

Food safety



FOOD SAFETY CHAPT A



Module overview

Module objectives :

The module of food safety will provide students with the necessary background and operational tools to manage the hygienic quality system of food production, with particular attention for the safety aspect, and guarantee the compliance with the law of processes and finished products characteristics.

There are 3 different “chapters” in this module, 1 being compulsory and 2 being optional :

- A. Food safety, regulations and quality management
- B. Fundamentals of food processing, industry design (optional, done in TFP module too)
- C. Feed safety (optional)

A - Food safety, regulations and quality management Module sections & sequences

	Sections of the discipline	Types of study (ECTS)					Forms of assessment
		TOTAL CLASS	LECTURES	SEMINARS	LAB WORK	PERSONAL WORK	
1	Food chemistry	4	1	1	1	2	Exam, oral, exam paper
2	Food microbiology	4	1	1	1	2	Exam, oral, exam paper
3	Food law and regulations	4	1	1	1	2	Exam, oral, exam paper
4	Food safety and quality management	5	2	1	1	3	Exam, oral, exam paper
	IN TOTAL	16	4	2	3	8	

Food chemistry



Seq.1 Food components (water, lipids, protein, nutrients, carbohydrates, vitamins, minerals,) and functional properties.

Seq.2 Food alteration processes



Food components and functional properties

Knowledge & know-how

- To be able to explain the fundamental chemical properties of components that comprise food (water, proteins, lipids, carbohydrates, minerals, vitamins, enzymes, pigments, and other additives)
- To be able to explain the concept of free-water and water relationships with other molecules
- To be able to describe the primary, secondary and tertiary structures of proteins; to define protein denaturation; to describe the biological, physical and chemical changes that occur on denaturation, and the principal agents that cause denaturation
- To be able to describe the structures of the amino acid as subunits of proteins, to outline their properties and reactions and ph-dependent changes
- To be able to define the term "lipid" and list the main categories of lipid molecules in food systems; to describe and draw the structures of the most commonly-occurring fatty acids in foods, and outline their key physical and chemical properties, including the principal factors that influence their melting behavior
- To be able to distinguish between monoglycerides, diglycerides and triglycerides and draw their structures;
- To be able to describe the key distinguishing features and properties of carbohydrates
- To be able describe the structures, and principal chemical reactions of monosaccharides
- To be able to outline the structures, sources and properties of the main polysaccharides used in the food industry, and the structures of disaccharides and oligosaccharides

Behavior

Communication skills, ability to receive and collect information, self-motivation



Food components and functional properties

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min);
2. Major and minor food components
3. Water: physical properties; chemical properties as solvent, reagent and product of reaction
4. Water activity.
5. Molecular mobility and its relation to food stability.
6. Proteins. Structure and chemical properties.
7. Protein denaturation and chemical changes as a consequence of micro-environmental factors. pH-dependent changes.
8. Carbohydrates. Structure and chemical properties
9. Mono and di-saccharides. Nomenclature and structure. Chemical reactivity.
10. Polysaccharides, starch and cellulose.
11. Hydrocolloids, properties and chemical reactivity.
12. Lipids. Nomenclature and structure.
13. Physical and chemical properties of lipids. Factors affecting their melting behaviour
14. Enzymes. Nature and chemical principles
15. Final considerations
16. Lab work

Tools and media

TOOLS: Whiteboard; books or other documents on food chemistry; material produced and provided by the teacher.

MEDIA: Power point

Prerequisites

Basic knowledge of Chemistry and Biochemistry, knowledge of lab procedures (included consumables and instrumentation)



Food alteration processes

Knowledge

- To be able to explain the fundamental chemical properties of components that comprise food (water, proteins, lipids, carbohydrates, minerals, vitamins, enzymes, pigments, and other additives)
- To be able to describe the main alterations occurring in food and their relationship with food composition
- To be able to outline which environmental conditions influence food alteration and to explain how
- To be able to describe the relationships between aw and food stability and its relationships with components' transformation
- To be able to explain which may be the sanitary concerns of a particular kind of food alteration
- To be able to illustrate which alterations mainly occur in the principal categories of food

Know how

- To be able to control the environmental conditions to avoid or reduce the occurrence of alterations
- To be able to predict which alterations may occur according to the kind of food and its composition
- To be able to recognize the main forms of food alteration
- To be able to avoid conditions that enhance alteration during processing
- To be able to choose proper actions to be taken when a particular alteration occurs (restoration; further processing; disposal, etc..)

Behavior

Communication skills, ability to receive and collect information, self-motivation



Food alteration processes

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min);
2. The concept of alteration and difference between alteration and senescence. The concept of shelf-life
3. Main alterations occurring in food and their categorization: microbiological/non-microbiological; intrinsic enzymes; physical and chemical causes: oxygen; radiations; heat; humidity; mechanical stress.
4. Most frequent reactions: lipid oxidation; hydrolysis; Maillard reaction. Sanitary considerations.
5. Main alterations due to the composition of food (proteins, carbohydrates, lipids). Sanitary considerations.
6. Relationship between Arrhenius reaction rate: lipid oxidation; non-enzymatic and enzymatic alterations; microbiological growth.
7. Main alterations in MEAT and meat TRAD products; influence of environmental and processing conditions. Action to be taken. Sanitary considerations.
8. Main alterations in MILK and dairy TRAD products; influence of environmental and processing conditions. Action to be taken. Sanitary considerations.
9. Main alterations in EGGS and egg products; influence of environmental and processing conditions. Action to be taken. Sanitary considerations.
10. Main alterations in FISH and fish products; influence of environmental and processing conditions. Action to be taken. Sanitary considerations.
11. Class work: group organization and task delivery: predicting possible alterations after delineating kind of food and environmental conditions
 - Group work outcome
12. Class work: group organization and task delivery: action to be taken when a determined alteration occurs in determined conditions
 - Group work outcome
13. Final considerations

Tools and media

TOOLS: Whiteboard; books or other documents on food chemistry; material produced and provided by the teacher.

MEDIA: Power point; short movies

Prerequisites

Food Chemistry

Food microbiology



Seq.1 Microbial contamination of food raw materials and food products

Seq.2 Microbial growth in food, ecology and microbial associations

Seq.3. Microbiological indicators

Seq.4. Microbial pathogens

Seq.5. Moulds and metabolites: Mycotoxins

Seq 6. The microflora of fish. Evolution of populations according to processing and environmental conditions

Seq 7. The microflora of milk. Evolution of populations according to processing and environmental conditions

Seq 8. The microflora of meat. Evolution of populations according to processing and environmental conditions

Seq 9. The microflora of plant-products. Evolution of populations according to processing and environmental conditions

Seq 10. The microbiological criteria according to the law



Microbial contamination of raw materials and food products

Knowledge

- To be able to describe the form of possible contaminations of food
- To be able to outline the prerequisites of producing facilities and environments to prevent or reduce contamination of raw materials and products and the working conditions and behavior of operators

Know how

- To be able to evaluate the contaminating potential of a defined environment
- To be able to evaluate if the proper prerequisites related to contamination prevention of the production chain are respected
- To be able to evaluate if the working behavior of operator is compliant with the GMP
- To be able to educate operators on the GMP, rules and behavior

Behavior

communication skills, ability to receive and collect information, self-motivation



Microbial contamination of raw materials and food products

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min);
2. The concept of contamination. Primary, secondary, tertiary and quaternary contamination.
3. Environment and contamination risk
4. Operators and contamination risks
5. Principles of control of microbiological contaminants.
6. Prerequisites of the production facilities
7. Final considerations

Tools and media

TOOLS: Whiteboard; books or other documents on food microbiology; material produced and provided by the teacher.

MEDIA: Power point; short movies

Prerequisites

General microbiology



Microbial growth in food, ecology and microbial associations

Knowledge

- To be able to summarize the factors that affect the growth of microorganisms in food environments
- To be able to outline the categories of microorganism with regard to their growing potential according to the environmental factors (i.e., aW, pH, temperature)
- To be able to describe the role and significance of microbial inactivation, adaptation and environmental factors on growth and response of microorganisms in various environments.
- To be able to summarize the concept of microbial ecology, the interaction among different species and effects on microorganism population in the final products

Know how

- To be able to identify the intrinsic and extrinsic factors associated with foods and foresee their possible effects on microbial survival and growth
- To be able to predict the effect of changing environmental conditions on microbial growth
- To be able to use informatic tools to simulate survival and the growth of microorganism in a defined environment

Behavior

communication skills, ability to receive and collect information, self-motivation



Microbial growth in food, ecology and microbial associations

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min);
2. Asking about already acquired knowledge on factor affecting the MO growth. The teacher asks the students to write down on a post-it 2 factors important for MO growth (5 min). Discussion.
3. Theoretical input from the teacher on each factor: intrinsic factors influencing microbial growth in food: kind of food (Aw, pH, Eh, micro and macro structure) ; MO (characteristics)
4. Extrinsic factors influencing microbial growth in food (T; humidity; pO₂)
5. Microbial associations: neutralism, synergism, antagonism and commensalism. Quorum sensing. The change of microbial population from raw materials to the final products: general concepts and examples.
6. Class work. Group and task planning. Creation of a hypothetical situation: prediction of MO evolution. Exercises presenting some food products: students are asked to evaluate the potential for MO growth. Some exercises with some modifications in environment and/or composition.
7. Presentation of outcomes.
8. Testing questions for students
9. Practical approach: microbial growth simulators
10. Synthesis from the teacher with hints to informatics modelling methods to assess MO growth (simulators)
11. Final considerations

Tools and media

TOOLS: Whiteboard; books or other documents on food microbiology; material produced and provided by the teacher; software for microbial growth simulation

MEDIA: Power point; short movies

Prerequisites

General microbiology



Microbiological indicators

Knowledge

- To be able to describe the different types of microorganisms typically associated with foods as indicators
- To be able to describe the spoilage and deterioration mechanisms in foods
- To be able to explain the principles that make a food product safe for consumption.
- To be able to outline the microbiological concerns associated with organic foods and mild technologies

Know how

- To be able to identify the important spoilage microorganisms in food and the conditions under which they will grow.
- To be able to identify the conditions under which the spoilage microorganisms are commonly inhibited or whose activity is significantly reduced

Behavior

communication skills, ability to receive and collect information, self-motivation



Microbiological indicators

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min);
2. Microbiological indicators: typicality indicators; quality indicators; salubrity indicators
3. Food spoilage microorganisms. Conditions of growth, growth inhibition and inactivation. Deterioration mechanisms.
4. Technological microorganisms. Fermentations. Role in contrasting the growth of food spoilage and pathogenic microorganisms
5. Organic food: Pro & con
6. Mild technologies: Pro & con
7. Final considerations

Tools and media

TOOLS: Whiteboard; books or other documents on food microbiology; material produced and provided by the teacher

MEDIA: Power point; short movies

Prerequisites

General microbiology



Microbial pathogens

Knowledge

- To be able to outline the characteristics of the main food pathogens and the conditions under which they grow.
- To describe the more favorable substrates on which pathogens may grow
- To outline the limiting conditions for their activity or survival
- To be able to provide comprehensive information on the prevalence and nature of microorganisms that cause foodborne diseases

Know how

- To be able to identify high risk food
- To be able to establish the limiting conditions under which the main pathogens are inactivated, killed or made harmless in foods.
- To be able to define a problem, identify potential causes and possible solutions, and make thoughtful recommendations.
- To apply critical thinking skills to new situations.
- To be able to critically review the literature

Behavior

communication skills, ability to receive and collect information, self-motivation



Microbial pathogens

Progression

1. Introductory speech; objectives and methodology of the sequence (10 min);
2. The main microbial pathogens in food: characteristics, natural habitat; occurrence in food; growing conditions and conditions of inactivation. Salmonella spp.
3. E. coli
4. Shigella
5. Campylobacter jejuni
6. Yersinia enterocolitica
7. Aeromonas hydrophila
8. Listeria monocytogenes and other Listeria
9. Staphylococcus aureus
10. Bacillus cereus
11. Clostridium perfringens
12. Clostridium botulinum and other Clostridium responsible for botulism cases
13. Vibrio spp.
14. Viruses (Norovirus, and other enterovirus; hepatitis viruses)
15. Case studies: real examples or events in which pathogens may grow and countermeasures to adopt to safeguard public health (on the a chain level)
16. Class work. Group organization and task delivery. Delineate context and development of microbial growth for each pathogens (story inventing).
 - Presentation of outcomes and discussion
17. Class work. Group organization and task delivery: literature review on significant studies on pathogens' characteristic (capacity of growth, resistance, challenge tests, etc..)
 - Presentation of outcomes and discussion
18. Final considerations

Tools and media

TOOLS: Whiteboard; books or other documents on food microbiology; material produced and provided by the teacher

MEDIA: Power point; short movies

Prerequisites

General microbiology



Moulds and metabolites: Mycotoxins

Knowledge

- To be able to outline conditions of survival and growth of moulds (included resistance forms) and their relationships with other microorganisms
- To be able to describe the main toxins produced by moulds and conditions for production
- To be able to describe the raw materials or high risk finished products on which mycotoxins may be produced
- To be able to outline the possible consequences for animal and public health

Know how

- To be able to identify potential conditions to which high risk of mould growth and toxin production are associated
- To be able to choose the proper conditions of conservation to avoid or limitate toxin production on raw materials or food
- To be able to plan the proper controls for high risk raw materials or food
- To be able to identify the proper countermeasures in case of mould contamination (disposal, reclamation, etc...)

Behavior

communication skills, ability to receive and collect information, self-motivation



Moulds and metabolites: Mycotoxins

Progression

1. Introductory speech; objectives of the sequence (10 min);
2. The world of fungi and moulds: definitions and general principles. Condition for survival, growth and production of toxic metabolites (Mycotoxins). Spores and resistance forms.
3. Aflatoxins: where, when, how. Sanitary implications. Controls.
4. Ochratoxins.....
5. Citrinin.....
6. Ergot alkaloids.....
7. Fumonisin.....
8. Patulins.....
9. Trichothecenes.....
10. Zearalenone.....
11. Hints to the normative
12. Final considerations

Tools and media

TOOLS: Whiteboard; books or other documents on food microbiology; material produced and provided by the teacher

MEDIA: Power point; short movies

Prerequisites

General microbiology



The microflora of fish. Evolution of population according to process and environmental conditions

Knowledge

- To be able to describe the microbiology of a range of commodities related to the fish industry, including detrimental MO and pathogens
- To be able to describe the changing in the microflora of fish during processing and storage.

Know how

- To be able to evaluate raw materials, possible processing and storing conditions to predict the microbiological conditions of intermediate products or finished products during their shelf life
- To be able to predict possible microflora variation when changing environmental conditions and eventual countermeasures to be taken

Behavior

communication skills, ability to receive and collect information, self-motivation



The microflora of fish. Evolution of population according to process and environmental conditions

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min)
2. Microbiology of fresh fish, according to the provenience (fresh/sea water; cold or warm water; habitat, etc..)
3. The effect of cold on the microbiological evolution
4. The effect of processing on microbiological evolution (salting, pickling, smoking, cooking)
5. Microbiology of other seafood
6. Practical activity: predicting the possible change in microflora by changing environmental conditions
7. Final considerations

Tools and media

TOOLS: Whiteboard; books or other documents on food microbiology; material produced and provided by the teacher

MEDIA: Power point; short movies

Prerequisites

General microbiology



The microflora of milk. Evolution of population according to process and environmental conditions

Knowledge

- To be able to describe the microbiology of a range of commodities related to the milk industry, including detrimental MO, typical MO and pathogens
- To be able to describe the changing in the microflora of milk and dairy products during processing and storage.

Know how

- To be able to evaluate raw materials, possible processing and storing conditions to predict the microbiological conditions of intermediate products or finished products during their shelf life
- To be able to predict possible microflora variation when changing environmental conditions and eventual countermeasures to be taken

Behavior

communication skills, ability to receive and collect information, self-motivation



The microflora of milk. Evolution of population according to process and environmental conditions

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min)
2. Microbiology of fresh milk
3. The effect of cold on the microbiological evolution
4. The effect of processing on microbiological evolution (pasteurization; sterilization)
5. Microbiology of dairy products: butter and creams
6. Microbiology of fermented products: cheese, yogurt and other sour products
7. Microbiology of other traditional products
8. Practical activity: predicting the possible change in microflora by changing environmental conditions
9. Final considerations

Tools and media

TOOLS: Whiteboard; books or other documents on food microbiology; material produced and provided by the teacher

MEDIA: Power point; short movies

Prerequisites

General microbiology



The microflora of meat. Evolution of population according to process and environmental conditions

Knowledge

- To be able to describe the microbiology of a range of commodities related to the meat industry, including detrimental MO, typical MO and pathogens
- To be able to describe the changing in the microflora of meat and meat products during processing and storage.

Know how

- To be able to evaluate raw materials, possible processing and storing conditions to predict the microbiological conditions of intermediate products or finished products during their shelf life
- To be able to predict possible microflora variation when changing environmental conditions and eventual countermeasures to be taken

Behavior

Communication skills, ability to receive and collect information, self-motivation



The microflora of meat. Evolution of population according to process and environmental conditions

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min)
2. Microbiology of fresh meat
3. The effect of cold on the microbiological evolution
4. The effect of processing on microbiological evolution
5. Microbiology of traditional products
6. Practical activity: predicting the possible change in microflora by changing environmental conditions
7. Final considerations

Tools and media

TOOLS: Whiteboard; books or other documents on food microbiology; material produced and provided by the teacher

MEDIA: Power point; short movies

Prerequisites

General microbiology



The microflora of vegetables. Evolution of population according to process and environmental conditions

Knowledge

- To be able to describe the microbiology of a range of commodities related to the industry of products of plant origin, including detrimental MO and pathogens
- To be able to describe the changing in the microflora of plant-products during processing and storage.

Know how

- To be able to evaluate raw materials, possible processing and storing conditions to predict the microbiological conditions of intermediate products or finished products during their shelf life
- To be able to predict possible microflora variation when changing environmental conditions and eventual countermeasures to be taken

Behavior

communication skills, ability to receive and collect information, self-motivation



The microflora of vegetables. Evolution of population according to process and environmental conditions

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min)
2. Microbiology of fresh vegetables and fruit
3. The effect of cold on the microbiological evolution
4. The effect of processing on microbiological evolution
5. Microbiology of traditional products
6. Practical activity: predicting the possible change in microflora by changing environmental conditions
7. Final considerations

Tools and media

TOOLS: Whiteboard; books or other documents on food microbiology; material produced and provided by the teacher

MEDIA: Power point; short movies

Prerequisites

General microbiology



Food Safety and quality management



Seq 1 Chemical and physical hazards

Seq 2. Additives

Seq 3. Allergens

Seq 4. Protozoans and parasites

Seq 5. Foodborne diseases

Seq 6. Risk analysis

Seq 7. Traceability & standards (ISO, etc...)



Seq 8. GMP, GHP, self-monitoring and HACCP

Seq 9. Cleaning and Sanitization

Seq 10. Pest management

Seq 11. Adulteration of food products

Seq 12. Transgenic products

Seq 13. Labelling

Seq 14. Sampling and metrology

Seq 15. Basis on microbiological analysis (what and how)

Seq 16. Basis on chemical analysis (what and how)

Seq 17. Basis on DNA based analysis (what and how)



Chemical and physical hazards

Knowledge & know-how

- To be able to identify the different categories of chemical and physical hazards and their causes
- To be able to describe the contamination of food raw materials and food products by chemical elements present in the environment and associated risks
- To be able to describe the food contamination by chemicals used as pharmaceuticals and associated risks and effects on animal and human organisms.
- To be able to describe ecological aspects of chemical contaminant, their transformation and degradation, and the distribution in living organisms
- To be able to describe the contamination by physical particles of food raw materials and food products and associated effects on animal and human organisms
- To be able to describe the radioactive contamination of food raw materials and food products and associated effects on animal and human organisms.
- To be able to describe how the risk from each contaminants can be managed.
- To be able to outline the legislative and regulatory framework.
- To be able to evaluate the risk related to contaminants associated to categories and origin of raw materials
- To be able to apply the ecological safety requirements for food products in various stages of production.
Classification of ecological safety in the RF, KZ, EU
- To be able to create and implement plans for management of risks in normal conditions and in non-standard conditions (high contaminations)
- To be able to set up the right control plan for raw materials and products and choose the right analytical methods
- To be able to apply procedures of disposal of non-compliant products or materials

Behavior

Ability of analysis and synthesis; social and ethical responsibility for decisions; communication skills; team-work; self-learning; ability to receive and collect information



Progression

1. Introductory speech, objectives of the sequence (10 min)
2. Contaminants and additives, definition and characterization.
3. Basic concepts for identification of hazards and evaluation on risk: acute and chronic effects, the NOAEL, LOAEL, ADI, etc. according to the international recommendations (Codex Alimentarius, FAO, WHO).
4. Non-biotic environmental contaminants (insecticides, fungicides, herbicides, fumigants, heavy metals, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, dioxins, phthalate). Sanitary implications.
5. Contaminants deriving from illegal or improper use of pharmaceuticals. (antimicrobics, growth promoters, tranquilizers, etc..). Sanitary implications.
6. Bio indicators and bio-magnifications.
7. Physical hazards from mechanical processes in food products. Sanitary implications.
8. Food and radioactivity. Sanitary implications.
9. Legal framework in RU/KZ
10. Hint to international laws (EU, others)
11. Practical activity. Group work and task delivery: examination of border alerts and refusal of entry at the border. Discussion.
12. Final considerations.

Tools and media

TOOLS: Whiteboard

MEDIA: Power point, books or other paper on food contaminants; materials produced by the teacher; public databases

Prerequisites

Food chemistry; food law



Additives

Knowledge & know-how

- To be able to classify food additives
- To be able to explain physical-chemical properties of the main food additives and outline functions, their importance and the advantages and disadvantages of their uses.
- To be able to describe possible risks associated to potentially hazardous additives and the main criteria for their safe use.
- To be able to describe allowable dose of additives in food products.
- To be able to list banned or severely limited food additives
- To be able to outline the main regulations on food additives
 - To be able to select food and safe additives for the production of food with desired quality characteristics.
 - To be able to evaluate the risk associated to improper use of additives
 - To be able to apply the requirements and policy relating to food additives for law-compliant production
 - To be able to orientate in law regulating additives

Behavior

Ability of analysis and synthesis; social and ethical responsibility for decisions; communication skills; team-work; self-learning; ability to receive and collect information



Progression

1. Introductory speech, objectives of the sequence (10 min)
2. Contaminants and additives, definition and characterization.
3. Basic concepts for identification of hazards and evaluation on risk: acute and chronic effects, the NOAEL, LOAEL, ADI, etc. according to the international recommendations (Codex Alimentarius, FAO, WHO).
4. Non-biotic environmental contaminants (insecticides, fungicides, herbicides, fumigants, heavy metals, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, dioxins, phtalate). Sanitary implications.
5. Contaminants deriving from illegal or improper use of pharmaceuticals. (antimicrobics, growth promoters, tranquilizers, etc..). Sanitary implications.
6. Bio indicators and bio-magnifications.
7. Physical hazards from mechanical processes in food products. Sanitary implications.
8. Food and radioactivity. Sanitary implications.
9. Legal framework in RU/KZ
10. Hint to international laws (EU, others)
11. Practical activity. Group work and task delivery: examination of border alerts and refusal of entry at the border. Discussion.
12. Final consideration.

Tools and media

TOOLS: Whiteboard

MEDIA: Power point, books or other paper on food contaminants; materials produced by the teacher; public databases

Prerequisites

Food chemistry; food law



Protozoans and parasites

Knowledge & know-how

- To be able to list the main protozoa and parasites possible dwelling in food
- To be able to outline the characteristics of the main protozoa and parasites possibly present in food
- To be able to associate raw materials or finished products to the possible presence of a determined protozoan or parasite
- To be able to explain the possible sanitary implications of the ingestion of food with livable protozoans or parasites
- To be able to describe the limiting conditions for their survival
- To be able to provide comprehensive information on the prevalence and nature of protozoans or parasites that cause foodborne diseases
- To be able to identify high risk food
- To be able to establish the limiting conditions under which the main protozoans or parasites are inactivated, killed or made harmless in foods.
- To be able to define a problem, identify potential causes and possible solutions, and make thoughtful recommendations.
- To apply critical thinking skills to new situations.
- To be able to critically review the literature

Behavior

Communication skills, ability to receive and collect information, self-motivation



Protozoans and parasites

Progression

1. Introductory speech; objectives and methodology of the sequence (10 min);
2. The main protozoan pathogens in food: characteristics, natural habitat; occurrence in food; conditions of inactivation. Sanitary concerns
3. The main parasites with pathogenic potential in meat: characteristics, natural habitat; occurrence in food; conditions of inactivation. Sanitary concerns
4. The main parasites with pathogenic potential in fish: characteristics, natural habitat; occurrence in food; conditions of inactivation. Sanitary concerns
5. Case studies: real examples or events in which livable parasites may be found and countermeasures to adopt to safeguard public health (on the a chain level)
6. Final considerations

Tools and media

TOOLS: Whiteboard, video projector

MEDIA: Power point, books; materials produced by the teacher

Prerequisites

Food microbiology; Food law and regulation



Foodborne diseases

Knowledge & know-how

- To be able to explain the concept of foodborne diseases and outline their possible etiology
- To be able to describe the main different kind of FBD and their possible sanitary concerns
- To be able to explain the modalities of transmission and virulence of foodborne pathogens
- To be able to discuss their impact on society
- To be able to outline the causes of FBD and discuss the way they could affect food production, included consequences for responsible FBO, companies, brands.
- To be able to explain how pathogens are evolving
- To be able to explain the impact of social and environmental evolution on FBD characteristics and impact
- To be able to describe an outbreak
 - To be able to evaluate possible hazards coming from raw materials or food coming from a defined area of the world in relation to the possibility to give rise to FBDs
 - To be able to find and interpret the significant literature and official reports on FBD epidemiology
 - To be able to evaluate the FBD resurgence risk associated to food manipulation, including processing.

Behavior

Communication skills, ability to receive and collect information, self-motivation



Foodborne diseases

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min);
2. Foodborne diseases (FBD): definition and contextualization
3. Distinction between acute and chronic or systemic diseases
4. Food toxicology (chemicals)
5. FBD pathology: enteric forms and complications; symptoms
6. Mechanisms of pathogenicity of invasive and non-invasive pathogens
7. Infections, intoxications and toxoinfections. Pathogens associated
8. Main FBD associated to protozoa and parasites.
9. Body mechanisms of defense
10. FBD outbreaks (outbreaks limited in space and time; high dispersion in space and time outbreaks)
11. Global socio-economic and sanitary implications
12. Evolution of FBD and evolution of society (aging; other diseases; changing in food habits; globalization)
13. Evolving pathogens and emerging pathogens
14. Climate changing and evolution of FBD. Perspectives
15. Diagnostic tools, statistic and epidemiological considerations. Examination of official reports
16. More involved microorganisms and geographical prevalence
17. Distribution of FBD according to food vehicle and place of meal delivery
18. FBD and food manipulation
19. Class work: group organization and task delivery.
 - The groups are asked to invent a story from contamination to the outbreak, justifying every steps and delineating the geographic involvement (i.e. one operator has a *S.aureus* infection and he/she does not properly protect the infected area..... which raw materials? Which finished product? What evolution?.
 - i.e.2 the processing plant was supplied with vegetables slightly contaminated with manure, which has not been properly sanitized....which bug? what evolution? Etc...)
20. Final considerations

Tools and media

TOOLS: Whiteboard, video projector

MEDIA: Power point, books; materials produced by the teacher, Official epidemiological reports;

Prerequisites

Food microbiology; Food law and regulations, previous sequences of the food safety and quality management section.



Risk analysis

Knowledge & know-how

- To be able to summarize the risk analysis principles
- To be able to perform a risk analysis on the food chain

Behavior

Communication skills; ability to receive and collect information; problem solving skills; self-motivation; ability to work in team; analytical ability

Progression

1. Introductory speech (10 min); objectives and modalities of the sequence
2. Risk analysis: risk assessment; risk management; risk communication
3. Practical approach: performing risk analysis in a pre-defined situation
4. Final considerations

Tools and media

TOOLS: Whiteboard, video projector

MEDIA: Power point, Books; Materials produced by the teacher

Prerequisites

Food chemistry; Food microbiology; Food law and regulations; previous sequences of the food safety and quality management section



GMP, GHP, self-monitoring, HACCP

Knowledge & know-how

- To be able to explain the normative background and the concept of Good Manufacturing Practices (GMP), Good Hygiene Practices (GHP) and their basis
- To be able to explain the concept of self-monitoring and the basic elements of hazard analysis critical control points (HACCP) and the general approach to implement a HACCP plan within a food process.
- To be able to describe an audit.
- To be able to apply the key elements of food quality assurance, including analyzing, writing and implementing HACCP plans in a food processing situation (includes prerequisite programs like GMP and GHP)
- To be able to project a HACCP plan
- To be able to set up and maintain a process control chart, design an effective sampling plan for a food processing/distribution environment, and effectively evaluate whether a process is in control

Behavior

Communication skills; ability to receive and collect information; problem solving skills; self-motivation; ability to work in team; analytical ability; organizational skills

Progression

1. Introductory speech (10 min); objectives and modalities of the sequence
2. An introduction to GMP and GHP and other prerequisite programs, (20 min). Self-monitoring
3. Examination of the hazard analysis and critical control point (HACCP) concept. The 5 phases and the 7 principles of HACCP
Analysis of generic HACCP modules
4. Practical approach: analysis of a HACCP plan (how many type of production?)
5. Class work: group organization and task delivery.
 - Development of a HACCP plan for meat industry
 - Presentation of each group outcome
 - Development of a HACCP plan for cheese industry
 - Presentation of each group outcome
 - Etc...
6. Final considerations



Tools and media

TOOLS: Whiteboard, video projector, empty posters; post-it

MEDIA: Power point, Books; Materials produced and provided by the teacher

Prerequisites

Food chemistry; Food microbiology; Food law and regulations; previous sequences of the food safety and quality management section



Traceability and standards

Knowledge & know-how

- To be able to describe the background, the various systems used and the practical implementation of the International Standards Organization (ISO) (and/or other) quality system(s) within the food manufacturing industry
- To be able to outline the legal requirements for traceability
- To be able to implement a quality system related to standards
- To be able to collect and interpret legal requirements for traceability implementation and be able to update and follow possible changes in the legal framework
- To be able to implement and critically review a traceability plan according to defined standards
- To be able to respond to a food recall

Behavior

Communication skills; ability to receive and collect information; problem solving skills; self-motivation; ability to work in team; analytical ability; organizational skills

Traceability and standards

Progression

1. Introductory speech (10 min); objectives and modalities of the sequence
2. The concept of traceability, its application along the chain and benefits. The difference between chain traceability and internal traceability
3. Legal requirements for traceability
4. National standards
5. International standards (ISO,....)
6. Logical steps to deliver an effective traceability system
7. Collecting relevant supplier information
8. Recall systems
9. Class work: group organization and task delivery.
 - Outlining a traceability system within a defined processing plant
 - Collection of information from suppliers
 - Alert simulation (i.e. food recall, etc....)
10. Experts working in a processing plant illustrate their internal traceability system
11. Final considerations

Tools and media

TOOLS: Whiteboard; books or other paper on food traceability; materials collected from international organizations for standards; materials produced by the teacher.

MEDIA: Power point, Short movie on internal traceability

Prerequisites

Food chemistry; Food microbiology; Food law and regulations; previous sequences of the food safety and quality management section.



Labelling

Knowledge & know-how

- To be able to outline the requirement for producing labelling in different categories of food
- To be able to describe the labelling obligations for the safeguard of the consumers' health, in particular regarding presence of allergens or use modality
- To be able to correctly classify food and possibly identify special needs of labelling
- To be able to produce labels for products to be sent onto the market in conformity with the law requirements

Behavior

To think critically about labelling requirements; technical writing; ability to receive and collect information; self-learning

Progression

1. Introductory speech. Objectives and modalities of the sequence (10 min);
2. Labelling requirements according to the local laws (to be divided in several steps according to the categories of food)
3. Labelling requirement according to the international rules
4. Class work: group organization and task delivery: students are required to produce labels for several different kind of food
5. Final consideration

Tools and media

TOOLS: Whiteboard; video projector; true labels of food

MEDIA: Power point; Reference to the normative; material provided by the teacher

Prerequisites

Food chemistry; food microbiology; Food law and previous sequences of Food safety



Cleaning and Sanitation

Knowledge & know-how

- To be able to describe conditions of working benches and machineries after each cycle of production
- To be able to explain the chemistry and practice of cleaning and sanitation
- To be able to describe the proper management of toxic chemical products
- To be able to outline the issues regarding safety of water
- To be able to outline the risks due to cross-contamination and condition of adulteration of surfaces
- To be able to analyse existing plans and design new plans for cleaning and sanitation protocols in food processing operations
- To be able to choose the proper products, based on their chemical properties, for a determined cleaning operation
- To be able to take the right choices to avoid cross-contamination and adulteration of surfaces
- To be able to survey the employee health conditions
- To be able to illustrate operational condition and cleaning and sanitation plans to employees

Behavior

Critical thinking; information acquisition skills; organizational skills; communication skills; team work; sense of responsibility

Cleaning and Sanitation

Progression

1. Introductory speech. Objectives and modalities of the sequence (10 min);
2. Processing environment and chemical and microbiological contamination scenario
3. Fundamentals of cleaning and sanitization. Physical and chemical alternatives.
4. Available chemicals and possible choices
5. Labelling, storage, and use of toxic chemicals
6. Water, steam, and ice safety
7. Processing equipment cleaning and sanitation
8. Cross-contamination prevention
9. Adulteration prevention (protection of food contact surfaces from contaminants)
10. Control of employee health conditions
11. Brushes and Buckets
12. Final considerations

Tools and media

TOOLS: Whiteboard

MEDIA: Powerpoint; books or other paper on food sanitization; labels of products; materials collected from manufacturers; materials produced by the teacher.

Prerequisites

Food chemistry; Food microbiology; Food safety



Pest management

Knowledge & know-how

- To be able to list different kind of pests
- To be able to outline the prevention actions to minimize the risk related to pest presence
- To be able to describe the steps for an effective pest management program
- To be able to set up a plan for pest management
- To be able to put into action plans for pest management, included the choice of the right treatment when pests infest the production environment and the production of the proper documentation

Behavior

Critical thinking; information acquisition skills; organizational skills; communication skills; team work; sense of responsibility

Progression

1. Introductory speech. Objectives and modalities of the sequence (10 min);
2. Different kind of pests in the food industry
3. Prevention
4. Inspection
5. Identification
6. Analysis
7. Treatment selection
8. Monitoring
9. Documentation
10. Practical work: case study
11. Practical work: analysis of documentation
12. Final consideration



Tools and media

TOOLS: Whiteboard

MEDIA: Power point; books or booklets on other paper on food sanitization; food industry documentation; materials produced by the teacher.

Prerequisites

Food chemistry; Food microbiology; Food safety



Transgenic products

Knowledge & know-how

- To be able to list the main GMOs available on the market
- To be able to outline the main sanitary concerns about GMO utilization
- To be able to summarize the regulation on GMO utilization
- To be able to explain the possible benefit and detriment of using GMO in food industry
- To be able to collect information on GMO from databases
- To be able to implement procedures in compliance with the law when including GMOs among ingredients

Behavior

To think critically; communication skills; ability to receive and collect information; self-learning

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min);
2. What is a GMO?
3. The main GMOs and their presence on the global market
4. Practical work: going through databases where GMO are registered and collecting information on their characteristics
5. GMO and security-related concerns
6. Consumers' point of view and possible benefit/detriment in using GMO in food production
7. National regulation on GMO utilization. Registration and labelling
8. Hint to international regulation on GMO utilization
9. Final considerations



Tools and media

TOOLS: Whiteboard, books or other papers on GMO; material produced by the teacher.

MEDIA: Power point; Internet databases.

Prerequisites

Food law and regulations.



FOOD SAFETY CHAPT B



There are 3 different “chapters” in the food safety module, 1 being compulsory and 2 being optional :

- A. Food safety, regulations and quality management
- B. Fundamentals of food processing, industry design**
- C. Feed safety (optional)

A note that the sequences of this chapter B are optional since they are also part of the TFP (Traditional Food Processing) module. It is up to the pedagogical teams to decide whether it is taught in this module or in the TFP or in both.

Fundamentals of food processing industry, design and management

Module sections & sequences

	Sections of the discipline	ECTS	Forms of assessment
1	Principles and methods of food preservation	2	Exam, oral, exam paper
2	Packaging	1	Exam, oral, exam paper
3	Storage and distribution. Hot & cold chain	1	Exam, oral, exam paper
4	Traditional product processing and safety concerns and management	2	Exam, oral, exam paper
5	Fundamentals of food industry design.	2	Exam, oral, exam paper
	IN TOTAL	8	



Fundamentals of food processing industry, design and management



Seq 1 Principles and methods of food preservation

Seq 2 Packaging

Seq 3 Storage and distribution. Hot + cold chain

Seq 4 Traditional product processing and safety concerns and management.

Seq 5 Fundamentals of food industry design. Prerequisites for the manufacturing environment.



Principles and methods of food preservation

Knowledge & know-how

- To be able to explain the principles that undergo food preservation, included microbiological inactivation, inhibition and intrinsic enzyme inactivation
- To be able to outline forces that drives food out of an equilibrium state
- To be able to describe algorithms to describe microorganism heat resistance
- To be able to update regarding the “state of the art” of possible methods for food preservation and extending shelf-life at the production level, included traditional food
- To be able to discuss ideal conditions in which raw material or food must be stored or maintained to minimize risks
- To be able to outline the factors at the basis of selection of specific processes and equipment for single food applications
- To be able to describe the chemical preservatives, the legal types, and the situation in which they are chosen in food systems
- To be able to discuss about concerns and risks of emerging processing methods, such as the mild technologies
- To be able to describe methods and processes used to separate food components on the basis of their physicochemical properties
- To be able to explain the impact of processing on food quality, included less conventional processes, such as irradiation or mild-technologies
- To be able to select appropriate processes and preservation methods for fresh foods and processed foods and food ingredients with enhanced shelf-life and the reason why one method is preferred to another
- To be able to calculate the extent and/or combination of treatments to produce safe food, including heat treatments on the basis of the type of food and kinetic of inactivation of microorganisms
- To be able to evaluate the degree of safeness of a defined process for production of a defined food
- To be able to evaluate the properness of storing conditions for raw-materials and intermediate or finished products
- To be able to evaluate the properness of methods used to separate food components
- To be able to use minimal processing methods to guarantee the safety of food and evaluate the impact of processing onto the organoleptic and nutritional quality
- To be able to perform a risk analysis of an integrated process for food preservation
- To be able to use informatics tools to evaluate efficacy of processes
- To be able to use food composition to predict its physicochemical properties and changes in processing and storage.
- To be able to plan a shelf-life test



Behavior

Critical thinking; problem solving skills; information acquisition skills; organizational skills; communication skills; interaction ability

Progression

1. Introductory speech. Objectives and modalities of the sequence (10 min);
2. Concept of shelf-life. Principles of food stability, preservation and safety; theory of obstacles
3. Phase and state transitions of food systems.
4. Traditional food preservation (salting, smoking, fermentation);
5. Food components and ingredients (role of composition and ingredients, mechanical separation of components, homogenisation and emulsification, membrane processes, ion exchange, distillation, stability control);
6. Additives
7. Freezing of food and frozen food stability;
8. Conventional, dielectric and microwave heating;
9. Thermal preservation (pasteurisation; sterilisation);
10. Thermal kinetics (chemical, microbial, time-temperature indicators);
11. Food concentration and dehydration; Water sorption and prediction of water activity
12. Food extrusion;
13. Irradiation of foods;
14. Minimal processing principles and novel food processing.
15. Impact of processing on food components and structure and its relationships with food composition
16. Informatic approach to correlate variables and predict outcomes.
17. Statistical approach and shelf-life tests
18. Visit to factories (+ eventual internships)
19. Final considerations

Tools and media

TOOLS: Whiteboard; books or other papers on food preservation methodology; material produced by the teacher.

MEDIA: Power point; short movies..

Prerequisites

Food chemistry; Food microbiology; Food safety.

Packaging

Knowledge & know-how

- To be able to outline the primary, secondary and tertiary role of packaging in the food industry
- To be able to outline the properties and uses of various packaging materials.
- To be able to describe the composition, properties and uses of food packaging materials
- To be able to describe the information required to be present on food packs as determined by law
- To be able to describe the use of seals and closure systems in commercial food packaging
- To be able to explain the importance of food pack specification documents and describe in detail how a specification document would be drawn up.
- To be able to describe the sanitary concerns associated to the use of a determined material and packaging solutions
- To be able to describe the use and function of active and smart packaging technologies for use with food products.
- To be able to choose the right packaging materials and solutions to guarantee the proper conservation of food in compliance with the law
- To be able to produce the information necessary for labelling
- To be able to interpret specification provided with packaging materials
- To be able to identify potential causes for problems and possible solutions, and make thoughtful recommendations.

Behavior

Critical thinking; problem solving skills; information acquisition skills; organizational skills; communication skills; team work

Packaging

Progression

1. Introductory speech. Objectives and modalities of the sequence (10 min);
2. Fundamentals of food packaging
3. Brief tracking shot on food packaging materials and possibilities (i.e.: glass; metals; paperboards; plastics; laminates)
4. Brief tracking shot on food packaging operations and possibilities (i.e. closure systems; adhesives; MAP; CAP; vacuum)
5. Active and smart packaging
6. Concerns about packaging materials and modalities: release and chemical concerns
7. Concerns about packaging materials and modalities: microbiological concerns
8. Labelling
9. warehousing-transport-distribution
10. QA/QC testing of packaging materials
11. legal requirements for food packaging
12. food packaging waste

Tools and media

TOOLS: Whiteboard;

MEDIA: Power point; books or other paper on food packaging; materials collected from manufacturers; materials produced by the teacher.

Prerequisites

Food chemistry; Food microbiology; Food safety.



Food law and regulation



Seq.1 Food law and regulation



Food law and regulations

Knowledge

- To be able to describe food law framework and organization in RU/KZ
- To be able to find the information on the major laws that influence the production, packaging, distribution and marketing of food
- To be able to explain specific implications of major laws
- To be able to describe the regulatory system of the Custom Union
- To be able to find and explain the local and regional normative
- To be able to explain the ethical issues related to the development and enforcement of food laws and regulations
- To be able to explain the role and approach of Codex Alimentarius Commission in harmonising non-tariff barriers to food trade worldwide
- To be able to outline the general organization and principles of the EU regulations on food

Know how

- To be able to explain the objectives of food legislation and the approach used to the enactment and enforcement of food legislation
- To be able to find and utilize the proper food laws for different purposes
- To be able to competently use library resources.
- To be able to design a product and/or process that is in compliance with applicable food laws and regulations

Behavior

to think critically about legislative issues; technical writing; problem solving in legal issues; communication skills; ability to receive and collect information; self-learning



Food law and regulations

Progression

1. Introductory speech; objectives and modalities of the sequence (10 min);
2. The framework and organization of the national law.
3. Explanation of the major laws, their meaning, their objectives and influence on the production, packaging, distribution and marketing of food
4. Regulations of the Custom Union
5. Local and regional law. Their integration with national law
6. Ethical issues related to law development and implementation. Consumer's rights, fair trade, animal welfare, environmental protection.
7. The international law system (EU and USA?)
8. The Codex Alimentarius. Influence on standards and law development
9. Class work: group organization and task delivery.
 - 1) Issuing of problems for problem solving group work by interpreting and implementing the normative.
 - Presentation of each group outcome
 - 2) Implementation of a product in compliance with the law
 - Presentation of each group outcome
 - 3) Raising of political or socio-economic issues and law adaptation or response
10. Final considerations (5 min)

Tools and media

TOOLS: Whiteboard, video projector

MEDIA: Power point; Codex website; Media websites; Newspapers; books on normative; material provided by the teacher

Prerequisites

None

Traditional Food Processing

Traditional Food Processing



Module overview

Module objectives :

At the end of the module, students are able to produce safe, good quality traditional food products and to adapt (scale up) trad food products at semi-industrial and industrial level

A - Module sections

From 2 to 15 pedagogical sequences in each section

	Sections of the discipline	Types of study (ECTS)			Forms of assessment
		TOTAL CLASS	LECTURES	PERSONAL WORK	
1	Introduction to the module	0.36	0.24	0.12	Exam, oral, exam paper
2	Food science	0.96	0.72	0.24	Exam, oral, exam paper
3	Unit operations	4.88	4	0.88	Exam, oral, exam paper
4	General technology of national products	3.92	2.88	1.04	Exam, oral, exam paper
5	New product development and scaling up	5.84	3.36	2.48	Exam, oral, exam paper
4	Starting and running a processing line	1.68	1.28	0.4	Exam, oral, exam paper
IN TOTAL		17.64	12.48	5.16	



Introduction to the traditional food processing module

Knowledge & know-how

- Will be able to explain the main reasons for appearance and development of national and regional traditional food products, with reference to geography, history, culture, provenance
- Will be able to analyse the reasons of appearance and specificities/similarities of different food products from different countries

Behavior

Communication skills, ability to receive and collect information, ability to trigger changes. Tolerant / open minded.



Introduction to the traditional food processing module

Progression

3 hours lecture.

(when possible, a professional is invited to listen to the presentation and to participate towards the end):

- Introduction by the teacher : presentation of the whole module, its objectives and of the "rules of the game" : students will work a lot by groups, make presentation, homework...
- Some insights of the local trad food products : the teacher speaks about history and geography, and how it explains the specificity of trad food products. Maybe the teachers can discuss with the students about the main TFP, and also describe some others (worldwide) that are interesting to know, because close to the ones that can be found locally, or in opposite very different and impossible to produce there because of historical, cultural or geographical reasons...
 1. distribution of the trad food products per group. This shall be done once a list of local trad food product has been drafted, by the teacher, the students or both.
 2. Discussion (clarification some difficult moments of lecture).
 3. Homework : individual presentation of a given TFP of another country by each student (they choose the TFP they want from the country they want). The teacher gives a list of topics to talk about : country, recipe and/or process, raw material, pictures, ... and also asks to say (cite?) about the sources of information.

Tools and media

TOOLS: Whiteboard and video projector

MEDIA:

- Short movie on nomad people
- Power point with introduction and synthesis
- Books on history of traditional food processing

Prerequisites



Presentation of the main regional/national products.

Knowledge & know-how

- Will be able to describe the main characteristics of the regional/national traditional food products.

Behavior

- communication skills, ability to receive and select good quality information.



Presentation of the main regional/national products

Progression

3h + 2h work per students (they are per groups) to prepare their presentations + 1h to correct after presentation.

When possible, a professional is invited to listen to the presentation and to participate towards the end.

Professional is invited to listen to the presentation and to participate towards the end.

One traditional product / group of 4-5 students.

- Step 01: Introductory speech by the teachers: objectives of the sequence then presentations of the students based on the teacher's template ie : the raw material utilised, the main process steps, the main issues and defects. The shelf life, the areas of production and consumption, the prices, the size of the market...

Recommandation : main local TFP shall be chosen but it is preferable (not compulsory) that among them there are one dairy, one meat and one vegetable products .

- Step 02: group1 presents TFP1, with video and ppt (15 min – preparation time 2 hours).
- Step 03: group2 presents TFP2 with video and ppt (15 min – preparation time 2 hours).
- Step 04 : group3 presents the TFP3 with video and ppt (15 min – preparation time 2 hours)

...

- there could be a class discussion (30min) with the teachers on the importance for local economy of the TFP (history, business, culture, tourism...).
- Syntheses from the teacher and professionals: giving technical and economical and environmental arguments to the students.
- Presentations are then corrected by the students within a few days and collected in a single place by the teacher.

Tools and media

TOOLS: Whiteboard and video projector, Computer to allow students to present their homework



The characteristics and properties of national types of animal and plant raw materials.

Knowledge & know-how

- To be able to select facts and information from various sources (internet, normative documents, books, publication...),
- To be able to summarize and compare the main characteristics of raw materials, including health aspects.

Behavior

- communication skills, ability to receive and select good quality information.

Prerequisites

- anatomy and physiology of farm animals, plant anatomy and physiology, general biochemistry.



The characteristics and properties of national types of animal and plant raw materials.

Progression

3 hours + 3 hours homework (including corrections after presentation).

- Introductory speech by the teachers ~10-20min. the teacher starts with some elements of food chemistry (protein, lipids; sugars, minerals and nutrients...) and food safety (main contaminants, including microbiological, pesticides, insects and pests, and mycotoxins..), economics (some are imported), classification, nutritional values, effects on health.... Then he/she explains what information the group of students have to find, and where are the main places to find this information.
- Each group would have to make a presentation on a given raw material : composition, quantities/year, seasonality (production and prices), important normative documents for quality and safety, main products (trad or not, raw, semi-processed and processed), main analyses, impact of zootechnics, welfare, agricultural practices, pretreatments and post-harvest treatments...on quality & safety.
- there could be one group not presenting anything, but compiling the presentations into a single document. And presenting the synthesis during the following lecture
- Discussion / (15 min).
- Syntheses from the teacher (30 min).

Tools and media

TOOLS: Whiteboard and video projector

MEDIA: Short movie on national types of animal and plant raw materials: goat's milk, Mare's milk, camels..., Power point with introduction and synthesis, Books about national types of animal and plant raw materials



The analyses of raw materials (milk, meat and others).

Knowledge

- To be able to choose and recommend the proper method for analysing a raw material.
- To be able to carry out the main analyses for raw materials.
- To be able to express properly the results (various types of calculation).
- To be able to summarize and present the results, and to conclude on the quality of the raw material.

Behavior

Communication skills, ability ability to self-criticize the work done, being tidy.

Prerequisites

Ability to work safely in a laboratory + basic knowledge of biochemistry and general chemistry and analytical tools.



The analyses of raw materials (milk, meat and others)

Progression

6 hours + 3 hours homework.

when possible, a professional is invited to listen to the presentation and to participate towards the end).

1. Lectures on the principles and methods for the main analyses
2. Laboratory work in groups: for each group biochemical, physical and chemical analysis of one species of animal or vegetable raw materials~3h30min. Analyses of composition leading to energetic values (sugars, protein, lipids, minerals --> energy). If relevant analyses of specific nutrients of particular interest (positive and negative).
3. Step 03 : Written and oral report~30min.

Tools and media

TOOLS: Whiteboard and video projector

MEDIA: Short movie on morphological, cytological, genetic and biochemical properties of meat Kalmyk breed cattle, Powerpoint with introduction and synthesis, Books about physical-chemical, biochemical, structural and mechanical properties of raw materials (milk, meat and others).



Technological properties of traditional raw materials

Knowledge & know how

- Will be able to compare various raw material.
- Will be able to select raw materials according to their technological properties,
- Will be able to detect falsifications of raw materials affecting the technological properties.
- Will be able to carry out the main analyses for technological properties, including basic sensory analysis.

Behavior

Communication skills, ability ability to self-criticize the work done, tidy.

Prerequisites

Ability to smell, taste... for sensory analysis.



Technological properties of traditional raw materials

Progression

3 hours lecture + 3 hours practical work + 3 hours serious gaming

1. Introductory speech by the teachers: objectives of the sequence + giving work to student groups (by category of traditional raw material) ~10-20min
2. Lecture on technological properties : texture, water binding, colour, freshness... Quick introduction to sensory analysis (which will be mainly used for finished products).
3. Lab work + sensory analyses (say triangular test to compare for instance cow milk and goat milk)
4. Serious gaming : the teacher (or a student) plays the role of the farmer that supplies milk (or another product) to the factory. The analyses of this milk are given to the student who has to argue that he doesn't accept the product because of the bad quality.

Tools

TOOLS: Whiteboard and video projector, Raw material for sensory analysis, Dedicated room for sensory analysis, Some equipment for quality analyses (colour, texture...)



Presentation of the main unit operations

Knowledge

- To be able to explain the main the technological operations in the processing of the main local/national raw materials.
- To be able to explain the main principles and the basic parameters of each operation (conditions of temperature, pressure, vacuum, etc.).
- To be able to recognise the basic equipment used in each operation: brand, device performance, the operating principle.

Behavior

Communication skills, ability ability to receive and collect and select information

Prerequisites

Basics of physics



Presentation of the main unit operations

Progression

3 hours lecture + 2 hours homework

- Introductory speech by the teacher : objectives of the sequence + explaining what is a unit operation then giving work to student groups by raw materials(during the previous course) →the teacher gives a template : for each raw material, the groups have to describe most common unit operations (equipment, pictures, principles...)
- Presentations by the groups of students ~15min
- Step 06 : Synthesis / conclusion from the teacher

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Short movie on production technology of dairy and meat products

Power point with introduction and synthesis

Books on technology and equipment of milk and meat products production.



Primary processing of milk and dairy products (from milking to factory gate). Technological equipment. Principles of operation and maintenance.

Knowledge

- To be able to describe processes and equipment of primary milk processing, including traditional processes and small scale equipment.
- To be able to select the optimal processing parameters (time, temperature...) for desired quality of milk (from milking to factory gate)
- To be able to follow regulation & set up the good cleaning operations at farm up to factory gate.
- To be able to suggest improvements regarding cleaning & sanitation and processing operations
- To be able to select the optimal equipment for a given unit operation : principle of operation, brand and performance.
- To be able to determine and reduce the losses in production processes to make material calculations.

Behavior

Ability to convince, communication skills, search for information and select the right ones, teamwork, ability to work under pressure, ability to control emotions and thoughts. Pedagogical abilities (to explain to farmers and collectors and workers what to do and the good practices).



Primary processing of milk and dairy products (from milking to factory gate).
Technological equipment. Principles of operation and maintenance.

Progression

6 hours lecture + 3 hours homework

1. Introductory course : content, modalities,
2. Description of milk processing steps at farm. Ask the students first to describe what they know.
3. National/regional regulations regarding milk primary processing.
4. Principle of operation of the various equipment. Different types of equipment for a given operation. Optimal process parameters for these operations, including specific equipment for specific animals (Camel, cow, goat, sheep, horse...).
5. Best practices of cleaning and sanitation, including specific cleaning operation and parameters (if any) for specific milk (Camel, cow, goat, sheep, horse...).
6. List of good suppliers. the teacher asks the students to come with a list of suppliers. One group of students per category of equipment
7. Case study by groups (with presentations to the classroom) : with pictures, movies and some text explaining the equipment & process parameters, the students have to explain what does not comply with the regulation and to suggest some improvements and better equipment (or convince the teachers (who plays the farmer's role). Ideally visit of farms.
8. When possible, visit to local farms with some practices on the milking equipment.
9. When possible short internship at the farm (few days) with a short written report on the primary milk processing.

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Short movie on primary and mechanical processing of milk, classification of milk and milk-containing products

Powerpoint with introduction and synthesis

Books on technology and equipment of milk products production



Separation & homogenisation. Technological equipment. The device principle of operation and maintenance.

Knowledge

- To be able to describe processes and equipment of separation and homogenisation of milk, including traditional processes and small scale equipments.
- To be able to select the optimal processing parameters (time, temperature...) for desired quality of milk.
- To be able to follow regulation & set up the good cleaning operations.
- To be able to suggest improvements regarding cleaning & sanitation and processing operations.
- To be able to select the optimal equipment for a given unit operation : principle of operation, brand and performance.
- To be able to determine and reduce the losses in production processes to make material calculations.
- To know theoretical foundations of separation (separation of components, cleaning and dispersion, normalization) and homogenisation.
- To be able to read and understand P&ID (maps showing the equipment in milk factories).

Behavior

Ability to convince, communication skills, search for information and select the right ones, teamwork, ability to work under pressure, ability to control emotions and thoughts. Pedagogical abilities (to explain to workers what to do and the good practices).

Prerequisites

Biochemistry of milk



Separation & homogenisation. Technological equipment.
The device principle of operation and maintenance.

Progression

4 hours lecture + 2 hours practical work

1. Introductory course : content, modalities,
2. Description of unit operations (separation & homogenisation). Ask the students first to describe what they know, notably regarding the purposes of these operations.
3. When relevant, National/regional regulations regarding milk separation & homogenisation..
4. Principle of operation of the various equipment. Different types of equipment for a given operation. Optimal process parameters for these operations, including specific equipment for specific animals (Camel, cow, goat, sheep, horse...).
5. Best practices of cleaning & sanitation, including specific cleaning operation and parameters (if any) for specific milk (Camel, cow, goat, sheep, horse...).
6. List of good suppliers. the teacher asks the students to come with a list of suppliers. One group of students per category of equipment
7. Case study or practical work :
 - a. Practical work : When possible, work at university lab on separator & homogenizers. When not possible, practical work with professionals at the factory in groups: for each group physical and chemical analysis of milk before separation and homogenisation, cream and skim milk.
 - b. Written report
8. When possible internship in milk factory.

Tools and media

TOOLS: Whiteboard and video projector, Laboratory instruments and devices, separator, Factory visit when available

MEDIA : Short movie on separation of milk
Powerpoint with introduction and synthesis
Books on technology and equipment of milk processing



Pretreatment and preparation of plant products. Technological equipment. The device principle of operation and maintenance.

Knowledge

- To be able to describe processes and equipment for storage, cleaning, peeling, cutting, milling and other primary processing of plant products, including traditional and small scale primary processing.
- To be able to select the optimal processing parameters for desired quality of intermediate product
- To be able to follow regulation
- To be able to set up the good cleaning operations
- To be able to suggest improvements regarding cleaning & sanitation and processing operations
- To be able to select the optimal equipment for a given unit operation : principle of operation, brand and performance.

Behavior

- communication skills, ability to receive and collect information, ability to trigger changes, stress resistance, ability to control emotions and thoughts...

Prerequisites

- biochemistry of plant, cereals and fruits, knowledge of good hygiene practices, basic knowledge of equipment...



Pretreatment and preparation of plant products. Technological equipment. The device principle of operation and maintenance.

Progression

8 hours + 2h homework

(when possible, a professional is invited to listen to the presentation and to participate towards the end). When relevant, lecture on national/regional regulations regarding primary processing.

- Lecture on principle of operation of the various equipment. Different types of equipment for a given operation. Optimal process parameters for these operations, including specific equipment for specific vegetables
- Best practices of cleaning & sanitation, including specific cleaning operation and parameters (if any)
- List of good suppliers. the teacher asks the students to come with a list of suppliers. One group of students per category of equipment
- Ideally factory visit

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Short movies on plant primary processing
Power point with introduction and synthesis
Books on plant primary processing and preparation



The slaughtering and primary processing of raw meat (cattle, horses, pigs, sheep, rabbits, poultry).
Technological equipment. The device principle of operation and maintenance.

Knowledge

- To be able to describe processes and equipment of slaughtering and primary processing of meat, including traditional slaughtering and small scale slaughtering.
- To be able to select the optimal processing parameters for desired quality of meat.
- To be able to follow regulation.
- To be able to set up the good cleaning operations.
- To be able to suggest improvements regarding cleaning & sanitation and processing operations.
- To be able to select the optimal equipment for a given unit operation : principle of operation, brand and performance.
- To know theoretical foundations of slaughtering and primary processing of meat.
- To be able to choose the right slaughtering method (modern, traditional...) according to the desired quality and religious specificities (Halal...).
- To adapt the slaughtering parameters regarding the specificities of the animals: pigs, cattles, sheeps, horse, poultry...

Behavior

Communication skills, ability to receive and collect information, ability to trigger changes, stress resistance, ability to control emotions and thoughts...

Prerequisites

Biochemistry of meat, recognition of breeds, basics of main animal diseases, knowledge of good hygiene practices, basic knowledge of equipment...



The slaughtering and primary processing of raw meat (cattle, horses, pigs, sheep, rabbits, poultry). Technological equipment. The device principle of operation and maintenance.

Progression

8 hours + 2h homework

when possible, a professional is invited to listen to the presentation and to participate towards the end

- Introductory speech by the teachers : objectives of the sequence + giving work to student groups (by category of animal) → the teacher gives a template (advantages and issues with trad and standard methods + main parameters and impact on quality + law + equipment + main analyses...) ~10-20min
- Group 1 presents poultry slaughtering, with video and presentation (15 min – preparation time 2 hours)
- Group 2 presents cattle slaughtering with video and presentation (15 min – preparation time 2 hours)
- Group 3 presents sheep slaughtering with video and presentation (15 min – preparation time 2 hours)
- Group 4 presents the main characteristics of Halal slaughtering with video and presentation (15 min – preparation time 2 hours)
- When relevant, lecture on national/regional regulations regarding slaughtering and primary meat processing.
- Lecture on principle of operation of the various equipment. Different types of equipment for a given operation. Optimal process parameters for these operations, including specific equipment for specific animals (Camel, cow, goat, sheep, horse...).
- Best practices of cleaning and sanitation, including specific cleaning operation and parameters (if any) for specific milk (Camel, cow, goat, sheep, horse...) and halal.
- List of good suppliers. the teacher asks the students to come with a list of suppliers. One group of students per category of equipment.
- Case study by groups (with presentations to the classroom) : with pictures, movies and some text explaining the equipment & process parameters, the students have to explain what does not comply with the regulation and to suggest some improvements and better equipment (or convince the teachers (who plays the farmer's role). Ideally visit of milk factories.
- Written report

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Short movie on traditional and modern slaughtering
Powerpoint with introduction and synthesis
Books on slaughtering



Heat treatment of meat, plant and dairy products.
Pasteurization. Sterilization. Ultra pasteurization.
Technological equipment. The device principle
of operation and maintenance.

Knowledge

- To be able to describe processes and equipment of heat treatment, including traditional processes and small scale equipment.
- To be able to select the optimal processing parameters (time, temperature...) for desired quality of product
- To be able to follow regulation & set up the good cleaning operations
- To be able to suggest improvements regarding cleaning & sanitation and processing operations
- To be able to select the optimal equipment for a given unit operation : principle of operation, brand and performance.
- To be able to determine and reduce the losses in production processes to make material calculations.
- To know theoretical foundations of heat treatment (including cooking value, pasteurisation and sterilisation value)
- To know the changes in the main components of meat, plant, dairy products under the heat treatment.

Behavior

Ability to convince, communication skills, Pedagogical abilities (to explain to workers what to do and the good practices).

Prerequisites

Biochemistry of milk, meat and plant products, basic knowledge of equipment and physics and mathematics.



Heat treatment of meat, plant and dairy products. Pasteurization.
Sterilization. Ultra pasteurization. Technological equipment.
The device principle of operation and maintenance.

Progression

10 hours lecture

- Introductory course : content, modalities,
- Description of unit operations (various kind of heat treatments). Ask the students first to describe what they know, notably regarding the purposes of these operations.
- When relevant, National/regional regulations regarding heat treatments, including the required certificate for conducting machines under pressure and/or high temperature machines.
- Principle of operation of the various equipment. Different types of equipment for a given operation. Optimal process parameters for these operations, including specific equipment for specific products (liquid, solid, meat, vegetables...). Focus and exercises on calculation of the sterilisation and pasteurisation and cooking values.
- Best practices of cleaning & sanitation
- List of good suppliers. the teacher asks the students to come with a list of suppliers. One group of students per category of equipment
- Practical work : When possible, work at university lab on heat treatment equipment (tubular exchangers, plate heat exchangers, retorts, ...). When not possible, practical work with professionals at the factory in groups: for each group analysis of the heat treatment (sterilisation/pasteurisation value, cooking value...)
- Written report
- When possible internship a canning factory (or other with a heat treatment).

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Short movie on heat treatments of meat, plant, dairy products

Power point with introduction and synthesis

Books and professional brochures on technology and equipment for heat treatment, including very small scale equipments (tanks and others)



Fermentation and other usages of micro-organisms

Knowledge

- To be able to choose and to use lactic acid, propionic acid, acetobacters and yeasts and other important microbes according to the manufactured product..
- To be able to explain the influence of fermentation on the properties of products.
- To be able to describe the type of fermentation for a given product.
- To be able to describe processes (and equipment, if any) of fermentation
- To be able to select the optimal processing parameters (time, temperature, pH,...) for desired quality of product, including the selection of the right ferment, ingredients and additives for a given product.
- To be able to follow regulation & set up the good cleaning operations
- To be able to suggest improvements regarding cleaning & sanitation and processing operations
- To be able to determine and reduce the losses in production processes to make material calculations.

Behavior

Communication skills, ability to receive and collect information, ability to trigger changes, stress resistance, ability to control emotions and thoughts...

Prerequisites

Biochemistry of milk, dairy products, meat products, basic knowledge on microbiology, knowledge about fermentation and bacterial cultures.



Fermentation and other usages of micro-organisms

Progression

8 hours lecture + 2 hours homework

- Introductory course : content, modalities.
- Description of different type of fermented products and therefore different fermentation processes. Ask the students first to describe what they know, notably regarding the purposes of these operations.
- When relevant, National/regional regulations regarding fermentation.
- Optimal process parameters for the different types of fermentation, including specific starters, additives and ingredients for specific products (sausages, dairy, beer, wine, kvass, cabbage...). Impact on quality (shelf life and organoleptic).
- Best practices and relevant law of cleaning & sanitation.
- List of good suppliers : starters, additives & ingredients and packaging.the teacher asks the students to come with a list of suppliers. One group of students per category of product.
- Group work : the students work on different types of fermentation (one type per group). For each group, they present the basic principles, the main products (photos and processes), the required additives and ingredients, ...
- Sensory analysis : comparison of different stages of fermentation of a given product, and link with the chemical and technological characteristics (pH, acidity, level of ethanol, texture and viscosity...).
- When possible internship in a sausage or dairy factory (or other with fermented products).

Tools and media

TOOLS: Whiteboard and video projector, Laboratory instruments and devices.

MEDIA : Short movie about fermentation of milk and dairy and meat and plant products

Power point with introduction and synthesis

Books on fermentation.



The drying various raw materials.
The theory of drying. Technological equipment.
The device principle of operation and maintenance.

Knowledge

- To be able to describe processes and equipment of drying, including pre-drying with salt and sugar solutions. including traditional processes and small scale equipment.
- To be able to select the optimal processing parameters (time, temperature...) for desired quality of product.
- To be able to properly prepare the product before drying.
- To be able to follow regulation & set up the good cleaning operations.
- To be able to suggest improvements regarding cleaning & sanitation and processing operations.
- To be able to select the optimal equipment for drying according to the desired quality : principle of operation, brand and performance.
- To be able to determine and reduce the losses in production processes to make material calculations.
- To know theoretical foundations of drying (including air velocity, moisture, temperature, air diagram, enthalpy...).
- To know the changes in the main components of meat, plant, dairy products under the drying process.
- Behaviour: communication skills, ability to receive and collect information, ability to trigger changes, ...
- Prerequisites: food processing, thermal engineering.

Behavior

Communication skills, ability to receive and collect information, ability to trigger changes.

Prerequisites

Food processing, thermal engineering.



The drying various raw materials. The theory of drying. Technological equipment.
The device principle of operation and maintenance.

Progression

8 h

- Introductory course : content, modalities,
- Description of unit operations (various kind of drying). Ask the students first to describe what they know, notably regarding the purposes of these operations and some dried products.
- When relevant, National/regional regulations regarding drying.
- Principle of operation of the various equipment. Different types of equipment for a given operation. Optimal process parameters for these operations, including specific equipment for specific products (liquid, solid, meat, vegetables...). Focus and exercises on calculation of the drying efficacy, starting by calculation of water content and water losses, up to scaling up of dryers.
- Best practices of cleaning & sanitation.
- List of good suppliers. the teacher asks the students to come with a list of suppliers. One group of students per category of equipment.
- Practical work : When possible, work at university lab on dryers. When not possible, practical work with professionals at the factory in groups: for each group analysis of the drying process (water losses, air temperature and velocity, moisture and understanding of the drier : inlet, outlet, vacuum pressure...)
 - Written report

When possible internship a canning factory (or other with a heat treatment).

- Synthesis from the teacher: giving technical and economical and environmental arguments to the students for modifying the current practices (when needed) (30 min).

Tools and media

TOOLS: Whiteboard and video projector, Laboratory instruments and devices.

MEDIA : Short movie about different methods of drying
Power point with introduction and synthesis
Books on technology of food processing.



The use of additives and ingredients: Characteristics of food additives and ingredients in the industry (meat, dairy, plant...). Impact on functional and technological properties of the products. The rules for their application.

Knowledge

- To be able to communicate with the suppliers in order to select the right additives and ingredients for the product, and to define the approximate quantities and concentration needed.
- To be able to demonstrate the advantages (technical, economical, environmental and marketing) of using (or not) additives and ingredients.
- To be able to take all necessary measures to avoid overdosing of additives and ingredients, and to comply with the regulation.

Behavior

Communication skills, ability to receive and collect information, ability to trigger changes, method and tidy...

Prerequisites

Food science



The use of additives and ingredients

Progression

8 hours + 2 hours homework

- Teacher's lecture about classification and main characteristics of food additives and ingredients in the industry (meat, dairy, plant...)
- Lecture on toxicity of additives and ingredients (natural, artificial...)
- Regulation regarding additives and ingredients.
- Technical, economical, environmental benefits or risks of using additives in food products
- Group work : each group work and present on the interesting additives and ingredients that would be useful for scaling up. Preservatives, texturant, colour, taste... the students will have to justify/calculate the technical, economical, environmental benefits or risks of using additives in their products.
- Good local suppliers and brands. Ideally the teacher invites a supplier (of additives and ingredients) who presents his products. Also the teacher asks the students to come with a list of suppliers. One group of students per category of product.
- Ideally there are discussions between the students and the supplier regarding the additives that he would recommend. If no supplier, discussion between the teacher (playing the role of the supplier) and the students.
- Synthesis from the teacher: giving technical and economical and environmental arguments to the students for modifying the current practices (when needed) (30 min).

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Short movie about different food additives,
Powerpoint with introduction and synthesis,
Books and suppliers brochures on food additives and ingredients.



The salting in technology of traditional products. Technological equipment. The device principle of operation and maintenance.

Knowledge

- To be able to describe processes and equipment of salting, including traditional processes and small scale equipments.
- To be able to select the optimal processing parameters (time, temperature...) for desired quality of product.
- To be able to follow regulation & set up the good cleaning operations.
- To be able to suggest improvements regarding cleaning & sanitation and processing operations.
- To be able to select the optimal equipment/type of salting: principle of operation, brand and performance.
- To be able to determine and reduce the losses in production processes to make material calculations, particularly water losses and salt intake.
- To be able to describe the theoretical foundations of salting (salting essence, methods of salting, preparation of brine, salting microflora).

Behavior

To be prepared to lead the collective in their professional activities, tolerant perceiving social, ethnic and cultural differences, communication skills, ability to receive and collect information.

Prerequisites

Food technology and chemistry, processes and devices of food



The salting in technology of traditional products. Technological equipment. The device principle of operation and maintenance.

Progression

4 hours + 1 hour homework

- Introductory course : content, modalities.
- Description of unit operations (various kind of salting). Ask the students first to describe what they know, notably regarding the purposes of these operations and some salted products.
- When relevant, National/regional regulations regarding salting.
- Principle of operation of the various equipment. Different types of equipment, notably for brine & injection salting and if any for dried salting. Optimal process parameters for these operations. Focus and exercises on calculation of the water losses and salt intake.
- Best practices of cleaning and sanitation.
- List of good suppliers for bringing equipment. The teacher asks the students to come with a list of suppliers. One group of students per category of equipment.
- Practical work : When possible, work at university lab. Dry or brine salting kinetics, in different conditions of temperatures for instance, and comparison of the salt intakes and water losses. Written report
- Synthesis from the teacher: giving technical and economical and environmental arguments to the students for modifying the current practices (when needed) (30 min).

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Powerpoint with introduction and synthesis

Short movie about salting technology of traditional products
Books on food processing.



The smoking in technology of traditional products. Technological equipment. The device principle of operation and maintenance.

Knowledge

- To be able to describe processes and equipment of smoking, including traditional processes and small scale equipments.
- To be able to select the optimal processing parameters (time, temperature...) for desired quality of product.
- To be able to follow regulation & set up the good cleaning operations.
- To be able to suggest improvements regarding cleaning & sanitation and processing operations.
- To be able to select the optimal equipment/type of smoking: principle of operation, brand and performance.
- To be able to determine and reduce the losses in production processes to make material calculations, particularly water losses, notably in combination with a salting and drying process.
- To be able to describe the production of toxic substances during smoking (especially Polycyclic aromatic hydrocarbures) and to set up the proper smoking conditions and parameters to avoid their presence in the final smoked products.
- To be able to describe the theoretical foundations of smoking (smoking essence, methods of smoking).

Behavior

To be prepared to lead the collective in their professional activities, tolerant perceiving social, ethnic and cultural differences, communication skills, ability to receive and collect information.

Prerequisites

Food technology and chemistry, processes and devices of food



The smoking in technology of traditional products. Technological equipment. The device principle of operation and maintenance.

Progression

3 hours + 1 hour homework

- Introductory course : content, modalities.
- Description of unit operations (various kind of smoking). Ask the students first to describe what they know, notably regarding the purposes of these operations and some smoked products.
- When relevant, National/regional regulations regarding smoking.
- Principle of operation of the various equipment. Different types of equipment, including traditional and small scale smoking.
- Optimal process parameters for these operations. Focus and exercises on calculation of the water losses.
- Specific focus on HAP (Hydrocarbures Aromatic polycyclic), their toxicity and the operating conditions to avoid them.
- Best practices of cleaning and sanitation.
- List of good suppliers for equipment. the teacher asks the students to come with a list of suppliers. One group of students per category of equipment.
- Practical work : When possible, work at university lab. Smoking at different temperatures (hot and cold smoke) and different relative humidities. Sensory analyses on the finished products (colour, smell, aspect, taste...).Written report
- When possible, factory visit (that produces smoked products). Written individual reports showing the production process, the salting, drying and smoking parameters and the brands of the main equipment (1-2 pages max).
- Synthesis from the teacher: giving technical and economical and environmental arguments to the students for modifying the current practices (when needed) (30 min).

Tools and media

TOOLS: Whiteboard and video projector, Factory visit to the factory.

MEDIA : Powerpoint with introduction and synthesis
Short movie about smoking technology of traditional products.



Packing and packaging. The packaging materials. Technological equipment. The device principle of operation and maintenance.

Knowledge

- To be able to describe packaging equipment, from very small scale equipment to large aseptic fillers machines.
- To be able to discuss with the packing suppliers in order to choose the best packaging suited for the products.
- To be able to describe the advantages of the vacuum and modified atmosphere packaging.
- To be able to select and use the proper methods for quality control of packaging.
- To be able to select the optimal processing parameters (type of packaging, type of modified atmosphere...) for desired quality of product.
- To be able to follow regulation & set up the good cleaning operations.
- To be able to suggest improvements regarding packing and packaging.
- To be able to select the optimal equipment for packaging according to the desired quality : principle of operation, brand and performance.
- To know the changes in the main components of meat, plant, dairy products under the packaging process.

Behavior

Communication skills, ability to receive and collect information.

Prerequisites

Food processing, thermal engineering



Packing and packaging. The packaging materials. Technological equipment.
The device principle of operation and maintenance.

Progression

8 hours + 1 hour homework

- Introductory course : content, modalities.
- Description of unit operations (various kind of packaging machines). Ask the students first to describe what they know, notably regarding the purposes of these operations. The teacher brings various kind of packed products and explain the technology/equipment behind.
- When relevant, National/regional regulations regarding packaging and packing.
- Principle of operation of the various equipment. Different types of equipment, including bottles, cans, tray and bag packaging machines. And aseptic filling.
- Characteristic of the different kind of packages, including metal, glass, plastic (PP, PET, PVD...) and paper packages.
- Specific focus on vacuum and modified atmosphere packaging, including influence of cold chain.
- Best practices of cleaning & sanitation.
- List of good suppliers for equipment and packages (bags and trays). the teacher asks the students to come with a list of suppliers. One group of students per category of equipment and packages.
- When possible, factory visit (that has different kind of packaging machines and packages). Written individual reports showing the production process, the packaging parameters, the packages materials parameters and the brands of the main equipment (1-2 pages max).
- Synthesis from the teacher: giving technical and economical and environmental arguments to the students for modifying the current practices (when needed) (30 min).

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Powerpoint with introduction and synthesis

Short movie about process of packing and packaging,
packaging materials and technological equipment for it

Books on food processing, packaging materials, technological equipment for packing and packaging
process. Brochures of suppliers.



Methods of cooling, freezing and thawing of food products

Knowledge

- To be able to describe processes and equipment of cooling and freezing, including small scale equipment.
- To be able to select the right equipment and the optimal processing parameters (time, temperature...) for desired quality of product, taking into account technical aspects as well as economical aspects.
- To be able to follow regulation & set up the good cleaning operations.
- To be able to suggest improvements regarding cleaning & sanitation and processing operations.
- To be able to select the optimal equipment/type of cooling / freezing: principle of operation, brand and performance.
- To be able to choose the right thawing method and equipment to ensure proper quality and food safety.
- To be able to determine and reduce the costs of production, particularly cost of energy for freezing/cooling and thawing (when required).
- To be able to describe the theoretical foundations of cooling/freezing (thermodynamical aspects).

Behavior

To be prepared to lead the collective in their professional activities, tolerant perceiving social, ethnic and cultural differences, communication skills, ability to receive and collect information.

Prerequisites

Food technology



Methods of cooling and freezing and thawing of food products

Progression

6 hours + 2 hours homework

- Introductory course : content, modalities.
- Lecture on the theoretical foundations of cooling/freezing/thawing (thermodynamical aspects).
- Description of unit operations (various kind of cooling and freezing and thawing machines & methods). Ask the students first to describe what they know, notably regarding the purposes of these operations.
- When relevant, National/regional regulations regarding cooling and freezing and thawing.
- Principle of operation of the various equipment. Different types of equipment, from refrigerators and cold rooms to spiral freezers, including discontinuous shelf freezers, cooling by immersion, direct gas (N₂ or CO₂) freezing equipments and lyophilisation, and thawing (thawing rooms, hot water baths, microwaves, high frequency).
- Best practices of thawing, and specific sanitary risks of this unit operation.
- List of good suppliers for equipment (including cold rooms). the teacher asks the students to come with a list of suppliers. One group of students per category of equipment.
- When possible, factory visit (that has freezing processes). Written individual reports showing the production process, the freezing/cooling/thawing parameters, and the brands of the main equipment (1-2 pages max).

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Powerpoint with introduction and synthesis

Short movie about methods of cooling and freezing and thawing of food products

Books on food processing



Ways and methods of storage of food products

Knowledge

- To be able to describe equipment of storage (cold and dry and ambient temperature storages) and monitoring, including small scale equipment, pallets, forklifts.
- To be able to select the right equipment and the optimal processing parameters (temperature) for desired quality of product, taking into account technical aspects as well as economical aspects.
- To be able to set up FIFO (First In First Out) and traceability in an efficient way.
- To be able to decide/choose the maximal storage duration for a given product.
- To be able to follow regulation & set up the good cleaning operations.
- To be able to suggest improvements regarding equipment, cleaning & sanitation and processing operations.
- To be able to select the optimal equipment/ wall materials / cold production device (when required) / forklifts: principle of operation, brands and performance.

Behavior

To be prepared to lead the collective in their professional activities, tolerant perceiving social, ethnic and cultural differences, communication skills, ability to receive and collect information.

Prerequisites

Food science



Ways and methods of storage of food products

Progression

6 hours + 1 hour homework

- Introductory course : content, modalities.
- Lecture on the different kind of storages (dry, cold, frozen and ambient) and point of attention regarding food quality and safety : oxidation, spoilage.
- When relevant, National/regional regulations regarding storage.
- Focus on storage monitoring (probes and alarms) and storage organisation (most importantly FIFO and traceability).
- Storage related equipment : wall of the cold rooms, forklifts.
- List of good suppliers for equipment (including rooms, probes, alarms, forklift...): the teacher asks the students to come with a list of suppliers. One group of students per category of equipment.
- When possible, factory visit. Written individual reports showing the way the FIFO is managed and the way the storage is monitored, and the brands of the main equipment (1-2 pages max).
- Lab work: What is the effect of storage conditions and their violations on the quality and composition of the trad product (microbiological analysis)?
- Synthesis from the teacher: giving technical and economical and environmental arguments to the students for modifying the current practices (when needed) (30 min).

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Powerpoint with introduction and synthesis

Short movie about methods of storage of food products

Books on food processing, milk and dairy, meat, fish products

Brochures from suppliers



Other equipment required for the production (utilities: compressor, boiler,...)

Knowledge

- To be able to describe the fundamentals and principles using of equipment required for the production, particularly utilities (compressor, boiler, valves, CIP kitchen...).
- To be able to select the right equipment and the optimal processing parameters, taking into account technical aspects of the productions lines (required power...) as well as economical aspects.
- To be able to follow regulation & set up the good cleaning operations and to deal with the suppliers to set up the right preventative maintenance.
- To be able to suggest improvements regarding equipment, cleaning & sanitation and processing operations.

Behavior

To be prepared to lead the collective in their professional activities, tolerant perceiving social, ethnic and cultural differences, communication skills, ability to receive and collect information, tidiness and good organisation.

Prerequisites

Food science



Other equipment required for the production (utilities: compressor, boiler...)

Progression

6 hours + 1 hour homework

- Introductory course : content, modalities,
- Lecture on the usages and principles of the main equipment : boiler, compressor, valves (automatic or not, ball valves...), CIP Kitchens. Lecture/tutorial also on power usage units (Kwh...) and invoicing, allowing students to forecast the power invoice in relation with the power consumption.
- When relevant, National/regional regulations regarding utilities. Including required accreditations for operation and maintenance.
- List of good suppliers for equipment : the teacher asks the students to come with a list of suppliers. One group of students per category of equipment.
- When possible, factory visit. Written individual reports showing the power usage for each utility, the water consumption..., and the brands of the main equipment (1-2 pages max).
- Synthesis from the teacher: giving technical and economical and environmental arguments to the students for modifying the current practices (when needed) (30 min).

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Powerpoint with introduction and synthesis

Short movie about other equipment required for the production (utilities: compressor, boiler...), (calculation, selection, metrology, commissioning, adjustment. Service, maintenance, cleaning.)

Books on food processing, milk and dairy, meat, fish products.



The general technology of national products.
Technological scheme and modern line for the production of traditional products, the types of defects of raw materials. The methods for prevention of defects (by type of product).
To be able to correct the tech. processes for prevent the contamination.

Knowledge

- To be able to describe the technological process (choosing the steps and drawing the technological scheme (including P&ID for liquid products), from Reception to expedition), from very small scale (kitchen, farm) to semi-industrial and industrial scale.
- To be able to produce (at small scale) a safe and good quality finished product,
- To be able to describe and measure the main quality aspects (colour, smell, texture...) of the product
- To be able to describe the main defects of the product, and to be able to deduct the main possible causes of these defects.
- To be able to describe the most common falsifications of the product.
- To be able to ensure that all raw materials, additives, ingredients, packaging and finished product comply with the current regulations and the customer's specifications.
- Therefore will be able to choose the right analyses and to define the proper labelling of the product.
- To be able to organise the methods and means of quality control & monitoring of raw materials, semi-finished and finished products additives, ingredients and packaging.
- To be able to determine the losses in production processes to make material calculations and to reduce them.
- To be prepared to respect and to preserve the historical heritage and cultural traditions, tolerance perceived social and cultural differences.



The general technology of national products

Behavior

- To be able to abstract thinking, analysis, synthesis, communication skills, ability to receive and collect information, ability to trigger changes, stress resistance, ability to control emotions and thoughts...

Progression

6 hours lecture + 8 hours lab and 5 hours personal work; per product

Using the work done in Sequence 2 (small scale process of traditional product), the teacher asks the groups of students to present the processes and the equipment, additives, packaging, utilities... and product labelling for a much bigger production scale (several tons per hours). Students will also present the normative documents (if any) dealing with their TFP.

From the student's presentation, discussion with the classroom then the teacher explain/confirm the best ways to scale up the given TFP : best equipment, ingredients, additives, packaging, utilities...He /she gives some figures about the expected yields of each process step. He/she gives and explain the proper labelling.

Lab work : Comparison of different products of the market (traditional and industrial) :

- Relevant physico-chemical analyses
- Sensory analyses

Lab work : competition between groups of students → which group has produced the best product 1...

- Relevant physico-chemical analyses
- Sensory analyses

Teacher will explain the main defects and falsifications.

Synthesis from the teacher: giving technical, cultural and economical and environmental arguments to the students for modifying the current practices (when needed)

Tools and media

TOOLS: Whiteboard and video projector

MEDIA : Powerpoint

Prerequisites

Hygiene, food safety & food science



By-products and waste valorization. Methods of rational use and introduction of non-waste and resource-saving technologies in the production of traditional food products.

Knowledge

- To be able to organize monitoring of by-products and waste currently dumped.
- To be able to establish a strategy regarding valorisation of wastes and by-product, taking into account technical, economical and environmental aspect.
- To be able to find the relevant regulation regarding by-product and waste management and to make sure it is applied regarding by-product valorisation.
- To be capable to subcontract and deal with specialists, suppliers, researchers..., who in some cases will play a role and/or be in charge of studies and implementation of by-product valorisation.

Behavior

To be able to to abstract thinking, analysis, synthesis. Capacity to deal with various category of professionals.



By-products and waste valorization

Progression

6 hours lecture + 6 hours personal work

- Introductory step : objective of the course. Setting up student's minds in the position of a technologist who is asked to find solutions in order to valorize by-products → the teacher ask them to make some calculations which will eventually show that making high value products with the waste are not always that beneficial since they will produce more waste...20min
- Lecture starting with a classification of the valorization way, from the less complex (agricultural valorization...) to the more complex (high value molecules). And recommendation/discussion regarding the different steps of a good strategy (starting by the evaluation and reduction of the losses).
- Chapter on local regulation.
- Followed by some examples of waste /by-product valorization of local products.
- Case study : students (in groups) should define the short, medium and long term strategy of a food factory regarding the valorization of its by-products. Factory & local context are different for each group.
- Presentation and discussion with the classroom.
- Synthesis by the teacher on common mistakes.

Tools and media

TOOLS: Whiteboard and video projector

MEDIA: Powerpoint with introduction and synthesis

Short movie about methods of rational use and introduction of non-waste and resource-saving technologies in the production of traditional dairy products

Books on food processing, milk and dairy, meat, fish products.

Prerequisites

Hygiene, food safety & food science



Waste management : Methods of disposal of waste in the production of products + local regulations regarding wastes.

Knowledge

- To be able to ensure the factory complies with the environmental regulations regarding waste management.
- To be able to organize monitoring of compliance with environmental cleanliness of production processes.
- To be capable to deal with specialists and/or suppliers, which will implement and/or be involved in the necessary measures to make sure the factory complies with the environmental regulations.

Behavior

To be able to to abstract thinking, analysis, synthesis. Ability to deal with different categories of professionals.



Waste management

Progression

10 hours lectures and examples

- Step 01 : Teacher's lecture about Methods of disposal of waste in the production of products + local regulations regarding wastes. Focus on wastewater and specific wastes in relation with local traditional products.
- Step 02: lecture by professional from a governmental service dealing with wastes from industry (ideally food industry).
- Step 03: lecture of a supplier specialised in waste management for food industry (ideally).

Tools and media

TOOLS: Whiteboard and video projector

MEDIA: Powerpoint with introduction and synthesis

Short movie about methods of disposal of waste in the production of products
+ local regulations regarding wastes.

Books on food processing, milk and dairy, meat, fish products.



New product development and scaling up (introductory course)

Knowledge & know-how

- Understanding of the main benefits and point of attention of NPD
- Understanding of the coverage & personal interest of the following lectures

Behavior

Creativity, creative thinking, ability to work in a team

Prerequisites

Technological equipment of food processing, Planning food enterprises, food processing



New product development and scaling up (introductory course)

Progression

4 hours lectures + 4 hours homework

Step 01 : Introductory speech, question to students...or whatever suits (50 min)

- Introductory course : content, modalities
- The concept of the new product. The objective necessity of the development and implementation of new products
- The process of developing a new product
- Overview of screening situations and expert assessment resources. The selection of ideas and products
- Current trends and future ways of development of new types of products
- Scientific basis for food technology
 - Definition of what is NPD, main steps...
- Discussion (clarification some difficult moments of lecture)
- By the teacher : presentation of the whole module: students will work a lot by groups, make presentation, homework...
 - Homework : individual presentation of a given TFP of another country by each student (they choose the TFP they want from the country they want). Reports of students on the analysis of the market and the needs of the production of traditional foods on the scale of the republic, on the analysis of companies in the region, producing new products; The teacher gives a list of topics to talk about : country, recipe and/or process.
 - Invitation of professionals with 2-3 companies.

Tools and media

TOOLS: Whiteboard and post it, video projector

MEDIA: Short movie on new product development
Statistical information for enterprises, the scale of food production.



The optimization of traditional technologies for small businesses: Experimental design methodology. Preparation of the formulation and definition of the constituent elements of traditional food products. The calculation of their nutritional value.

Knowledge & know-how

- Will be able to set up the proper management of a project of NPD : planning, resources, stakeholder analysis & communication plan, risks & mitigation...
- Will be able to choose and set up the right methodology for optimising a process at small scale, including experimental design methodology.
- Will be able to apply the right methodology for scaling up a process at semi-industrial scale
- Will be able to find the missing information related with an unknown process/product.

Behavior

Rigorous, precision, curiosity, creativity, teamwork (ability to coordinate a multidisciplinary team)

Prerequisites

Technology processing, design



The optimization of traditional technologies for small businesses: Experimental design methodology. Ctd.

Progression

5 days

1. Introductory speech
2. Lecture methodology for adaptation of cuisine recipes to factory scale.
3. Exercice : calculation of energetic value from a recipe. Discussion of results with teacher & students.
4. Lecture on project management applied to NPD : planning, resources, stakeholder analysis & communication plan, risks & mitigation...the lecture starts with a question to students (post it) : Cite 3 projects you managed in your life. 3 hours.
5. Lecture on experimental design methodology : 2 days
6. Exercices on experimental design methodology : 0,5 day
7. Practical work on experimental design methodology : for example optimisation of the texture of whipped cream. 1 day.
8. Written report.

Tools and media

TOOLS: Whiteboard and post it, video projector, specific softwares (statistics, factory design...)

MEDIA: Short movie on the planning and design of small businesses
Powerpoint with the technology for the production of new types of yogurt, etc.
Books on technology of food production and design methodology.



The definition of acceptable levels (targets) of quality indicators for new products, the procedure for establishing the shelf life.

Knowledge & know-how

- To be able to define the limits between an acceptable and non-acceptable product, and to set up the proper analyses to monitor these limits.
- To be able to apply the procedure for defining the product shelf life.
- To be able to justify the shelf life of a given new product.

Behavior

Ability to write precise instructions, and to train staff regarding these instructions & procedures. Ability to communicate with several different stakeholders, including customers/marketing.

Prerequisites

Chemistry, microbiology



The definition of acceptable (target) levels of quality indicators for new products,
the procedure for establishing the shelf life evaluation

Progression

5 days

1. Introductory speech
2. Lecture methodology for adaptation of cuisine recipes to factory scale.
3. Exercice : calculation of energetic value from a recipe. Discussion of results with teacher & students.
4. Lecture on project management applied to NPD : planning, resources, stakeholder analysis & communication plan, risks & mitigation...the lecture starts with a question to students (post it) : Cite 3 projects you managed in your life. 3 hours.
5. Lecture on experimental design methodology : 2 days
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8. Written report.

Tools and media

TOOLS: Whiteboard and post it, video projector, specific softwares (statistics, factory design...)

MEDIA: Short movie on the planning and design of small businesses
Powerpoint with the technology for the production of new types of yogurt, etc.
Books on technology of food production and design methodology.



The principles of factory design for the production of traditional food products

Knowledge & know-how

- To be able to define (with the entrepreneur) the requirements for the future factory → product(s), capacity(ies), evolution at short and mid term...
- To be able to define the production process(es).
- To be able to find the required equipment and suppliers.
- To be able to estimate the number of employees required.
- To be able to draw the 2D map of the future factory.

Behavior

Ability to argue with the entrepreneur to make sure his/her project stays reasonable/relevant. Ability to deal with the equipment suppliers to get quotes and advices.

Prerequisites

Design, technology processing



The principles of factory design for the production of traditional food products

Progression

15 hours lectures + tutorials + 10 hours homework

- Introductory speech, question to students (who form groups and answer on a piece of paper) : to your opinion, what is the right methodology to design a factory? Discussion and eventually presentation/confirmation by the teacher of the right methodology.
- Students are by groups (one TFP per group). Succession of homework and presentation with comments from the teacher and students.
 - a. Requirement of the factory : They have to define precisely the capacity of the factory, per hour and per year. The product(s) : weight, packaging, The sizes of the storages and to justify these sizes...choice of energy (gas, electricity, charcoal...), seasonality of production, laboratory or not? ...
 - b. Definition of the processes of manufacturing
 - c. Choice of the equipment
 - d. General manufacturing diagram (which shows the separations between unit operations).
 - e. Evaluation of the number of workers (1, 2, 3 shifts?).
 - f. Lecture on basics for design : no way back for the product, separations of cold, hot, dry, dirty spaces, storage ...
 - g. 2D design of the factory using the trial version of microsoft Visio.
 - h. Local regulations about factory design and building.

Tools and media

TOOLS: Trial version of Microsoft Visio, Specific softwares (statistics, factory design...), Video Projector

MEDIA: Power point with the right methodology of factory design for the production of traditional food products, Books on the design and method of calculation



The Development and introduction of new recipes (traditional) products in small farms.

The improvement of the product in accordance with market and regulatory requirements.

Knowledge & know-how

- To be able to set up the minimal requirements for safe production at very small scale (premises, hygiene...).
- To be able to find the smallest scale equipment for in farm production.

Behavior

Ability to take into account the specificities of the work in farms : ability to listen & understand the needs & constraints of the farmers, ability to formulate with him/her the “processing project”, Ability to train the farmers to food safety & food processing at small scale.

Prerequisites

Economic, business planning



The Development and introduction of new recipes (traditional) products in small farms.
The improvement of the product in accordance with market and regulatory requirements.

Progression

4 hours lectures + 30 hours homework/internship

This sequence can be a short internship in a farm or done during the normal courses. This can be combined with the entrepreneurship/marketing module to define the costs of production and possibly some marketing strategy.

Each student goes and speaks with a local farmer. The purpose is, on paper, to design a project of small scale production of a given traditional product for his/her farm.

Written report and oral presentation.

Tools and media

TOOLS: Whiteboard and post it, Specific conditions (farm or small shop, mini department of industry), Video projector

MEDIA: Powerpoint with a report in accordance with the individual tasks and passed practice

Books on business planning and marketing,

Learning module for pre-requisites on business planning



The procedure for preparation and approval of regulatory documents for new traditional products

Knowledge & know-how

- To be able to figure out when there is a need for a specific procedure or specific document related with the new product,
- When needed, to be able to find the right expertise for conducting further studies and getting the agreement to produce.

Behavior

Writing ability, capacity to describe the new product and its specificities, ability to deal with various people. Ability to deal with researchers and administration.

Prerequisites

Law basics



The procedure for preparation and approval of regulatory documents for new traditional products

Progression

6 hours+3 hours homework

Lecture on methodology for developing these documents, with examples. The teacher also explains when these documents are required.

Homework and presentation : each group of student develop the documents for their TFPs.

Tools and media

TOOLS: Whiteboard and post it, Specific softwares (statistics, documents design), Video Projector

MEDIA: Powerpoint with concerning the documents of approval and market a new product

Books on the basics of law

Normative and technical documentation approved in the republic



Starting and running a processing line/processing unit. Introductory course.

Progression

Sequence 9 steps (30min)

The objective of this introductory course is to start putting the students in the situation of production managers or entrepreneurs. The teacher will also present the program and objectives of the 5 following sequences, and the pedagogical methods that will be used (by groups? Practical session, tutorials...).



State programs to support small food businesses and farms

Knowledge & know-how

- To be able to find the updated information related with state programs.
- To be able to apply for these state programs in an efficient manner and to draw up the application forms.

Behavior

Writing ability, capacity to describe his/her project and its assets, ability to deal with various people. Ability to deal with the administration.

Prerequisites

Agrobusiness organization



State programs to support small food businesses and farms

Progression

4 hours lecture

- Lecture on the current programs : what are they, where to find information, what do they fund/support? ...
- Case study : you are a young entrepreneur and you need some help to launch your TFP? You can apply to the program XXX. Homework : Fill in the form YYY.
 - Each student present at least one paragraph of the document to the classroom. Discussion with students and teacher.

Tools and media

TOOLS: Whiteboard and post it, Specific softwares (factory design examples of design of production lines and units), Process equipment

MEDIA: Short movie about the installation process line
Power point with presentation of existing programs and concepts of development of agro-industrial complex
Books on entrepreneurship and process equipment.



Organization of production of new traditional products in small enterprises

Knowledge & know-how

- To be able to set up an efficient organisation of a production line in a small food factory,
- To be able to draft the proper documentation in order to organise and monitor the production, in terms of human resources, supply, stock management productive capacity, maintenance and quality (of products).
- To be able within a reasonable time, to use a specialised software (ERP : Engineering Resource Planning) for production management.

Behavior

Writing ability, ability to manage a small production team and to report to the management.

Prerequisites

Law basics, technology processing



Organization of production of new traditional products in small enterprises

Progression

10 hours lectures + 10 hours homework

- Lectures
- Serious gaming

Tools and media

TOOLS: Whiteboard and post it, Specific softwares (factory design examples of design of production lines and units in small enterprises), Process equipment

MEDIA: Short movie about the installation process line
Power point with presentation of production of new traditional products
Books on technology processing
Normative and technical documentation approved in the republic



Continuous improvement “methods”: lean management, 5S, Kaizen, ISO9001...

Knowledge & know-how

- To be able to identify & communicate the need for continuous improvement and to be able to define the best methods to use according to the factory’s specificities.
- To be able to deal with experts of the “continuous improvement methods”, which implies a good knowledge of the objectives and main aspects of these methods.

Behavior

Writing ability, ability to convince and negotiate.

Prerequisites

Management, technology processing



Continuous improvement “methods : lean management, 5S, Kaizen, ISO9001...

Progression

7 hours

- Step 01 : Introductory speech, question to students...or whatever suits (50 min)
- Step 02 : « FAO concept » (30 min)
- Step 03 : «The concept of food safety in the country» (30 min)
- Step 04 : «Quality Management System » (50 min)
- Step 05 : «ISO9001» (50 min)
- Step 06 : lean management : principles and methods, 3 hours
- Step 06 : Synthese / conclusion or whatever suits (60 min)

Tools and media

TOOLS: Whiteboard and post it, Specific softwares (statistics, factory design...), Video projector

MEDIA: Powerpoint with presentation of concepts and quality systems
Books on management, food safety
Learning module for pre-requisites



The safe workplace in small food enterprises and farms

Knowledge & know-how

- To be able to identify the main risks for staff on their workplace.
- To be able to minimise the risk of injury and diseases within the workplace.
- To be able to set up the required procedures and to make sure they are apply for the long term each time necessary.

Behavior

Ability to communicate with all staff, from employees to management. Ability to trigger changes, to negotiate & argue with the management (sometimes/often reluctant).

Prerequisites

Life safety basics



The safe workplace in small food enterprises and farms

Progression

10 hours

- Introductory speech demonstrating the importance of safety at work, the responsibility of the technologist to set up the right measures for protecting workers, and the local frequency of injuries and deaths related with unsafe work conditions.
- Description/discussion on the main causes of injury.
- Discussion on the basic individual protection against noise, eye injury, cuts as well as the safety systems on moving machines.
- Lecture and exercises on first help. What you must do and not do in case of emergency.
- Exercise : each student should explain to a worker (another student) how to use a given protection device.
- Lecture and exercises on the methodology to detect hazards and prevent them.
- Factory visit : Each student should detect at least 5 hazards and propose preventive measures. Oral presentation.

Tools and media

TOOLS: Whiteboard and post it, Specific softwares (factory design), Visual aids (posters, brochures, etc.)

MEDIA: Some posters showing the basic protection measures in food factory
Books on labor protection
Rules on safety and first aid

Marketing and entrepreneurship



Marketing and entrepreneurship



Module overview

Module objectives :

At the end of the module, students are able to create a new product; conduct a market analysis; develop a business plan

Note : the whole module realizes the concept of innovative approach to learning and involves students into the practical activity as a main object of the study. During studying student must develop **3 projects** indicated further. Theoretical part of the module comprises **4 disciplines courses**.

All pedagogical sequences use the projects as a support for workgroup for students

A - Module sections

From 4 to 10 pedagogical sequences in each section

	Sections of the discipline	TOTAL ECTS	Forms of assessment
1	Marketing	3	Exam, oral, exam paper
2	Management	4	Exam, oral, exam paper
3	Business planning	4	Exam, oral, exam paper
4	Entrepreneurship	4	Exam, oral, exam paper
	IN TOTAL	15	



Commodity policy and life cycles

Knowledge & know-how

- to be able to list different commodities and their principal actors
- to be able to describe commodity markets and risks
- to be able to describe the different steps of the life cycle of a commodity trade
- to be able to identify the rate for trading commodities
- to be able to identify the step of the life-cycle of a commodity trade
- to be able to conduct the analyses of commodity policy and life cycles in support of the commodity teams
- to be able to explain one commodity crisis
- to be able to explain the trends of the commodity trading markets

Behavior

Curious, internationally oriented.

Prerequisites

Notions of business trading

Sequences steps

Step 1 : Introductory course

Step 2 : course on trading of commodities

Step 3 : Exercise students will have to present a trading companies (research on Internet and do a presentation by group)

Step 4 : course on prospective on trading markets

Tools and media

TOOLS: Whiteboard and video projector

MEDIA: Internet and courses



Packaging design

Knowledge & know-how

- to be able to identify the key elements of a packaging composition including placement, product & audience
- to be able to describe the ways in which marketing research target audiences and user profiles affect the packaging process

know how:

- to be able to draw different packaging for a product

Behavior

Curious

Prerequisites

Basics experience in graphic design

Sequences steps

Step 1 : Introductory course

Step 2 : course on packaging design

Step 3 : Exercise : students will have to present different packaging design, to analyse and to discuss with the class and to answer the question : where is the innovation of the packaging ? material, for the user....

Step 4 : groupwork on the packaging design of the « fil rouge » product

Tools and media

TOOLS: Whiteboard and video projector, Adobe illustrator & adobe photoshop

MEDIA: Internet and street markets, library, museum, arts galleries



Segmentation of the market

Knowledge & know-how

- to be able to describe differences between big markets and niche markets
- to be able to identify niche markets and the ways to target them
- to be able to describe customers targets and the behaviour of the customer in the market
- to be able to use statistics methods, panels and databases

Behavior

Be curious, analytical mind

Prerequisites

Basics experience in graphic design.

Sequences steps

Step 1 : Introductory course

Step 2 : course on panels and use of them to identify niche markets

Step 3 : course on behaviour customer

Step 3 : Exercise : students will have to identify and present new emerging niche markets

Step 4 : group work to describe the targets of the « fil rouge » product

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Customer survey

Knowledge & know-how

- to be able to identify the right customers (b to b, b to C)

Know how

- to be able to use appropriate tools and places to do a market survey
- to be able to conduct a survey in the street and on the Internet
- to be able to analyse the results of a survey
- To be able to present the results

Behavior

Good listener, good communication and analytical skills

Prerequisites

Statistic tools for data analysis

Sequences steps

Step 1 : Introductory course :

Step 2 : lecture on « how to write a questionnaire”

Step 3 : Exercise : students will need to conduct 2 surveys : one in the street and one on Internet . They will have to choose products linked with the « fil rouge » product. They will present the results in front of the class and lead discussion

Tools and media

TOOLS: Whiteboard and video projector.

Software for data analysis (sphinx, lime survey) and for emailing campaign (send in blue, mail chimps)

MEDIA: Internet.



Brand marketing

Knowledge & know-how

- to be able to recognize the key branding concepts, methods, and tools
- to be able to contribute to brand building projects
- to be able to analyse the brand identity of a product

Behavior

Curious

Sequences steps

Step 1 : Introductory course : what is a brand ?

Step 2 : exercise : each student presents its favourite brand and explain why. The teacher uses this to underline the key factors of a brand identity

Step 3 : Case study: an entrepreneur can present his brand or the teacher can take existing cases like « Nescafé »

Step 4 : Lecture as a summary of all what has been said and organised in 3 Steps : Brand leadership, brand identity and brand building

Step 5 : Group work on the storytelling of the « fil rouge » product

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet., videos and case study.



Advertisement campaign

Knowledge & know-how

- to be able to identify the right media for an ad campaign
- to be able to write a brief for an ad campaign
- to be able to monitor the results of an ad campaign

Behavior

- to be able to negotiate with communication agencies
- to be able to manage a project

Sequences steps

Step 1 : Introductory course

Step 2 : Exercise : students will have to select an « ad campaign » during an big sport event, they will have to show it to the class, to explain the target, the message, to show the audience and the price of the ad, to identify the agency and the other media of the campaign

Step 3 : lecture « media markets and audience for ad campaign »

Step 4 : lecture « how to write a brief » done by a professionnall

Step 5 : workgroup on writing a brief for an ad agency to promote « the fil rouge product »

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Retail network

Knowledge & know-how

- to be able to explain a contract with a retailer
- to be able to describe the rules between suppliers and retailers
- to be able to identify the right retailers to sell a product
- to be able to recognize and discuss trends in retailing

Behavior

to be able to negotiate with a retailer

Sequences steps

Step 1 : Introductory course :

Step 2 : lecture on « Retailing : actors and trends»

Step 3 : lecture : « negotiation with retailers »

Step 4 : workgroup : identify where to sell the « fil rouge » product

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Digital marketing (IT marketing, inbound marketing, content marketing)

Knowledge & know-how

- to be able to explain online customers behaviour and the effects of digital media on consumer decisions
- to be able to describe the basics elementary steps of a digital marketing plan
- to be able to describe the tools and techniques for evaluating digital performance
- to be able to compare and contrast strengths and weakness of various digital marketing tools

Behavior

Digital skills

Prerequisites

Account in a social network



Digital marketing (IT marketing, inbound marketing, content marketing)

Sequences steps

Step 1 : Introductory course :

Step 2 : Teacher will ask the student which company is the more powerful in the digital sphere

Step 3 : lecture on « social media marketing »

Step 4 : lecture on « digital trends » by professional if possible

Step 5 : Exercise : group work students have to build a website for the « fil rouge product »

Step 6 : Exercise : groupwork students will need to build content for a digital campaign for Facebook or another social media for the « fil rouge product »

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Customer relationship Management

Knowledge & know-how

- to be able to identify advantages of a product
- to be able to promote the advantages of the product
- to be able to build brand loyalty of customers
- to be able to build a promotion program
- to be able to use databases of customers and a use a CRM software

Behavior

Critical thinking skills, communication skills

Prerequisites

Statistic tools for data analysis

Sequences steps

Step 1 : Introductory course :

Step 2 : teacher will ask the student in which fidelity program they are involved in

Step 3 : lecture on « Customer relationship management » by a professional or teacher

Step 4 : lecture on « how to build the customer loyalty for a brand »

Step 5 : Groupwork : imagine a fidelity program for the « fil rouge product » consumers

Tools and media

TOOLS: Whiteboard and video projector.
Softwares for CRM

MEDIA: Internet.



Quality Management

Knowledge & know-how

- to be able to describe the subject of ISO 9001, ISO 14001, ISO 28001
- to be able to be an internal auditor a quality management system
- to be able to manage a continuous improvement system
- to be able to describe the PDCA and the Deming cycle and the benefits
- to be able to apply the PDCA approach to a process
- to be able to use a cause and effect diagram
- to be able to use root causes analysis tools to solve a problem

Behavior

Assessment skills, critical thinking

Sequences steps

Step 1 : Introductory course :

Step 2 : lecture on « continuous improvement tools : PDCA, Ishikawa, 5 why... »

Step 3 : exercise : students will be ask to present some of the heroes of the quality system : Taylor, W. Shewhart, Deming, Joseph Duran, Ishikawa,

Step 4 : lecture on « certification and Iso system»

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Development of marketing strategy

Knowledge & know-how

- to be able to identify the best channels to advance the marketing strategy
- to be able to understand and forecast trends of customers
- to be able to develop, defend, and execute solid marketing strategies that drive corporate success
- to be able to incorporate market feed-back into a marketing plan to gain a competitive advantage

Behavior

Analytical skills, critical thinking

Sequences steps

Step 1 : Introductory course :

Step 2 : lecture on « Vision, Values and mission »

Step 3 : exercise : case study from internet explained by a teacher

Step 4 : lecture on « develop a marketing strategy » testimony from a professional

Step 5 : Group work on the « furlough product » to build the marketing strategy

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Swot analysis and other matrix

Knowledge & know-how

- to be able to recognize and describe the limits of the swot analysis
- to be able to use a swot analysis
- to be able to select the right matrix to analyse a market
- to be able to present the results of the swot analysis or a matrix

Behavior

To be able to follow directions to use swot analyses and do not jump to the conclusion

Sequences steps

Step 1 : Introductory course :

Step 2 : lecture on « swot analysis and other tools such as BCG, ADL, Ansoff matrices »

Step 3 : exercises : students will have to apply one the three matrix to a market

Step 4 : workgroup : students will be ask to do the swot analysis for their « fil rouge product »

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Project management

Knowledge & know-how

- to be able to describe roles and responsibilities of project team members across the project life cycle
- to be able to define the foundations of a project management plan, including the projects requirements document, work breakdown structure, schedule and other resources
- to be identify all the stakeholders of a project
- to be able to develop project plan
- to be able to conduct project planning activities that accurately forecast project costs, timelines, and quality

Behavior

- To be able to demonstrate a strong working knowledge of ethics and professional responsibility
- To be able to demonstrate effective organizational leadership and change skills for managing projects, project teams, and stakeholders

Sequences steps

Step 1 : Introductory course :

Step 2 : lecture on « Planning management and tools : Gantt Chart, network diagram, critical path »

Step 3 : Testimony : a professional project manager is invited in the class and explain his job

Step 4 : Group work : the students will have to build the gantt Chart of the « fil rouge » project and present it to the class.
They will have to identify the critical path and identify major risks

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Strategic management

Knowledge & know-how

- to be able to recall the vision and the mission of different companies
- to be able to participate at the definition of a strategy
- to be able to identify competitors and competitive advantages

Behavior

To be able to gain confidence to manage a project from beginning to end.

Sequences steps

Step 1 : Introductory course :

Step 2 : history of strategy

Step 3 : lecture on « blue ocean strategy »

Step 4 : video : Michael Porter about strategy

Step 5 : Groupwork : the student present their strategy for their company (filrouge product)

Tools and media

TOOLS: Whiteboard and video projector, tedx talks.

MEDIA: Internet.



Supply chain management

Knowledge & know-how

- to be able to recognize the importance of sourcing in the cost of a product
- to be able to explain the different transport modes and their economic, environmental and technology characteristics
- to be able to identify types of supply chains matched with types of products
- to be able to describe the role of inventory and factors affecting inventory levels
- to be able to identify the risks in the supply chain (contamination, conflicts, out of supply...)

Behavior

Critical-thinking and analytical decision-making capabilities

Sequences steps

Step 1 : Introductory course :

Step 2 : lecture on « supply chain management »

Step 3 : exercise : students will present the supply chain strategy of Amazon, Columbia, Toyota, Nestlé, Dell, Nike

Step 4 : Groupwork : identify the different suppliers for « the fil rouge » product, the sourcing and the cost of raw materials and energy.

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Logistics management

Knowledge & know-how

- to be able to explain the different transport modes and their economic, environmental and technology characteristics
- to be able to describe the main trends in logistics
- to be able to explain embargo rules and constraints
- to be able to analyse a company's strategic situation, with a particular emphasis on its purchasing function, logistics function and supplier network
- to be able to develop suggestions for change and development of a company's strategies for the purchasing function, including management of supplier relationships and networks and the logistics function

Behavior

To be able to reflect on and combine key perspectives and frameworks within the fields of purchasing management and logistics management

Sequences steps

Step 1 : Introductory course :

Step 2 : lecture on « logistics and transport modes»

Step 3 : Groupwork : students will have to present the best way to send their product to moscow (or another place) and have the cost of it. They will have to justify their choice regarding the quality of service, the customer expectations, and the cost.

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Risks management

Knowledge & know-how

- To be able to identify threats of a projects and weigh their value in the project
- To be able to use decision trees to prioritize actions
- To be able to analyze situations and constructing and selecting viable solutions to solve problems
- To be able to analyse risks and determine risk tolerance

Behavior

- To be able to make decisions in a fast paced environment
- To be able to react rapidly
- To be able to answer efficiently to a question from a media

Prerequisites

Use of probabilities

Sequences steps

Step 1 : Introductory course

Step 2 : lecture on « Risk management in food industry »

Step 3 : Exercise : Students will have to make a research about the biggest food crisis in the state since 20 years and present to the other.

Step 4 : exercise : students will have to do a play role about a food crisis about a contamination of salmonella in products. Some will play the consumers, some the state, some the industrial part, some the quality manager, some the media. They will debate

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Sales management

Knowledge & know-how

- to know the distinction between the skills required for selling and sales management
- to be able identify the key factors in establishing and maintaining high morale in the sales force
- to be able to create an effective sales strategy
- to be able to design a high-performance sales organization
- to be able to participate in creating value for the customers

Behavior

Communicative skills, self-assessment abilities

Prerequisites

Use of probabilities

Sequences steps

Step 1 : Introductory course

Step 2 : lecture on « NLP techniques for selling »

Step 3 : Exercise : Students will have to experience different ways of behaviour to sell something (role-play)

Step 4 : lecture : « sales strategy »

Step 5 : Student Workgroup : they have to build the strategy of selling for their « filrouge » product and present it to their salesforce

Tools and media

TOOLS: Whiteboard and video projector.

MEDIA: Internet.



Innovation management

Knowledge & know-how

- to be able to describe innovation process concepts, approaches and challenges
- to be able to identify relevant innovation trends and developments within selected food areas
- to be able to describe the principles of various tools and techniques in innovation processes
- to be able to overview and discuss approaches to manage innovations in various food sectors

Behavior

Communication skills, analytical thinking, creativity, working in team, leader's skills

Sequences steps

1. Introductory course: objectives of the sequence
2. Lecture - Concepts of innovation, Innovation in the food sector, managing innovation within firms
3. Group discussion "Determinants of innovation"
4. Summary of group discussion by lecturer
5. Lecture – Innovation assessment tool; Innovation and operations management
6. Case study (Innovative food item – BioChok, chocolate)
7. Summary by lecturer

Tools and media

TOOLS: Internet, case study.



Brand management

Knowledge & know-how

- to be able to define trademarks and brand names
- to be able to explain how to maintain, improve and uphold a brand so that the name is associated with positive results
- to be able to explore the concept of branding: its nature, scope, characteristics and value

Behavior

Communication skills, analytical thinking, creativity, working in team, leader's skills, loyalty to company

Sequences steps

1. Introductory course: objectives of the sequence
2. Invited lecture - Managing intellectual property – role of patents in innovations
3. Lecture Brand names, nature, scopes, value and methods to maintain, improve and uphold a brand
4. Discussion with brand examples – Coca Cola vs traditional product
5. Summary by lecturer

Tools and media

TOOLS: Internet, case study.



Organisational planning

Knowledge & know-how

- to be able to identify an organization's immediate and long-term objectives
- to be able to describe and explains related laws and regulations on national level
- to be able to formulate specific strategies to achieve objectives
- to be able to develop monitoring strategies

Behavior

To be able to allocate and coordinate work between team members, analytical thinking, leader's skill, organizational skills

Sequences steps

1. Introductory course: objectives of the course and the modalities. Instructions to group work (virtual company)
2. Invited lecture by professionals (medium business)
3. Group discussion
4. Lecture on national regulations
5. Presentation of group work by students
6. Summary of sequence

Tools and media

TOOLS: Booklet on laws and regulations, internet



Marketing planning

Knowledge & know-how

- to be able to explain relationship between the marketing plan and organization's objectives
- to be able to develop the marketing strategies that the organization will use within given time and budgets

Behavior

Analytical thinking, organizational skills, accuracy, creativity.

Sequences steps

1. Introductory course: objectives of the course and the modalities. Instructions to group work (virtual company)
2. Lecture Marketing planning overview and strategies
3. Presentation of each other's group work and opposition
4. Debate "The role of organization's objectives in marketing planning"
5. Summary of sequence

Tools and media

TOOLS: Internet



Financial planning

Knowledge & know-how

- to be able to explain the concepts and procedures of financial planning
- to be able to apply the financial planning process in the practice of financial planning

Behavior

Impartiality, analytical thinking, organizational skills, accuracy, working in the team

Sequences steps

1. Introductory course: objectives of the course and the modalities. Instructions to group work (virtual company)
2. Lecture Financial planning overview and principles
3. Lecture Process of financial planning
4. Review of financial plans developed by a small enterprise
5. Reading and commenting on scientific paper (case study) Constructing a Cash Budget and Projecting Financial Statements: An Exercise of Short-Term Financial Planning for Entrepreneurs
6. Summary of sequence

Tools and media

TOOLS: Internet, scientific paper (case study), financial plans from «real » company



Strategic planning

Knowledge & know-how

- To be able to explain the reasons and needs for strategic planning
- To be able to identify strategic directions
- To be able to develop strategic planning taking into considerations current trends, perspectives and risks analysis

Behavior

Impartiality, analytical thinking, organizational skills, accuracy, creativity, working in the team

Sequences steps

1. Introductory course: objectives of the course and the modalities. Instructions to group work (virtual company)
2. Discussion of the reasons and needs for strategic planning
3. Review of financial plans developed by a small enterprise
4. Debate “How to use information on novel trends in optimal strategic planning?”
5. Lecture Strategic planning process – stages, directions, considerations
6. Presentation of group work
7. Summary of sequence

Tools and media

TOOLS: Internet, presentation.



Strategic planning

Knowledge & know-how

- to be able to identify the major stages in organization of production process
- to be able to explain the nature of resource planning in the production process
- to be able to identify issues in the production process organization
- to be able to solve issues in the production process organization
- to be able to suggest how organization of production process satisfy the needs of the national economy

Behavior

Communication skills, analytical thinking, leader's skill

Sequences steps

1. Introductory course: objectives of the course and the modalities.
2. Ask students to provide examples of organization in various production types (food product oriented).
3. Group discussion with leading role of teacher on the previous exercise
4. Lecture on major stages in organization of production process
5. Students should comment on each stage and explain the importance of each stage
6. Lecture " Nature of resource planning"
7. Case study – video on "real organization", analysis of organization process in relation to specific region; students should find issues and strategies to improve
8. Student should ask relevant questions on organization of production process, and to the next meeting these questions should be answered by their classmates
9. Summary of sequence

Tools and media

TOOLS: Video, « real documents », internet, case study



Financial sources

Knowledge & know-how

- to be able to identify types and sources of financing (equity, debt financing, lease...)
- to be able to recognize the differences between types of enterprises in financial needs
- to be able to explain norms and regulations on national and international level
- to be able to calculate the size of needed financial sources
- to be able to work with financial documentation

Behavior

Communication skills, analytical thinking, accuracy, ability to work under pressure; ability to search and extract relevant information

Sequences steps

1. Introductory course: objectives of the course, instructions to group work
2. Ask students at the end of the sequence to present the “virtual company”, calculate and explain the need for start-up, goals and sustainability and relation to mega-trends
3. Lecture on types and sources of financing
4. Invited lectures (leader of a small and medium business)
5. Students should comment on invited lecture contents and identify differences between small and medium business financial needs
6. Lecture
7. Final presentation by students (group work)

Tools and media

TOOLS: Internet, Financial documentation, Booklets on regulations and norms.



Taxes and taxation

Knowledge & know-how

- to be able to explain the types and principles of taxes and taxation
- to be able to overview the components of taxable income determination
- to be able to assess and discuss the effect of taxes on economic decisions for business-related taxpaying entities

Behavior

Communicate tax conclusions in a clear and concise manner to relevant stakeholders, ability to search and extract relevant information

Sequences steps

1. Introductory course: objectives of the sequence
2. Lecture on types and principles of taxes and taxation, and components of taxable income
3. Excurses on calculation of taxes
4. Group discussion on effect of taxes on economic decisions for business-related taxpaying entities

Tools and media

TOOLS: Internet, Financial documentation, Booklets on regulations and norms.



Efficiency assessment of production

Knowledge & know-how

- to be able to explain why and how production is monitored
- to be able to describe the measures of quality and efficiency of their production activities
- to be able to describe optimal methods to improve the quality and efficiency of production
- to be able to select optimal methods to improve the quality and efficiency of production

Behavior

Communication skills, analytical thinking, impartiality

Sequences steps

1. Introductory course: objectives of the sequence
2. Students are asked to suggest the reasons for assessment of production needs
3. Overview of the reasons by lecturer
4. Lecture – measures of quality and efficiency
5. Lecture – methods to measure
6. Case study (from previous sequence “organization of production process”– video on “real organization students should perform assessment of production
7. Summary by lecturer

Tools and media

TOOLS: Internet, Video, case study, real documentations.



Cooperation networks

Knowledge & know-how

- to be able to explain the needs for cooperation
- to be able to identify major cooperators in organization and production performance
- to be able to communicate relevant topics with potential cooperators in a professional way

Behavior

Communication, convincing and negotiation skills, analytical thinking

Sequences steps

1. Introductory course: objectives of the sequence
2. Students are asked to suggest the needs for cooperation
3. Summary of suggested and new needs by lecturer
4. Invited lecture by potential collaborators from various segments
5. Debate with potential collaborators on the efficient ways of collaborations
6. Summary by lecturer

Tools and media

TOOLS: Internet, Video, case study, real documentations.

