

Booklet

Food Packaging open courseware for higher Education and Staff of companies (FitNESS)



FitNESS projects 1 & 2:



Food Packaging open courseware for higher Education and Staff of companies (FitNESS) no°2017-1-FR01-KA202-037441 (01/09/2017 - 31/08/2020)



Food Packaging open courseware for higher Education and Staff of companies 2.0 (FitNESS-2) no°2021-1-FR01-KA220-HED-000023509 (01/11/2021 - 31/10/2024)

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FitNESS learning pathways

Introduction

Traditional curriculum is usually likened to a “one-size-fits-all” approach, with a set of skills or knowledge to be communicated to an entire class in the same fashion at the same time. On the contrary, learning pathways ([e-learning](#)) seek to instead meet individual needs. They create learner-centric, targeted activities that are customizable to each individual while aligning with the greater learning objectives.

The FitNESS platform enables new learning pathways on food packaging topics, as an innovative and open resource programme of higher and vocational education and training, which provides an adapted program to equip professionals with the specific (basic, intermediate and advanced) knowledge and skills specifically required for the food packaging sector.

The free and interactive online content, developed since [FitNESS v1](#), offers a comprehensive curriculum on the conventional aspects of food packaging. It was beneficial to maintain the continuity of teaching during the first stage of the COVID-19 outbreak at the beginning of 2020.

The [FitNESS 2.0](#) project relies on the same modular technology developed during FitNESS v1 that allows the platform's front end to operate as a fully autonomous application. The trainer can design an assessment, and the learner can take it with or without a connection to a server. The aim is to accelerate the production and distribution of interactive digital content without resorting to heavy infrastructure, which generally remains incompatible between institutions and companies.

Learning Across Two Levels

The core content includes learning pathways (LPs) split into two main levels (basic and advanced), learning activities (assessment and assignments), and instructional material (case studies, guides). These pathways help learners easily follow a curriculum most fitting for their professional role. Introductory LPs are accompanied by teaser videos, free online textbooks, and trainer insights. These contents explore more deeply the relationships between food and packaging, packaging and food processing, regulations of packaging, packaging, and consumer safety, etc.

They also include eco-design and responsible food packaging, safe-by-design packaging, packaging reuse, packaging reduction, packaging recycling, returnable packaging, minimally processed food, short supply chains, bulk storage, food

transportation, and food waste. The included video recordings of practical works, tutorials of advanced simulations and engineering, and opinions on emerging issues

(e.g., regulatory, sanitary) create added value for professionals as well as small and medium-sized enterprises (SMEs).

Advanced contents are also offered and used to build specialized LPs for:

- other applications of packaging (such as controlled release)
- new regulatory issues (restrictions of single-use plastics, microplastics)
- related technologies and science (analytical chemistry, online sensors, logistics)
- material science (micro and nanocomposites, fibrous materials, surface treatments, polymer science)
- modelling and optimization techniques (finite element techniques, multiscale modelling, mechanical calculation, multicriteria optimization)
- design techniques (CAD – Computer Aided Design, prototyping, 3D printing)
- societal issues (environmental protection, impact studies, etc.)
- risk assessment of chemicals, nanoparticles and microplastics (consumer exposure, persistence in the environment, decision-making, risk-benefits)
- innovation methodology (TRIZ - Theory of Inventive Problem Solving, approach, problem-solving)
- regulations of packaging materials (Europe, USA)

The FitNESS platform is distributed under the LGPL (Lesser General Public License) 2.0 for software and Creative Commons 4.0 for content, encouraging duplication and redistribution by universities, companies, and individuals ([Vitrac et al., 2024](#)).

Because these are innovative and emerging topics, standardization will not be sought, and each institutional user will be free to define the educational content that makes use of these specialized areas. FitNESS 2.0 only recommends a harmonization of the user's experiences that can be followed for these topics (i.e., by providing a similar layout and browsing experience).

A wide range of content is also offered at the basic level and is suitable for all audiences. Each level is described by learning outcomes. The interface of the platform adapts to the chosen level and proposes only LPs associated with the chosen level or lower. The built-in search engine allows users to easily explore and find all the learning content.

A Decentralized Approach to Assessment and Certifications

The distinctive features of the platform rely on the separation of content and formatting. Broadly speaking, the content is written in a lightweight markup language (e.g., Markdown, JSON) or converted from PowerPoint slides (via an open-source converter developed during FitNESS v1). The Markdown/JSON content (linear or non-linear

lecture and the assessments) is rendered within a viewer applet. Within FitNESS 2.0, the viewer has been significantly upgraded to recognize the user between visits, save the progress made, check their assessment results, and certify the assessments.

Important to note is that the platform is not intended to retain the results of the assessments, the learners' identity, or their completion of topics. This is an important technical choice that guarantees compliance with the EU Regulation on the protection of personal data and provides a high degree of flexibility. The assessment results are recorded only locally and can then be sent to the reference trainer or certifying organization with the agreement of the learner. The progress and scores are stored as a shareable digital fingerprint. The certification of the assessment results counting towards a certificate are realized in the same way as COVID certificates during the pandemic based on a personal digital code.

When using the platform to contribute towards the completion of a university degree, it is the referring trainer's responsibility to verify the learner's digital identity. The platform provides the mechanism to create and distribute an assessment in a few minutes without involving a central server (only the viewer applet needs to be downloaded) and even offline. The digital identity viewer will display any compatible assessment completed on the platform, any website, or any file.

The FitNESS framework has been designed to work with or without a server. This architecture greatly simplifies the distribution since installation is performed only by extracting downloadable files from the latest branch of the project (either directly on a computer or a shared local server). The platform works in the same way on Windows, Mac OS, and Linux, and it does not require software other than a web browser (Vitrac et al., 2024). Cloning and maintenance manuals are also available (*please contact the Developer and Administrator for more information: Olivier Vitrac, olivier.vitrac@agroparistech.fr*).

In addition, communication materials have been created (such as a leaflet, video presentation, and press articles) to widely disseminate the FitNESS platform and encourage cloning by European and International universities with food and packaging specialties as well as by national and European industry associations.

The new capacity within FitNESS 2.0 to create assessments without a central server is unique and not available on any other learning platforms across the sector. The fingerprints of the assessment answers are encrypted directly in the questions and answers (Q&A) assessment page in a way that the number of correct answers is known, but not the specific answers. At the end of the assessment (possibly offline), the learner has the possibility to send their encrypted results with their identity to a trainer (encrypted JSON file), who will have the possibility to deliver a certificate when a minimum of prerequisites is fulfilled. This process encourages not only the certification but also the interactions with trainers. This procedure enables each institution to register its learner without using any external server. The platform provides only the encryption tool to encode the HTML document's answers and decipher the certificate generated at the end of each assessment. This setup allows a small number of distributed servers to support many institutions.

Target Audience

Due to the online availability of the Learning Pathways (LPs) within the FitNESS v1.0 & 2.0 projects developed through Erasmus+ programme, the platform does not introduce any criteria for limiting its use. The training content is available in an open-access form for all interest groups to support education without barriers. While some examples within the learning topics are European-specific, the vast majority of the core content is globally applicable and can support learners based anywhere in the world.

Learning Pathways and Outcomes

While the FitNESS platform contains many different modules covering a diverse range of topics that learners are free to explore and use, it also structures these into a set of specific learning pathways with learning outcomes catered to four common professional roles within the food packaging industry.

According to the Recommendation on the European Qualifications Framework for lifelong learning ([CELEX, 2017](#)), “*Learning outcomes*” are statements regarding what a learner knows, understands, and is able to do upon completion of a learning process. This is defined in terms of knowledge, skills, responsibility, and autonomy. The use of pathways aims to contribute to modernising education and training systems and to increase the employability, mobility and social integration of workers and learners. It further aims at better linking formal, non-formal and informal learning and supporting the validation of learning outcomes acquired in different settings.

The four professional roles addressed with specific learning pathways within FitNESS 2.0 are shown in [Figure 1](#), and the structure of the coding used is illustrated in [Figure 2](#).



Figure 1. FitNESS Learning pathways and abbreviation

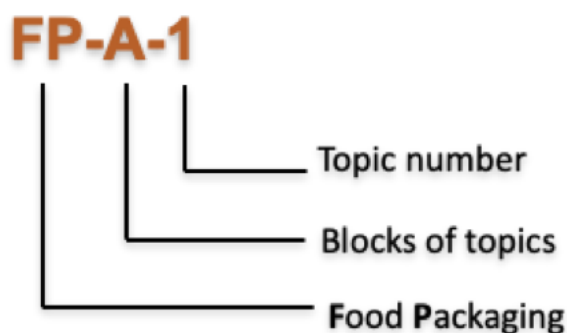


Figure 2. Topic code description

Details for each Learning pathway, containing a set of mandatory (M) and elective (E) topics, are given in **Tables 1 to 4**. The European Credit Transfer and Accumulation System (ECTS) is also shown and represents learning based on defined learning outcomes and their associated workload. The learning time for each unit was estimated considering the degree of difficulty of the topics and the length of the training materials.

Table 1a. Research and Development Managers in Food Packaging

LP title	Research and Development Managers in Food Packaging - RDMFP
Level	Basic
Objectives	<p>The objective of the learning pathway is to provide an understanding of:</p> <ul style="list-style-type: none"> ● Types, methods of production, and characteristics of food packaging materials ● Packaging material properties and testing methods ● Food packaging methods (vacuum, aseptic, modified atmosphere etc.) ● Types and principles of packaging/packing/filling methods ● Food interaction patterns with a particular type of food packaging material, mechanisms of food spoilage and the consequences for packed food, consumers, and environment ● Shelf life of packed food ● Innovative food packaging materials ● Regulatory aspects of food packaging ● Permanent and non-permanent materials in food contact applications and their implications for recycling and chemical safety including chemical migration
Outcomes	<ul style="list-style-type: none"> ● Explain the role and function of food packaging ● Interpret packaging material properties and testing methods ● Compare the types and principles of packaging/packing/filling methods ● Explain the possible interactions of a specific food product with different food packaging materials or of different food products with a specific packaging material ● Interpret concepts of shelf-life, factors affecting shelf-life, and strategies for extending shelf-life ● Explain the roles of active and intelligent food packaging ● Explain the health implications of food-package interactions including the migration of hazardous chemicals and aspects related to reuse and recycling ● Compare the different types of packaging materials and be able to identify permanent vs. non-permanent materials

Code	Topic	Hours	ECTS	M / E
FP-A	Panorama of Food Packaging			
FP-A-1	History and overview	2	0,5	M
FP-B	Packaging Materials			
FP-B-1	Glass	3,5	0,5	M
FP-B-2	Metal	3	0,5	M
FP-B-3	Plastic	4	0,5	M
FP-B-4	Paper and paperboard	4	0,5	M
FP-B-5	Bio-based polymers	3,5	0,5	M
FP-B-6	Cork	3	0,5	M
FP-B-7	Wood	2	0,5	M
FP-C	Packaging Material Properties			
FP-C-1	Thermal properties	3	0,5	M
FP-C-2	Mechanical properties	3	0,5	M
FP-C-3	Optical properties	1	0,5	E
FP-C-4	Surface properties	1	0,5	E
FP-C-5	Mass transfer properties	3	0,5	M
FP-C-10	Mechanical design	8	1,0	E
FP-D	Packaging Processes			
FP-D-1	Introduction to mechanical processes	3,5	0,5	M
FP-D-2	Forming of pre-products	4,5	0,5	M
FP-D-3	Aseptic packaging	8	1,0	M
FP-D-4	Filling and dosing	8	1,0	M
FP-D-5	Beverage filling	4,5	0,5	M
FP-D-6	Sealing	8	1,0	M
FP-D-7	Forming, filling and sealing machinery	8	1,0	M
FP-D-8	Surface treatments and coatings	8	1,0	M
FP-D-9	Vacuum and modified atmosphere packaging	4,5	0,5	M
FP-E	Packaging and Food Shelf-life			
FP-E-1	Defining shelf-life	1	0,5	M
FP-E-2	Food preservation technologies and packaging	6	1,0	M
FP-E-3	Modified atmosphere packaging and shelf-life	8	1,0	M
FP-E-4	Food-packaging interactions	10	1,0	M
FP-E-5	Factors affecting shelf-life	1	0,5	M
FP-E-6	Physico chemical factors affecting food stability	13	1,5	M
FP-E-7	Shelf-life study	1	0,5	M
FP-E-8	Microbiological assessment of food and packaging	13	1,5	M
FP-E-9	Sensory science applied to food packaging	13	1,5	M
FP-E-10	Predicting shelf-life	4	0,5	M
FP-F	Innovative Food Packaging			
FP-F-1	Bioplastics	5	0,5	M
FP-F-2	Bacterial polyesters	7	1,0	E

FP-F-3	Advanced cellulosic materials	7	1,0	E
FP-F-4	Active packaging	5,5	1,0	M
FP-F-5	Intelligent packaging	5,5	1,0	M
FP-F-6	Nanotechnology strategies	5,5	1,0	M
FP-H	Legislation and Safety			
FP-H-1	Basic legal framework on food packaging materials	5	0,5	M
FP-H-2	Regulatory framework in the EU and the US	12,5	1,5	M
FP-H-7	Universe of food contact chemicals	4	0,5	M
FP-I	Modelling Tools			
FP-I-3	Introduction to decision theory and risk management	13	1,5	E
	TOTAL	241	33,5	

Table 1b. Research and Development Managers in Food Packaging

LP title	Research and Development Managers in Food Packaging - RDMFP			
Level	Advanced			
Objectives	The objective of the learning pathway is to provide an understanding of: <ul style="list-style-type: none"> • Mass transfer in food-packaging-environment system • Permeation and migration modelling • Recycling, reuse, and the waste hierarchy in the context of foodware and food packaging • Risk assessment and risk management • Environmental and human health impacts of food packaging • Modelling tools applied to migration process 			
Outcomes	<ul style="list-style-type: none"> • Explain the barrier properties of packaging (permeability to gases, water vapor) and their impacts on the quality and safety of packaged product • Predict the specific migration from plastic food contact materials into a contact medium for a given substance • Explain interconnection between food-packaging-environment • Distinguish hazardous chemicals in reuse and recycling 			
Code	Title	Hours	ECTS	M/E
FP-C	Packaging Material Properties			
FP-C-6	Advanced principles of mass transfer	10	1,0	M
FP-C-7	Calculation of permeability in composite systems	4	0,5	E
FP-C-8	Multicomponent diffusion & predictive models	7	1,0	M
FP-C-9	Microholes and leaks: measurement and case studies	5	0,5	M
FP-G	Ecodesign Tools and Technologies			
FP-G-1	What is Sustainability?	2	0,5	M
FP-G-2	Environmental and human health impacts of packaging	6	1,0	M
FP-G-3	Overview over microplastics issue	4	0,5	M
FP-G-4	Tools for ecodesign and life cycle assessment	4,5	0,5	M
FP-G-5	Glass food contact material recycling	2	0,5	M
FP-G-6	Metal food contact material recycling	2	0,5	M
FP-G-7	Plastic recycling	8	1,0	M
FP-G-8	Paper and board recycling	8	1,0	M
FP-G-9	Biodegradation and biobased carbon content	8	1,0	E

FP-G-10	Returnable and reuse systems	8	1,0	E
FP-H	Legislation and Safety			
FP-H-3	Recycled plastics - Regulation (EU) 2022/1616	4	0,5	M
FP-H-4	Safety assessment of plastic recycling processes	3,5	0,5	M
FP-H-5	Safety assessment of recycled paper and board	3,5	0,5	M
FP-H-8	Overview on risk assessment	8	1,0	E
FP-I	Modelling Tools			
FP-I-1	Migration modelling in monomaterials	13	1,5	M
FP-I-2	Migration modelling in multimaterials	13	1,5	M
FP-I-4	Managing uncertainty by intervals and worst-case scenarios	13	1,5	E
FP-I-5	Probabilistic approaches and Bayesian approaches	12	1,5	E
FP-I-6	History and principles of FMEA-FMECA	12	1,5	M
FP-I-7	Diagram-based approaches	12	1,5	E
FP-I-8	Computer-aided approaches	12	1,5	E
FP-I-9	Principles of online databases	12	1,5	E
FP-I-10	Microscopic theories of transport coefficients and free-energies	12	1,5	E
FP-I-11	Calculation using fluctuation theorems	12	1,5	E
	TOTAL	220,5	28,0	

Table 2a. Quality Managers in Food Packaging

LP title	Quality Managers in Food Packaging - QMFP
Level	Basic
Objectives	<p>The objective of this learning pathway is to provide an understanding of:</p> <ul style="list-style-type: none"> ● Types, methods of production, and characteristics of food packaging materials ● Packaging material properties and testing methods ● Food packaging methods (vacuum, aseptic, modified atmosphere etc.) ● Types and principles of packaging/packing/filling methods ● Food interaction patterns with a particular type of food packaging material, mechanisms of food spoilage and the consequences for packed food, consumers, and environment ● Shelf life of packed food ● Innovative food packaging materials ● Regulatory standards and requirements (EU or US) in the food packaging industry ● Quality control and assurance principles and techniques specific to food packaging ● Risks associated with food packaging processes ● Permanent and non-permanent materials in food contact applications and their implications for recycling and chemical safety including chemical migration
Outcomes	<ul style="list-style-type: none"> ● Explain the role and function of food packaging ● Interpret packaging material properties and testing methods ● Compare the types and principles of packaging/packing/filling methods ● Classify the different mechanisms of food spoilage and their physical, chemical, and biological background ● Illustrate the possible interactions of a specific food product with different food packaging materials or of different food products with a specific packaging material ● Explain the consequences of the food-package interaction on food shelf-life and/or consumer safety ● Explain concepts of shelf-life, factors affecting shelf-life, and strategies for extending shelf-life ● Compare the different types of packaging materials and be able to identify permanent vs. non-permanent materials ● Explain the roles of active and intelligent food packaging

	<ul style="list-style-type: none"> Assess risks associated with food packaging processes Interpret the health implications of food-package interactions including the migration of hazardous chemicals and aspects related to reuse and recycling 			
Code	Title	Hours	ECTS	M/E
FP-A	Panorama of Food Packaging			
FP-A-1	History and overview	2	0,5	M
FP-B	Packaging Materials			
FP-B-1	Glass	3,5	0,5	M
FP-B-2	Metal	3	0,5	M
FP-B-3	Plastic	4	0,5	M
FP-B-4	Paper and paperboard	4	0,5	M
FP-B-5	Bio-based polymers	3,5	0,5	M
FP-B-6	Cork	3	0,5	M
FP-B-7	Wood	2	0,5	M
FP-C	Packaging Material Properties			
FP-C-1	Thermal properties	3	0,5	M
FP-C-2	Mechanical properties	3	0,5	M
FP-C-3	Optical properties	1	0,5	M
FP-C-4	Surface properties	1	0,5	M
FP-C-5	Mass transfer properties	3	0,5	M
FP-D	Packaging Processes			
FP-D-1	Introduction to mechanical processes	3,5	0,5	M
FP-D-2	Forming of pre-products	4,5	0,5	M
FP-D-3	Aseptic packaging	8	1,0	M
FP-D-4	Filling and dosing	8	1,0	M
FP-D-5	Beverage filling	4,5	0,5	M
FP-D-6	Sealing	8	1,0	M
FP-D-7	Forming, filling and sealing machinery	8	1,0	M
FP-D-8	Surface treatments and coatings	8	1,0	M
FP-D-9	Vacuum and modified atmosphere packaging	4,5	0,5	M
FP-E	Packaging and Food Shelf-life			
FP-E-1	Defining shelf-life	1	0,5	M
FP-E-2	Food preservation technologies and packaging	6	1,0	M
FP-E-3	Modified atmosphere packaging and shelf-life	8	1,0	E
FP-E-4	Food-packaging interactions	10	1,0	M
FP-E-5	Factors affecting shelf-life	1	0,5	M
FP-E-6	Physico chemical factors affecting food stability	13	1,5	M
FP-E-7	Shelf-life study	1	0,5	M
FP-E-8	Microbiological assessment of food and packaging	13	1,5	M
FP-E-9	Sensory science applied to food packaging	13	1,5	M
FP-E-10	Predicting shelf-life	4	0,5	M
FP-F	Innovative Food Packaging			
FP-F-1	Bioplastics	5	0,5	M

FP-F-2	Bacterial polyesters	7	1,0	E
FP-F-3	Advanced cellulosic materials	7	1,0	E
FP-F-4	Active packaging	5,5	1,0	M
FP-F-5	Intelligent packaging	5,5	1,0	M
FP-F-6	Nanotechnology strategies	5,5	1,0	M
FP-H	Legislation and Safety			
FP-H-1	Basic legal framework on food packaging materials	5	0,5	M
FP-H-2	Regulatory framework in the EU and the US	12,5	1,5	M
FP-H-4	Safety assessment of plastic recycling processes	3,5	0,5	M
FP-H-5	Safety assessment of recycled paper and board	3,5	0,5	M
FP-H-6	GMP and quality assurance standards	6	1,0	M
FP-H-7	Universe of food contact chemicals	4	0,5	M
FP-H-8	Overview on risk assessment	8	1,0	E
FP-I	Modelling Tools			
FP-I-3	Introduction to decision theory and risk management	13	1,5	E
TOTAL		254	35,5	

Table 2b. Quality Managers in Food Packaging

LP title	Quality Managers in Food Packaging - QMFP			
Level	Advanced			
Objectives	<p>The objective of this learning pathway is to provide an understanding of:</p> <ul style="list-style-type: none"> • Mass transfer in food-packaging system • Permeation and migration modelling • Modelling tools applied to migration process • Environmental and human health impacts of food packaging 			
Outcomes	<ul style="list-style-type: none"> • Define the barrier properties of packaging (permeability to gases, water vapor) and their impacts on the quality and safety of packaged product • Predict the specific migration from plastic food contact materials into a contact medium for a given substance • Discuss the environmental issues pertaining to food packaging 			
Code	Title	Hours	ECTS	M/E
FP-C	Packaging Material Properties			
FP-C-6	Advanced principles of mass transfer	10	1,0	M
FP-C-7	Calculation of permeability in composite systems	4	0,5	E
FP-C-8	Multicomponent diffusion & predictive models	7	1,0	M
FP-C-9	Microholes and leaks: measurement and case studies	5	0,5	M
FP-G	Ecodesign Tools and Technologies			
FP-G-4	Tools for ecodesign and life cycle assessment	4,5	0,5	M
FP-I	Modelling Tools			
FP-I-1	Migration modelling in monomaterials	13	1,5	E
FP-I-2	Migration modelling in multimaterials	13	1,5	E
TOTAL		56,5	6,5	

Table 3. Packaging Production Line Workers

LP title	Packaging Production Line Workers - PPLW			
Level	Basic			
Objectives	<p>The objective of this learning pathway is to provide an understanding of:</p> <ul style="list-style-type: none"> • Types, methods of production, and characteristics of food packaging materials • Package properties and testing methods • Food packaging methods (vacuum, aseptic, modified atmosphere etc.) • Types and principles of packaging/packing/filling methods. • Application of food preservation technologies and packaging • Quality control and assurance principles and techniques specific to food packaging. 			
Outcomes	<ul style="list-style-type: none"> • Explain the role and function of food packaging • Interpret packaging material properties and testing methods • Compare the types and principles of packaging/packing/filling methods • Determine general machine processes and operations on the food/beverage line • Demonstrate correct packaging techniques and procedures, including labelling, sealing, and stacking, to ensure consistent and efficient packaging operations. • Compare selection of appropriate packaging for processed food • Quality control and assurance principles and techniques specific to food packaging • Risks associated with food packaging processes 			
Code	Titles	Hours	ECTS	M/E
FP-A	Panorama of Food Packaging			
FP-A-1	History and overview	2	0,5	M
FP-B	Packaging Materials			
FP-B-1	Glass	3,5	0,5	M
FP-B-2	Metal	3	0,5	M
FP-B-3	Plastic	4	0,5	M
FP-B-4	Paper and paperboard	4	0,5	M
FP-B-5	Bio-based polymers	3,5	0,5	E
FP-B-6	Cork	3	0,5	E
FP-B-7	Wood	2	0,5	E
FP-C	Packaging Material Properties			
FP-C-1	Thermal properties	3	0,5	M
FP-C-2	Mechanical properties	3	0,5	M
FP-C-3	Optical properties	1	0,5	M
FP-C-4	Surface properties	1	0,5	M
FP-C-5	Mass transfer properties	3	0,5	M
FP-D	Packaging Processes			
FP-D-1	Introduction to mechanical processes	3,5	0,5	M
FP-D-2	Forming of pre-products	4,5	0,5	M
FP-D-3	Aseptic packaging	8	1,0	M
FP-D-4	Filling and dosing	8	1,0	M
FP-D-5	Beverage filling	4,5	0,5	M
FP-D-6	Sealing	8	1,0	M
FP-D-7	Forming, filling and sealing machinery	8	1,0	M
FP-D-8	Surface treatments and coatings	8	1,0	E

FP-D-9	Vacuum and modified atmosphere packaging	4,5	0,5	E
FP-E	Packaging and Food Shelf-life			
FP-E-2	Food preservation technologies and packaging	6	1,0	E
FP-H	Legislation and Safety			
FP-H-6	GMP and quality assurance standards	6	1,0	M
FP-H-8	Overview on risk assessment	8	1,0	E
	TOTAL	113	16,5	

Table 4a. Packaging Production Managers

LP title	Packaging Production Managers - PPM			
Level	Basic			
Objectives	<p>The objective of this learning pathway is to provide an understanding of:</p> <ul style="list-style-type: none"> • Different packaging materials, equipment, and processes commonly used in the food packaging industry • Package properties and testing methods • Food packaging methods (vacuum, aseptic, modified atmosphere etc.) • Types and principles of packaging/packing/filling methods • Food interaction patterns with a particular type of food packaging material, mechanisms of food spoilage and the consequences for packed food, consumers, and environment • Shelf life of packed food • Innovative food packaging materials • Regulatory aspects of food packaging 			
Outcomes	<ul style="list-style-type: none"> • Compare the different types of packaging materials and be able to identify permanent vs. non-permanent materials • Interpret packaging material properties and testing methods • Compare the types and principles of packaging/packing/filling methods • Explain the possible interactions of a specific food product with different food packaging materials or of different food products with a specific packaging material • Classify the different mechanisms of food spoilage and their physical, chemical, and biological background • Explain the consequences of the food-package interaction on food shelf-life and/or consumer safety • Demonstrate correct packaging techniques and procedures, including labelling, sealing, and stacking, to ensure consistent and efficient packaging operations • Explain the roles of active and intelligent food packaging 			
Code	Title	Hours	ECTS	M/E
FP-A	Panorama of Food Packaging			
FP-A-1	History and overview	2	0,5	M
FP-B	Packaging Materials			
FP-B-1	Glass	3,5	0,5	M
FP-B-2	Metal	3	0,5	M
FP-B-3	Plastic	4	0,5	M
FP-B-4	Paper and paperboard	4	0,5	M
FP-B-5	Bio-based polymers	3,5	0,5	E
FP-B-6	Cork	3	0,5	E
FP-B-7	Wood	2	0,5	E
FP-C	Packaging Material Properties			

FP-C-1	Thermal properties	3	0,5	M
FP-C-2	Mechanical properties	3	0,5	M
FP-C-3	Optical properties	1	0,5	M
FP-C-4	Surface properties	1	0,5	M
FP-C-5	Mass transfer properties	3	0,5	E
FP-C-10	Mechanical design	8	1,0	E
FP-D	Packaging Processes			
FP-D-1	Introduction to mechanical processes	3,5	0,5	M
FP-D-2	Forming of pre-products	4,5	0,5	M
FP-D-3	Aseptic packaging	8	1,0	E
FP-D-4	Filling and dosing	8	1,0	M
FP-D-5	Beverage filling	4,5	0,5	M
FP-D-6	Sealing	8	1,0	M
FP-D-7	Forming, filling and sealing machinery	8	1,0	M
FP-D-8	Surface treatments and coatings	8	1,0	M
FP-D-9	Vacuum and modified atmosphere packaging	4,5	0,5	E
FP-D-10	Optimization	8	1,0	M
FP-E	Packaging and Food Shelf-life			
FP-E-1	Defining shelf-life	1	0,5	M
FP-E-2	Food preservation technologies and packaging	6	1,0	M
FP-E-3	Modified atmosphere packaging and shelf-life	8	1,0	E
FP-E-4	Food-packaging interactions	10	1,0	M
FP-E-5	Factors affecting shelf-life	1	0,5	M
FP-E-6	Physico chemical factors affecting food stability	13	1,5	E
FP-E-7	Shelf-life study	1	0,5	E
FP-E-8	Microbiological assessment of food and packaging	13	1,5	E
FP-E-9	Sensory science applied to food packaging	13	1,5	E
FP-E-10	Predicting shelf-life	4	0,5	M
FP-F	Innovative Food Packaging			
FP-F-1	Bioplastics	5	0,5	M
FP-F-2	Bacterial polyesters	7	1,0	E
FP-F-3	Advanced cellulosic materials	7	1,0	E
FP-F-4	Active packaging	5,5	1,0	M
FP-F-5	Intelligent packaging	5,5	1,0	M
FP-F-6	Nanotechnology strategies	5,5	1,0	M
FP-H	Legislation and Safety			
FP-H-1	Basic legal framework on food packaging materials	5	0,5	M
	TOTAL	219,5	31,0	

Table 4b. Packaging Production Managers

LP title	Packaging Production Managers - PPM			
Level	Advanced			
Objectives	The objective of this learning pathway is to provide an understanding of: <ul style="list-style-type: none"> • Permanent and non-permanent materials in food contact applications and their implications for recycling and chemical safety including chemical migration • Good Manufacturing Practices (GMP) and its implementation. • Hazard Analysis and Critical Control Points (HACCP) principles application in food packaging processes. 			
Outcomes	<ul style="list-style-type: none"> • Compare the different types of packaging materials and be able to identify permanent vs. non-permanent materials. • Outline LCA methodology and its application • Explain the concepts of recycling, reuse, and the waste hierarchy in the context of foodware and food packaging. • Explain the importance of GMP and HACCP systems in food production and processing 			
Code	Title	Hours	ECTS	M/E
FP-G	Ecodesign Tools and Technologies			
FP-G-2	Environmental and human health impacts of packaging	6	1,0	M
FP-H	Legislation and Safety			
FP-H-6	GMP and quality assurance standards	6	1,0	M
FP-H-7	Universe of food contact chemicals	4	0,5	M
FP-I	Modelling Tools			
FP-I-8	Computer-aided approaches	12	1,5	E
	TOTAL	28	4,0	

Assessments and Certificates

The FitNESS 2.0 platform delivers tailor-made training and skills to a very diverse audience, including from Bachelors, Masters, and PhD programs as well as to both junior and senior entrepreneurs/corporate professionals from different backgrounds. It is important to formally recognise user engagement in the learning materials, but this can be difficult given the clear diversity of learners. To address this, the FitNESS 2.0 platform allows for “tracking” the engagement and progress of the learner using assessment tools (quizzes, application exercises, assessment, etc.) (Vitrac et al., 2024).

These assessments appraise the knowledge, know-how, skills and/or competencies of an individual against the predefined criteria for a module (learning expectations, measurement of learning outcomes). Successful completion of an assessment is followed by certification. Assessments evaluate knowledge acquired at the end of each Learning Pathway. Learners will have 1 attempt to pass each of the final Learning Pathways. The platform offers a certification for learner completion at the end of the pathway when each assessment has successfully been completed with a minimum score of 65%.

To include FitNESS training materials within the official studies for university or company graduations, the use of FitNESS 2.0 content has to be pre-validated by the institution. The institution can then recognize afterwards the FitNESS certification and could attribute ECTS credits when the steps described above have been achieved by the learner. The 65% minimum score requirement applies exclusively to mandatory lectures.

References

CELEX (2017) Council Recommendation on the European Qualifications Framework for lifelong learning and repealing the recommendation of the European Parliament and of the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning (2017/C 189/03) [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615\(01\)](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017H0615(01))

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