EQVEGAN

European Qualifications & Competences for the Vegan Food Industry

621581-EPP-1-2020-1-PT-EPPKA2-SS

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Deliverable 2.2

Innovative training for the vegan food industry technician

Workpackage 2	Design of innovative trainings
Task 2.2	Design learning outcomes-based VET training using ECTS credits for EQF 5
Lead Beneficiary	Polytechnic of Coimbra (IPC)
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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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Dissemination Level		
PU	Public (since 24/11/30)	√
PP	Restricted to other programme participants (including Commission services and projects reviewers)	
CO	Confidential, only for members of the consortium (including EACEA and Commission services and projects reviewers)	

Content

1. Summary

The 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).

The aim of this deliverable is to guide the trainers on the design of training at level 5 (for the food technician) on four modules: Plant-based processing technology, Green Skills, Digitalization and automation, and Soft Skills. It contains information about the trainings including 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 suggested as well.

The stakeholders of the EQVEGAN, interested in these trainings, 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 technician

The trainings for the food industry technician (EQF 5) should consist partly of lectures, and practicals using pilot plant/laboratory equipments or processing lines. Practical skills, such as lab of equipment related, will have a compulsory face-to-face component. An optional online can be used to introduce theory and preparation of practical classes.

The following sections detail the four modules identify the aim of the respective module in EQF 5, 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

This module covers:

- Technologies
- Nutrition
- Food safety
- Analysis

It is suggested a module of 6 ECTS credits.

3.1.1. Technologies

Aim of Unit: Design of innovative trainings

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 to produce food analogues (meat, dairy, eggs) and plant-based beverages processes wil be presented in detail. Special attention will be paid to the influence of technological processes on nutrients of food plant products. on.

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. 0perations and technologies applied in production of plant food including machinery and equipment selection. Contemporary information concerning vegan food production will be presented. The influence of technological processes on nutritional content of food plant products will be emphasized.

Teaching Topics:

EQF5
Contact hours: 30h in class/on-line; 30h practice. Non-contact hours: 76 hours
1. Leguminous products (2 h in class/online – 6h practice)
2. Production of plant proteins (2h in class/on-line; 6h practice)
3. Technologies of fungi & yeasts products (5h in class/on-line)
4. Technologies of meat analogues (6h in class/on-line)
5. Technologies of dairy analogues (2h in class/on-line; 6h practice)
6. Technologies of eggs analogues (2h in class/on-line; 6h practice)
7. Technologies of plant-based beverages production (2h in class/on-line; 6h practice)
8. Quality control & food safety (preservation principles) (3h in class/on-line)

Learning Outcomes:

- Identify the problems inherent in the production, processing and preservation of Vegan foods, Dairy & Meat substitutes
- Describes the technological principals of processing of Vegan foods, Dairy & Meat substitutes
- Applies the general principles of food preservation to Vegan foods, Dairy & Meat substitutes
- Sketch Vegan foods, Dairy & Meat substitutes processing diagrams Operates methods of quality control and food safety

Content of Unit:

1. Leguminous products
2. Production of plant proteins
3. Technologies of fungi & yeasts products
4. Technologies of meat analogues
5. Technologies of dairy analogues
6. Technologies of eggs analogues
7. Technologies of plant-based beverages production

Assessment for Unit:

1. Explain and discuss leguminous products.
2. Discuss and compare technics used for protein production. Show differences between proteins from different sources.
3. Discuss meat analogues and main methods for their production.
4. Discuss dairy analogues and main methods for their production.
5. Discuss eggs analogues and main methods for their production.
6. Discuss plant-based beverages ans main methods for their production.
7. Explain and discuss preservation principles and methodology used to guarantee the quality control and food safety of these products.

Reading List for Unit:

1. Abu-Ghannam, N., & Gowen, A. (2011). Pulse-based food products. Pulse Foods: Processing, Quality and Nutraceutical Applications, 249-278.
2. Chang, A. S., Sreedharan, A., & Schneider, K. R. (2013). Peanut and peanut products: A food safety perspective. Food Control, 32(1), 296-303.
3. Colletti, A., Attrovio, A., Boffa, L., Mantegna, S., & Cravotto, G. (2020). Valorisation of by-products from soybean (Glycine max (L.) Merr.) processing. Molecules, 25(9), 2129.

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8. Kaur, R., & Prasad, K. (2021). Technological, processing and nutritional aspects of chickpea (Cicer arietinum)-A review. Trends in Food Science & Technology.

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17. Wittek P., Zeiler N., Karbstein H.P., Emin M.A. (2021) High moisture extrusion of soy protein: investigations on the formation of anisotropic product structure. Foods 10:102.

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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23. Boz, Z. and Erdogdu, F., "Thermal processing: aseptic processing and canning", Handbook of Vegetable Preservation and Processing, 2nd ed., ed. by Hui, Y. H. and Evranuz, O., chpt.-7, CRC Press –Taylor & Francis Group, Boca Raton, FL, USA, 2016.

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29. Schreuders F.K.G., Schlangen M., Kyriakopoulou K., Boom R., van der Goot A.J. (2021) Texture methods for evaluating meat and meat analogue structures: A review. Food Control 127:108103.
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34. Tangyu M., Muller J., Bolten C.J., Wittmann C. (2019) Fermentation of plant-based milk alternatives for improved flavour and nutritional value. Appl Microbiol Biot 103:9263-9275.
35. Grossmann L., McClemens D.J. (2021) The science of plant-based foods: Approaches to create nutritious and sustainable plant-based cheese analogs. Trends Food Sci 118:207-229.
36. Laaksonen O., Kahala M., Marsol-Vall A., Blasco L., Järvenpää E., Rosenvald S., Virtanen M., Tarvainen M., Yang B. (2021) Impact of lactic acid fermentation on sensory and chemical quality of dairy analogues prepared from lupine (Lupinus angustifolius L.) seeds. Food Chem 346:128852.
37. McClements D.J., Grossmann L. (2021) The science of plant-based foods: Constructing next-generation meat, fish, milk, and egg analogs. Compr Rev Food Sci F 20:4049-4100.
38. Yazici G.N., Ozer M.S. (2021) A review of egg replacement in cake production: Effects on batter and cake properties. Trends Food Sci Technol 111:346-359.
39. Lafarga T. Alvarez C., Villaro S. Bobo G., Aguilo-Aguayo I. (2020) Potential of pulse-derived proteins for developing novel vegan edible foams and emulsions. Int J Food Sci Technol 55:475-481.
40. Raikos V., Hayes H., Ni H. (2019) Aquafaba from commercially canned chickpeas as potential egg replacer for the development of vegan mayonnaise: recipe optimisation and storage stability. Int J Food Sci Technol 55:1935-1942.

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.

Description of Unit:

In unit Nutrition in plant-based diets, students will become familiar with vegetarian diets categorization. The unit aims to deliver to students knowledge concerning nutritional value of vegan diets in relation to type/restrictivness. Students will learn how to distinguish/analyse deficiencies, identify and avoid them on vegetarian diets in human nutrition.
Health-related benefits and threats of plant diets consumption will be analysed.

Teaching Topics:

EQF5
Contact hours: 6 hours. Non-contact hours: 8 hours
1. Plant-based diets: categorization and definition (1h)
2. Macro- and micronutrients in vegetarian diets (Nutritional value) (1h)
3. Nutrient's bioavailability and bioaccessibility of vegan diets (2h)
4. Health-related benefits and threats of plant diets consumption (2h)

Learning Outcomes:

- Name and explain basic types of vegetarian diets, descriptions and rules of their application. Foods proportions in diets.
- Name and define nutritional value of plant-based diets, with distinguishing sources of nutrients.
- Identify the major antinutrients from plant sources and discuss how two manage them with technological operations in food industry.
- Name and understand risks and benefits of plant-based diets in terms of health and noncommunicable diseases.

Content of Unit:

1. Plant-based diets: categorization and definition
2. Macro- and micronutrients in vegetarian diets
3. Nutrient's bioavailability and bioaccessibility of vegan diets
4. Health-related benefits and threats of plant diets consumption

Assessment for Unit:

1. Distinguish and categorize the different plant-based diets;

2. Explain how increase nutritional value of vegan diets;
3. Discuss nutrient's bioavailability and bioaccessibility in vegan diets;
4. Discuss potential risk and health benefits of plant-based diets.

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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3. Dinu, M., et al. (2017). Vegetarian, vegan diets and multiple health outcomes: A systematic review with meta-analysis of observational studies [Abstract]. https://www.tandfonline.com/doi/abs/10.1080/10408398.2016.1138447?journalCode=bfsn20
4. Kim, H., et al. (2019). Plant-based diets are associated with a lower risk of incident cardiovascular disease, cardiovascular disease mortality, and all-cause mortality in a general population of middle-aged adults. https://www.ahajournals.org/doi/10.1161/JAHA.119.012865
5. Qian, F., et al. (2019). Association between plant-based dietary patterns and risk of type 2 diabetes:A systematic review and meta-analysis [Abstract]. https://jamanetwork.com/journals/jamainternalmedicine/article-abstract/2738784?guestAccessKey=5e8aaedb-e77d-4bc1-9d52-b626e406138e&utm_source=For_The_Media&utm_medium=referral&utm_campaign=ftm_links&utm_content=tfl&utm_term=072219
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7. Saturated fat. (n.d.). https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/fats/saturated-fats
8. Turner-McGrievy, G. M., et al. (2015). Comparative effectiveness of plant-based diets for weight loss: A randomized controlled trial of five different diets [Abstract]. https://www.sciencedirect.com/science/article/abs/pii/S0899900714004237
9. Whole grains, refined grains, and dietary fiber. (2016). https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/nutrition-basics/whole-grains-refined-grains-and-dietary-fiber
10. World Health Organization. (2015). IARC Monographs evaluate consumption of red meat and processed meat [Press release]. https://www.iarc.fr/wp-content/uploads/2018/07/pr240_E.pdf
11. https://www.eatrightpro.org/-/media/eatrightpro-files/practice/position-and-practice-papers/position-papers/vegetarian-diet.pdf
12. Mariotti, François, and Christopher D. Gardner 2019. "Dietary Protein and Amino Acids in Vegetarian Diets—A Review" Nutrients 11, no. 11: 2661. https://doi.org/10.3390/nu11112661
13. Janet R Hunt, Bioavailability of iron, zinc, and other trace minerals from vegetarian diets, The American Journal of Clinical Nutrition, Volume 78, Issue 3, September 2003, Pages 633S–639S, https://doi.org/10.1093/ajcn/78.3.633S

14. https://openbiotechnologyjournal.com/VOLUME/13/PAGE/68/FULLTEXT/
15. https://academic.oup.com/nutritionreviews/article/76/11/793/5053734
16. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7600777/
17. https://www.tandfonline.com/doi/abs/10.1080/10408398.2013.781011?tab=permissions&scroll=top
18. https://academic.oup.com/ajcn/article/78/3/633S/4690005
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Resources for Unit:

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

3.2. Green Skills

Despite the fact that 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 ECTS credits, it covers:

- Sustainability,
- Economy and entrepreneurship,
- Food legislation,
- Society and visibility.

3.2.1. Sustainability

Aim of Unit:

The unit aims to bring students' knowledge on sustainability issues, general definition and issues of sustainable development. Sustainable vegan processing and plant-based processing will be presented in detail. Emphasis will be given to food by-products further incorporation of output products. Special attention on the need of proper water, energy and waste management and solutions for converting wastes into value-added items.

Description of Unit:

In unit Sustainability, students will become familiar with issues that stand in terms of sustainable development and with the sustainable vegan processing and plant-based processing. Students will learn about energy/water/waste critical points in processing and how food waste in processing process can be reduced. Students will compare, in terms of sustainability parameters, conventional and vegan food processing technologies, and they get acquainted with plans to enhance sustainability evaluation of vegan food processing. Also, students will be educated regarding food waste, how to reduce, reuse and recycle plant-based products.

Teaching Topics:

EQF5
Contact hours: 21 hours. Non-contact hours: 18 hours
1. Introduction to sustainability (3h)
2. Energy/water/waste critical points (4h)
3. Food waste (2h)
4. Food by-products (3h online + 3h visit to processing plant)
5. Waste management (2h + 2h visit to processing plant)
6. Assessment (Student seminar preparation) (2h)

Learning Outcomes:

- List sustainable parameters.
- Name conventional technologies and VFP (vegan food processing) and energy/water/ waste critical points in VFP.
- Relate food waste reduction in VFP with consumers.
- Underline possible by-products in VFP.
- Identify data that should be obtained to perform sustainability evaluation in VFP.
- State possible ways of reporting sustainability evaluation that should be present in VFP.

Content of Unit:

1. Sustainable food production and food sources
2. Strategies for improving the sustainability of food systems.
3. Mapping of energy/water/waste critical points in VFP.
4. Strategies to make food production more sustainable.
5. Solutions for converting solid wastes into value-added items.
6. Plant food by – products and reusage (OR Underline possible by-products in VFP.
7. Discuss data that should be obtained to perform sustainability evaluation in VFP.

Assessment for Unit:

State possible ways of reporting sustainability evaluation that should be present in VFP.

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. Economy and Entrepreneurship

Aim of Unit:

This unit is aimed to explore the interwinding principles of economy, marketing, and entrepreneurship within the framework of green skills. Encouraging learners to be creative and innovative with approaches towards a more sustainable future. The principles and the relevance of green economy, circular economy and waste reduction will be presented in detail. Special attention will be given to the crucial role of implementing strategies focusing on environmentally sustainable solutions.

Description of Unit:

In this unit students will get familiar with assessing formal economic approaches and translate them into circular designs, based on concepts of sustainability and productivity. Importance should also be given to concepts of green economy. They should become familiar with the concept environmental concerns, both in national, international and global scales. Also, they should become familiar with the concept of entrepreneurship and to come up with more creative, original and feasible solutions to challenges that will arise.

Teaching Topics:

EQF5
Contact hours: 14 hours. Non-contact hours: 20 hours
1. Circular economy (5h)
2. Green economy (4h)
3. Entrepreneurship (4h)
4. Assessment (Quiz) (1h)

Learning Outcomes:

- Understand role and objectives of business organizations within the economy.
- Understand the concept and the importance the green economy.
- Understand the difference between linear and circular economy.
- Understand an economy based on low carbon, resource efficiency and social inclusiveness.
- Explore the concept of the entrepreneurial mindset.

Content of Unit:

1. Basic definitions for food production economics.
2. Factors for the development of the food sector, including vegan products.
3. Introduction to circular economy principles
4. Strategies for converting linear to circular economy for the food industry, particular in vegan food processing.

5. Introduction to green economy concept and trends.
6. The link between the economy and the environment.
7. Introduction and definition to Entrepreneurship.
8. Characteristics of an Entrepreneur.

Assessment for Unit:

Knowledge test - multiple choice

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. Weetman, C. (2020) A Circular Economy Handbook: How to Build a More Resilient, Competitive and Sustainable Business
12. Charter, M. (2018) Designing for the Circular Economy

Resources for Unit:

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

3.2.3. Food Legislation

Aim Unit:

The Food Legislation Unit is designed to provide students with an initial grounding in the main fields of food related laws and regulations relating 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, students will get information about regulations related to the production and consumption of vegan foods. The course emphasizes the issues related to food ethics and food fraud.

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 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. Food regulations and standards will be discussed in the context of sustainability, ethics, and science-based principles.

Teaching Topics:

EQF5
Contact hours: 14 hours. Non-contact hours: 20 hours
1. Sustainability Policy (2h)
2. Food law and legislation (3h)
3. Food ethics (2h)
4. Visit to laboratory (3h)
5. Visit to processing plant (3h)
6. Assessment (Quiz) (1h)

Learning Outcomes:

- Identify the role of policy in promoting sustainable food practices
- Identify the main government policies associated with sustainable food systems
- Know European Legislation on Food Waste
- Recognize the importance of the legal regulations related to the production and consumption processes of vegan foods
- Recognize the terminology for food ethics and food fraud

Content of Unit:

1. Role of policy in promoting sustainable food practices
2. Government policies associated with sustainable food systems
3. European Legislation on Food Waste
4. The concept of food law and legislation
5. Legal regulations related to the production and consumption process of vegan foods
6. Food ethics and food fraud

Assessment for Unit:

Knowledge test - quiz

Reading List for Unit:

1. Food Ethics Education, by Rui Costa, Paola Pittia (Editor); Springer; 2018
2. Agovino, 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. Allen, T., & Prosperi, P. (2016). Modeling sustainable food systems. Environmental management, 57(5), 956-975.
4. Anonymous (2019). What Does Food Sustainability Really Mean?. https://www.ecoandbeyond.co/articles/food-sustainability/
5. EC (2020). Towards a Sustainable Food System. Independent Expert Report.
6. Drewnowski, A. (2015). Global food policy and sustainability. In Nutrition for the Primary Care Provider (pp. 174-178). Karger Publishers.
7. FAO (2021). Dietary guidelines and sustainability. https://www.fao.org/nutrition/education/food-dietary-guidelines/background/sustainable-dietary-guidelines/en/
8. Lang, 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. Obayelu, 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 2011on 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 2011on 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 2011on 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)

38. Başgöze, P. & Tektaş, Ö.Ö. 2012. Ethical Perceptions and Green Buying Behavior of Consumers: A Cross-National Exploratory Study. Journal of Economics and Behavioral Studies. 4. 477-488.

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41. Coff C., Barling D., Korthals M., Nielsen T. (eds) Ethical Traceability and Communicating Food. The International Library of Environmental, Agricultural and Food Ethics, vol 15. Springer, Dordrecht

42. Carolan M. Ethical eating as experienced by consumers and producers: When good food meets good farmers. Journal of Consumer Culture. January 2020. doi:10.1177/1469540519899967

43. Early, R. 2019. Food ethics: the moral maze. Food Science and Technology, 33:44-47.

44. Éliás, B. A., & Jámbor, A. (2021). Food Security and COVID-19: A Systematic Review of the First-Year Experience. Sustainability, 13(9), 5294. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su13095294

45. Galanakis, C. M. (2020). The Food Systems in the Era of the Coronavirus (COVID-19) Pandemic Crisis. Foods, 9(4), 523. MDPI AG. Retrieved from http://dx.doi.org/10.3390/foods9040523

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47. Grossmann, L., & McClements, D. J. (2021). The science of plant-based foods: Approaches to create nutritious and sustainable plant-based cheese analogs. Trends in Food Science & Technology, 118(Part A), 207–229.

48. Julia C. Wiebe, ... Leticia Cuéllar. 2016. Vegan Diet, Molecular Nutrition and Diabetes

49. Kaiser, M., Goldson, S., Buklijas, T. et al. Towards Post-Pandemic Sustainable and Ethical Food Systems. Food ethics 6, 4 (2021). https://doi.org/10.1007/s41055-020-00084-3

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51. Mepham, 2000. The role of food ethics in food policy. The Proceedings of the Nutrition Society, 59(4), 609–618.

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53. van Ruth, S. M., Huisman, W., & Luning, P. A. (2017). Food fraud vulnerability and its key factors. Trends in Food Science and Technology, 67, 70-75. https://doi.org/10.1016/j.tifs.2017.06.017

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.

3.2.4. Society and Visibility

Aim of Unit:

This unit aims to explore links between the environment and food systems. Students should be guided to develop concern with the protection of natural resources and ecosystem services. Learners should be familiar with how food systems can contribute more broadly to the Sustainable Development Goals. They should also identify opportunities for rationalization of resources and new practices to improve environmental performance and formulate critical environmental thinking associated with vegan food processing.

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. It aims to lead students to understand and compare the effects of environmental changes, such as climate change, biodiversity loss, and the relation with the various food systems and diets, including vegan. 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. They will compare the environmental performance of conventional and vegan food systems.

Teaching Topics:

EQF5
Contact hours: 21 hours. Non-contact hours: 18 hours
1. Food systems concepts (5h)
2. Environment and food systems (7h)
3. Environmental footprints (5h online + 3h visit to processing plant)
4. Assessment (Student seminar preparation) (1h)

Learning Outcomes:

- Distinguish between sustainable and vegan food systems.
- Explain the environmental impacts of food industry and vegan food processing.
- Analyze the relationship between the different components in the food system with environmental goals and with SDG 2030.
- Discuss the factors that may influence the environmental footprint of food systems.
- Identify appropriate measures of environmental performance of the vegan food processing.

Content of Unit:

1. Sustainable and vegan food systems
2. Food system and SDG 2030
3. Environmental impacts of food industry and vegan food processing
4. Environmental footprints and sustainability
5. Environmental footprint of food systems
6. Environmental footprints and impact on climate change
7. How environmental footprints can be reduced.

Assessment for Unit:

Public presentation of documents elaborated during classes.

Reading List for Unit:

1. Čuček, L., Klemeš, J., Kravanjab, Z. (2012). A Review of Footprint analysis tools for monitoring impacts on sustainability. Journal of Cleaner Production, 34, 9-20. (https://doi.org/10.1016/j.jclepro.2012.02.036)
2. Dury, S., et al. eds. 2019. Food Systems at risk: new trends and challenges. Rome, Montpellier, Brussels, FAO, CIRAD and European Commission.
3. EC, 2019. The European Green Deal. Brussels, 11.12.2019. COM (2019) 640 final (https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52019DC0640&from=ET)
4. EEA, 2019. The European environment - state and outlook 2020. Knowledge for transition to a sustainable Europe. Denmark (eea.europa.eu)
5. Environmental Footprints - Assessing Anthropogenic Effects. Kai Fang Editor. Springer Nature Switzerland AG, 2021. (http://www.springer.com/series/8868)
6. Environmental Water Footprints - Concepts and Case Studies from the Food Sector. Muthu Editor. Springer Nature Switzerland AG, 2019. (http://www.springer.com/series/13340)
7. Hoekstra, A. Y., et al., 2011. The Water Footprint Assessment Manual. Earthscan Ltd, Dunstan House, 14a St Cross Street, London EC1N 8XA, UK (https://waterfootprint.org/en/resources/publications/water-footprint-assessment-manual/)
8. Karwacka, M., et al. (2020). Sustainable Development in the Agri-Food Sector in Terms of the Carbon Footprint: A Review. Sustainability, 12, 6463; doi:10.3390/su12166463 - www.mdpi.com/journal/sustainability
9. Liu, X., et al. (2021). The land footprint of the global food trade: Perspectives from a case study of soybeans. Land Use Policy, 111, 105764.
10. Matustík, J., Kocí, V. (2021). What is a footprint? A conceptual analysis of environmental footprint indicators. Journal of Cleaner Production 285,124833.
11. Miralles-Wilhelm F., Iseman, T. (2021). Nature-based solutions in agriculture – the case and pathway for adoption. FAO and The Nature Conservancy. https://doi.org/10.4060/cb3141en

12. Scarborough, P., et al. (2014). Dietary greenhouse gas emissions of meat-eaters, fish-eaters, vegetarians and vegans in the UK. Climatic Change, 125:179–192 DOI 10.1007/s10584-014-1169-1
13. Steen-Olsen, K., et al. (2012).Carbon, Land, and Water Footprint Accounts for the European Union: Consumption, Production, and Displacements through International Trade. Environ. Sci. Technol., 46, 10883 - 10891, dx.doi.org/10.1021/es301949t.
14. Tim G. Benton et al, 2021. Food system impacts on biodiversity loss, Energy, Environment and Resources Programme.
15. Wolf, M. J, et al. (2022). 2022 Environmental Performance Index. New Haven, CT: Yale Center for Environmental Law & Policy (https://epi.yale.edu/).

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 are 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 3 ECTS credits:

- Automation
- ICT
- Robotics

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. Assessments

Teaching Topics:

EQF5
Contact hours: 40 hours. Non-contact hours: 22 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 (3h in class/on-line)
6. PLC - Software (3h in class/on-line; 20h practice)
7. Vegan Food Process Sensoring (2h in class/on-line)
8. Thermal Processing Control (2h in class/on-line)
9. Introduction to Automation (3h in class/on-line)

Learning Outcomes:

- Operate effective cooperation with automation specialists
- Recognize manual controlling of machines and processes
- 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

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. PLC - Hardware
6. PLC - Software
7. Vegan Food Process Sensoring
8. 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 https://app.knovel.com/hotlink/toc/id:kpARIAM001/advanced-robotics-intelligent/advanced-robotics-intelligent
5. Kress-Rogers, E. Brimelow, C.J.B. (2001). Instrumentation and Sensors for the Food Industry (2nd Edition). Woodhead Publishing. Retrieved from https://app.knovel.com/hotlink/toc/id:kpISFIE008/instrumentation sensors/instrumentation-sensors
6. 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. Erdoğdu, 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 software's, 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 4 teaching topics below.

Teaching Topics:

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)
4. Assessments (3h)

EQF5
Contact hours: 12 h in class/on-line; 25h practice. Non-contact hours: 20 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:

Operate with basic ICT (working with human-machine interface; use different software, like traceability, IoT)

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
   - ybersecurity
2. ICT unit
   - Human-Machine Interface
   - IoT Remote Monitoring
   - AI
   - Traceability Software
3. Production function, data analysis using BI and Excel

   At MAXTOR, it manufactures products and has the following data capture systems:

   - A transfer system that details who works when on which line. This system stores the data in a txt file.
   - A Scada system that records which product has been produced when. This system reports the hours to a csv file.
   - An ERP that saves the weights of the products (exportable file to excel).

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., 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

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 operation of industrial robots on- and offline. The course provides fundamental knowledge of robotics.

Description of Unit:

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

1. Introduction to Robotic Systems (3h)
2. Industrial Manipulator Robots (3h)
3. Robot Programming Languages and Techniques (3h)
4. Collaborative Robotic Systems (6h)
5. Assessments

Teaching Topics:

EQF5
Contact hours: 22 hours. Non-contact hours: 20 hours
1. Introduction to Robotic Systems (3h in class/on-line)
2. Industrial Manipulator Robots (3h in class/on-line)
3. Robot Programming Languages and Techniques (3h in class/on-line; 6h practice)
4. Collaborative Robotic Systems (6h in class/on-line; 1h practice)

Learning Outcomes:

- Identify various types of robots
- identify how to use robots in factory automation and other areas where robotics are used
- Recognise the structure, properties, co-ordinations of robots, as well as the additional devices used in robots

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:

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

https://app.knovel.com/hotlink/toc/id:kpIAR00001/industrial-automation/industrial-automation

2. Habib, Maki K.. (2020). Advanced Robotics and Intelligent Automation in Manufacturing. IGI Global. Retrieved from https://app.knovel.com/hotlink/toc/id:kpARIAM001/advanced-robotics-intelligent/advanced-robotics-intelligent

3. Jaulin, Luc. (2019). Mobile Robotics (2nd Edition). John Wiley & Sons. Retrieved from https://app.knovel.com/hotlink/toc/id:kpMRE00014/mobile-robotics-2nd-edition/mobile-robotics-2nd-edition

4. Mullakara, Nandan Asokan, Arun Kumar. (2020). Robotic Process Automation Projects. Packt Publishing. Retrieved from 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/**

3.4. Soft Skills

On a total of 4,5 ECTS 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 suugested duration for trainings with the students. It is recommended that at the implementation of trainings on EQF 4 to 7, the Soft Skills trainnings 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: 11 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.itseducation.asia/article/the-road-to-a-solution-generating-ideas
2. *https://www.itseducation.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: 11 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 Mepham Explain the ethical matrix of Ben Mepham. 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 Mepham

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: 11 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-Brigss 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; Mysers-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: 11 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
4. Show attentiveness and provide feedback (2h) Learn ways of showing they are listening by using body language and by providing feedback.
5. Appropriate responsiveness (2h) Learn how to respond appropriately through practice.
6. Assessment Continuous assessment is carried out throughout the delivery sessions.
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.

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: 11 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: 11 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.