of the art of every tackled issue.

**Program :**

- Sanitary Risks in the building :
  - o Lead, asbestos, radon, air inside, noise, molds, wood,
  - o Sanitary Characteristics of building materials,
  - o Management of the unexplained collective syndromes,
  - o Soil remediations ...
- Risks bound(connected) to products / establishments of health:
  - o Management of chemical risks
  - o Risks in radiotherapy,
  - o Risks of pandemic,
  - o Management of radioactive waste

**Examination :** 100% Continuous assessment



**Bibliography :**

- Coeudevez, C. and Déoux, S. (2011). Bâtiments, santé, le tour des labels. 1st ed. Andorra: Medieco.
- Collignan, B. (2008). Le radon dans les bâtiments. 1st ed. Centre Scientifique et Technique du Bâtiment.
- Construire Sain - Guide à l'usage des maîtres d'ouvrage et maîtres d'oeuvre pour la construction la construction et la rénovation. (2013). 2nd ed. Ministère de l'Ecologie, du Développement Durable, de l'Energie.
- Déoux, S. (2010). Bâtir pour la santé des enfants. 1st ed. Andorra: Medieco.
- Déoux, S. and Déoux, P. (n.d.). Le guide de l'habitat sain. 1st ed. Andorra la Vella: Medieco.
- Gestion de la qualité de l'air intérieur - Établissements recevant du public. (2010). 1st ed. InVS, Ministère de la Santé.
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- MARCHAND, C. and CARRILHO, H. (2015). Accompagnement de la surveillance obligatoire de la qualité de l'air intérieur dans les établissements d'enseignement, d'accueil de la petite enfance et d'accueil de loisirs. 1st ed. INERIS.
- Moisissures dans votre logement ?. (2015). 1st ed. CSTB.



-Prévention du risque amiante dans la gestion du bâtiment. (2012). 1st ed. Ministère de l'Economie, des Finances et de l'Industrie.

Schriver-Mazzuoli, L. (2017). La pollution de l'air intérieur. 1st ed. Dunod.

 GBS	<i>Statutory aspects and audits</i>	
	5A / Semester 9	UE 9-3.2
	13h20 CM / 29h20TD / 8h TP	Deepening training : GRSS

**Keywords :**

Audit, regulations, reference table, ISO, methodology

**Prerequisites :**

Quality approach, tools quality, common-core syllabus on the audit.

**Objectives :**

At the end of the module II, the student must have understood the diverse stages and the necessary methodology to lead an audit. He must be capable of realizing an audit by himself: determination of the subject, the construction of the railing of audit, animation of the diverse meetings, the document retrieval, the search for proof, analysis of the results, the construction of the audit report, the writing of the conclusions.

**Program :**



- Statutory Aspects, requirements of reference tables SSI health.
- Methodology of analysis of the risks in IS security.
- Normalize ISO, risk management.
- Audit: principles, objectives, action plan. Concrete examples with applied cases.
- Analysis of practices

**Examination :**

100% Continuous assessment

**Bibliography :**

Given by teachers

 <b>GBS</b>	<i><b>Integrated risk management</b></i>	
	5A / Semestre 9	
	20h CM, 40h TD, 6h40 TP	Deepening training : GRSS

**Keywords :**

Risk management, project management, management system, safety, pharmaceutical industry, products of health, human factor

**Prerequisites :**

Common-core syllabus 4A / 5A GBS on the risk management and the quality / quality management.

**Objectives :**

The student has to understand the stakes and the methods of the risk management in the diverse approached sectors: information system, establishments of health, industry of the products of health. He has to master the concepts and be capable of applying the current proposed tools. He has to be up to date statutory evolutions and recent currents of thought in the domain.

**Program :**

- Project management of health information system and risk management, information security,
- Management of the risks in establishment of health,
- Methodology of risk management a priori, a posteriori
- Human factors,
- Crisis management,
- Sanitary Risks and management, indicators,
- Risks in pharmaceutical industry, in food-processing industry.



**Examination :**

100% Continuous assessment

**Bibliography :**

- Manuel of certification of the establishments of health V2010, in June, 2009, Direction(Management) of the accreditation Orders National of Accreditation and Evaluation in Health, High Authority of Health.
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- David AUTISSIER Isabelle VANDAN GEON-DERUMEZ Alain VAS - Change management: key concepts 50 years of practices stemming from works of the founding authors, published(edited) DUNOD, on 2014
- Martinez, Fabien. The general principles of the quality. ADSP, in June, 2011
- White, Didier. Health and social, the ISO 9001 in your reach(impact). Afnor Edition, 2008, 304p.
- Cattan, Michel. Guides of the processes, let us pass in the practice. Afnor Edition, on 2013

- Gillet Goinard, Florence. The big book of the quality controller. EYROLLES, on 2011, 486p.
- Duck, Frédéric. Quality management. LEXTENSO edition, on 2009, 304p.
- Roux-Dufort, Christophe. Manage and decide in crisis situation - 2nd edition: tools of diagnosis, prevention and decision. 2nd éd. Paris: Dunod, on 2003.

 <b>GBS</b>	<b><i>Human resources management</i></b>	
	5A / Semester 9	
	20h CM / 26h40 TD / 17h20 TP	Deepening training : MPCs

**Keywords :**

Bio-products industry, clinical trials, health sectors

Management, logistics and flow management, specificities of clinical trials

**Prerequisites :**

Module 8-3.3 4A GBS: Management of complex processes and quality management system

**Objectives :**

In the different sectors of application,

- coordinating and securing processes
- use the piloting tools wisely
- Managing and coordinating the actors involved

**Program :**



- Process control in industry and health sectors  
Study of support processes (payroll, billing, outsourcing ...)  
Transversal management  
Tools (5S ...)
- Clinical research tools  
Project management in clinical research  
Vigilances  
Tools (imaging, organization of the URC ... ..)  
Applications

**Examination :**

100% Continuous assessment

**Bibliography :**

Given by teachers

 <b>GBS</b>	<b><i>Management of flows, processes and health structures</i></b>	
	5A / Semester 9	
	14h40 CM / 36h TD / 8h TP	Deepening training : MPCs

**Keywords :**

Bio-products industry, clinical trials, health sectors

Management of production, management and management of human resources, management of clinical research

**Prerequisites :**

Module 8-3.3 4A GBS: Management of complex processes and quality management system

**Objectives :**

In the different sectors of application:

- driving performance
- mastering production processes
- control the costs

**Program :**

- **The management of continuous improvement in industry**

Performance suppliers, after-sales service, production management tools (CMMS, Just in time, SMED, Kanban ...).

- **Clinical research tools**

Statistics, Epidata, data management

Pharmacovigilance

Regulatory aspects

Logistical and managerial aspects in clinical trials

Applications

- **Steering health structures**

Governance and strategic management

Financing arrangements



Management and Human Resources Management

**Examination :**

100% Continuous assessment

**Bibliography :**

Given by teachers

 <b>GBS</b>	<i><b>Project management</b></i>	
	5A / Semester 9	
	21h20 CM / 36h TD	Deepening training : MPCS

**Keywords :**

Bio-products industry, clinical trials, health sectors

Lean, performance, management, management tools, clinical research tools

**Prerequisites :**

Module 8-3.3 4A GBS: Management of complex processes and quality management system

**Objectives :**

In the different sectors of application:

- design and master the tools to make them efficient
- analyse and improve professional practices

**Program :**

- **Lean and Performance**

Visual Management

Healthy Lean

Measuring Performance

Practical cases (6 sigma, TRS calculations ...)

- **Tools and skills of the manager**

Reporting, dashboards

Leadership, Values, and Responsibilities

Analysis of practices

Environmental adaptations and continuous improvement

- **Clinical research tools**

Pharmacodynamics, pharmacokinetics, pharmacogenetics

Over cost grids

Medical devices



Applications

**Examination:**

100% Continuous assessment

**Bibliography:**

Given by teachers

 <b>GBS</b>	<i>Project</i>	
	5A / Semester 9	
	100h	Projects: PEA and PPPE

**Keywords :**

Team working, Project management, Project

**Required :**

Project management, quality courses

**Objectives :**

Have students work in small groups (3 to 6 people) on case studies proposed by professionals in connection with the chosen course of study.

**Program :**

The project runs over the entire semester 9 and is a kind of thread in the last year of engineering school.

This project is thus an opportunity for the student to deepen knowledge of the sector, the sector or the field related to the subject.

The project must be innovative. The goal is to go through all the stages of conception and realization of a product or a service, from the idea to the turnkey project.

The subjects most often concern the development of a new product or the creation, evaluation or improvement of an action, service or service structure. In both cases, students are encouraged to consider economic and regulatory constraints.

The project leads to the writing of a report as well as an oral defense



**Evaluation :**

Project report and oral defense

**Bibliography :**

Related to each project

# 5A - Semestre 10

 <b>GBS</b>	<i>Internship</i>	
	5A / Semester 10	
	5-6 month	Internship

**Keywords :**

Occupational integration

**Prerequisite :**

All lessons from semesters S5 to S9

**Objectives :**

- Original production in relation to the expectations of the company and more broadly the expectations of the profession
- Occupational integration

**Program :**

Internship in company, laboratory or nursery of 5 months minimum or 4 months for research internship

**Evaluation :**

- Monthly reports, visits by a referent teacher
- Report, oral defense, evaluation of the training supervisor