Syllabus - Specialty in Biological Engineering and Health systems (GBS) English version

Syllabus
Specialty in Biological Engineering and Health systems
(GBS) 
S5 (3rd year)

Version May 2020
Responsible : Marie Bonnin

GBS	***English***	POLYTECH ANGERS
	3A / Semester 5	UE 5-1
	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

GBS	***Foreign Languages: German or Spanish***	POLYTECH ANGERS
	3A / Semester 5	UE 5-1
	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

GBS	***Company knowledge***	POLYTECH ANGERS
	3A / Semester 5	UE 5-1
	16h TD	General Skill

Keywords: corporate functions, legal status, group, social economy, collaborative economy, CSR, business and corporate strategies

Prerequisites: None

Objectives:
Discover:

- the main functions in companies
- the diversity of companies
- business and corporate strategies
- corporate social responsibility

Programme:

I. The main functions in companies
II. All forms of companies: size, legal status, social economy, collaborative economy
III. CSR
IV. Business and corporate Strategies

Bibliography:
Communicated by teachers

GBS	*Economics*	POLYTECH ANGERS
	3A / Semester 5	UE 5-1
	12h TD	General Skill

Keywords: market, economic growth, political economics, sharing economy

Prerequisites: none, except interest and curiosity

Objectives:
- Understanding the issues of current economic debates
- Knowing about vocabulary and economic indicators
- Enrich general knowledge

Programme:
- Economics challenge (in teams)
- The basics of economy
- Economic news and analysis (students' work: report of an article in the economic press)
- New economic forms

Bibliography:
Communicated by teachers

GBS	***Integration challenge***	
	3A / Semester 5	UE 5-1 General Skill
	26h TD	

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 ISTIA training in project mode
- Playful introduction to lessons in project mode
- Importance of the multidisciplinarity 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 (coming from all places and enrolled in all specialties: mixed teams). A specification is given to them on Monday morning: a project must be made and functional for Friday (challenge, competition on Friday). Other events come punctuate the week:
- Presentation of the team of their team
- Product promotion poster
- Cooking Tournament
- Integration quizzes

Bibliography:
Communicated by teachers

GBS	***Sport or scholastic sponsorship***	
	3A / Semester 5	UE 5-1 General Skill
	12h TD	

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

GBS	***Quality approach***	POLYTECH ANGERS
	3A / Semester 5	UE 5-2
	9h20 CM – 10h40 TD – 5h20 TP	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, 1ère édition, 2003
NAOUS Benoît, *Construire le système documentaire*, AFNOR, 1ère 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

GBS	*Quality methodology and tools – Part 1*	POLYTECH ANGERS
	3A / Semester 5	UE 5-2
	13h20 CM – 14h40 TD – 5h20 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, QQOQCP, 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

GBS	*Computer tools*	POLYTECH ANGERS
	3A / Semester 5	UE 5-2
	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:
  - Know how to use the main means of communication
  - Know how to manage the relationship with the different parties, depending on the type of medium and the level of information to be transmitted.
  - Know how to structure your message in conditions
  - 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'Relly, 4ème édition, mars 2006
Introduction pratique aux bases de données relationnelles : A. Meier, 2006, Springer 2ème édition
Comprendre Merise : Outils conceptuels et organisationnels de Jean-Patrick Matheron
Exercices et cas pour comprendre MERISE de Jean-Patrick Matheron

GBS	***Control***	POLYTECH ANGERS
	3A / Semester 5	UE 5-3
	12h CM – 1h20 TD – 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

GBS	*Immunological detection*	POLYTECH ANGERS
	3A / Semester 5	UE 5-3
	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, counterimmunoelectrophoresis. 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

GBS	*Cleaning and disinfection*	POLYTECH ANGERS
	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
Antisepsie et désinfection : J.Fleurette, J.Freney, M.E Reverdy Editions ESKA 1995

GBS	*Applied Microbiology*	POLYTECH 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

GBS	***Risks and infectious agents***	
	3A / Semester 5	UE 5-3
	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

GBS	***DNA Technology***	POLYTECH ANGERS
	3A / Semester 5	UE 5-3
	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

GBS	*Applied studies*	POLYTECH ANGERS
	3A / Semester 5	UE 5-4
	32 h TD	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 throughout the year (S5 and S6)
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

GBS	***Project knowledge and management***	POLYTECH ANGERS
	3A / Semester 5	UE 5-4
	10h40 CM – 21h20 TP	Project

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

Syllabus
Specialty in Biological Engineering and Health systems
(GBS) 
S6 (3rd year)

Version May 2020
Responsible : Marie Bonnin

GBS	***English***	POLYTECH ANGERS
	3A / Semester 6	UE 6-1
	20h 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	*Foreign Languages: German or Spanish*	POLYTECH ANGERS
	3A / Semester 6	UE 6-1
	16h 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

GBS	***Communication***	POLYTECH ANGERS
	3A / Semester 6	UE 6-1
	5h20 CM – 17h20 TD – 1h20 TP	General Skill

Keywords: Presentation, internship report, poster, intercultural, Professional Student Project

Prerequisites: Note

Objectives:
- Present a synthetic work experience
- Write an internship report
- Create a poster
- Stakes of the intercultural
- Adapt to the communication profile of the contact person
- Engage in an active approach of choice of orientation
- Discover the sectors of activity and socio-economic realities
- Develop a critical attitude towards the information gathered

Programme:
Professional Student Project
Discovery of the sectors of activity and functions concerned
- Conducting business documentary research
- Learn to contact professionals
- Meet with professionals
- Analysing collected information
- Evolving career choices

Communication strategy
1 / Definition of communication objectives
2 / Identify targets
3 / Position yourself in your environment
4 / Formulating the message
5 / Analyse the human and financial resources of your company
6 / Define appropriate means of communication.
7 / Establish communication plan

Bibliography:
L. Bellenger, *Etre constructif dans les négociations et les discussions*, Entreprise Moderne d'Edition, 1984.
A. Da-Silva, *Savoir se présenter efficacement*, Kindle, 2012.
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, *Négocier avec des gens difficiles*, Paris, Le Seuil, 1990.
BRESSY Gilles, KONKUYT Christian, Management et Economie des entreprises, 10ème édition, Collection Aide Mémoire, SIREY, 2011

GBS	***Entrepreneurship***	POLYTECH ANGERS
	3A / Semester 6	UE 6-1
	12h TD	General Skill

Keywords: Entrepreneurship, intellectual property, intrapreneurship.

Prerequisites: None

Objectives:

- ✓ Discern the entrepreneurial spirit, the passion of entrepreneurs, their need to create and innovate and their orientation towards action
- ✓ Propose entrepreneurial projects
- ✓ Implementing creativity and monitoring methods
- ✓ Building a CANVAS business model

Programme:

This introductory entrepreneurship course aims to develop the student's sense of initiative and entrepreneurial spirit, so that he or she can discover and exploit his or her full entrepreneurial potential.

The program takes the student through the entrepreneurial process. Students are led to discover the process of creating a business: from the creation of the idea to commercialization. This course integrates the concepts of industrial property: trademarks, designs and patents.

The notions are approached through the construction of a virtual company that the students will build based on the methods of creativity, the construction of a CANVAS business model and the creation of the identity and values of the company to be built.

Learning outcomes:

The student is expected to identify the stages of an activity creation and to be able to organize a process from the idea to the realization of his entrepreneurial project.

The student must understand the issues involved in intellectual protection and know the broad outlines of the rules of law that govern any activity in society.

Bibliography:

BODELL, Richard W., Garry RABBIOR et Larry W. SMITH, Entrepreneuriat - L'esprit d'aventure, Montréal, Les Éditions de la Chenelière, 1994, 35 p. *

BODELL, Richard W., Garry GASSE, Yvon, et al., PME - Posséder mon entreprise, Vanier, Centre franco-ontarien de ressources pédagogiques, 1998, 281 p.* GASSE, Yvon, et al., PME - Posséder mon entreprise, (Guide de l'étudiant et guide pour réaliser le plan d'affaires),

JOHNSON, M. W. CHRISTENSEN C.M., KAGERMANN H. Reinventing Your Business Model. Harvard Business Review, Dec 2008

LE LOARNE, S. BLANCO, S. et al., Management de l'Innovation, Ed. Pearson, 2e édition, 2012

RIES E., Lean startup, ed Pearson, 2015, 319p.

GBS	*Management and Accounting*	POLYTECH ANGERS
	3A / Semester 6	UE 6-1
	24h TD	General Skill

Keywords: Balance sheet, assets, liabilities, income statement, expenses, incomes, organizational behaviour, social influence, corporate structures, corporate culture

Prerequisites: None

Objectives: To be able to understand the financial information of a business, to understand the human behaviour in the organizations and to meet the requirements to act more effectively in a professional situation

Programme:

Introduction to Organizational Behaviour

I. Individual characteristics and behaviour
   a. The diversity of individuals in organizations
   b. Individual determinants of organizational behaviour
II. Groups
   a. Group pressure or conformism
   b. Standards in a group
   c. Group decision-making
III. The impact of the organizational context on behaviour
   a. Corporate structure and behaviours
   b. Corporate culture

Accounting

I. Objectives and means of accounting
   a. The aims of accounting
   b. Means of general accounting
II. The balance sheet and the impact of management options
   a. Liabilities items
   b. Assets items
   c. Major financial balances
III. The income statement and interim management sales
   a. Incomes analysis and expenses

Bibliography:

Alexandre-Bailly F. (coll.) : « Comportements humains et management » Ed. Pearson Education, 2006
Crozier M. et Friedberg E : « L'acteur et le système » Ed. Seuil, 1977
Doise W., Deschamps J-C., Mugny G. : « Psychologie sociale expérimentale » Ed. Colin, 1991
Robbins S. et Judge T. : « Comportements organisationnels. »: Ed Pearson, 2011
Schermerhorn JR. Et al. (collectif) : « Comportements humains et organisation » Ed ERPI, 2010
Colasse B., Comptabilité générale, Economica, 2000

GBS	*Theatre or scholastic sponsorship*	POLYTECH ANGERS
	3A / Semester 6	UE 6-1
	1h20 CM – 10h40 TP	General Skill

Keywords: Visual and oral communication, expression and behaviour

Prerequisites: None

Objectives:
Manage the relationship to space, to the other, to the body, to speaking and to listening.
Understanding the basics and issues of effective communication
Take a step back from your personal attitude
Adapt to the communication profile of his interlocutor

Programme:

- ✓ Self-confidence, feeling comfortable in oral exercises, mastery of theatrical practices
- ✓ Know how to improvise, react to various situations
- ✓ Be able to master his speech (breathing, articulation, flow, strength of the voice, etc.) and his gesture (holding the body, look, etc.)
- ✓ Know how to communicate, convince and persuade the audience
- ✓ Affirm his personality while knowing how to create in group

Means:

- progressive exercises (individual or collective)
- improvisations
- restitution / show in front of the group

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.

Bibliography:
Communicated by teachers

GBS	***Evolution of health system and socio-medical cares***	POLYTECH ANGERS
	3A / Semester 6	UE 6-2
	16h CM – 4h TD	Engineer Training

Keywords: Social security system, Heath economics, Functioning of Heath system

Prerequisites: none

Objectives:
Give general marks to students concerning Heath system in France.
Give general marks to students concerning Europeans Health system.
Understand the management of Heath establishments
Allow and optimized participation during internships and taking office in health institutions

Programme:
Introduction of the notion of social security and health system
Knowledge of the social security:

- History and evolution
- Finances and reforms of the Social Security

Introduction to the economy of the health

- Economic Specificities of the sanitary domain
- Growth and regulation of healthcare costs
- Needs for cares and consumption of medical cares
- Public Production of cares: economic representation of the hospital sector

Evolution and history of the hospitable system

- The legal and statutory framework
- The national strategy of health
- Administrative and financial functioning of hospitals

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, 5ème 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, 5ème édition, Collection Que sais-je ?, PUF, 2010
PALIER B., La réforme des retraites, Que sais-je ? n°3667, 4ème 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

GBS	*Quality methodology and tools – Part 2*	POLYTECH ANGERS
	3A / Semester 6	UE 6-2
	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 Parsi 2003

GBS	***Experimental design***	POLYTECH 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

GBS	***Health and environment***	POLYTECH ANGERS
	3A / Semester 6	UE 6-2
	14h40 CM – 6h40 TD – 5h20 TP	Engineer Training

Keywords: Hazard/risk, waste, pollution/pollutants, discharges, toxicology/toxicity

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

Bibliography:
Communicated by each teacher

GBS	***Bioinformatics***	POLYTECH ANGERS
	3A / Semester 6	UE 6-3
	8h CM – 9h20 TP	Bio-product technologies

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

GBS	***Biomarkers***	POLYTECH ANGERS
	3A / Semester 6	UE 6-3
	12h CM – 4h TD	Bio-product technologies

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 responses 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

GBS	***Conservation***	POLYTECH ANGERS
	3A / Semester 6	UE 6-3
	17h20 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

GBS	***Molecular detection***	
	3A / Semester 6	UE 6-3
	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 principle
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. Editons 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/

GBS	*Extraction and purification*	POLYTECH ANGERS
	3A / Semester 6	UE 6-3
	18h40 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:

- 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

GBS	***Immunotechnologies***	POLYTECH ANGERS
	3A / Semester 6	UE 6-3
	16h 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) counterimmunoelectrophoresis, 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, 2nd edition, Walker JM., Humana Press, 2002
The immunoassay handbook, 3rd 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

GBS	*Applied studies*	POLYTECH ANGERS
	3A / Semester 6	UE 6-4
	32h Project	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 throughout the year (S5 and S6)
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

GBS	***Internship abroad***	POLYTECH ANGERS
	3A / Semester 6	UE 6-5
	Abroad internship – 13 weeks 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

Syllabus
Specialty in Biological Engineering and Health systems
(GBS) 
S7 (4th year)

Version May 2020
Responsible : Sandrine Giraud

GBS	***English***	POLYTECH ANGERS
	4A / Semester 7	UE 7-1
	28h TD	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.

Evaluation:
Continuous assessment (100%)

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

GBS	*Foreign Languages: German or Spanish*	POLYTECH ANGERS
	4A / Semester 7	UE 7-1
	14h TD	General skills

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

Evaluation
100% Continuous assessment

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

GBS	*Global responsibility and prevention of occupational risks*	POLYTECH ANGERS
	4A / Semester 7	UE 7-1
	12h TD	General skills

Keywords: occupational health and safety, occupational risks, ergonomic, occupational psychology, musculo skeltal disorder, psychosocial risks, single document

Prerequisites: Business organization, rules and regulation

Objectives:
This module is constructed on the base of the referential BES&ST «Bases Essentielles en Santé et Sécurité au Travail» formalised in 2005 (Inrs). It is intended to give to any future engineer essential skills in order to integrate occupational hygiene within all of his/her professional activities.

Programme: Tutorials
- Practice and study on concrete cases based on videos, photos and if possible role-playing, evaluation of working situations (human and technical)
- Calculation, analyses and interpretationion of occupational hygiene indicators
- Analysis of the different dimensions of an occupational accident : causal tree method
- Identification and risks assessment : « unique document » construction and action plan

Evaluation:
100% Continuous assessment

Learning outcomes: Integration of occupational hygiene in its professional activity
- **Identify in any working organization the human, social, economic and legal issues of occupational hygiene**
  Regulatory and normative context, responsibilities
  Internal and external actors of occupational hygiene
  Occupational hygiene indicators and sources of information
- **Integrate occupational hygiene in the management of its activities and projects**
  Vocabulary and definitions - Identify hazardous situations
  Take into account the human factor at work including physical, physiological, cognitive and psychological dimensions, and the working reality
  Identify et assess risks: a priori and a posteriori
  Ergonomics, tools and methods
  « Unique document » for risks assessment: methods and issue
  Risks prevention – Prevention principles
- **Contribute to occupational hygiene management**
  Occupational hygiene management and integrated management system, management commitment
  Safety culture - Reflection on Lean Management: which issue for health at work?

Bibliography :
Sources d'information en santé et sécurité au travail, L. Laborde, B. Berlioz, M. Ferreira, *Techniques de l'ingénieur, collection Sante 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; www.anact.fr; www.travail-et-securite.fr

GBS	***Communication***	POLYTECH ANGERS
	4A / Semester 7	UE 7-1
	20h TP	General skills

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

Prerequisites: French language written and spoken

Objectives:

- Preparing for job search
- Meeting and group animation

Evaluation:
100% Continuous assessment (50% oral checks and 50% written tests)

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.

GBS	*Sport or scholastic sponsorship*	POLYTECH ANGERS
	4A / Semester 7	UE 7-1
	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

GBS	*Statistics and Statistical process control*	POLYTECH ANGERS
	4A / Semester 7	UE 7-2
	10h40 CM / 13h20 TD	Engineer Training

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 biologu**
- **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

Evaluation:
100% Continuous assessment

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

GBS	*Conditionning and packaging*	POLYTECH ANGERS
	4A / Semester 7	UE 7-2
	10h40 CM / 9h20 TD	Engineer training

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

Evaluation:
100% Continuous assessment

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

GBS	***R&D, production***	POLYTECH ANGERS
	4A / Semester 7	UE 7-2
	20h CM / 12h TD / 18h40 TP	Engineer training

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

Evaluation:
100% Continuous assessment

Bibliography:
BioTechnologies, BioProduction, BioMédicaments : Eric Levacher, Instutut des Métiers et des Tecnologies, 2011

GBS	***Processing - Formulation***	POLYTECH ANGERS
	4A / Semester 7	UE 7-2
	13h20 CM / 13h20 TD / 4h TP	Engineer 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 (Anne-Marie Leray Richomme et Frank Boury)

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 emphasise some key points.

Evaluation:

100% Continuous assessment

Bibliography:

Supplied by the teachers

GBS	*Conception and Innovation*	POLYTECH ANGERS
	4A / Semester 7	UE 7-2
	10h40 CM / 6h40 TD / 2h40 TP	Engineer training

Keywords: Conception, innovation processus, Creativity tools, business, eco-conception et suitable 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, crushing ...
Group animation in creativity
Scenario using case studies, role-playing
The problem of innovation in design
Innovation Methodology TRIZ
Ecodesign and sustainble development

Evaluation:
100% Continuous assessment

Bibliography:
Supplied by the teachers

GBS	***Flow management***	POLYTECH ANGERS
	4A / Semester 7	UE 7-2
	10h40 CM / 10h40 TP	Engineer training

Keywords: logistic, production flow, invetory 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

Evaluation:
100% Continuous assessment

Bibliography:
Supplied by the teacher

GBS	*Specific module: Interpersonal communication*	POLYTECH ANGERS
	4A / Semester 7	UE 7-3
	13h20 TD / 6h40 TP	Management course

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

Evaluation :
None

Bibliography :
Méthodes de communication écrite et orale – DUNOD, 4ème édition 2013- ***Michelle Fayet,Jean- Denis Commeignes***
Theories et pratqiues de la communication_ L'HARAMATAN- 2011- Patrice Mbianda,Pierre Mouandjo Lewis

GBS	*Human resources management*	POLYTECH ANGERS
	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

Evaluation:
100% Continuous assessment

Bibliography :
Supplied by teacher

GBS	*Corporate strategy and decision support tools*	POLYTECH ANGERS
	4A / Semester 7	UE 7-3
	12h CM / 10h40 TD	Management course

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), CANVAS*des projets*

Evaluation:
100% Continuous assessment

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

GARRETTE Bernard, DUSSAUGE Pierre et alii. *Strategor*, 6ème édition, Dunod, 2013

JOHNSON Gerry, SCHOLES Kevan et alii. *Stratégique*, 9ème édition, Pearson Education, 2011

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

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

LENDREVIE Jacques, LEVY Julien, *Mercator*, 11ème 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

GBS	***Risks assessment***	POLYTECH ANGERS
	4A / Semester 7	UE 7-3
	22h40 CM / 9h20 TD	Management course

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 programmemes in health care
Biological and chemical hazards
Health Information System
Presentation
Associated risks

Evaluation:
100% Continuous assessment

Bibliography:
Supplied by teachers

GBS	*Audit and quality management*	POLYTECH ANGERS
	4A / Semester 7	UE 7-3
	18h40 CM / 12h00 TD	Management course

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

Evaluation:
100% Continuous assessment

Bibliography:
Supplied by teacher

GBS	*Applied studies*	POLYTECH ANGERS
	4A / Semester 7	UE 7-4
	40h Project	Projects

Keywords: Team working, Project management, Project

Prerequisites: Project management, quality courses

Objectives :

- To be able to analyse a problem and to propose innovative concepts ans solutions related to business practices.
- To use project managment tools on an actual project

Programme:

Evaluation :
Continuous assessment

Bibliography :
Related to each project

GBS	***Professional and Personal Student Project (PPSP)***	POLYTECH ANGERS
	4A / Semester 7	UE 7-4
	6h40h TP	Projects

Keywords: Professional and Personal Student Project

Prerequisites: PPSP EI3- professional experience

Objectives:

- To confirm their choice (choice in semester 7 of a training module that will reinforce the students in their choice of career)
- To take stock of his background, his skills, his knowledge and personal characteristics, his professional project and life project
- To validate and confront his choices with the socio-economic reality

Programme:
Identification of his skills
Precision his profesional project
Anticipating his professional integration

Evaluation:
100% Continuous assessment

Syllabus
Specialty in Biological Engineering and Health systems
(GBS) 
S8 (4th year)

Version May 2020
Responsible : Sandrine Giraud

GBS	***English***	POLYTECH ANGERS
	4A / Semester 8	UE 8-1
	24h TD	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.

Evaluation:
Continuous assessment (100%)

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.

GBS	*Foreign Languages: German or Spanish*	POLYTECH ANGERS
	4A / Semester 8	UE 8-1
	14h TD	General skills

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

Evaluation:
100% Continuous assessment

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 car 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

GBS	***Business Games***	POLYTECH ANGERS
	4A / Semester 8	UE 8-1
	24h TD	General skills

Keywords: Challenges, Financial balance, Treasury, profitability, Teams, multidisciplinary

Prerequisites: Fundamentals in management, marketing, human resources, R&D, business strategy, inventory management, project management and corporate finance.

Objectives:
In the continuity of the financial analysis course, develop an understanding of the operational and financial management of an international group in a competitive environment that is constantly evolving through the practice of a serious game.

Evaluation:
100% Continuous assessment
Continuous monitoring via enterprise game challenges
The performance of participants is measured and compared by both operational and financial indicators, including net income, market shares, return on capital, earnings per share, capacity utilization rates and employee productivity.
The overall performance of the teams is measured by the return to shareholders, which consolidates all the key success factors into a synthetic indicator that can be used to compare the teams.
Oral presentation

Sources
Cesim Global Challenges

GBS	*Team Management and Project planning*	POLYTECH ANGERS
	4A / Semester 8	UE 8-1
	4h CM / 24h TD	General skills

Keywords: Team management, Leadership, Project management, needs analysis, planning, project management and management, project closure and evaluation

Prerequisites: Knowledge of a company

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

Project planning
The objective of this part is to make students aware of the concepts and tools of project management through scenarios, ongoing exchanges with the teacher from the definition and framing of a project, its planning and management until the project is completed and evaluated.
At the end of this course, students will have a better knowledge for:
- Meet project deadlines
- Manage time, quality and resources effectively
- Achieve the objectives set
- Manager the human factor and the different categories of actors involved
- Facilitate teamwork through appropriate communication and common repositories
- 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.

Project planning
- **Needs analysis and project launch**

Tools : QQOQCCP, Brainstorming, Ishikawa diagram, SWOT, project mapping, SMART objectives…
- **Build and Plan**

Tools: WBS, OBS, RACI, planning, decision matrix, backplanning, Gantt, Pert, Eisenhower matrix, risk matrix
- **Driving and Piloting**

Tools : dashboards, decision matrix, mind mapping, PDCA
- **Close and evaluate**

Tools: closing report (post mortem), Deming wheel

Examination :
100% Continuous assessment
situational assessments

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
L'essentiel de la gestion de projet – Aim, Roger (Gualino 2016

GBS	*Sport or scholastic sponsorship*	POLYTECH ANGERS
	4A / Semester 8	UE 8-1
	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

GBS	***Specific module: Contract Law***	POLYTECH ANGERS
	4A / Semester 8	UE 8-2
	10h40 CM / 6h40 TD	Engineer training

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

Evaluation:
100% Continuous assessment

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 (1ère édition)
HESS-FALLON B, SIMON A-M, *Droit Civil*, 23ème 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*, 2ème 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

GBS	***Marketing***	POLYTECH ANGERS
	4A / Semester 8	UE 8-2
	14h40 CM / 1h20 TD / 9h20 TP	Engineer 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

Evaluation :
100% Continuous assessment

Bibliography :
DUBOIS Pierre-Louis, JOLIBERT Alain, *Le marketing, fondements et pratique*, 4ème édition, Economica, 2005

GARRETTE Bernard, DUSSAUGE Pierre et alii. *Strategor*, 6ème édition, Dunod, 2013

JOHNSON Gerry, SCHOLES Kevan et alii. *Stratégique*, 9ème édition, Pearson Education, 2011

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

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

LENDREVIE Jacques, LEVY Julien, *Mercator*, 11ème édition, Dunod 2014

GBS	*GMP, GLP, qualification and validation*	POLYTECH ANGERS
	4A / Semester 8	UE 8-2
	10h40 CM / 9h20 TD	Engineer training

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 responsabilities
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

Evaluation :
100% Continuous assessment

Bibliography :
GLP, Edition OCDE 2006.
GMP

GBS	*Automated systems*	POLYTECH ANGERS
	4A / Semester 8	UE 8-2
	4h CM / 2h40 TD / 7h TP	Engineer training

Keywords: Production tools, Automatism, Quality managment

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

Evaluation :
100% Continuous assessment

Bibliography :
Supplied by teachers

GBS	*Water and Environment*	POLYTECH ANGERS
	4A / Semester 8	UE 8-2
	12h CM / 12h TD	Engineer training

Keywords: Energy, industrial water, purification, pollutions

Prerequisites: basics in physics, chemistry and biology

Objectives:
To understand the modes of energy supply and the problems of water management in a company. Ecological approach to pollution

Programme:
Energy supply for companies
Industrial Hydrology
Affluent
Uses: industrial hot water, cooling water, etc.
Industrial effluents and their treatments
Recycling
Pollution of water
Cycles of nitrogen, phosphorus, carbon
Pure water: methods of obtaining, monitoring

Evaluation:
100% Continuous assessment

Bibliography:
Supplied by teachers

GBS	*Health environments and associated risks*	POLYTECH ANGERS
	4A / Semester 8	UE 8-3.1
	20h CM / 29h20 TD	PPSP training courses

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

Prerequisites: Risks management (EI4-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

Evaluation :
100% Continuous assessment

Bibliography :
Supplied by teachers

GBS	*Built environments and associated risks*	POLYTECH ANGERS
	4A / Semester 8	UE 8-3.1
	25h20 CM / 6h40 TD / 8h 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 responsability
High Environmental Quality
Accessibility and security of persons
Legionellosis
Technological risks

Evaluation:
100% Continuous assessment

Bibliography:
Supplied by teachers.

GBS	*Biotechnology engineering*	POLYTECH ANGERS
	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

Evaluation:
100% Continuous assessment

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

GBS	***Process engineering***	POLYTECH ANGERS
	4A / Semester 8	UE 8-3.2
	18h40 CM / 18h40 TD / 16h 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 benefical or harmful chemical reactions which are involved in food
- To establish relationships between physico-chemical properties of constituents and their main sensory, technological and nutritional propoerties.
- To aquire some expertise on physico-chemical structure and stability of food products
- To put formulation process engineering process knowledge into practice

Programme:

Lectures and tutorials

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

Practical work :

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

Evaluation:

100% Continuous assessment

Bibliography:

Supplied by teachers

GBS	*Management of complex processes*	POLYTECH ANGERS
	4A / Semester 8	UE 8-3.3
	17h20 CM / 18h40 TD / 14h40 TP	PPSP training courses

Keywords: Flow management, Supply chain and logistic, clinical research, data management, monitoring

Prerequisites: Flow management (S7 EI4)

Objectives :

- To be able to organize and support the logistics function
- To know how to optimize production and / or distribution logistics
- To be able to identify the actors of the clinical research and implement the monitoring
- To master the clinical research tools (TMF, BI, BP, data management)

Programme:
Flow management tools
Industrial and business plan, production plan
Cold chain, la marche en avant
Complexity of the supply chain and logistic
Management of clinical studies
Actors of the clinical reseach, role of a project manager
Informed consent
MEP visite, monitoring
Data management

Evaluation:
100% Continuous assessment

Bibliography:
Supplied by the teachers.

GBS	*Quality management system*	POLYTECH ANGERS
	4A / Semester 8	UE 8-3.3
	21h20 CM / 18h40 TD / 2h40 TP	PPSP training courses

Keywords: Quality management, continuous improvement, regulations in clinical research

Prerequisites: None

Objectives :

- To implement a process of continuous improvement
- To understand regulatory requirement for clinical trials
- To understand the specificities of private health institutions and to understand health cooperation

Programme:
Quality management in industry
Direction and quality management
Le lean management and RCA
Regulatory environment for clinical trials
regulations
Protection of persons Committee (PPC)
Risks management in clinical trials
Quality management in healthcar facilities
Health care system organization
Management of Hospitalization at home (HAH), health cooperation
User rights
Manage the restoration function and HACCP

Evaluation:
100% Continuous assessment

Bibliography:
Supplied by teachers.

GBS	*Applied studies*	POLYTECH ANGERS
	4A / Semester 8	UE 8-4
	40h project	Project

Keywords: Team working, Project management, Project

Prerequisites: Project management, quality courses

Objectives:

- To be able to analyse a problem and to propose innovative concepts ans solutions related to business practices.
- To use project managment tools on an actual project

Prsogramme:

Evaluation:
100% Continuous assessment

Bibliography:
Related to each project

GBS	***Training period***	POLYTECH ANGERS
	4A / Semester 8	UE 8-5
	3-4 months	Training courses

Keywords: professional experience, training period

Prerequisites:

Objectives:
First experience as engineer in the speciality domain

Evaluation:
100% Continuous assessment

Syllabus
Specialty in Biological Engineering and Health systems
(GBS) 
S9 (5th year)

Version May 2020
Responsible : Jean-Michel Oger

GBS	***English***	POLYTECH ANGERS
	5A / Semester 9	UE 9-1
	16h TD	General Skill

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

Programme :
- 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 (5th year industrial project)
The student can write a professional report, an abstract, a professional e-mail and a personal profile.

GBS	*Foreign Languages : German or Spanish*	POLYTECH ANGERS
	5A / Semester 9	UE 9-1
	16h TD	General Skill

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
-

Programme :
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

GBS	*Sport or scholastic sponsorship*	POLYTECH ANGERS
	5A / Semester 9	UE 9-1
	16h 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

GBS	*Employability*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-1
	16h TD	General Skills

Keywords :
Job, employability, hiring, integration, professional watch

Prerequisites :
None

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
. positioning of Polytech Angers students in terms of evolving trends
. projections

2.The keys to integration into a team:
. know yourself and have clear objectives to communicate
. exchange of experiences on the fundamentals (codes, social life...)

3.Focus on skills
. Evaluation of the individual skills of his speciality based on the expectations of the CTI
. Convince in 3 minutes for an integration (professional or project)

4.Digital identity
. Digital capsule to know everything
. Audit of your online presence to be ranked at the top of the search list

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.
- Axelle Larroumet, **« Quels talents ! »,** Ed. Diagonart, 2012.
- Isabelle Rouhan en collaboration avec Clara-Doïna Schmelck, **Les métiers du futur, First éditions. 2019.**

GBS	*Employment law*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-1
	8h CM, 8h TD	General Skills

Keywords :
Labour code, employment contract, Collective Agreements, justice

Prerequisites :
None

Objectives :
- 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

Programme :
• 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 :
- Code du travail , ed.Dalloz
- RAY Jean-Emmanuel, « Droit du travail, Droit vivant 2017 », Ed Liaisons, 25ème édition 2016

GBS	*Project costs mastering*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-1
	4h CM, 12h TD	General Skills

Keywords : Market, investment, budget, cost

Prerequisites :

Financial analysis

Objectives :

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

Program :

- 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

Examination : Continuous assessment (100%)

Bibliography :

- Stratégique – Gerry JOHNSON, Kevan SCHOLES, Frédéric FRERY – Ed. PEARSON (10ème 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

GBS	*Ethics*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-1
	16h TD	General Skills

Keywords :
Societal responsibility, environment, societal issues, company, professions, skills, ethics, quandary, values, training, engineer

Prerequisites :
None

Objectives :
- Integrating the impacts of corporate social responsibility internally and externally
- How to position yourself
- Knowing how to value yourself

Program :

1. Corporate Social Responsibility - CSR = an imperative
. CSR as a management tool in companies
. tools to involve employees and stakeholders in a CSR approach : CSR to make work more meaningful and innovative.

2. The IESF engineer's ethical charter
SPIE. the engineer in society
. the engineer and his skills
. the engineer and his job
. the engineer and his missions
. comparison with the ethical charter for engineers in Belgium
https://www.fabi.be/l-ingenieur-charte

+ an ethics workshop: placing groups of students in a dilemma (per spe + animation)

3.Ethics in everyday life

Launching of the actions of your choice: (Specifications + validation of the leads to be carried out)
Follow-up of the actions : (provide a mini specification for each action)
Report on actions : (organize a daily ethics forum where the teams present their work in the appropriate format according to the action and achievements)

A- . The citizen-engineer's commitment to society: carrying out an "honest engineer" project (organizing a blood donation, promoting artistic skills among children in difficulty, organizing an artistic and cultural week on the theme of "art and science", meeting sick children, running to collect doses of vaccine, etc.).
B- Being a creative scientist with an open mind and knowing how to question oneself: through the history of technology, the sociology of work and geopolitics, the student is led to weave links between his future profession as an engineer and the associated activities, considered in their historical, sociological and geopolitical context.
C- . To be a relevant, honest, tolerant and fair professional: zetetic workshop (art of rational doubt). The student is led to confront critical analysis in a concrete way, seeking to distinguish scientific content from pseudo-scientific content, to detect lies with commercial or

propaganda aims, or to prevent the intrusion into the scientific method of ideologies such as racism or creationism.
D- . Being an efficient, vigilant, far-sighted, rigorous and responsive leader: a driving force behind proposals for school and/or training

https://www.innovation-pedagogique.fr/article245.html

Examination :
100% continuous assessment

Bibliography :
NF ISO 26000 Novembre 2010, AFNOR.

GBS	*Management and performance evaluation*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-2
	13h20 CM, 17h40 TD	Engineer training

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

GBS	***Communication, crisis management, conflict management***	POLYTECH ANGERS
	5A / Semestre 9	UE 9-2
	10h40 CM, 20h TD	Engineer training

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

GBS	*Change management*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-2
	4h CM, 4h TD, 4h TP	Engineer training

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

GBS	***Change management***	POLYTECH ANGERS
	5A / Semestre 9	UE 9-2
	8h CM, 1h20 TD, 2h40 TP	Engineer training

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

GBS	*Legal and regulatory specificities in health*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-2
	26h40 CM, 20h TD, 4h TP	Engineer training

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

GBS	***Module I : Health Products Quality Management and Regulatory Approach***	POLYTECH ANGERS
	5A / Semestre 9	UE 9-3.1 (IIPS option) Deepening training
	9h20 CM, 22h TD	

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 specifics regulations for different health sectors
- food products
- beauty produtcs
- 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	*Module II : R&D and Innovation for health products*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-3.1 (IIPS option) Deepening training
	4h CM, 49h TD, 45h TP	

Keywords :
Innovation, Formulation, Physico-chemical caracterization, 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 apllications
- 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
- Buisness innovation

Practical work:
- Microencapsulation
- Spray Drying and Gelation
- Microemulsion
- Foam formulation

Examination :
Continuous assessment (100%)

Bibliography :
Given by teachers

GBS	***Module III : Design and production of health products***	POLYTECH ANGERS
	5A / Semestre 9	UE 9-3.1 (IIPS option) Deepening training
	5h20 CM, 18h40 TD, 26h40 TP	

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

GBS	*Module I : The risks in health*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-3.2 (GRSS option) Deepening training
	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 :
  - Lead, asbestos, radon, air inside, noise, molds, wood,
  - Sanitary Characteristics of building materials,
  - Management of the unexplained collective syndromes,
  - Soil remediations …
- Risks bound(connected) to products / establishments of health:
  - Management of chemical risks
  - Risks in radiotherapy,
  - Risks of pandemic,
  - 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.
-KERMAREC, F., HEYMAN, C. and DOR, F. (2017). Diagnostic et prise en charge des syndromes collectifs inexpliqués. 1st ed. InVS.
-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	*Module II : Statutory aspects and audits*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-3.2 (GRSS option) Deepening training
	12h CM, 32h TD, 8h TP	

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

GBS	*Module III : Integrated risk management*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-3.2 (GRSS option) Deepening training
	20h CM, 40h TD, 6h40 TP	

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.
- Manuel of certification of the establishments of health V2010, in January, 2014, Direction(Management) of the accreditation Orders National of Accreditation and Evaluation in Health, High Authority of Health.
- 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, Fréderic. 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.

GBS	***Module I : Coordination of Complex Health Processes***	POLYTECH ANGERS
	5A / Semestre 9	UE 9-3.3 (MPCS option) Deepening training
	20h CM, 26h40 TD, 17h20 TP	

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

GBS	***Module II : Global management of complex health processes***	POLYTECH ANGERS
	5A / Semestre 9	UE 9-3.3 (MPCS option) Deepening training
	18h40 CM, 40h TD, 4h TP	

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

GBS	***Module III : Design, evaluation and optimization of complex health processes***	POLYTECH ANGERS
	5A / Semestre 9	UE 9-3.3 (MPCS option) Deepening training
	17h20 CM, 36h TD, 4h TP	

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

GBS	*Project*	POLYTECH ANGERS
	5A / Semestre 9	UE 9-4
	100h	Project

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.

Programme :
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

Syllabus
Specialty in Biological Engineering and Health systems
(GBS) 
S10 (5th year)

Version May 2020
Responsible : Jean-Michel Oger

GBS	*Internship*	POLYTECH ANGERS
	5A / Semestre 10	UE 10-1
	5-6 month	Intership

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