



EQVEGAN
European Qualifications & Competences for the Vegan Food Industry
621581-EPP-1-2020-1-PT-EPPKA2-SS

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Deliverable 2.3

Innovative training for the vegan food industry technologist/engineer EQF6

Workpackage 2 Professional profiles and skills
Task 2.3 Designing learning outcomes-based VET trainings following ECTS (EQF6)
Lead Beneficiary Faculty of Food Technology and Biotechnology (FFTB)

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Foreword

The work described in this guideline was developed under the project EQVEGAN: European Qualifications & Competences for the Vegan Food Industry (621581-EPP-1-2020-1-PT-EPPKA2-SS). If you wish any other information related to this report or the EQVEGAN project please visit the project web-site (www.eqvegan.eu) or contact:

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1. Summary

EQVEGAN project will provide updated trainings to vegan food industry professionals in order to improve their technical and soft skills in the fast-changing industry. The training materials are prepared for four European Qualifications Framework (EQF) levels, from level 4 to level 7. The occupational profiles tackled by EQVEGAN are the “Fruit, vegetable and related preserver” (EQF4, ISCO-08 code, ESCO 7514), “Food Production Operator” (EQF 4), the “Food technician” (EQF 5), the Food Technologist/Engineer (EQF 6 and 7).

Another level for the training materials is the trainer level which is the subject of this deliverable. The aim of this deliverable is to guide the trainers who will use the training materials prepared by EQVEGAN project on how they need to conduct the trainings and use the materials. It contains information about the trainings including modules, teaching topics, learning outcomes and the content of trainings.

2. Trainings in EQVEGAN

Trainings were designed into four modules:

- 1- Plant-based processing technology,
- 2- Green skills,
- 3- Digitalization and automation,
- 4- Soft skills

The modules are composed of units. In training materials, the aim and description of the units are provided, the teaching topics and learning outcomes are defined and the whole content is given. The assessment, reading list and resources for unit are explained as well.

The stakeholders of the EQVEGAN were identified and professional’s profiles were defined in the first work package of the projects, which constituted the objectives to the design of training. These results are available on the Food Skills portal (food-skills.eu).

The quality of trainings will be assessed for validation and further improvement. Learning outcomes, ECVET and ECTS credits will be validated across the different countries to facilitate the design of a reliable European certification scheme. The certification scheme will be designed to include recognition of prior non-formal and informal learning and guidelines will be issued for guidance by the training organizations.

3. Training for the vegan food industry technologist/engineering

The trainings for the vegan food industry technologist/engineer (EQF 7) should consist of lectures, and practicals and site visits. The training modules on plant-based processing technology, soft skills, digitalization and automation and green skills.

The following sections identify the aim of the respective module in EQF 7, a short description of the module, the contents being explored, the suggested reading and link to training materials that the trainers can use.

3.1. Plant-Based Processing Technology

On a total of 8 ECVET credits, this module covers:

- Technologies
- Nutrition
- Food safety
- Analysis
- Marketing-Law-Economic-New Food Product Development

3.1.1. Technologies

Aim of Unit:

Unit aims to bring to students knowledge of vegan food production.

Students will gain knowledge of the basic raw materials for vegan food production and technological processes used in the food industry. Technologies for the production of food analogues of animal origin and the use of fermentation processes will be presented in detail. Special attention will be paid to the influence of technological processes on nutrients of food plant products.

Description of Unit:

In the Technology unit, students will learn about chemical composition, functional properties and biochemical processes occurring in plant raw materials used for vegan food production. Properties of typical pathogens and microorganisms that cause vegan foods spoilage (origins, development conditions, health impact) will be discuss. Also operations and technologies applied in production of plant food including machinery and equipment selection. Contemporary information concerning vegan food production will be presented.

Teaching Topics:

EQF6
Contact hours: 88h in class/on-line; 28h practice. Non-contact hours: 4 hours
1. Leguminous products (6h in class/on-line; 4h practice)
2. Production of plant proteins (10h in class/on-line; 4h practice)
3. Thermal and non-thermal food processing (20h in class/on-line; 10h practice)
4. Technologies of fungi & yeasts products (8h in class/on-line; 2h practice)
5. Technologies of meat analogues (10h in class/on-line)
6. Technologies of dairy analogues (10h in class/on-line; 2h practice)
7. Technologies of eggs analogues (6h in class/on-line; 2h practice)
8. Technologies of fermented and non-fermented beverages (14h in class/on-line; 4h practice)

Learning Outcomes:

- Principles and legislation to follow when producing vegan food that make the product safe for the consumer
- The influence of technological processes on nutrients of food plant products
- Chemical composition, functional properties and biochemical processes occurring in plant raw materials used for vegan food production
- Properties of typical pathogens and microorganisms that cause vegan foods spoilage (origins, development conditions, health impact)
- Operations and technologies applied in production of plant food including machinery and equipment selection
- Contemporary information concerning vegan food production and packaging in accordance with the technical knowledge and market requirements

Content of Unit:

- 1.1. Legume-based products
- 1.2. Legumes as components of food products
- 2.1. Plant protein extraction methods
- 2.2. Plant protein extrusion
- 2.3. Comparison of plant based proteins from different sources
- 3.1. Thermal food processing
- 3.2. Non-thermal food processing
- 4.1. The use of fungi and yeast in the production of vegan food
 2. Technological treatment of fungi and yeasts
 3. Biotechnological treatment of fungi and yeast
- 5.1. Basics of the production of meat analogues
- 5.2. Technologies in the production of meat analogues
- 5.3. Design and manufacture of meat analogues
- 6.1. Liquid dairy analogues
- 6.2. Fermented dairy analogues
- 6.3. Quark analogues
- 6.4. Cheese analogues
- 6.5. Spread analogues
- 7.1. Basics of the production of egg analogues
- 7.2. Ingredients and technologies in the production of egg analogues
- 7.3. Design and manufacture of egg analogues
- 8.1. Fermented beverages
- 8.2. Non-fermented beverages

Assessment for Unit:

1. Characterize the chemical composition, functional properties and biochemical processes occurring in plant raw materials used for vegan food production.
2. Describe the typical pathogens and microorganisms that cause vegan foods spoilage.

3. Discuss the effect of microbiota on quality and health of consumers.
4. Describe operations and technologies applied in production of plant food including machinery and equipment selection

Reading List for Unit:

1. Abu-Ghannam, N., & Gowen, A. (2011). Pulse-based food products. *Pulse Foods: Processing, Quality and Nutraceutical Applications*, 249-278.
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18. Cornet S.H.V., Snel S.J.E., Schreuders F.K.G., van der Sman R.G.M., Beyrer M., van der Goot A.J. (2020) Thermo-mechanical processing of plant proteins using shear cell and high-moisture extrusion cooking. *Crit Rev Food Sci* DOI: 10.1080/10408398.2020.1864618
19. Zhu H.-G., Tang H.Q. Cheng Y.-Q., Li Z.-G. Tong L.T. (2021) Electrostatic separation technology for obtaining plant protein concentrates: A review. *Trends Food Sci Tech* 113:66-76.

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Resources for Unit:

A fully equipped classroom; hardware and software for online teaching; Whiteboard; Projector.

3.1.2. Nutrition

Aim of Unit:

The unit aims to bring students' knowledge about the topic about types of vegetarian diets, risk of nutritional deficiencies and possibilities to supplement. Students learn about health-related aspects of plant diets consumption. They will find out about differences between bioavailability and bioaccessibility of some nutrients in vegetarian diets. Students will gain knowledge how increase and avoid low bioavailability of nutrients on plant-based diets. They also get acquainted with the rules of proteins supplementation to increase nutritional value of plant diets in relation to level of animal food limitations in diet.

Description of Unit:

In unit Nutrition, students will become familiar with vegetarian diets categorization. The unit aims to deliver to student's knowledge concerning nutritional value of vegan diets in relation to type/restrictiveness. Students will learn how to distinguish/analyse deficiencies, identify and avoid them on vegetarian diets in human nutrition. They get acquainted with the bioavailability and bioaccessibility evaluation and modifications on plant diets. Liebig law development in relation to proteins complementation in vegan nutrition will be presented and discussed.

Methods of the diet supplementation and complementation of vegan diet will be presented (training will be performed).

Health-related benefits and threats of plant diets consumption will be analysed basing on population studies will be (4h).

Unit is composed of teaching topics:

- Plant diets – categorization and definition
- Macro- and micronutrients in vegetarian diets (Nutritional value)
- Nutrient's bioavailability and bioaccessibility of vegan diets
- Protein complementation in vegan diets.
- Health-related benefits and threats of plant diets consumption.
- Assessment

Teaching Topics:

EQF6
Contact hours: 20 hours. Non-contact hours: 10 hours
1. Plant diets – categorization and definition (3h)
2. Macro- and micronutrients in vegetarian diets (Nutritional value) (3h)
3. Nutrient's bioavailability and bioaccessibility of vegan diets (3h)
4. Protein complementation in vegan diets (4h)
5. Health-related benefits and threats of plant diets consumption (5h)
6. Assessment (2h)

Learning Outcomes:

- Name and explain basics types of vegetarian diets, descriptions and rules of their application. Foods proportions in diets.

- Name and explain nutritional value of vegan diets, with distinguishing sources of nutrients and anti-nutritional compounds.
- Name and understand rules of bioavailability and bioaccessibility of nutrients in plant diets.
- Name and understand basic roles of protein's complementation on vegetarian's dietary patterns.
- Name and understand risks and benefits in terms of health and non-communicable diseases.

Content of Unit:

- 1.1. History of vegetarianism/veganism in human nutrition
- 1.2. Types and rules of plant/vegan diet classification
- 1.3. Analysis of nutritional value of vegan diets from the perspective of requirements
- 1.4. Analysis of anti-nutritional compounds and health risk related
- 1.5. Bioavailability and bioaccessibility of nutrients and its limitation in vegan nutrition
- 1.6. Strategy for diet planning considering limitation of proteins, minerals and vitamins.
- 1.7. Analysis of pro-healthy ingredients of vegan diets and its relation to human health and non-communicable diseases (bioactive ingredients, minerals, vitamins)

Assessment:

- 6.1. Distinguish and categorize type of animal protein restrictions in dietary patterns. Explain and discuss levels of restrictiveness.
- 6.2. Explain how to increase nutritional value of vegan diets.
- 6.3. Plan meals including higher bioavailability of nutrients
- 6.4. Plan meals including protein complementary mechanism.
- 6.5. Discuss potential risks and benefits of vegan nutrition and the risk for health
- 6.6. Discuss potential risks and benefits of vegan nutrition and the benefit in non-communicable diseases epidemic

Assessment for Unit:

2h Student seminar preparation

Reading List for Unit:

1. Rizzo, N. S., Jaceldo-Siegl, K., Sabate, J., & Fraser, G. E. (2013). Nutrient profiles of vegetarian and nonvegetarian dietary patterns. *Journal of the Academy of Nutrition and Dietetics*, 113(12), 1610–1619. <https://doi.org/10.1016/j.jand.2013.06.349>
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15. <https://academic.oup.com/nutritionreviews/article/76/11/793/5053734>
16. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7600777/>
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Resources for Unit:

A fully equipped classroom; hardware and software for online teaching; Whiteboard; Projector.

3.1.3. Food Safety

Aim of Unit:

The unit aims to provide knowledge of the general EU principles of food safety, food safety hazards with a focus on vegan food processing and control requirements at the industry level (e.g. prerequisite program requirements and the HACCP system).

Description of Unit:

In unit Safety, students will become familiar with basic food hygiene and food safety legal requirements – prerequisite programs and HACCP system.

In the introductory part, the most important legal acts will be described with the emphasis on the EC 852/2004.

Students will learn about the hazards in food vegan food processing (microbial, chemical and physical) and microbiological criteria for vegan foods as well as typical contamination routes in vegan food processing.

Students will get acquainted with the hygiene requirements for the food premises (outer and inner building requirements); water, air, equipment and surfaces; temperature control; food handling and health of food operators; control of raw materials and food suppliers as well as sanitation protocols, and will learn how to design and complete the mandatory checklists.

Practical assignment will include surface hygiene exercise in a laboratory / allergen testing.

The subunit on HACCP will include basic information on the principles and steps of HACCP system, hazard analysis and critical control points as well as how to develop a HACCP plan. The practical assignment will include the assessment of the HACCP plan of the selected vegan food industry.

Unit is composed of the following teaching topics:

1. EU food safety system and control principles
2. Food safety hazards
3. Prerequisite programs (GMP, GHP, premises, people, product)
4. HACCP system

Teaching Topics:

EQF6
Contact hours: 20 hours. Non-contact hours: 10 hours
1. EU food safety system and control principles (2h)
2. Food safety hazards (6 h)
3. Prerequisite programs (GMP, GHP, premises, people, product) (6 h: 4 lecture+2 practical)
4. HACCP system (4 h: 2 lecture+ 2 practical)
5. Assessment (2h)

Learning Outcomes:

1. Explain the EU food safety system and hygiene control in food industry
- 2.1. Describe hazards in vegan food processing
- 2.2. Compare hazards in terms of sources of contamination, growth and survival in foods and control options
3. Create generic prerequisite program for vegan food processing
- 4.1. Elaborate principles and steps of HACCP system
- 4.2. Analyse HACCP plan of selected vegan food processing plant

Content of Unit:

1. EU food safety system and control principles (2h)
 - The EU food safety strategy and food law – main principles; examples of EFSA reports and RASSF system notifications including vegan foods
 - Regulation 852/2004: Definitions - Prerequisite programs and HACCP
2. Food safety hazards (6 hours)
 - Most common physical and chemical in vegan food processing
 - General characteristics of microbial hazards in vegan food processing
 - Microbiological criteria and microbiological hazards of vegan food
 - Examples of contamination routes of and hazard control in 1-2 vegan food process(es)
3. Prerequisite programs (GMP, GHP, premises, people, product)
 - Elements of prerequisite program: EC (852/2004): building, zoning, construction, water, air, equipment, surfaces, temperature control, food handlers health and practices, food suppliers, cleaning, disinfection, pest control
 - Control plans
 - Checklists and verification
 - Practical: Surface hygiene exercise in a laboratory / allergen testing
4. HACCP
 - 7 principles and 12 steps
 - Hazard analysis
 - Critical Control Points
 - Developing a HACCP plan
 - Practical: Case study- assessment of the HACCP plan

Assessment for Unit:

Project (basic documents/procedures)

Exam (whole course)

Reading List for Unit:

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2. EHEDG Doc. 44 Hygienic Design Principles for Food Factories <https://www.ehedg.org/guidelines/>
3. Heiskanen, S. 2006. Elintarviketeollisuuden HACCP-pohjainen omavalvontaohje. Kasvis- ja marjateollisuus. Versio 5/2006. Helsinki: ETL, Evira & LaatuKetju. 35 p. (in Finnish)
4. Implementation of HACCP plan for blue-mould tofu with focus on microbial hazards https://stud.epsilon.slu.se/10477/1/sapieja_a_171019.pdf
5. Regulation (EC) No 178/2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex%3A32002R0178>
6. Regulation (EC) No 852/2004 on the hygiene of foodstuffs <https://eur-lex.europa.eu/eli/reg/2004/852/oj>
7. Regulation (EC) No 2073/2005 on microbiological criteria for foodstuffs <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32005R2073>
8. The Royal Borough of Kensington and Chelsea. 2019. Vegetarian guide to food hygiene. Retrieved from <https://www.rbkc.gov.uk/business-and-enterprise/food-safety/vegetarian-guide-food-hygiene> on January 28, 2022.
9. Validating a HACCP System for the Production of Vegetable Shito <https://www.hindawi.com/journals/jfg/2018/7146040/>
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Resources for Unit:

- A fully equipped classroom
- Hardware and software for online teaching
- Laboratory and materials for microbial surface testing/allergen testing

3.1.4. Analysis

Aim of Unit:

Unit aims to bring to students knowledge of topic about food analysis. Students learn about the methods of analysing food compounds, contaminants and physical properties, which are important from vegan food quality point of view. They will find out about strategies for determining allergenicity of new plant raw materials and plant based food. Students will gain knowledge on the analysis of the organoleptic properties of vegan food, both by instrumental and sensory methods. They also get acquainted with the basic methods of determining the authenticity of raw materials and food products.

Description of Unit:

In unit Analysis, students will become familiar with methods and strategies used in food analysis. The unit aims to deliver to students knowledge concerning proteins nutritional quality, methods of bioactive compounds and antioxidant activity determination, methods of food contaminants and residues determination and analysis of natural compounds with adverse health effects. Students will learn methods of analysis of rheological properties and texture of vegan food. They get acquainted with the current strategies for determining allergenicity of new plant raw materials and plant based food. Instrumental methods of the organoleptic characteristics of vegan food will be presented (color analysis, aroma analysis, food acoustic analysis, particle characteristics and oral processing analysis). Students will learn sensory techniques used in the analysis of plant products and will be able to design research in order to determine the preferences of vegan consumers (preference mapping) and to indicate possible sensory optimization options for the product intended for them. Intentional and unintentional food adulteration and their implications, the health risks associated with food adulteration, genomic and proteomic-based methods of fraud detection as well as professional and ethical aspects of responsibility for the production of authentic/high-quality food will also be presented.

Unit is composed of teaching topics:

- Food compounds, contaminants and physical properties analysis
- Strategy for determining allergenicity of new plant raw materials and plant based food
- Instrumental studies of the organoleptic characteristics of vegan food
- Food authenticity
- Sensory analysis in vegan product designing
- Assessment

Teaching Topics:

EQF6
Contact hours: 20 hours. Non-contact hours: 10 hours
1. Food compounds, contaminants and physical properties analysis (3h)
2. Strategy for determining allergenicity of new plant raw materials and plant based food (3h)
3. Instrumental studies of the organoleptic characteristics of vegan food (4h)

4. Food authenticity (4h)
5. Sensory analysis in vegan product designing (4h on-line)
6. Assessment (2h)

Learning Outcomes:

- 1.1. Discuss specialized methods of vegan food compounds and physical properties analysis
- 2.1. Evaluate potential allergenicity of new raw materials
- 3.1. Discuss instrumental methods of organoleptic characteristics and design their applications in solving technological problems
- 4.1. Explain intentional and unintentional food adulteration and their implications
- 4.2. Assess the health risks associated with food adulteration
- 4.3. Distinguish between genomic and proteomic-based methods of fraud detection
- 4.4. Evaluate the importance of the analysis of food origin and authenticity
- 4.5. Appraise the importance of professional and ethical responsibility for the production of authentic/high-quality food
- 5.1. Plan sensory techniques used in the analysis of plant products.
- 5.2. Design research in order to determine the preferences of vegan consumers (preference mapping) and to indicate possible sensory optimization options for the product intended for them.

Assessment:

1. Explain and discuss methods of vegan food compounds and physical properties analysis
2. Explain how to evaluate allergenicity of raw materials
3. Discuss instrumental methods of organoleptic characteristics of vegan food
4. Discuss methods of vegan food fraud detection
5. Plan sensory techniques used in the analysis of plant products and design research in order to determine the preferences of vegan consumers (preference mapping) and to indicate possible sensory optimization options for the product intended for them.

Content of Unit:

1. Protein nutritional quality tests
2. Determination of bioactive compounds
3. Analysis of antioxidant activity of vegan food
4. Analysis of food contaminant and residues
5. Analysis of natural compounds with adverse health effects and undesirable compounds
6. Physical properties of vegan food measurements methods
7. Strategy for determining allergenicity of new plant raw material and plant based food
8. Instrumental studies of the organoleptic characteristics of vegan food
9. Color analysis
10. Aroma analysis
11. Food acoustic analysis

12. Particle characteristics
13. Oral processing analysis
14. Food Authenticity
15. Sensory analysis in vegan product designing

Assessment for Unit:

2h Student seminar preparation

Reading List for Unit:

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12. <https://www.eurofins.de/food-analysis/food-news/food-testing-news/meat-substitutes-from-raw-material-control-to-sensory-analysis/>
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19. https://ec.europa.eu/food/system/files/2021-02/pesticides_mrl_guidelines_2020-12830.pdf Guidance Document on Pesticide Analytical Methods for Risk Assessment and Post-approval Control and Monitoring Purposes
20. https://ec.europa.eu/food/plants/pesticides/maximum-residue-levels/guidelines-maximum-residue-levels_en Guidelines - Maximum Residue levels
21. <https://www.fda.gov/food/laboratory-methods-food/pesticide-analytical-manual-pam> Pesticide Analytical Manual (PAM)
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84. Klampfl C.W. 2018. Ambient mass spectrometry in foodomics studies. *Current Opinion in Food Science*, 22, 137–144. <https://doi.org/10.1016/j.cofs.2018.03.014>
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86. Montowka M. Fornal E. (2018). Detection of peptide markers of soy, milk and egg white allergenic proteins in poultry products by LC-Q-TOF-MS/MS. *LWT - Food Science and Technology*, 87, 310-317. <http://dx.doi.org/10.1016/j.lwt.2017.08.091>
87. Kotecka-Majchrzak K., Natalia Kasałka-Czarna N., Sumara A., Fornal E., Montowska M. 2021. Multispecies Identification of Oilseed- and Meat-Specific Proteins and Heat-Stable Peptide Markers in Food Products. *Molecules*, 26, 1577. <https://doi.org/10.3390/molecules26061577>
88. The counterfeiting in the food sector. Consumer guide. How you can learn more to be better prepared. Ministry for Economic Development, Italy. www.uibm.gov.it/attachments/no_to_fake_food.pdf
89. <https://www.europol.europa.eu/publications-documents/operation-opson-ix-%E2%80%93-analysis-report>
90. https://ec.europa.eu/food/food/agri-food-fraud_en
91. https://knowledge4policy.ec.europa.eu/food-fraud-quality/about_en
92. ISO 6658:2017(en) Sensory analysis — Methodology — General guidance
93. ISO 8587:2006 SENSORY ANALYSIS — METHODOLOGY — RANKING
94. ISO 5492:2008(en) Sensory analysis — Vocabulary
95. ISO 8589:2007 Sensory analysis — General guidance for the design of test rooms
96. ISO 13300-2:2006(en)
97. Sensory analysis — General guidance for the staff of a sensory evaluation laboratory — Part 2: Recruitment and training of panel leaders.
98. ISO 13300-1:2006(en)
99. Sensory analysis — General guidance for the staff of a sensory evaluation laboratory — Part 1: Staff responsibilities
100. ISO 13299:2016(en) Sensory analysis — Methodology — General guidance for establishing a sensory profile
101. Sensory Evaluation of Food Lawless H.T., Heymann H. ISBN 978-1-4419-6488-5
102. Principles of Sensory Evaluation of Food, Amerine M. A., Pangborn R.M., Roessler E.B. eBook ISBN: 9781483225210

103. Sensory Evaluation Techniques Meilgaard M. C., Civille G.V., Carr B.C. ISBN 9780849338397
104. ISO 20784:2021(en) Sensory analysis — Guidance on substantiation for sensory and consumer product claims
105. ISO 11035:1994(en) Sensory analysis — Identification and selection of descriptors for establishing a sensory profile by a multidimensional approach
106. Progress in sensory analysis and consumer studies of food. Baryłko-Pikielna N., Matuszewska I. Pol. J. Food Nutr. Sci., 1996, 5 (46), 4-18
107. Sensory evaluation practices Chapter 7 - Affective Testing Stone H., Sidel J. Academic Press, 1985, 227 – 252.
108. Role of sensory evaluation in consumer acceptance of plant-based meat analogs and meat Extenders: A scoping review. Fiorentini M., Kinchla A.J., Nolden A.A. Foods 2020, 9, 1334; doi:10.3390/foods9091334
109. Plant-based cheeses: A systematic review of sensory evaluation studies and strategies to increase consumer acceptance. Short EC, Kinchla AJ, Nolden AA. Foods. 2021;10(4):725. Published 2021 Mar 30. doi:10.3390/foods10040725

Resources for Unit:

- A fully equipped classroom
- hardware and software for online teaching
- Whiteboard
- Projector.

3.1.5. Marketing-Law-Economic-New Food Product Development

Aim of Unit:

The purpose of this unit is to familiarize students with the basic concepts of economics and selected elements of law in relation to food production and marketing. Students learn about certain regularities that guide them and their most important instruments and processes.

Description of Unit:

In unit Marketing-Law-Economic-New Food Product Development, students will become familiar with economic methods and strategies used in food economy and law. The student will learn the regularities of the market and its determinants and will understand the basic legal instruments in the field of food production including vegan food.

Unit is composed of teaching topics:

1. Economics – basic definition
2. Food trends in marketing
3. Food legislation
4. Labelling and packaging
5. Assessments

Teaching Topics:

EQF6
Contact hours: 15 hours. Non-contact hours: 15 hours
1. Economics – basic definition (1h)
2. Food trends in marketing (3h)
3. Food legislation (5h)
4. Labelling and packaging (5h)
5. Assessment (1h)

Learning Outcomes:

1. Explain the concept of market and its rules in national and global economy
- 2a. Explain basic methods and techniques for shaping market processes and using marketing to develop food production
- 2b. Identify methods of basic marketing analysis, appropriate tools in particular food marketing processes, and basic activities in marketing vegan products
- 3a. Express basic principles of food law, identifies legal regulations that shape food safety
- 3b. Identify legal requirements in vegan food production
- 4a. Complete a food product label that follows the current food labelling legislation and is ethically acceptable
- 4b. Suggests a package material suitable to examples of vegan products

Content of Unit:

1. Economics – basic definition
 - 1a. The nature of economics, macro- and microeconomics
 - 1b. Market – function, types
 - 1c. Economic indicators
 - 1d. Economic cycle
2. Food trends in marketing
 - 2a. The impact of marketing on food production and food market functioning and consumer decisions
 - 2b. Marketing mix - the 4p and 4c approach
 - 2c. Product (product levels, brand, packaging, assortment, product life cycle)
 - 2d. Price (stages and methods of price determination pricing)
 - 2e. Distribution (types of distribution channels, conditions of designing distribution channels)
 - 2f. Promotion
3. Food legislation
 - 3a. The application of legal principles relating to food and food products
 - 3b. The structure of the regulatory system, major laws, and current status of EU food law
 - 3c. Food business, food business operator
 - 3d. Food safety and quality
4. Labelling and packaging
 - 4a. Mandatory information for prepacked foods
 - 4b. Ingredients list
 - 4c. Quantity of certain ingredients
 - 4d. Allergen information
 - 4e. Labelling
 - 4f. Food product dating (use-by-date date; best-before date; obtaining data for shelf life prediction, shelf life times of similar products, consumer complaints)
 - 4g. Food packaging materials

Assessment for Unit:

Knowledge test - multiple choice

Reading List for Unit:

1. Blink J., Dorton I., *Oxford IB Diploma Programme: IB Economics Course Book*, Oxford 2020
2. Bremmers H., Purnhager K., *Regulating and Managing Food Safety in the EU*, Springer-Verlag GmbH 2018
3. Kotler P.T., Armstrong G., *Principles of Marketing*, Global Edition, Pearson Education Limited, 2020
4. Meulen van der B., *EU Food Law Handbook*, European Institute for Food Law series, Vol. 9, 2014

5. Sloman J., D. Garratt, *Essentials of Economics*, Pearson 2018

Resources for Unit:

- A fully equipped classroom
- hardware and software for online teaching
- Whiteboard
- Projector.

3.2. Green Skills

Even though food waste is primarily the responsibility of agriculture and consumers, the food industry seeks to improve its performance in order to minimize food waste even further, both for sustainability and profitability. Therefore, 'GREEN SKILLS' assists in building skills in energy and water management.

With suggested 6 ECVET credits, it covers:

- Sustainability,
- Vegan food processing,
- Economy, marketing and entrepreneurship,
- Food legislation
- Society and visibility.

3.2.1. Sustainability

Aim of Unit:

Unit aims to bring to students knowledge of topics about sustainability, general definition and parameters that stand in terms of sustainable development. The unit aims to deliver to students what sustainable vegan processing and plant-based processing is. Another is to explain energy/water/waste critical points in processing and how food waste in processing can be reduced. Also, observation regarding food waste, would be oriented towards, how to educate consumers how to treat plant-based products, how to reduce, reuse and recycle plant-based products. Through the unit, there will be focus on food by-products and effective usage of by-products in extraction processing and further incorporation of output products. In waste management, it is necessary to establish critical thinking and skills toward future lead in vegan food processing technology.

Description of Unit:

In unit Sustainability, students will become familiar with general definitions and parameters that stand in terms of sustainable development. The unit aims to deliver to students what sustainable vegan processing and plant-based processing is. Another is to explain energy/water/waste critical points in processing and how food waste in processing can be reduced. Students will compare conventional and vegan food processing technologies. Also, students will be trained to prepare plans for food waste reduction in vegan food processing. There will be education regarding food waste, how to educate consumers how to treat plant-based products, how to reduce, reuse and recycle plant-based products. Through the unit, there will be focus on food by-products and effective usage of by-products in extraction processing and further incorporation of output products. In waste management, it is necessary to establish critical thinking and skills toward future lead in vegan food processing technology. There will be usage of software to understand, collect and analyze data from vegan food processing plants and analyze data in terms of sustainable parameters.

Unit is composed of teaching topics:

- Introduction to Sustainability
- Energy/water/waste critical points
- Food waste – targeting consumers
- Food by-products
- Waste management

- Assessment

Teaching Topics:

EQF6	
Contact hours: 30 hours. Non-contact hours: 3 hours	
1.	<p>Introduction to_sustainability</p> <ul style="list-style-type: none"> - Sustainable food production - Sustainable food sources - Protein sources - Traditional and emerging technologies and approaches used along the food chain - Challenges for sustainable food value chains - Strategies for improving the sustainability of food systems - Sustainable development goals - Food technology sustainable techniques - Nutrition - Future Efforts
2.	<p>Energy/water/waste critical points</p> <ul style="list-style-type: none"> - Mapping of Energy/water/waste critical points - Sustainable production - Carbon cycle - Actions to make food production more sustainable - Food classification systems - Footprint
3.	<p>Food waste – targeting consumers</p> <ul style="list-style-type: none"> - Vegan food processing and waste - Comparison with standard technologies information on waste generation - Comparison of available technologies and waste generation - Waste utilization
4.	<p>Food by-products</p> <ul style="list-style-type: none"> - Visit to processing plant (3h) - Sustainable Development Goals - Sustainable Food Systems - Plant food by – products and reuse - Lean, green and digitalization towards smart, sustainable and energy efficient processing with low emission technologies
5.	<p>Waste management</p> <ul style="list-style-type: none"> - Visit to processing plant (2h) - Food waste - Footprints - Life cycle assessment and digitalization- waste prevention - Climate Protection

Learning Outcomes:

- 1.1 Identify sustainable parameters
- 1.2. Explain vegan food processing in terms of sustainability
- 2.1 Compare conventional technologies with VFP
- 2.2 Distinguish energy/water/ waste critical points in VFP
- 3.1 Create a plan for food waste reduction in VFP
- 3.2 Manage education for consumers regarding sustainability in VFP
- 4.1. Estimate by-products in VFP
- 4.2. Evaluate food byproducts worth for further processing
- 5.1. Analyze data obtained from sustainability evaluation in VFP
- 5.2. Apply tools for sustainability evaluation in VFP in complete value chain

Assessment:

- 6.1. Quantified sustainability values using software tools for calculations in VFP chain
- 6.2. Develop plan for food waste consumer education

Content of Unit:

- 1.1 Identify sustainable parameters
- 1.2. Explain vegan food processing in terms of sustainability
- 2.1 Compare conventional technologies with VFP
- 2.2 Distinguish energy/water/ waste critical points in VFP
- 3.1 Create a plan for food waste reduction in VFP
- 3.2 Manage education for consumers regarding sustainability in VFP
- 4.1. Estimate by-products in VFP
- 4.2. Evaluate food byproducts worth for further processing
- 5.1. Analyze data obtained from sustainability evaluation in VFP
- 5.2. Apply tools for sustainability evaluation in VFP in complete value chain

Assessment for Unit:

- 2h Student seminar preparation and calculations

Reading List for Unit:

- 1. Sustainable Food Processing 1st Edition; by Brijesh K. Tiwari (Editor), Tomas Norton (Editor); Nicholas M. Holden (Editor); Elsevier (2013)
- 2. Sustainable Food Processing and Engineering Challenges; by Charis Michel Galanakis (Editor); Academic Press; 2021
- 3. Sustainable Food Systems from Agriculture to Industry, by Charis M. Galanakis (Editor); Academic Press; 2018
- 4. Sustainable Food Waste Management: Concepts and Innovations, by Monika Thakur, V. K. Modi, Renu Khedkar (Editors); Springer; 2021
- 5. Valorization of Food Processing By-Products; by M. Chandrasekaran (Editor), CRC, 2012

6. Sustainability of the Food System, by Noelia Betoret, Ester Betoret (Editors); Academic Press; 2020
7. Sustainable Production in Food and Agriculture, by Jolanta B. Królczyk, Pawel Sobczak, Wioletta Żukiewicz-Sobczak (Editors), MDPI Books; 2020

Resources for Unit:

A fully equipped classroom; hardware and software for online teaching; Whiteboard; Projector, Software for calculations of sustainable parameters. Special time and organization for on-site visit to vegan food processing plants.

3.2.2. Vegan Food Processing

Aim of Unit:

Unit aims to bring to students knowledge of topics about vegan processing technology, critical points in sustainable vegan food production and assessment of safety in vegan food. The unit aims to deliver to students knowledge about basics vegan processes in no waste philosophy. Another is to explain how sustainable vegan production is. In assessment of safety of vegan food products topics students will know how to prepare documents to realize basic safety requirements.

Description of Unit:

In unit Introduction to vegan processing technology, students will become familiar with general information about basic processes useful in vegan food production and try to implement no waste philosophy in VFP. Another is to explain how sustainable is vegan food production and how to prepare to plan for mapping in sustainable production of vegan food. Students will compare conventional and vegan food processing technologies. Also, students will be trained to prepare basic procedures for safety requirements in VFP.

Unit is composed of teaching topics:

1. Introduction to vegan processing technology
2. Mapping of critical points in sustainable vegan food production (raw material, processing, packaging)
3. Assessment of safety of VFP
4. Assessment

Teaching Topics:

EQF6

Contact hours: 30 hours. Non-contact hours: 2 hours

1. Introduction to vegan processing technology (6h)
 - Why veganism is key to zero-waste eating ?
 - What is veganism?
 - What is zero waste?
 - Why is veganism the key to zero-waste eating?
 - Is veganism healthy?
 - What Are Vegan Meat Alternatives Made Of?
 - Meat Alternatives, their economical and environmental effects
 - Meat Alternative Technology
 - Ingredients for Plant-Based Meats and Seafood
 - Good Manufacturing guidelines for Vegan Products
 - Industry Standards
 - Prerequisite Programmes
2. Mapping of critical points in sustainable vegan food production (raw material, processing, packaging) (12h)
 - The relationship between health and diet

- The relationship between environment and plant-based diet
3. Assessment of safety of VFP (10h)
4. Assessment (2h)

Learning Outcomes:

- Implement “no waste” philosophy in VFP.
- Create a plan for mapping in sustainable production of vegan food.
- Prepare procedures of the assessment system in VFP.
- Preparation of documents for the system & Test

Content of Unit:

1. Implement “no waste” philosophy in VFP
2. Create a plan for mapping in sustainable production of vegan food
3. Prepare procedures of the assessment system in VFP
4. Preparation of documents for the system & Test. Submission of developed system documents and procedures and test.

Reading List for Unit:

1. Agnoli, C., Baroni, L., Bertini, I., Ciappellano, S., Fabbri, A., Papa, M., & Sieri, S. (2017). Position paper on vegetarian diets from the working group of the Italian Society of Human Nutrition. *Nutrition, Metabolism, and Cardiovascular Diseases*, 27(12), 1037–1052.
2. Banis, D. (2018). Everything is ready to make 2019 the "year of the vegan". Are you? *Forbes*, 31 Dec, 2018.
3. Pojic, M., Misan, A., & Tiwari, B. (2018). Eco-innovative technologies for extraction of proteins for human consumption from renewable protein sources of plant origin. *Trends in Food Science & Technology*, 75, 93–104.
4. Dagevos, H., & Voordouw, J. (2013). Sustainability and meat consumption: Is reduction realistic? *Sustainability: Science, Practice and Policy*, 9(2), 60–69
5. Ulla A. Saari, U. A. Saari, Cornelius Herstatt, C. Herstatt, Rajnish Tiwari, R. Tiwari, Ozgur Dedehayir, O. Dedehayir, & Saku J. Mäkinen, S. J. Mäkinen. (2021). The vegan trend and the microfoundations of institutional change: A commentary on food producers’ sustainable innovation journeys in Europe. *Trends in food science & technology*, 107, 161-167.

Resources for Unit:

A fully equipped classroom; hardware and software for online teaching; Whiteboard; Projector.

3.2.3. Economy, Marketing and Entrepreneurship

Aim of Unit:

This unit is aimed to delve deeper into the interwinding principles of economy, marketing and entrepreneurship. Throughout this unit the learner should be guided to appreciate the long term impact of research and development on business activities. Encouraging learners to be creative, innovative and ethical towards both shareholders and stakeholders. This should be in support of their ability to plan and manage projects in order to achieve objectives.

Being in touch with today's essential requirements dictates that any process embarked upon should rely on a circular economy concept and to be sensitive to the multidisciplinary view of the ecosystem of ideas, legislation and stakeholders at play in such scenarios. It is not enough to produce without taking into consideration the future outcomes of such production. Learners should not only be familiar with the concepts of the green economy, but also be able to identify areas where such activities can be implemented successfully.

Traceability is of paramount importance and reflecting this reality, the learners will be able to analyse a production supply chain identifying its hazards and to design a traceability system for the management of food safety problems.

Description of Unit:

Throughout this unit learners will become intrinsically familiar with assessing formal economic approaches and translate them into circular designs, based on concepts of sustainability and productivity. Learners will be exposed to theories that are proved to assist in shifting from linear to circular economy. Importance should also be given to the concepts of green economy. Learners should be familiar with the concept of global environmental concerns, that is, serious environmental issues of immediate global relevance and therefore considered to be of common interest; both in national and international scales.

In traceability the learners are required to master the correct terminology to express concepts relating to traceability, food safety and food quality. Learners must know principles of food safety legislation, food traceability and labeling. Moreover learners are to be exposed to blockchain technologies in order to be able to understand how such technologies can assist in food traceability. Blockchain's properties are to be discussed and applied to a food traceability scenario.

Learners will finally become familiar not only with the main theories related to entrepreneurship and business start-ups but will have the opportunity to explore, interact and learn from a number of first-hand situations. The challenges of working with diverse team members will provide the learners not only with the possibility to look at entrepreneurship ideas from different perspectives, but also to come up with more creative, original and feasible solutions to challenges that will arise.

This unit is composed of teaching topics:

- Circular economy
- Green economy concept
- Traceability (over Blockchain)
- Introduction to Entrepreneurship
- Assessment

Teaching Topics:

EQF6

Contact hours: 23 hours. Non-contact hours: 4 hours

1. Circular economy – 5 h
2. Green economy concept – 5 h
3. Traceability (over Blockchain) – 5 h
4. Entrepreneurship – 5 h
5. Assessment – 3h

Learning Outcomes:

- 1.1 - Assess the 'take-make-dispose approach forming the basis of the existing economic system
- 1.2- Apply theories based on circular economy approach to design more sustainable products
- 1.3 – Examine theories that enable the shift from a linear model to a circular economy
- 2.1- Examine interdependencies of both local and global environmental problems
- 2.2- Evaluate economy of green energy generated from various energy sources
- 3.1 - Map food processes using flow charts and communication diagrams
- 3.2 - Explore blockchain properties as applied to critical control points for food quality and traceability
- 4.1 - Compare techniques used to generated and evaluate business ideas
- 4.2 – Examine important considerations when developing a business idea
- 4.3 – Apply business planning and control initiatives

Content of Unit:

- 1.1 - Assess the 'take-make-dispose approach forming the basis of the existing economic system
- 1.2- Apply theories based on circular economy approach to design more sustainable products
- 1.3 – Examine theories that enable the shift from a linear model to a circular economy
- 2.1- Examine interdependencies of both local and global environmental problems
- 2.2- Evaluate economy of green energy generated from various energy sources
- 3.1 - Map food processes using flow charts and communication diagrams
- 3.2 - Explore blockchain properties as applied to critical control points for food quality and traceability
- 4.1 - Compare techniques used to generated and evaluate business ideas
- 4.2 – Examine important considerations when developing a business idea
- 4.3 – Apply business planning and control initiatives

Assessment:

- 5.1. Develop circular business plan for a food industry
- 5.2. Develop plan for blockchain implementation for food traceability

Assessment for Unit:

- 3 Business plan and blockchain implementation

Reading List for Unit:

1. Tay, F. (2015), Turning Good Ideas Into Small Businesses)
2. Hudson, K (2007), The Idea Generator: Tools for Business Growth
3. Barrow C., Barrow P., Brow R. (2012) The Business Plan Workbook
4. Svane, M., Adler, C. (2015) Startupland: How Three Guys Risked Everything to Turn an Idea into a Global Business
5. Evans, V., Tracy, B. (2014) The Standout Business Plan: Make It Irresistible and Get the Funds You Need for Your Startup or Growing Business
6. Griffin, M.P., (2015), How to Write a Business Plan: A Step-by-Step Guide to Creating a Plan That Gets Results, Fifth Edition
7. BURNS, P (2011) Entrepreneurship and Small Business. 3rd Ed. Basingstoke: Palgrave MacMillan.
8. DOWN, S. (2010) Enterprise, Entrepreneurship and Small Business. London: Sage.
9. CARTER, S. and JONES-EVANS, D. (2012) Enterprise and Small Business: Principles, Practice and Policy. London: Pearson.
10. NEWTON, A. (2014) An Introduction to the Green Economy: Science, Systems and Sustainability
11. DRESCHER, D. (2017) Blockchain Basics: A Non-Technical Introduction in 25 Steps
12. WEETMAN, C. (2020) A Circular Economy Handbook: How to Build a More Resilient, Competitive and Sustainable Business
13. CHARTER, M. (2018) Designing for the Circular Economy

Resources for Unit:

A fully equipped classroom; hardware and software for online teaching; Whiteboard; Projector.

3.2.4. Food Legislation

Aim of Unit:

The Food Legislation Unit is designed to provide students with a thorough grounding in all major fields of food laws and regulations related to the vegan industry. The aim of this unit is to educate students about the sustainability policy. The unit also aims to explain the concept and importance of food law and legislation. Additionally, the students will get information about regulations related to the production and consumption of vegan foods, such as Food Safety, Food Labelling, Food Contaminants, Additives, GMO, etc. Another aim is to examine the background and terminology of food ethics and food fraud and to introduce key concepts related to control measures to combat the vulnerability to fraud in various cases. The course emphasizes the basic principles of voluntary food labelling and offers the opportunity to illustrate the importance of labelling for vegan products in the food industry.

Description of Unit:

This Food Legislation Unit offers a unique opportunity for students to gain a general overview of food laws and regulations related to the vegan industry. This course examines the role of policies on sustainable food system, government policies associated with sustainable food systems, Farm to Fork Strategy, and European Legislation on food waste. Students will understand the concept and significance of food law and legislation as well as be aware of Codex Alimentarius and European Union Legislation systems. This course provides an in-depth understanding of the legal framework relating to Food Safety, Food Contact Materials, Food Labelling, Food Contaminants, Pesticides, Additives, GMO regulations. Through the unit, students will get an understanding of the background and terminology for food ethics and food fraud as well as key concepts related to control measures to combat the vulnerability to fraud in various cases. This unit examines what voluntary food labelling is and why it is important for the vegan industry. Food regulations and standards will be discussed in the context of sustainability, ethics, and science-based principles.

Unit is composed of teaching topics:

1. Sustainability Policy
2. Food law and legislation
3. Food ethics
4. Voluntary labelling
5. Assessment

Teaching Topics:

EQF6
Contact hours: 24 hours. Non-contact hours: 2 hours
1. Sustainability Policy (presentation pptx)
2. Food law and legislation (presentation pptx)
3. Food ethics (presentation pptx)

4. Voluntary labeling (presentation pptx)
5. Visit to laboratory
6. Visit to processing plant

Learning Outcomes:

- 1.1 Identify the role of policy in promoting sustainable food practices
- 1.2. Analyse government policies associated with sustainable food systems
- 1.3. Analyse European Legislation on Food Waste
- 2.1. Evaluate the concept of food law and legislation
- 2.2. Evaluate the legal regulations related to the production and consumption processes of vegan foods
- 3.1 Examine the background and terminology for food ethics and food fraud
- 3.2 Inspect relevant control measures to combat the vulnerability to fraud for various cases
- 3.3. Evaluate legislation on food fraud in the EU
- 3.4. Analyse definition of vulnerability assessment tools such as The Rapid Alert System for Food and Feed (RASFF), EMAAlert, etc.
- 3.5. Appraise consumer perceptions of food ethics and food fraud
- 4.1. Evaluate what voluntary food labelling is.
- 4.2. Illustrate the importance of labelling for vegan industry

Assessment:

- 5.1. Describe basic report of food legislation used in vegan food processing

Content of Unit:

- 1.1 Identify the role of policy in promoting sustainable food practices
- 1.2. Analyse government policies associated with sustainable food systems
- 1.3. Analyse European Legislation on Food Waste
- 2.1. Evaluate the concept of food law and legislation
- 2.2. Evaluate the legal regulations related to the production and consumption process of vegan foods
- 3.1 Examine the background and terminology for food ethics and food fraud
- 3.2 Inspect relevant control measures to combat the vulnerability to fraud for various cases
- 3.3. Evaluate legislation on food fraud in the EU
- 3.4. Analyse the definition of vulnerability assessment tools such as The Rapid Alert System for Food and Feed (RASFF), EMAAlert, etc.
- 3.5. Appraise consumer perceptions of food ethics and food fraud.
- 4.1. Evaluate what voluntary food labelling is.
- 4.2. Illustrate the importance of labelling for vegan industry

Assessment:

- 5.1. Describe basic report of food legislation that used in vegan food processing

Assessment for Unit:

2h The basic report of food legislation that used in vegan food processing

Reading List for Unit:

1. Food Ethics Education, by Rui Costa, Paola Pittia (Editor); Springer; 2018
2. govino, M., Cerciello, M., & Gatto, A. (2018). Policy efficiency in the field of food sustainability. The adjusted food agriculture and nutrition index. *Journal of environmental management*, 218, 220-233.
3. llen, T., & Prospero, P. (2016). Modeling sustainable food systems. *Environmental management*, 57(5), 956-975.
4. nonymous (2019). What Does Food Sustainability Really Mean?. <https://www.ecoandbeyond.co/articles/food-sustainability/>
5. C (2020). Towards a Sustainable Food System. Independent Expert Report.
6. rewnowski, A. (2015). Global food policy and sustainability. In *Nutrition for the Primary Care Provider* (pp. 174-178). Karger Publishers.
7. AO (2021). Dietary guidelines and sustainability. <https://www.fao.org/nutrition/education/food-dietary-guidelines/background/sustainable-dietary-guidelines/en/>
8. ang, T. and Barling, D. (2013). Nutrition and sustainability: an emerging food policy discourse. *Proceedings of the Nutrition Society*, 72(1), pp. 1-12. doi: 10.1017/S002966511200290X
9. bayelu, A. E., & Ayansina, S. O. (2020). Agricultural and Food Policy: Pathways to Sustainable Food Systems and Food Security. In *Developing Sustainable Food Systems, Policies, and Securities* (pp. 1-15). IGI Global.
10. Sabate, J., & Soret, S. (2014). Sustainability of plant-based diets: back to the future. *The American journal of clinical nutrition*, 100(suppl_1), 476S-482S.
11. Codex alimentarius, Understanding Codex. <http://www.fao.org/3/ca1176en/CA1176EN.pdf>
12. Commission Directive 2007/42/EC of 29 June 2007 Relating to Materials and Articles Made of Regenerated Cellulose Film Intended to Come into Contact with Foodstuffs (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007L0042&from=EN>)
13. Commission Regulation (EU) No 10/2011 of 14 January 2011 on Plastic Materials and Articles Intended to Come into Contact with Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011R0010&from=EN>)
14. Commission Regulation (EC) No 450/2009 of 29 May 2009 on Active and Intelligent Materials and Articles Intended to Come into Contact with Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R0450&from=EN>)
15. Commission Regulation (EC) No 1881/2006 of 19 December 2006 Setting Maximum Levels for Certain Contaminants in Foodstuffs (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R1881&from=EN>)
16. Commission Regulation (EC) No 1441/2007 of 5 December 2007 amending Regulation (EC) No 2073/2005 on Microbiological Criteria for Foodstuffs (<https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:322:0012:0029:EN:PDF>)

17. Commission Regulation (EC) No 2023/2006 of 22 December 2006 on Good Manufacturing Practice for Materials and Articles Intended to Come into Contact with Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R2023&from=EN>)
18. Council Directive of 15 October 1984 on the Approximation of the Laws of The Member States relating to Ceramic Articles Intended to Come into Contact with Foodstuffs (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31984L0500&from=EN>)
19. Council Regulation (EEC) No 315/93 Of 8 February 1993 Laying Down Community Procedures for Contaminants in Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31993R0315&from=EN>)
20. Codex alimentarius, Understanding Codex. <http://www.fao.org/3/ca1176en/CA1176EN.pdf>
21. Commission Directive 2007/42/EC of 29 June 2007 Relating to Materials and Articles Made of Regenerated Cellulose Film Intended to Come into Contact with Foodstuffs (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007L0042&from=EN>)
22. Commission Regulation (EU) No 10/2011 of 14 January 2011 on Plastic Materials and Articles Intended to Come into Contact with Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011R0010&from=EN>)
23. Commission Regulation (EC) No 450/2009 of 29 May 2009 on Active and Intelligent Materials and Articles Intended to Come into Contact with Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R0450&from=EN>)
24. Commission Regulation (EC) No 1881/2006 of 19 December 2006 Setting Maximum Levels for Certain Contaminants in Foodstuffs (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R1881&from=EN>)
25. Commission Regulation (EC) No 1441/2007 of 5 December 2007 amending Regulation (EC) No 2073/2005 on Microbiological Criteria for Foodstuffs (<https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:322:0012:0029:EN:PDF>)
26. Commission Regulation (EC) No 2023/2006 of 22 December 2006 on Good Manufacturing Practice for Materials and Articles Intended to Come into Contact with Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R2023&from=EN>)
27. Council Directive of 15 October 1984 on the Approximation of the Laws of The Member States relating to Ceramic Articles Intended to Come into Contact with Foodstuffs (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31984L0500&from=EN>)
28. Council Regulation (EEC) No 315/93 Of 8 February 1993 Laying Down Community Procedures for Contaminants in Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31993R0315&from=EN>)
29. Codex alimentarius, Understanding Codex. <http://www.fao.org/3/ca1176en/CA1176EN.pdf>
30. Commission Directive 2007/42/EC of 29 June 2007 Relating to Materials and Articles Made of Regenerated Cellulose Film Intended to Come into Contact with Foodstuffs (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007L0042&from=EN>)
31. Commission Regulation (EU) No 10/2011 of 14 January 2011 on Plastic Materials and Articles Intended to Come into Contact with Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32011R0010&from=EN>)

32. Commission Regulation (EC) No 450/2009 of 29 May 2009 on Active and Intelligent Materials and Articles Intended to Come into Contact with Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009R0450&from=EN>)
33. Commission Regulation (EC) No 1881/2006 of 19 December 2006 Setting Maximum Levels for Certain Contaminants in Foodstuffs (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R1881&from=EN>)
34. Commission Regulation (EC) No 1441/2007 of 5 December 2007 amending Regulation (EC) No 2073/2005 on Microbiological Criteria for Foodstuffs (<https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2007:322:0012:0029:EN:PDF>)
35. Commission Regulation (EC) No 2023/2006 of 22 December 2006 on Good Manufacturing Practice for Materials and Articles Intended to Come into Contact with Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32006R2023&from=EN>)
36. Council Directive of 15 October 1984 on the Approximation of the Laws of The Member States relating to Ceramic Articles Intended to Come into Contact with Foodstuffs (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31984L0500&from=EN>)
37. Council Regulation (EEC) No 315/93 Of 8 February 1993 Laying Down Community Procedures for Contaminants in Food (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31993R0315&from=EN>)
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Resources for Unit:

A fully equipped classroom; hardware and software for online teaching; Whiteboard; Projector, Special time and organization for on-site visit to laboratory and vegan food processing plant.

3.2.5. Society and Visibility

Aim of Unit:

This unit aims to explore the links between the environment and food systems. Students should be guided to develop concern with the protection of natural resources and ecosystem services. Food systems and also food processing should contribute to the preservation and enhancement of environmental integrity, and contribute more broadly to the Sustainable Development Goals. They also must discuss the cause-effect relationships between environmental and food systems and to know which are the environmental performance indicators and tools to analyze the environmental impacts of different dietary options. It is also important to know how to communicate environmental issues to consumers. They should identify opportunities for rationalization of resources and new practices to improve environmental performance and formulate critical environmental thinking associated with processing and vegan diets.

Description of Unit:

In this unit, students will become familiar with the definition of food systems, with their contributions to the Sustainable Development Goals. The unit aims to develop students' understanding of the environmental impacts associated with food systems and diets in a context of respect for sustainability principles. It aims to lead students to understand and compare the effects of environmental changes, such as climate change, biodiversity loss, depending on the various food systems and diets, including veganism. It will permit to understand the importance of approaches to help integrate environmental concerns into food systems and diets and develop simple consumer information tools. Students will be engaged with the concept of the environment footprint and associated tools. They will compare the environmental performance of conventional and vegan food systems. They also will analyze and interpret data, synthesize information in order to validate conclusions and propose actions for environmental improvement in vegan processing.

Unit is composed of teaching topics:

- Food systems concepts
- Environment and food systems
- Environmental footprint
- Assessment

Teaching Topics:

EQF6

Contact hours: 30 hours. Non-contact hours: 2 hours

1. Food systems concepts (presentation pptx) – 8 h
2. Environment and food systems (presentation pptx) - 8h (2h online)
3. Environmental footprints (presentation pptx) - 12h (4h online + 4h visit)
4. Student seminar preparation + Test – 2 h

Learning Outcomes:

- Distinguish between food systems, sustainable and vegan food systems
- Discuss, from an environmental perspective, the differences between sustainable and vegan food systems
- Explain the contribution of vegan food systems to SDG 2030
- Explore the broad tools that can be used to make food systems sustainable
- Develop strategies for communicating about vegan food systems
- Compare the impact of food systems (including vegan food systems) on natural resources and ecosystems services
- Discuss the influence of effects of environmental issues into the vegan food systems (including land use, climate change and biodiversity loss)
- Explore some tools used to collect information about the impact of vegan diet in environmental issues (such as the use of big data, modeling and behavior change models)
- Propose food systems changes to achieve an environmental integrity
- Explore the environmental performance indicators associated with sustainable and vegan diet
- Discuss the how we collect data from individuals and how to translate that into a measure of impact
- Use some tools to collect information about environmental impacts of food systems and diets
- Use software tools to evaluate footprints diets, including vegan diet
- Discuss appropriate measures of environmental performance of the vegan food processing
- Calculate the environmental footprint of vegan diet
- Propose strategies to reduce environmental footprint
- Communicate the environmental footprint of vegan diet
- Public presentation of documents elaborated during classes

Content of Unit:

1. Distinguish between food systems, sustainable and vegan food systems
2. Discuss, from an environmental perspective, the differences between sustainable and vegan food systems
3. Explain the contribution of vegan food systems to SDG 2030
4. Explore the broad tools that can be used to make food systems sustainable
5. Develop strategies for communicating about vegan food systems
6. Compare the impact of food systems (including vegan food systems) on natural resources and ecosystems services
7. Discuss the influence of effects of environmental issues into the vegan food systems (including land use, climate change and biodiversity loss)
8. Explore some tools used to collect information about the impact of vegan diet in environmental issues (such as the use of big data, modeling and behavior change models)

9. Propose food systems changes to achieve an environmental integrity
10. Explore the environmental performance indicators associated with sustainable and vegan diet
11. Discuss the how we collect data from individuals and how to translate that into a measure of impact
12. Use some tools to collect information about environmental impacts of food systems and diets
13. Use software tools to evaluate footprints diets, including vegan diet
14. Discuss appropriate measures of environmental performance of the vegan food processing
15. Calculate the environmental footprint of vegan diet (using life-cycle assessment)
16. Propose strategies to reduce environmental footprint
17. Communicate the environmental footprint of vegan diet
18. Public presentation of documents elaborated during classes

Assessment for Unit:

2h Student seminar preparation + Test

Reading List for Unit:

1. Tim G. Benton et al, 2021. Food system impacts on biodiversity loss, Energy, Environment and Resources Programme.
2. McLaren, S., et al., 2021. Integration of environment and nutrition in life cycle assessment of food items: opportunities and challenges. Rome, FAO.
3. Dury, S., et al. eds. 2019. Food Systems at risk: new trends and challenges. Rome, Montpellier, Brussels, FAO, CIRAD and European Commission.
4. Environmental Footprints, by Kai Fang (Editor); Springer (2021)
5. Environmental Water Footprints; by Subramanian Senthilkannan Muthu (Editor); Springer (2019)

Resources for Unit:

A fully equipped classroom; hardware and software for online teaching; Whiteboard; Projector, Software for calculations of environmental footprints. Special time and organization for on-site visit to a vegan food processing plant.

3.3. Digitalization and Automatization

Digitalization and automatization is important in food industry to keep advanced, safe, high technology processing. With the introduction of Industry 4.0, smart factories, there are new opportunities to implement elements of industry 4.0 in vegan food processing.

This module provides detailed information about digitalization and automatization under below topics with suggested 11 ECVET credits:

- Automation
- ICT
- Robotics
- Electives
-

3.3.1. Automation

Aim of Unit:

Students will be able to differentiate between various automation systems and identify the components used in them. They will understand how automation systems work. Students will be knowledgeable of the structure, function and connections of relays and PLC drivers and the more common types of sensors and actuators. They will learn the idea behind the logic needed in automation technology.

Description of Unit:

In the Automation course, students will become familiar with automated systems. Unit is composed of teaching topics:

1. Introduction to Automation
2. Effective cooperation with automation specialists
3. Manual controlling of machines and processes
4. Programmable Logic Controllers (PLC)
5. PLC - Hardware
6. PLC - Software
7. Vegan Food Process Sensoring
8. Thermal Processing Control
9. Assessments

Teaching Topics:

EQF6
Contact hours: 22.5 hours. Non-contact hours: 60 hours
1. Introduction to Automation (3h in class/on-line)
2. Effective cooperation with automation specialists (1h in class/on-line)
3. Manual controlling of machines and processes (1h in class/on-line)
4. Programmable Logic Controllers (PLC) (2h in class/on-line)
5. PLC - Hardware (4h in class/on-line)
6. PLC - Software (4h in class/on-line; 20h practice)

7. Vegan Food Process Sensoring (2h in class/on-line)
8. Thermal Processing Control (2.5h in class/on-line)
9. Assessments (3h)

Learning Outcomes:

- Operate effective cooperation with automation specialists
- Explain basic understanding of automated systems
- Identify common sensors in the automation of components and use cases for sensors
- Organize PLC and how it can be used in systems control units
- Design sensing for specific vegan food processes
- Identify online offline need of sensing
- Identify instruments and systems used in process automation, such as control rooms, control instruments and field buses in the process industry

Content of Unit:

1. Introduction to Automation
2. Effective cooperation with automation specialists
3. Manual controlling of machines and processes
4. Programmable Logic Controllers (PLC)
5. Vegan Food Process Sensoring
6. Thermal Processing Control

Assessment for Unit:

Project and exam

Reading List for Unit:

1. Edgar, T. F., Smith, C. L., Shinskey, F. G., Gassman, G. W., Waite A. W. R., McAvoy, T. J. & Seborg, D. E. (2007). Process control, in Perry's Chemical Engineers' Handbook 8th ed. R. H. Perry, and D. W. Green, eds. McGraw-Hill, New York, NY, US.
2. EN 1672-2:2020 Food processing machinery – Basic concepts – Part 2: Hygiene and cleanability requirements.
3. Fellows, P. J. (2017). Food Processing Technology: Principles and Practice. 4th edition. London: Woodhead Publishing Group.
4. Habib, Maki K. (2020). Advanced Robotics and Intelligent Automation in Manufacturing. IGI Global. Retrieved from
5. <https://app.knovel.com/hotlink/toc/id:kpARIAM001/advanced-robotics-intelligent/advanced-robotics-intelligent>
6. Kress-Rogers, E. Brimelow, C.J.B.. (2001). Instrumentation and Sensors for the Food Industry (2nd Edition). Woodhead Publishing. Retrieved from
7. <https://app.knovel.com/hotlink/toc/id:kpISFIE008/instrumentation-sensors/instrumentation-sensors>

8. Morgan, M. T. & Haley, T. A. (2019). Design of food process controls system. In M. Kutz (ed.) Handbook of Farm, Dairy and Food Machinery Engineering. 3rd ed. Amsterdam: Academic Press. <https://doi.org/10.1016/B978-0-12-814803-7.00022-1>

Thermal Processing Control

1. J. Castleman, in Coal Combustion Products (CCP's), 2017
2. Gregory W. O'Neil, ... Christopher M. Reddy, in Biofuels from Algae (Second Edition), 2019
3. Z. Boz, ... F. Erdoğan, in Encyclopedia of Food Microbiology (Second Edition), 2014
4. Petr Stehlík, in Handbook of Process Integration (PI), 2013
5. P.E.D. Augusto, ... M. Cristianini, in Encyclopedia of Food Microbiology (Second E)

Resources for Unit:

1. A fully equipped classroom; hardware and software for online teaching;
2. Suggestions on software:
 - <https://factoryio.com/> 30 day free trial available
 - <https://www.plcfiddle.com/> ladder logic simulator - free.
 - Siemens Tia Portal - Siemens software
 - others

3.3.2. ICT

Aim of Unit:

The students are familiar with the digital transformation that faces the vegan food industry. They are able to use the current softwares, different online services and online learning environment. The student is able to apply basic information technology skills in new hardware and software environments.

Description of Unit:

In ICT courses, students will become familiar with information technology systems. Unit is composed of teaching topics:

- Industry 4.0
- ICT unit (3h in class/on-line; 8h practice)
- Production function, data analysis using BI and Excel (6h in class/on-line; 12h practice)
- Assessments (3h)

Teaching Topics:

EQF6
Contact hours:22.5 hours. Non-contact hours: 60 hours
1. Industry 4.0 (3h in class/on-line; 5h practice)
2. ICT unit (3h in class/on-line; 8h practice)
3. Production function, data analysis using BI and Excel (6h in class/on-line; 12h practice)

Learning Outcomes:

- Arrange version control for natural origin raw material changes and properties
- Operate with basic ICT (working with human-machine interface; use different software, like traceability, IoT)
- Apply Manufacturing Enterprise System software for documentation

Content of Unit:

1. Industry 4.0
 - Internet of Things (IoT) and cloud computing
 - Additive production and 3D printing
 - Big Data
 - Visual technologies (augmented reality / virtual reality / computer vision)
 - Automation and intelligent robotics
 - Cybersecurity
2. ICT unit
 - Human-Machine Interface
 - IoT Remote Monitoring
 - AI
 - Traceability Software

Assessment for Unit:

Project and exam

Reading List for Unit:

1. Bai, C., P. Dallasega, G. Orzes, and J. Sarkis. 2020. Industry 4.0 technologies assessment: A sustainability perspective. *International Journal of Production Economics* 229:107776. doi: 10.1016/j.ijpe.2020.107776.
2. Barbut, S. 2020. Meat industry 4.0: A distant future? *Animal Frontiers: The Review Magazine of Animal Agriculture* 10 (4):38–47. doi: 10.1093/af/vfaa038.
3. Bottani, E., Vignali, G., & Carlo Tancredi, G. P. (2020). A digital twin model of a pasteurization system for food beverages: Tools and architecture. 2020 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), 1–8. <https://doi.org/10.1109/ICE/ITMC49519.2020.9198625>
4. Da, X. L., E. L. Xu, and L. Li. 2018. Industry 4.0: State of the art and future trends. *International Journal of Production Research* 56 (8):2941–2962. doi: 10.1080/00207543.2018.1444806
5. Dalzochio, J., R. Kunst, E. Pignaton, A. Binotto, S. Sanyal, J. Favilla, and J. Barbosa. 2020. Machine learning and reasoning for predictive maintenance in Industry 4.0: Current status and challenges. *Computers in Industry* 123:103298. doi: 10.1016/j.compind.2020.103298.
6. Garg, D., Luthra, S., & Mangla, S. K. (ei pvm.). 9.3 Functional Roles of it in SCM. *Teoksessa Supply Chain and Logistics Management*. New Academic Science. <https://app.knovel.com/hotlink/pdf/id:kt012NVIU1/supply-chain-logistics/functional-roles-it-in>
7. Hassoun, A., Aït-Kaddour, A., Abu-Mahfouz, A. M., Rathod, N. B., Bader, F., Barba, F. J., Biancolillo, A., Crobotova, J., Galanakis, C. M., Jambrak, A. R., Lorenzo, J. M., Måge, I., Ozogul, F., & Regenstein, J. (2022). The fourth industrial revolution in the food industry—Part I: Industry 4.0 technologies. *Critical Reviews in Food Science and Nutrition*, 0(0), 1–17. <https://doi.org/10.1080/10408398.2022.2034735>
8. Hugos, M. (ei pvm.). 4.2.5 Enterprise Resource Planning (ERP). *Teoksessa Essentials of Supply Chain Management (4th Edition)*. John Wiley & Sons. <https://app.knovel.com/hotlink/pdf/id:kt0127YA81/essentials-supply-chain/enterprise-resource-planning>
9. Jambrak, A. R., M. Nutrizio, I. Djekić, S. Pleslić, and F. Chemat. 2021. Internet of nonthermal food processing technologies (Iontp): Food industry 4.0 and sustainability. *Applied Sciences* 11:1–20.
10. Kayikci, Y., N. Subramanian, M. Dora, and M. S. Bhatia. 2020. Food supply chain in the era of Industry 4.0: Blockchain technology implementation opportunities and impediments from the perspective of people, process, performance, and technology. *Prod Plan Control* 33:301–321. doi: 10.1080/09537287.2020.1810757.
11. Khan, P. W., Y. C. Byun, and N. Park. 2020. IoT-blockchain enabled optimized provenance system for Food Industry 4.0 using advanced deep learning. *Sensors* 20 (10):2990. doi: 10.3390/s20102990.
12. Lee, J., B. Bagheri, and H. A. Kao. 2015. A cyber-physical systems architecture for Industry 4.0-based manufacturing systems. *Manufacturing Letters* 3:18–23. doi: 10.1016/j.mfglet.2014.12.001.

13. Lennon Olsen, T., and B. Tomlin. 2020. Industry 4.0: Opportunities and challenges for operations management. *Manufacturing & Service Operations Management* 22 (1):113–122. doi: 10.1287/ msom.2019.0796.
14. Scholten, B. (ei pvm.). *MES Guide for Executives—Why and How to Select, Implement, and Maintain a Manufacturing Execution System*. <https://app.knovel.com/hotlink/toc/id:kpMESGEWH2/mes-guide-executives/mes-guide-executives>
15. Soroush, M., Baldea, M., & Edgar, T. F. (ei pvm.). *Smart Manufacturing—Concepts and Methods*. <https://app.knovel.com/hotlink/toc/id:kpSMCM0003/smart-manufacturing-concepts/smart-manufacturing-concepts>

Resources for Unit:

A fully equipped classroom; hardware and software for online teaching;

3.3.3. Robotics

Aim of Unit:

Students will learn about various types of robots and examine robots and how to use them in factory automation and other areas where robots are needed. They will know the structure, features and coordinate systems of robots as well as the periphery devices used in robotics. Students will be competent in handling and programming industrial robots on- and offline. The course provides fundamental knowledge of robotics and an ability to design and select equipment for the automatic handling of products.

Description of Unit:

In the Robotics course, students will become familiar with robotic systems. Unit is composed of teaching topics:

- Introduction to Robotic Systems
- Industrial Manipulator Robots
- Robot Programming Languages and Techniques
- Collaborative Robotic Systems
- Assessments

Teaching Topics:

EQF6
Contact hours: 13.5 hours. Non-contact hours: 69 hours
1. Introduction to Robotic Systems (4h in class/on-line)
2. Industrial Manipulator Robots (10h in class/on-line)
3. Robot Programming Languages and Techniques (6h in class/on-line; 30h practice)
4. Collaborative Robotic Systems (6h in class/on-line)
5. Assessments (4h)

Learning Outcomes:

- Identify various types of robots
- Operate fault diagnostic of robots
- Recognise the structure, properties, co-ordinations of robots, as well as the additional devices used in robots
- Operate in handling and programming industrial robots using online and offline methods of programming
- Select devices for the automatic handling of products.
- Integrate devices for the automatic handling of products.

Content of Unit:

1. Introduction to Robotic Systems
2. Industrial Manipulator Robots
3. Robot Programming Languages and Techniques
4. Collaborative Robotic Systems

Assessment for Unit:

Project and exam

Reading List for Unit:

1. Gupta, A.K. Arora, S.K. Westcott, Jean Riescher. (2017). Industrial Automation and Robotics. Mercury Learning and Information. Retrieved from
2. <https://app.knovel.com/hotlink/toc/id:kpIAR00001/industrial-automation/industrial-automation>
3. Habib, Maki K.. (2020). Advanced Robotics and Intelligent Automation in Manufacturing. IGI Global. Retrieved from
4. <https://app.knovel.com/hotlink/toc/id:kpARIAM001/advanced-robotics-intelligent/advanced-robotics-intelligent>
5. Jaulin, Luc. (2019). Mobile Robotics (2nd Edition). John Wiley & Sons. Retrieved from
6. <https://app.knovel.com/hotlink/toc/id:kpMRE00014/mobile-robotics-2nd-edition/mobile-robotics-2nd-edition>
7. Mullakara, Nandan Asokan, Arun Kumar. (2020). *Robotic Process Automation Projects*. Packt Publishing. Retrieved from
8. <https://app.knovel.com/hotlink/toc/id:kpRPAP0001/robotic-process-automation/robotic-process-automation>

Resources for Unit:

A fully equipped classroom; hardware and software for online teaching: RokoDK, KUKA, ABB, Yaskawa...<https://robodk.com/>

3.3.4. Electives

Aim of Unit:

In elective studies, students can become familiar with the latest tools of digital transformation, which will also be encountered in the vegan food industry in the future.

Description of Unit:

In the Digitalisation and Automation Electives course, students will become familiar with specific digital systems. Unit is composed of teaching topics:

- Additive technologies in food processing
- Machine vision
- Machine learning (ML)
- Artificial Intelligence (AI)
- Augmented Reality (AR)
- Assessments

Teaching Topics:

EQF6
Contact hours: 15 hours. Non-contact hours: 40 hours
1. Additive technologies in food processing
2. Machine vision
3. Machine learning (ML)
4. Artificial Intelligence (AI)
5. Augmented Reality (AR)
6. Assessments

Learning Outcomes:

- Categorize additive manufacturing technologies (e.g. 3D printing to the food processing)
- Select correct methods of automated quality control, e.g. machine vision, Artificial Intelligence (AI) and Machine Learning (ML)
- Analyze the meaning of thermal processing control

Content of Unit:

1. Additive technologies in food processing
2. Machine vision
3. Machine learning (ML)
4. Artificial Intelligence (AI)
5. Augmented Reality (AR)

Assessment for Unit:

Project and exam

Reading List for Unit:

1. Gupta, A.K. Arora, S.K. Westcott, Jean Riescher. (2017). Industrial Automation and Robotics. Mercury Learning and Information. Retrieved from
2. Demestichas, K., N. Peppas, and T. Alexakis. 2020. Survey on security threats in agricultural IoT and smart farming. *Sensors* 20 (22):6458. doi: 10.3390/s20226458.
3. Hassoun, A., Aït-Kaddour, A., Abu-Mahfouz, A. M., Rathod, N. B., Bader, F., Barba, F. J., Biancolillo, A., Cropotova, J., Galanakis, C. M., Jambrak, A. R., Lorenzo, J. M., Måge, I., Ozogul, F., & Regenstein, J. (2022). The fourth industrial revolution in the food industry—Part I: Industry 4.0 technologies. *Critical Reviews in Food Science and Nutrition*, 0(0), 1–17. <https://doi.org/10.1080/10408398.2022.2034735>
4. Jambrak, A. R., M. Nutrizio, I. Djekić, S. Pleslić, and F. Chemat. 2021. Internet of nonthermal food processing technologies (Iontp): Food industry 4.0 and sustainability. *Applied Sciences* 11:1–20.

Resources for Unit:

A fully equipped classroom; hardware and software for online teaching

3.4. Soft Skills

On a total of 4 ECVET credits, this training covers:

- Critical and innovative thinking,
- Ethical understanding,
- Intrapersonal and interpersonal skills
- Active listening
- Teamwork
- Leadership and team building

The Soft Skills trainings are presented differently from the trainings on Plant-based Processing, Green Skills and Digital and Automatization Skills.

They are described here as suggested to be delivered on EQF 4 to 7 trainings. The duration of activities is the suggested duration for trainings with the students. It is recommended that at the implementation of trainings on EQF 4 to 7, the Soft Skills trainings are embedded in the other modules.

3.4.1. Critical and Innovative Thinking

Aim of Unit:

After this unit, students will recognize that decision-making and problem solving are competences that can and should be trained and developed; they will have gathered a few strategies to develop their mental plasticity and ability to decide and solve problems in various personal and professional domains.

Description of Unit:

In this unit students will become familiar with a range of strategies used for wise decision making and effective problem solving. The aims are to be accomplished through group dynamics; case studies; readings; metacognition and video watching. The unit is composed of teaching topics:

Teaching Topics:

EQF 4 to 7
Contact hours: 6 hours. Non-contact hours: 17 hours
1. Strategies used for wise decision making and effective problem solving
2. Learning from failure, thinking out of the box
3. Innovative solutions, thinking out of the box
4. Cooperative problem solving: The marshmallow challenge
5. Reflection and metacognition
6. Assessment (Student written essay and debate) (2h)
7. Self-Study (Non-Guided Learning) (10h): Novel literature update

Learning Outcomes:

- Understand the problem before making decisions and taking action.
- Evaluate available information for problem solving.
- Identify the reasonableness of the decision and find out alternatives.
- Take into account the consequences of the decision.
- Choose problem solving methods and procedure
- Apply relevant knowledge
- Evaluate the results of the decision.

Content of Unit:

1. Strategies used for wise decision making and effective problem solving
2. Learning from failure
3. Innovative solutions, thinking out of the box
4. Cooperative problem solving: The marshmallow challenge
5. Reflection and metacognition

Assessment for Unit:

Student written essay and debate

Reading List for Unit:

1. <https://www.itseeducation.asia/article/the-road-to-a-solution-generating-ideas>
2. <https://www.itseeducation.asia/article/finding-possible-solutions>
3. <https://simplicable.com/new/decision-making>
4. <https://simplicable.com/new/problem-solving>
5. <https://www.marshmallowchallenge.com/>
6. https://www.youtube.com/watch?v=H0_yKBitO8M ted talk by Tom Wujec 'Build a tower, build a team'

Resources for Unit:

A fully equipped classroom; hardware and software for online teaching; Whiteboard; Projector.

3.4.2. Ethical Understanding

Aim of Unit:

To support student to develop an understanding of the breadth of ethical judgements and factors that affect it.

Description of Unit:

In this unit the student will review the ethics principles, ethical judgment development and which factors can affect ethics judgments. Food ethics issues will be analyzed and discussed in a role play so students can understand the different possible ethical views on a single issue. Students will learn how to use the ethical matrix for decision making on ethics issues.

Teaching Topics:

EQF 4 to 7	
Contact hours: 7 hours. Non-contact hours: 17 hours	
1. Ethics principles 2. Stages of moral development 3. Factors that affects moral judgements	Overview of ethics issues (food fraud, etc.) and what affects moral judgements (ethics principles, stages of moral development, factors that affect moral judgements). Give an overview to students of ethics issues in food (2h)
4. Food ethics issues	Divide students in groups, assign to each group an issue and to each student a role according to the stakeholders (representatives of food industry, consumers association, policy maker, animal protection association, etc.). (1.5h)
5. Ethical matrix of Ben Mephram	Explain the ethical matrix of Ben Mephram. Divide students in groups and assign an issue to each group. (0.5h)
6. Assessment (2h)	Role playing (1.5h) Presentation of the ethical matrix (0.5h)
7. Self-Study (Non-Guided Learning) (14h):	Search on an ethics issue, reflection on the ethical judgments of a given stakeholder (7h) Search on an ethics issue, reflection on the ethical judgments of all the stakeholders involved, and structure an ethics matrix (7h)

Learning Outcomes:

After this unit, students will be recognizing the breadth of ethical judgements and factors that affect it; they will be able to reflect on an ethical issue and to produce sound decisions considering the judgements of different stakeholders.

Content of Unit:

1. Ethics principles
2. Stages of moral development
3. Factors that affect moral judgements
4. Food ethics issues
5. Ethical matrix of Ben Mephram

Assessment for Unit:

- Role playing (1.5 h)
- Presentation of the ethical matrix (0.5 h)

Reading List for Unit:

1. Costa, R., Pittia, P. eds: Food ethics education. Springer International Publishing (2017)
2. Behave: The biology of humans at our best and worst, Sapolsky, Robert M. Penguin Press: New York, NY. 2017
3. FAO. 2021. Food fraud – Intention, detection and management. Food safety technical toolkit for Asia and the Pacific No. 5. Bangkok, <https://www.fao.org/3/cb2863en/cb2863en.pdf>

Resources for Unit:

- Classroom with projector
- Students with access to WWW.

3.4.3. Intrapersonal and Interpersonal Skills

Aim of Skills:

The aim of this unit is to highlight the importance of intrapersonal skills to enhance the student's self-awareness, self-discipline and self-management.

Description of Unit:

In this unit the students will be introduced to the difference between intrapersonal and interpersonal skills, and their importance for their personal and professional lives. Following that, students will work on their self-awareness and learn how a journey of self-awareness helps them to become more self-disciplined and organized. The unit is highly practical, although students will be expected to continue reflecting on topics discussed during their free time.

Teaching Topics:

EQF 4 to 7

Contact hours: 6 hours. Non-contact hours: 17 hours

1. Intrapersonal and Interpersonal Skills

Greeting students; Expectations of students; Introduction of students; Observing different types of skills; Defining intrapersonal and interpersonal skills; Discussing the importance of

the different skills; Giving equal importance to intrapersonal and interpersonal skills; Sharing experiences where skills have improved. (2h)
2. Self-awareness Defining self-awareness; Activity - Who am I?; Activity - How I see myself and how I think others see me?; Activity - How others' perceptions affect me?; Different types of personalities; Myers-Briggs Test; Working in a team; Activity - Believing in myself. (2h)
3. Managing time, stress and organization Defining self-discipline and self-control; Activity - Resisting my mobile phone; Strategies to manage time better; Strategies to be more organised; Self-care assessment; Strategies to manage time better; Strategies to be more organized
4. Assessment (4h) Reflection on self-awareness and plans to address areas that require improvement
5. Self-Study (Non-Guided Learning) (15h): Further reading on intrapersonal and interpersonal skills (4h) Further reading on self-awareness; Myers-Briggs Test and reflection (8h) Further reading on self-care (3h)

Learning Outcomes:

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

- differentiate between intrapersonal and interpersonal skills
- understand that intrapersonal and interpersonal skills can be practiced and improved
- use different techniques to enhance self-awareness
- use different techniques to enhance self-discipline
- organise better their personal and professional lives

Content of Unit:

1. Intrapersonal and Interpersonal Skills
2. Self-awareness
3. Managing time, stress and organization

Assessmen for Unit:

Reflection on self-awareness and plans to address areas that require improvement

Reading List for Unit:

1. What self-awareness really is (and how to cultivate it), Harvard Business Review, 2018
<https://hbr.org/2018/01/what-self-awareness-really-is-and-how-to-cultivate-it>
2. An Overview of the Myers-Briggs Type Indicator
<https://www.verywellmind.com/the-myers-briggs-type-indicator-2795583>
3. Maximizing Your Working Style – How to Identify and Develop your Work Style Type
<https://www.tonyrobbins.com/career-business/whats-working-style/>
4. Manipulate Time With These Powerful 20 Time Management Tips

<https://www.forbes.com/sites/johnrampton/2018/05/01/manipulate-time-with-these-powerful-20-time-management-tips/?sh=392bf44a57ab>

5. Time Management Won't Save You, Harvard Business Review, 2021
<https://hbr.org/2021/06/time-management-wont-save-you>
6. Time Management is About More than Life Hacks, Harvard Business Review, 2020
<https://hbr.org/2020/01/time-management-is-about-more-than-life-hacks>

Resources for Unit:

- Classroom with projector and speakers
- Students with access to internet

3.4.4. Active Listening

Aim of Unit:

The aim of this unit is to call students attention to the importance of practicing active listening, give them the opportunity to learn a few techniques to improve it and use it to gain control over their teaching-learning process.

Description of Unit:

Active Listening is probably the most critical of interpersonal communication skills because it reinforces open communication, being an effective way for the students to gain self-understanding, feel understood, make the learning-teaching process easier, which is indeed basic and critical for any kind of apprenticeship. Thus, this Unit aims at making students understand that and help them in learning a few techniques to improve active listening in a way that will contribute to their successful autonomous learning.

Teaching Topics:

EQF 4 to 7

Contact hours: 8 hours. Non-contact hours: 17 hours

1. The meaning of Active Listening (2h)

List situations when active listening is very important – classroom, workplace, interaction with professors, colleagues, clients, team leaders, etc. It is the most critical of interpersonal communication skills because it reinforces open communication, being an effective way for the students to gain self-understanding, feel understood, make the learning-teaching process easier.

2. Paying attention (2h)

Paying attention

Learn some techniques to improve active listening.

3. Managing time, stress and organization (2h)

Defining self-discipline and self-control; Activity - Resisting my mobile phone; Strategies to manage time better; Strategies to be more organised; Self-care assessment; Strategies to manage time better; Strategies to be more organised

<p>4. Show attentiveness and provide feedback (2h) Learn ways of showing they are listening by using body language and by providing feedback.</p>
<p>5. Appropriate responsiveness (2h) Learn how to respond appropriately through practice.</p>
<p>6. Assessment Continuous assessment is carried out throughout the delivery sessions.</p>
<p>7. Self-Study (Non-Guided Learning) (4h): Students are asked to find out websites and materials about active listening for further learning on these topics.</p>

Learning Outcomes:

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

- Understand what it takes to be a good listener.
- Understand the importance of paying attention.
- Know a few techniques to practice and improve active listening.
- Use body language (non-verbal communication through gestures, tone of voice, etc.).
- Provide feedback by questioning or asking for clarification.
- Show appropriate responsiveness.
- Show assertiveness with respect.
- Hold judgement.
- Paraphrase.

Content of Unit:

1. The meaning of Active Listening
2. Paying attention
3. Show attentiveness and provide feedback
4. Appropriate responsiveness

Assessment for Unit:

Continuous assessment is carried out throughout the delivery sessions.

Reading List for Unit:

1. <https://www.youtube.com/watch?app=desktop&v=t2z9mdX1j4A&feature=youtu.be>
2. http://files.teachingjedi.webnode.com/200000004-6f61f705bf/ActiveListening_RogersFarson.pdf
3. <http://www.elanica.com/collaboratory/ActiveListening2020-spreads.pdf>

Resources for Unit:

- Classroom with projector and speakers
- Access to internet
- Two texts, pen and paper

3.4.5. Teamwork

Aim of Unit:

The aim of this unit is to introduce the students to teamwork i.e. how to build up a team and how to empower employee based on the employees' competencies.

Description of Unit:

In this unit, a systematic team-building training is drawn up to teach the students to fill the skill gaps based on various cases. This action prepares the students to better understanding the need of various skills to enable employees to learn new skills needed in the team and to engage new workers employed. The teambuilding skills also enable the student how to act when applying for employment in a company and how to act as a team member in his/her tasks in the future. The team-building training will be based on theoretical classes and improvising in class in which the students are trained in various phases in the team development process. Here the teamwork skills are developed. Limitations and future research directions will also be discussed at EQF-level 7.

Teaching Topics:

EQF 4 to 7
Contact hours: 9 hours. Non-contact hours: 17 hours
1. Building blocks in teamwork principles (3h)
2. How to use the diversity of members' knowledge, when building a team (3h)
3. Steps on how to advance jointly, to persuade and to manage changes in teams (3h)
4. Assessment (3h) team-building exercise on a given case (0.5h) evaluation of the above-mentioned case performed in a group of 3-4 students (2h) oral exam on theory (2-3 tasks to explain individually) (0.5h)
5. Self-Study (Non-Guided Learning) (13h): reading literature (both found in the literature search and material given to the class), individual effort compiling a case presentation as a team to the class; individual effort.

Learning Outcomes:

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

- is able to learn proper team habits
- is aware of the team structure
- understands how to create a team
- knows how to manage a team
- is able to empower both already available and new members in the team

Content of Unit:

1. Understanding of teamwork principles
2. Usage of the diversity of members' knowledge in building a team
3. Information on steps how to advance jointly, persuade and manage changes in the team

Assessment for Unit:

- team-building exercise on a given case
- evaluation of the above-mentioned case performed in a group of 3-4 students
- oral exam on theory (2-3 tasks to explain individually)

Reading List for Unit:

1. Bird, A., Mendenhall, M., Stevens, M.J. & Oddou, G. 2010. Defining the content domain of intercultural competence for global leaders. *Journal of Managerial Psychology*, 25, 810-828. DOI 10.1108/02683941011089107.
2. Brinck, L & Tanggaard., L. 2016. Embracing the unpredictable. *Leadership, learning, changing practice. Human Resource Development International*, 19, 374–387, <http://dx.doi.org/10.1080/13678868.2016.1141607>.
3. Bartel, j. 2018. Teaching soft skills for employability. *ESL Canada Journal*, 2018, 35, 78–92, <http://dx.doi.org/10.18806/tesl.v35i1.1285>.
4. Marasi, S. 2019. Team-building: Developing teamwork skills in college students using experiential activities in a classroom setting. *Organization Management Journal*, 16, 324-337, DOI: 10.1080/15416518.2019.1662761.
5. Paros, A., Taylor, M. & Yawson, R.M. 2020. Enhancing student understanding of networks using experiential learning. *Organization Management Journal*, 17, 173-183, DOI 10.1108/OMJ-05-2020-0930
6. Volkova, N., Lebid, O., Hrom, O., Zinukova, N. & Korobeinikova, T. 2021. Teamwork as an interactive educational technology at pedagogical universities. *SHS Web of Conferences*, 104, 03003. <https://doi.org/10.1051/shsconf/202110403003>.

Resources for Unit:

- Classroom with projector and speakers
- Access to internet
- Two texts, pen and paper

3.4.6. Leadership

Aim of Unit:

The aim of this unit is to introduce the students to the concept of leadership and help them understand how to develop and apply the basic principles of effective leadership.

Description of Unit:

In this unit, students will analyze the concept of leadership, different leadership styles, their characteristics and influence on the performance of groups and work teams.

Teaching Topics:

EQF 4 to 7
Contact hours: 16 hours. Non-contact hours: 17 hours
1. Defining leadership (1h)
2. Storytelling and Case studies (group work) (2h)
3. The elements of leadership (1h)
4. Role play – the good and the bad leaders (1h)
5. Self-Assessment and peer assessment (10h)
6. Project based learning (min 10h)
7. Readings (min 4h)
8. Assessment (2h) Self-Assessment and peer assessment (1h) Project based learning (results – group presentation) (1h)
9. Self-Study (Non-Guided Learning) (min 4h): Reading literature

Learning Outcomes:

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

- Define leadership.
- Understand and explain how leadership operates in organizations.
- Identify his own strengths and development needs as a leader.
- Describe qualities and behaviours of effective leaders.
- Work effectively with other people, by applying leadership techniques related to specific situations.

Content of Unit:

1. Understanding the concept and principles of leadership
2. Recognize effective leadership styles through real examples.
3. Recognize effective leadership styles through real examples.
4. Participate in situations that make use of leadership qualities.

Assessment for Unit:

- Self-Assessment and peer assessment
- Project based learning (results – group presentation)

Resources for Unit:

Classroom; Library; readings.