DIGIWIND

D4.1
LIFELONG LEARNING MODULE DEVELOPMENT GUIDE

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D4.1 – LIFELONG LEARNING MODULE DEVELOPMENT GUIDE

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Authors	John Cosgrove (TUS), Gerard Cahill (TUS),
Acknowledgements/ Reviewers	Patricia Mancebo May (TUD), Bea de los Arcos Fernández (TUD), Christoffer Hannevig (TUS), Karsten Kryger (DTU), Malgorzata Lipska (PG), Olimpo Anaya-Lara (NTNU), Elena Stroo-Moredo (TUD), Hans Bonekamp (Whiffle), Laura Jakobsen (Cadpeople), Darragh McShane (IMR), Saeid Rezaei (TUS), Tuhfe Göçmen (DTU).
Short Abstract	D4.1 covers the development, enhancement, and execution of self-standing Lifelong Learning Modules (LLLM). Based on the industry needs gathered in WP2, modules will be designed either as off-the-shelf offerings or as bespoke offerings to specific industry clients, always keeping scalability and reusability in mind. The LLL modules will be executed and evaluated by participants and improvements will be made between cycles through loops of evaluation and feedback.
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26/06/2025	2.0	Final Consortium Management Review	Submission-ready version with mostly formatting edits

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Abstract

This Lifelong Learning Module Development Guide includes a review of best practice, current partner operations and DigiWind module specifications, which will be updated as Modules are rolled out and feedback received. The deliverable covers the development, enhancement, and execution of self-standing Life Long Learning Modules (LLLMs) by public as well as private providers., and provide guidance on a consistent design, structure, nomenclature, credit range, entry requirements, learner effort, assessment and feedback mechanisms for the DigiWind approved modules. Based on the industry needs gathered in WP2, modules will be designed either as off-the-shelf offerings or as bespoke offerings to specific industry clients, always keeping scalability and reusability in mind. Existing, enhanced, and new modules, predominantly set at 5 - 10 ECTS, and containing comprehensive learning outcomes and content will be developed for industry-based learners in order to provide significant upskilling in advanced digital technologies and their application to Wind and other Energy Systems. The modules will be curated by leading academic experts with inputs from researchers, industry, and digitalisation specialists, and will be delivered in a range of blended, hybrid, or online modes of delivery leveraging on the methodologies and operation procedures of *T2.2* and the DigiWind virtual classroom exemplar in *T2.3*. The LLLMs will be executed and evaluated by participants and improvements will be made between cycles through loops of evaluation and feedback. All modules will complete learner feedback in line with the Kirkpatrick Four-Level Training Evaluation Model (Level I – Reaction, Level II – Learning) to review the overall learner experience and effectiveness of the LLLMs.

1 Introduction

1.1 DigiWind Specifications

1.1.1 Introduction

Supporting Europe's digital and green transition, DigiWind will deliver the interdisciplinary Specialised Education Programmes (SEP) needed to future-proof the careers of Science, Technology, Engineering and Math (STEM) professionals in wind and energy systems through their acquisition of advanced digital skills including the Digital Europe Programme's (DEP) key capacity areas of High-Performance Computing (HPC), Artificial Intelligence (AI), Cybersecurity, and other emerging technologies relevant to the needs of professionals in wind and energy systems engineering.

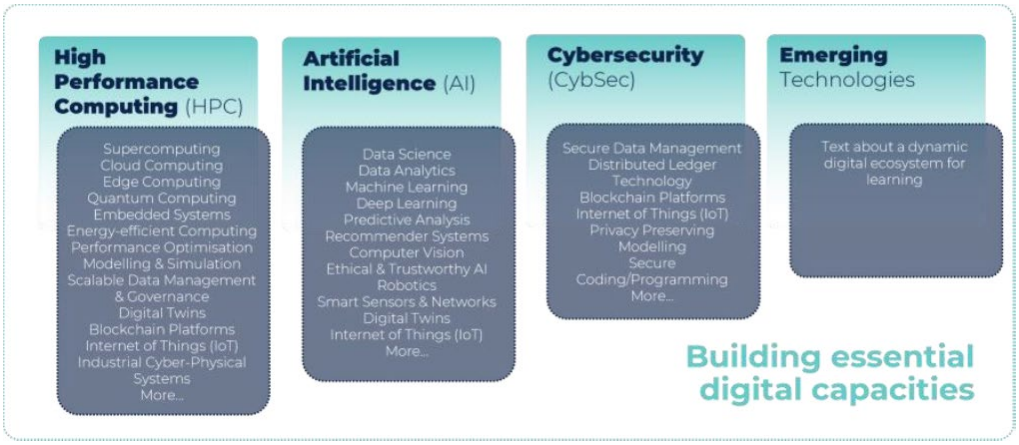


Figure 1. DigiWind, building essential digital capacities as defined by the DEP

The conceptual approach for DigiWind is rooted in Specific Objective (SO) 4: Advanced Digital Skills of the DEP and achieved through the Digital Masters of Wind and Energy Systems actions, as illustrated in Figure 2.

1.1.2 Scope

The Wind and Energy Systems engineering sector broadly addresses all aspects of large-scale Wind Turbine Technology and Wind Farm development, maintenance & operations, including the integrated Electrical, Grid, Transmission and Distribution networks. Furthermore, related systems, including grid-connected solar PV, hydro, ocean energy, power-to-x, electrification, and battery technologies are within the scope. The full life cycle from resource assessment, materials, design, financing, community engagement, project management, construction, protection and safety, to decommissioning, can all be strengthened by the adoption of new Advanced Digital Technologies to meet the needs of the Wind & Energy systems engineering sector.

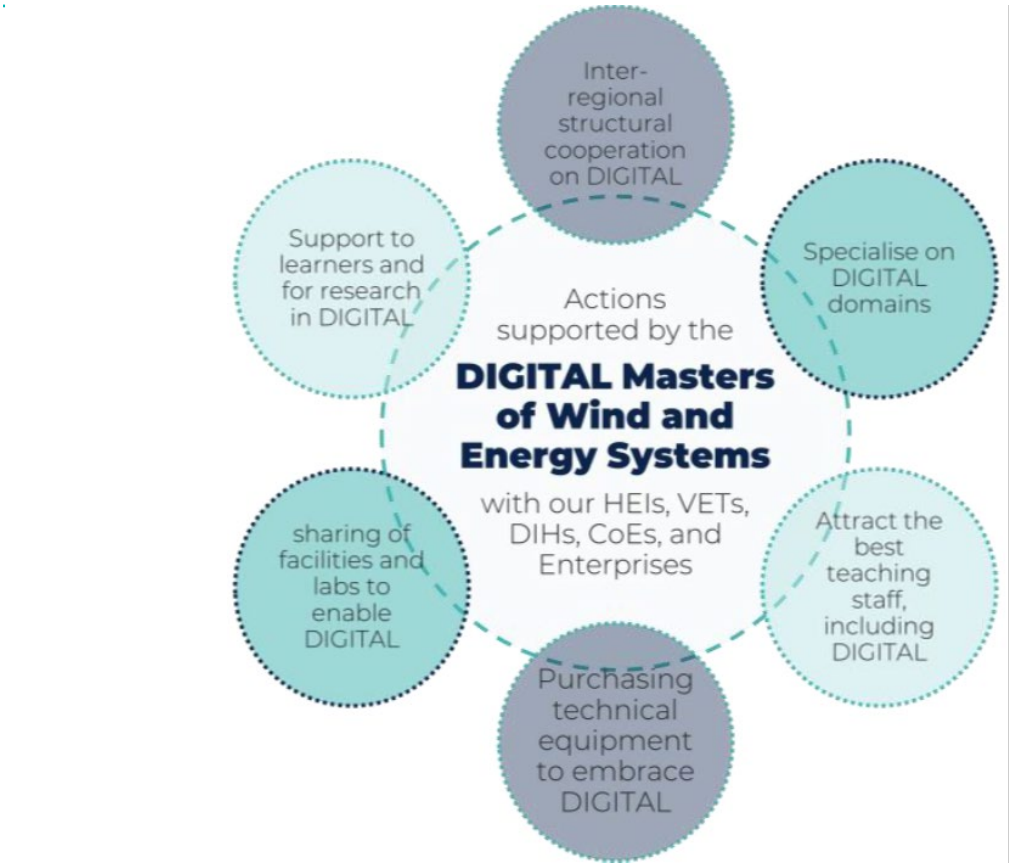


Figure 2. *DigiWind contribution to DEP SO4 - Advanced Digital Skills*

1.1.3 Aim

DigiWind will expand the existing knowledge base regarding the needs for competences in key capacity areas in wind and energy systems. The project will promote computational thinking and digital mindsets to enable people and organisations to see how data, algorithms, and advanced digital technologies open new possibilities and chart a path for success in a digital era increasingly dominated by data-intensive and intelligent technologies.

DigiWind has the primary aim of contributing to narrowing the skills gap in the wind and energy sector through;

1. Enhancing the advanced digital skills of professionals who are qualified or experienced in wind and energy systems engineering.
2. Educating individuals whose starting point is a degree in cognate disciplines, e.g. Mechanical or Electrical Engineers, or other non-ICT fields, to attract or retain them in the wind and energy systems sector.
3. Attracting new learners to exciting careers in wind and energy systems, particularly from under-represented groups.

1.1.4 EQF Level

DigiWind will focus on the development of programmes, courses and modules at EQF Level 7 – i.e. Masters Level education. This will be achieved through the development or enhancement of Masters of Science (MSc) Programmes (or equivalent), Masters Courses and individual and integrated lifelong learning modules (micro-credentials) at Masters level.

Table 1. Types of programmes

Programme	Type	Award	ECTS Credit Range
Masters of Science (MSc)	Programme	EQF Level 7 Major Award	90-120 ECTS
Masters Course (Post-graduate Diploma, SPA)	Course	EQF Level 7 Minor/Supplemental Award	30-60 ECTS
Lifelong Learning Module (Micro-credentials)	Module	EQF Level 7 Special Purpose Award / Individual Module Certificate	2 – 30 ECTS

In addition, due to the identified skills gap in the Wind and Energy Systems Sector, courses or modules aimed at enhancing the digital skills of field-service technicians, through online, hybrid and/or industry-based education and training, are also in the scope of DigiWind.

To enhance shared use of modules and simplify recognition of modules and courses, the adoption of a 5 ECTS Module definition structure is recommended.

1.1.5 Life-Long Learning (LLL)

In 2011, authors and researchers John Seely Brown and Peter Denning (Thomas, D., & Brown, J. S., 2011) determined that the half-life of a learned skill was around five years. This means that, five years on from any learning undertaken, the value of the skill or skills gained would have halved, with most skills picked up 10 years ago or more likely to be obsolete. With the pace of recent technological change, particularly in the field of digitalisation, it is safe to assume that the lifespan of learned skills has further decreased.

For continuing personal and career development, it is imperative that professionals engage in continuous learning to stay current with trends and technologies, to ensure they remain relevant in a competitive job market, to guarantee job security, and to progress in their careers. Increasingly, employers are realising the benefit that a commitment of an individual to continuous learning and improvement can bring to their organisation.

A key aspect of lifelong learning is that the chosen learning is voluntary and led by that individual – they choose what they want to learn, when and how, and whether they undertake it for personal fulfilment or to support their professional development. Thus, the importance of the developing knowledge bank in WP2

which provides information and guidance for the partners to tailor their education offerings in terms of target groups, scope, and training formats. The initial results indicate that DigiWind Lifelong Learning (LLL) modules will be taken by professionals who want to upgrade their skills and/or (technical) knowledge. A significant output from the Knowledge Bank is the key requirement for both advanced digital skills and domain-related knowledge. Domain knowledge is essential for properly applying digital skills to actual problem solving and obtaining insights from the results. The requirements for substantial training, i.e. accredited programmes, and delivery formats that are tailored to daily circumstances of the participants have also been highlighted.

The top 5 Advanced Digital Skills identified in WP2, are set out in the table below.

Table 2. Top 5 Target Skills Topics

Numerical analysis, simulation, optimisation, modelling tools
Scientific programming and software development
Machine learning, deep learning and data science
Data engineering, semantics, interoperability and quality assurance
Generative AI and Large Language Models

Life-long Learning Modules in the DigiWind Project are, in the main, accredited short programmes of study, suited for career and/or personal development, and are aligned with the European principles for the design and issuance of micro-credentials.

To be defined as a DigiWind LLLM, at a minimum, a module should include at least two of the three elements described below.

1. Be situated in the domain area of wind and energy systems engineering and/or related sectors.
2. Address the application of advanced digital technologies, methods and/or tools.
3. Adopt a Digital Pedagogy approach to the module delivery (i.e. online, hybrid, immersive).

1.2 DELTA Strategy

1.2.1 Digitally Enhanced Learning, Teaching, and Assessment (DELTA) Strategy

The DigiWind project will encompass a pioneering, digitally enhanced approach that leverages the core expertise and the intellectual, physical, and digital assets of the HEI and Industry Partners to deliver accredited and quality-assured educational experiences. The framework for ensuring the coherence and effectiveness of this approach is supported by a Digitally Enhanced Learning, Teaching and Assessment (DELTA) strategy (Prescott & Wolstencroft, 2024). The strategy empowers our Lecturers to support the effective use of educational technologies in ways that deliver benefits for student learning and outcomes, provides Learners with personalised learning pathways, flexibility, and choice in what, where, when, and how they learn.

Figure 3. Empowering Learning (Couros, 2015)

The DELTA Strategic approach

The DELTA approach:

- Champions the development of advanced digital skills so that students can take full advantage of their learning experiences and develop their digital capabilities for applications in industry.
- Embeds digital innovation, inclusivity, flexibility and accessibility into curriculum design so that every module comprises both hybrid and virtual elements that work together seamlessly.

- Sustains our investment in our digital and virtual campus and classrooms, to ensure that they are equipped with technology that is accessible, flexible, and able to support independent and collaborative learning.
- Empowers educators to support the effective use of digital educational technologies in ways that benefit student learning and outcomes. This enables the optimal use of technology to enhance pedagogy, delivering active, engaging, and supportive student learning.

The DigiWind Project, through WP2, will deliver the user and technical specifications of the virtual campus that will be a portal to the immersive learning experiences and will guide Learners into the DigiWind programmes and LLL modules. In addition, the partners will invest in the required hardware, software and other equipment for hybrid teaching to facilitate the deployment of Digitally Enhanced Learning, Teaching and Assessment.

DigiWind Resources

TUS CIPD Professional Development Programme offers a Certificate in Digitally Enhanced Learning, Teaching and Assessment, Level 9 (EQF7), 15 ECTS Credits, Online. This will be made available as part of the Train-the-Trainers Toolkit in Task 5.4 in WP5.

1.3 Motivation & Communication

1.3.1 What is motivation?

Motivation is the force that encourages a Learner to persist even when they meet challenges or obstacles. In adult learning, it is assumed that most learners are motivated by personal goals. Motivation is a good predictor of success, retention and completion in learning environments.

1. Internal motivation comes from within and is tied to personal goals and values. Individual interests and values can play a vital role in internal motivation.
2. External motivation comes from outside of yourself to reach a goal. Usually, this motivation comes in the form of encouragement or requirement from someone else (an employer, peer network, etc.)

Many learners are primarily motivated (or moved to engage in learning behaviours) by external factors, which can include requirements from an employer, the opportunity for payment/advancement in their career, to meet the expectations of others, or by deadlines.

ARCS Model of Motivation

The ARCS model of motivation (Fang et al, 2023) is widely used in eLearning, which focuses on creating and maintaining motivation through a course. There are four components to the ARCS model of motivation:

1. Attention: This refers to capturing and maintaining the learner's attention. This can be done through providing variety in the methods of presenting information, using **real-world examples** or creating conflict within their knowledge and encouraging active participation and inquiry.
2. Relevance: This refers to helping learners bridge the gap between what they are being taught and how they will use this information 'in the real world'. Connecting to current or future goals, understanding and meeting the needs of the learners, allowing choice, modelling and **linking to previous experiences** are ways to create relevance.
3. Confidence: This refers to developing an expectation of success among learners. This is achieved by **clear communication** of learning outcomes, providing feedback and opportunities for practice and allowing learners to have control of their own learning.
4. Satisfaction: This refers to the direct connection between satisfaction and motivation. Encouraging intrinsic enjoyment of learning, ensuring equal standards across the course, and **providing feedback and 'rewards'** to boost satisfaction.

One very important aspect of motivating learners is providing clear, explicit goals and instructions. Communication is key to letting learners know what they are expected to learn, how they are expected to learn it, and how they will show evidence of their learning. This explicit road map makes it easier for learners to create a plan for their learning and engage in behaviours that will result in the intended learning outcomes.

Online Learning Best Practices

As you get started building your online course on your platform, here are five important principles to keep in mind:

1. Clearly define the learning goals and learning outcomes.
2. Match your learning outcomes to the content you present and the ways you assess learning.
3. Create opportunities for learners to engage with a) what they've learned, b) their peers, c) the course instructor.
4. Address the needs and motivations of different learners.
5. Create a course outline before you start building.

Assessments

There are three main reasons why outcomes are assessed:

1. For learning: assessment for learning can lead to increased motivation, building confidence, to help learners self-assess and to identify areas of strength and areas for improvement.
2. For certification: to provide a grade, rank, or certification, to complete training or job performance requirements, and to meet industry regulations.
3. For quality assurance: to assess the achievement of course/program aims (learning goals), to track learning achievement over time, and to protect the profession and the public.

There are different types of assessment, all of which can be graded or ungraded and can be built in a wide variety of ways.

Formative assessment: These assessments are meant to support learning. These are often 'low stakes' or ungraded assessments. These assessments should always include feedback.

Summative assessment: These assessments are meant to evaluate learning at the end of a module. These assessments are graded. Where practical, feedback should also be given to students following a summative assessment.

2 Module Development

2.1 Instructional Design

2.1.1 What is instructional Design?

Instructional design is a combination of educational psychology, communications and user experience design. Instructional design, in its most basic definition, is the creation of materials used to teach, either in-person, hybrid or online. However, instructional design goes beyond just the creation of materials to considering the best approaches and tools for teaching depending on the learner and the educational platform. Today, instructional design has become synonymous with online learning.

2.1.2 The ADDIE Model

The ADDIE model is a process used by instructional designers. It was developed in 1975 and is widely accepted worldwide. Various revisions have been made over time, and most instructional designers have their own approach to the model. There are five phases in the ADDIE model: analyse, design, develop, implement and evaluate. In each phase, there are guiding questions and important points to consider. Below are some of the items discussed in each step.

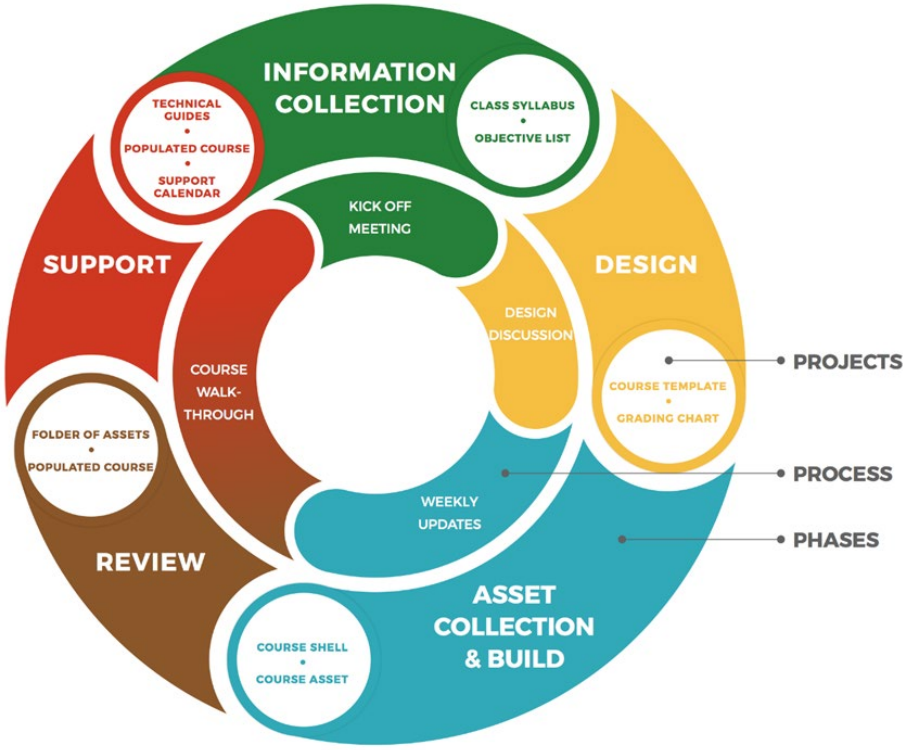


Figure 4 ADDIE Model

In each phase, there are guiding questions and important points to consider. Below are some of the items discussed in each step.

- **Analyse:** clarify the problem, decide on the learning outcomes and objectives, consider the audience and set the scope and timeline for the project.
- **Design:** create the structure for the course, determine assessment methods, create content storyboards, and plan lessons.
- **Develop:** build the course by creating or collecting the content and assessments in the LMS.
- **Implement:** the delivery of the course, which may require some instructor and/or student training and redesigns based on feedback from learners and instructors
- **Evaluate:** use formative and summative feedback throughout the process and during delivery of the course to determine if the goals (learning outcomes) are being met.

Each phase results in an output that feeds into the following step. However, the process is not linear. There are often multiple iterations that require an ID to return to the previous step.

2.1.3 Backwards Design

The module development process model is based on the ADDIE model and tied to the principles of backwards design. Backwards design in education is a process that requires a Lecturer to first consider the outcome of a learning interaction (i.e. what will the learner know or be able to do) before they determine how they will assess that learning, and then finally consider the methods of instruction. This may be different from traditional approaches, which can focus first on what and how the instructor would teach, with the focus being on the teacher's imparting of knowledge compared to the learner's understanding.

1. Start with learning outcomes - What do we expect students will be able to do or know when they complete this course? Identify the desired result.
2. Determine your assessment - How will we authentically measure that the students have met the learning outcomes? Determine the acceptable evidence.
3. Outline the content required - What content, teaching materials, and strategies will provide students with what they need to do well on the assessments. Plan the teaching and learning.

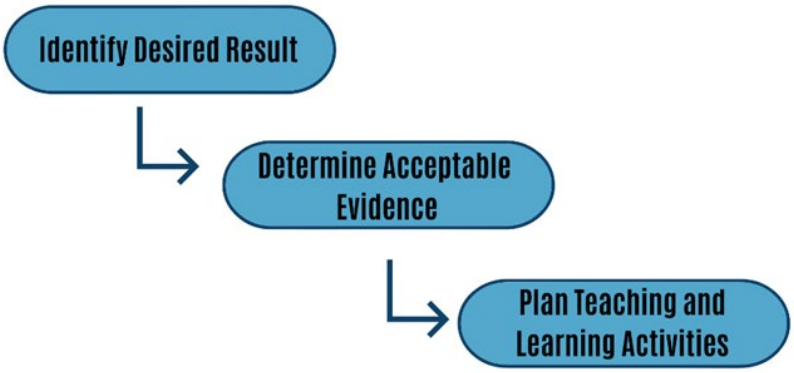


Figure 5 Backwards Design

The backwards design can also be referred to as Constructive alignment, which is an educational principle for designing learning interactions that make learning organised and explicit. In this module design, the expected learning outcomes, activities and assessment should align or match.

- Learning outcome: What should your learner know or be able to do at the end of the module/course?
- Learning activity: How will the learners learn content or practice?
- Learning assessment: How will learners provide evidence that they have met the outcome?

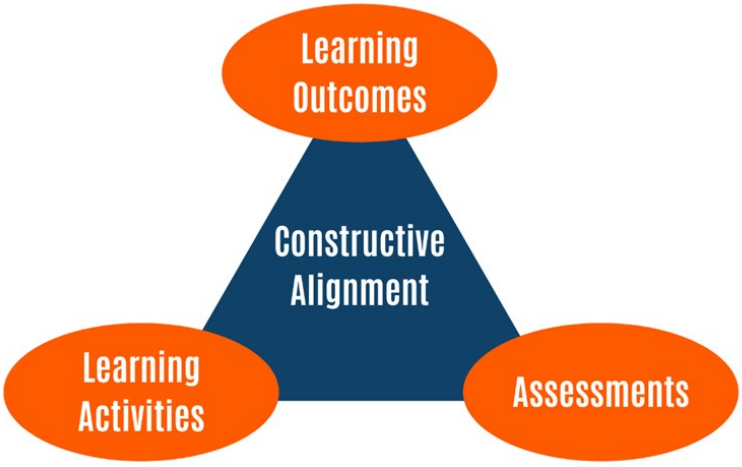


Figure 6 Constructive Alignment

2.1.4 Learning Goals, Objectives & Outcomes

Learning Goals, Objectives and Outcomes are three course design terms that are often used interchangeably. But they are, in fact, meaningfully different terms.

- **Learning Goals:** are big picture focused. Learning goals are often about the purpose of the modules and how they fit with the strategy. In DigiWind, the Learning Goals are set by the Digital Europe Programme and the industry and stakeholder feedback gathered in the knowledge bank in WP2.
- **Learning Objectives:** are instructor-focused. Objectives are the things that the instructor wants to teach or accomplish in the course. Objectives should be translated into outcomes.
- **Learning Outcomes:** are learner-focused. Learning outcomes are statements that provide clarity about what a learner should know or be able to do at the end of a course.

2.2 Process Steps in ADDIE Model Development

2.2.1 Analyse:

Clarify the problem, decide on the learning goals, consider the audience and set the scope and timeline for the project. At this stage, it is good to create a draft course syllabus and a list of learning outcomes.

DigiWind Resource - TUD 1 page Course Blueprint:
https://docs.google.com/presentation/d/1nRZfSuK-9nGxMBkhQn65m1iQpP-CMJgd/edit?slide=id.p1#slide=id.p1

Learning Goals

Figure 7 Goals, Objectives and Outcomes

Learning goals are often defined at the industry or sectoral level. i.e. What knowledge is needed and why? The use of an 'Audience Profile Analysis' template can help the Lecturer to think through who the audience will be and why they might be interested in (motivated or required to) take the module.

It is good practice to have a structured review of the intended audience who will be taking your module. Keeping track of their expected characteristics, and updating them over time, will help to build content that is relevant and interesting.

Audience Profile Analysis

Input Name	Example Input	(Example) Course Implications
Expected Audience Size	*E.g. 50 - 100*	We will need enough teaching assistants to manage a class this size.
Audience Characteristics	*E.g. Age, Location, Availability, Profession/Industry*	Courses should be short, on-demand, modular, etc...
Education Level	*E.g. Mostly college educated*	Module can assume that users have experienced college level work.
Why do they want to take your course?	*E.g. To be able to learn how to code in Python*	Ensure that your learning objectives cover the basic principles required to code in Python
What will the learner expect upon completion of the course?	*E.g. Job Advancement, greater general knowledge, a certificate*	Ensure that the objectives above could lead to job advancement, certificate-level knowledge, etc.
What do learners already know about the topic?	*E.g. Basic coding experience*	No need to spend much time explaining the basics

Table 3 Audience Profile

Learning Objectives

Learning Objectives are defined by the course creators or instructor(s). Learning objectives are teacher or instructor-focused. Objectives are often displayed as a list of topics that are to be covered in a course, lecture, on a course page, etc. Learning objectives help an instructor create lesson plans and ensure they are providing the information and skills training needed for learners to achieve the learning outcomes.

Some questions to ask when determining learning objectives:

- What are the major topics that need to be covered to help learners meet the learning outcome?
- What are the key terms, definitions, concepts, theories, and/or examples that need to be presented?

DigiWind Resources

TUD has developed a guide (Persona) and templates to complete a persona exercise, which assists with course design from the perspective of the Learner by defining key characteristics of the potential Learners.

2.2.2 Design

Create the structure for the course, determine assessment methods, create content storyboards, and plan lessons. At this stage, it is useful to create a course outline document that identifies the structure and components of your course..

One suggested approach is to adopt the Course Outline Template (Excel) that provides an excellent framework for the ADDIE model, and also includes sections on planning, grading, asset gathering and collaborative development

Course Outline Template (Excel) is accessible via:
https://docs.google.com/spreadsheets/d/1wq3tIIXNqZyy0bL2Dn8hgO9UY0xQMwGbhct_MQ9DSZc/edit?gid=729428176#gid=729428176

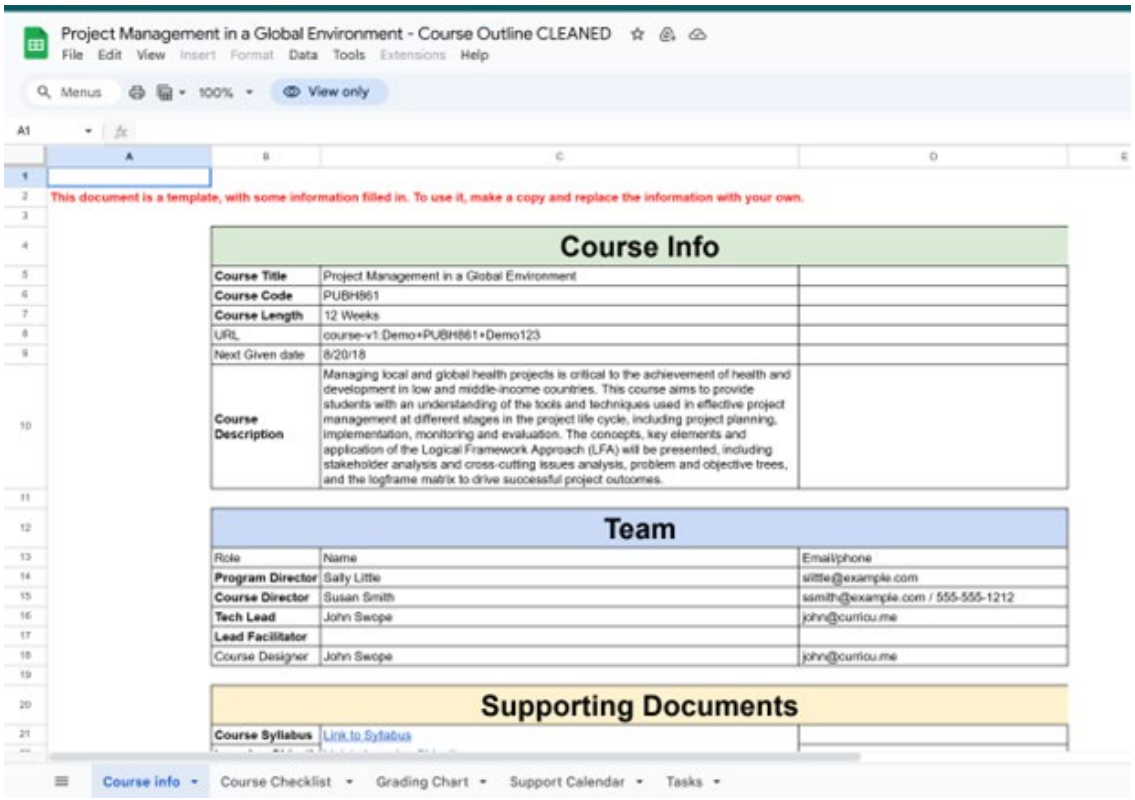


Figure 8. Example Course Structure

Learning Outcomes

Learning outcomes should be learner-focused. Learning outcomes should give learners an idea of what they are expected to learn and how they will provide evidence of their learning. A learning outcome is something that is achievable and measurable within the parameters of the course.

The use of learning outcomes can bring a strong focus to the purposes of teaching, assessment, validation and certification. Learning outcomes provide the language that enables different (quality assurance) stakeholders to interact and coordinate.

Learning outcomes are always written for particular purposes and applied in a national, institutional and/or discipline context. They need to be fit-for-purpose and there is no single fit-for-all solution; the use of learning outcomes needs to strike a balance between rigidity and flexibility. Learning outcomes need to be formulated in a way that supports or allows for flexibility in approaches to learning and qualification, especially if lifelong learning and/or individually adapted education and training are to be encouraged.

Learning outcomes begin with a measurable or observable action verb. Bloom's Taxonomy of learning is used to help course instructors pinpoint the level of learning that can be achieved within their course.

Some appropriate questions to ask when determining learning outcomes can be listed as:

- What will my learner know or be able to do at the end of this section, unit, or course?
- How will my learner provide evidence of their learning? How can I assess their achievement of the learning outcome?

Sample Learning Outcomes & Alignment Worksheet

Learning Objective	Content Delivery	Assessment	Measurement
The Learner will be able to...	*Live Lecture, Video, Audio, Reading, Discussion, Project...*	*Quiz, Paper, Discussion, Project...*	*Students should achieve a score of > 80%...*

Table 4 Alignment Worksheet Example

2.2.3 Develop

Build the course by creating or collecting the content and assessments in the LMS. This can be one of the longest phases as it requires the Lecturer to create or curate content and the assessments in the course. By the end of this phase, you should have the entire course built in the LMS.

Asset Collection & Build

The goal of this phase is to create or collect all of the course materials and build the course in the LMS. The course outline that you created in phase two is a vital input in this phase and will continue to grow in this phase.

In this phase, it is important to share any background materials that may be used in the creation of this course (a handbook, an existing in-person training deck, a series of PowerPoint lectures, etc). A well-organised shared repository (an associated Teams environment, Google Drive, Dropbox, etc.) for course materials can be very helpful during this phase, especially with larger teams and lots of content being accumulated.

You may need to:

- Develop video scripting and video production suggestions.
- Translate existing materials into text, images, and interactive content.
- Find or create images, graphics, etc.
- Build assessments, provide assessment instructions and connect to the gradebook.
- Create and implement a design theme or branding for the course.

Note: In this phase, it is important to remember that learners have different learning preferences and needs. It is important to provide a variety of media in a course if it is possible. A mix of text, video, images and varying levels of interactivity will be important here to create opportunities for active learning.

It is also important to create opportunities for learners to connect the content to their own experiences and apply their learning.

Remember to check in on the learning outcomes throughout this phase: are the assessments aligned with the learning outcomes? Do the learners have the right content to help them complete those assessments successfully?

DigiWind Resources

TUD Video recording tips

https://drive.google.com/file/d/0B9h5Ht5087lNQ0VZclVlRFpRQVU/view?resourcekey=0-dZ97xWKx1vRzMHWGAyPyUw

https://drive.google.com/file/d/0B9h5Ht5087lNQnZxeUFkb1AydVk/view?resourcekey=0-6DvWhYq8Nted_If2GqBZOg

https://drive.google.com/file/d/0B9h5Ht5087lNaUJjSGVsTzl2bDQ/view?resourcekey=0-tt22ZyNBypKffCsQXCkHIA

https://drive.google.com/file/d/0B9h5Ht5087lNRlZ4c2lucGlncEU/view?resourcekey=0-Xc9WUchjSrAXXj7o6esjGg

https://drive.google.com/file/d/0B9h5Ht5087lNTGtwak9yeE16WDQ/view?resourcekey=0-oiA5jJmD3ztSNcv2u54wWA

https://drive.google.com/file/d/0B9h5Ht5087lNMGtsMVU3TFJzZDA/view?resourcekey=0-DMqAHCCfheQfZhbrCBlLLA

2.2.4 Implement

The delivery of the course may require some instructor and/or student training, and redesigning based on feedback from learners and instructors. This should include a review phase, where the course team, as well as a few beta testers, should review the course from start to finish, as seen by a Learner. This review should be thorough; every link should be clicked, every video viewed, every assessment completed, etc. The units and assessment will need to be tested, checked for accessibility and readiness for delivery to the Learners.

The focus of this phase should be on Learner satisfaction. Coming into this phase, you should have a completed course built in the LMS and an up-to-date course outline document. By the end of this phase, you should have incorporated feedback and have a fully populated course in the LMS. The course development and testing

team should remember to review the platform(s) and the overall content on desktop and mobile devices as well!

DigiWind Resources

TUD Accessibility Guidelines:
https://docs.google.com/document/d/1tsn98rnRoo2auFolG2QyAgg2g0XEhdtB/edit

Accessibility checklist:
https://docs.google.com/document/d/1FOUgnrBICqs9D1H4V4H5x9BpUpFCmL0a/edit

2.2.5 Evaluate

Evaluate the course design and learning experience through feedback, and the achievement of the learning outcomes using formative and summative assessment throughout the process and during delivery of the course.

Communications

This phase usually happens during the delivery of the course, but it is important to have strategies in place prior to the launch of the course. In this phase, communication with learners is key. Creating a communication plan that outlines the type and frequency of communication can help to keep learners engaged and progressing through your course. It can be useful to create a support calendar and assign tasks to instructors or team members. This is especially important for synchronous courses where learners expect to have interaction with and communication from their instructors.

Note: Even in asynchronous courses, learners appreciate the opportunity to connect with the course instructors. That may be through emails, responses to discussion forums, or associated Q&A sessions.

Remember: Course development is an iterative process. It is important to assume that there will be some changes made after the first group of learners completes the course and provides feedback.

DigiWind Resources

TUD Communication plan template:
https://docs.google.com/document/d/1NGnXn27BZfC1pC2M7k_7ybgbsYfjM8LE/edit

Engaging strategies: https://docs.google.com/document/d/1Gv_A3ndqEzT-rGfDwWAfO9v4Sk1W-UunA_t665m1jHI/edit?tab=t.0

Online course email guide: https://docs.google.com/document/d/1DaDGy5FVI5Mq-MroxkZDFvQrtLyjSy4-/edit

The goal of using this process is to increase the speed at which a course is created and to improve the team dynamics. Remember that while these phases are presented in a linear order, you will often have to return to previous phases and make adjustments.

3 Best Practices in Module Definition

3.1 Levels of Learning

The Proposed DigiWind programmes, courses and modules are predominantly focused at EQF7 (Second Cycle or 'Masters' Level), and are classified at the higher levels of thinking in the cognitive domain, such as:

1. Analysis: you can break something down
2. Synthesis: you can create something new as a result of the analysis
3. Evaluation: you can pass judgment on something

These levels are closely linked with the general level descriptors in the EQF (Annex IV)

	Knowledge	Skills	Responsibility and autonomy
	In the context of EQF, knowledge is described as theoretical and/or factual.	In the context of EQF, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) and practical (involving manual dexterity and the use of methods, materials, tools and instruments)	In the context of the EQF, responsibility and autonomy is described as the ability of the learner to apply knowledge and skills autonomously and with responsibility.
Level 6	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study	Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups
Level 7	Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research Critical awareness of knowledge issues in a field and at the interface between different fields	Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields	Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams

Module Learning Outcomes must be chosen that reflect the appropriate level of learning.

Note: The concepts of knowledge and skills can be disentangled differently across countries. At the EU level, the main elements of the EQF level descriptors can be

listed as 1) knowledge described as factual and/or theoretical; 2) Skills described as cognitive and practical; and 3) autonomy and responsibility. Before the 2017 EQF revision, the third element was named 'competence', but it was described in terms of autonomy and responsibility. This guideline delineates 'Skills', 'Knowledge and 'Autonomy and Responsibility' as the domains for wider commonality with national and European descriptors.

3.2 Micro-credential Module Description

3.2.1 Micro-Credential Specifications

A Micro-credential is a record of the learning outcomes that a learner has acquired following a small volume of learning (EC C243/02, 20222). These learning outcomes will have been assessed against transparent and clearly defined criteria. Learning experiences leading to micro-credentials are designed to provide the learner with specific knowledge, skills and competences that respond to societal, personal, cultural or labour market needs. Micro-credentials are owned by the learner, can be shared and are portable. They may be stand-alone or combined into larger credentials. They are underpinned by quality assurance following agreed standards in the relevant sector or area of activity.

The 10 principles presented below specify the nature of micro-credentials and offer guidance to Member States, public authorities and providers on the design and issuance of micro-credentials and systems for micro-credentials. The principles highlight the key characteristics of the European approach to micro-credentials that can enable the trust and quality of micro-credentials

1. Quality: Micro-credentials should be of high quality, ensuring that they accurately reflect the learning outcomes achieved and are subject to robust quality assurance processes.
2. Transparency: Information about micro-credentials, including their content, learning outcomes, and assessment methods, should be easily accessible and understandable.
3. Relevance: Micro-credentials should be relevant to the needs of learners and the labour market, addressing specific skills gaps and aligning with industry requirements.
4. Valid Assessment: Assessments should be valid, reliable, and fair, ensuring that they accurately measure the learning outcomes of the micro-credential.
5. Learning Pathways: Micro-credentials should be designed to fit into broader learning pathways, allowing learners to progress towards higher-level qualifications and build upon their existing knowledge and skills.
6. Recognition: Micro-credentials should be recognized by educational institutions, employers, and other relevant stakeholders, ensuring that they are valued and contribute to career development.

7. Portability: Micro-credentials should be portable and easily transferrable across different institutions and countries, facilitating mobility and lifelong learning.
8. Learner-Centeredness: The design and delivery of micro-credentials should be learner-centred, taking into account the needs and preferences of the learners.
9. Authenticity: Micro-credentials should be authentic, reflecting the true learning experiences and achievements of the learners.
10. Information and Guidance: Learners should have access to clear and comprehensive information about micro-credentials and the learning opportunities they provide, including guidance on how to select and use them.

According to the definition by the European Union, micro-credentials are a record of the skills and knowledge acquired by a learner by completing a short amount of learning. The assessment of these learning outcomes is based on clearly defined and transparent criteria. Micro-credentials belong to the learner, are shareable and portable. Micro-credentials might exist independently or be integrated into more comprehensive credentials. “They are underpinned by quality assurance following agreed standards in the relevant sector or area of activity” (Council of the European Union, 2022).

1) ‘Portability’ means the ability for a credential-holder to store their micro-credentials in a system of their choice, to share the credential with a party of their choice (whether national or transnational) and for all parties in the exchange to be able to understand the content and verify the authenticity of the credentials. This enables portability between and within education and training sectors, in the labour market and across countries.

2) ‘Stackability’ means the possibility, where relevant, to combine different micro-credentials and build logically upon each other. Decisions to ‘stack’ or combine credentials lie with the receiving organisation (e.g. education and training institutions, employers, etc.) in line with their practices and should support the goals and needs of the learner. Stacking does not create an automatic entitlement to a qualification or a degree. Such decisions are made by regional and national authorities or institutions in line with their awarding processes.

3) ‘Assessment’ means the process or method used to evaluate, measure and eventually describe the learning outcomes acquired by individuals through formal, non-formal or informal settings. Assessment is performed by the provider or other recognised assessment providers.

The European standard elements to describe a micro-credential (as described in Annex I) include the following mandatory elements:

Table 5 Micro-credential definitions

European standard elements to describe a micro-credential	
Mandatory elements:	Identification of the learner
	Title of the micro-credential
	Country(ies)/Region(s) of the issuer
	Awarding body(ies)
	Date of issuing
	Learning outcomes
	Notional workload needed to achieve the learning outcomes (in ECTS credits, where possible)
	Level (and cycle, if applicable) of the learning experience leading to the micro-credential (EQF, QF-EHEA), if applicable
	Type of assessment
	Form of participation in the learning activity
	Type of quality assurance used to underpin the micro-credential
Optional elements, where relevant (non-exhaustive list):	Prerequisites needed to enrol in the learning activity
	Supervision and identity verification during assessment (unsupervised with no identity verification, supervised with no identity verification, supervised online, or onsite with identity verification)
	Grade achieved
	Integration/stackability options (stand-alone, independent micro-credential/integrated, stackable towards another credential)
	Further information

These standard elements will be included in a European data model that specifies a common format for describing micro-credentials. The data model will be available as an open standard to be used by providers of micro-credentials, where relevant, and could support interoperability and easier exchange of data on micro-credentials.

Elements for data fields for the electronic publication of information on qualifications with an EQF level – Annex VI EQF Recommendation

DATA	Required / Optional
Title of the qualification	Required
Field*	Required

Country/Region (code)			Required
EQF Level			Required
Description of the qualification	Either	Knowledge	Required
		Skills	Required
		Responsibility and autonomy	Required
	Or	Open text field describing what the learner is expected to know, understand and be able to do	Required
Awarding body or competent authority**			Required
Credit points/ notional workload needed to achieve the learning outcomes			Optional
Internal quality assurance processes			Optional
External quality assurance/regulatory body			Optional
Further information on the qualification			Optional
Source of information			Optional
Link to relevant supplements			Optional
URL of the qualification			Optional
Information language (code)			Optional
Entry requirements			Optional
Expiry date (if relevant)			Optional
Ways to acquire qualification			Optional
Relationship to occupations or occupational fields			Optional

*ISCEd FoET2013

**The minimum required information on the awarding body or the competent authority should facilitate to find information which would include its name, or if applicable the name of the group of awarding bodies or competent authorities, completed with a URL or contact information.

These essential data-points are incorporated into the DigiWind Module Descriptor – included in Annex 1.

3.2.2 Comparable descriptions of qualifications

A working group of the EQF-Europass project (EuroPass, 2024) have published European guidelines for the development and writing of standardised descriptions of qualifications, to facilitate transparency and comparability of qualifications across Europe. These short and synthetic descriptions, which build on but do not replace full national descriptions, have multiple benefits as they can provide an easy access and an entry point for individual learners or employers seeking information on specific qualifications. Structuring short descriptions according to the same principles is important to increase transparency and understanding and facilitate comparison; it can also support the leveraging of digital developments to access, use, connect and compare information on the content and profile of qualifications.

The aim of the approach is to promote common principles and therefore a consistent structure and approach to develop short and synthetic descriptions of modules for publication on qualifications databases/registers connected to Europass. Existing information models (e.g. European Learning Model) propose information fields (e.g. name of the qualification, awarding body, field, etc) to improve information sharing on qualifications and databases/registers of qualifications.

Annex IV of the EQF recommendation indicates mandatory and optional data fields for the digital publication of information on all types and levels of qualifications (e.g. name of qualification, awarding body, field). Building on Annex III, the Qualification Dataset Register (QDR) and the European Learning Model (ELM) support the publishing and sharing of information on qualifications in Europass.

The development of Short descriptions of qualifications allows for stakeholders (including learners, employers, counsellors, parents, teachers, education and training providers, validation practitioners) to understand quickly the content, complexity and orientation of learning.

When drafting short descriptions, it is important to approach the key content aspects listed in the guidelines (breadth/scope, depth/complexity, and context) with flexibility and not in a rigid or mechanistic way. Some distinctions are conceptual abstractions that in practice overlap.

EQF-Europass Project Building Blocks (EuroPass, 2024)

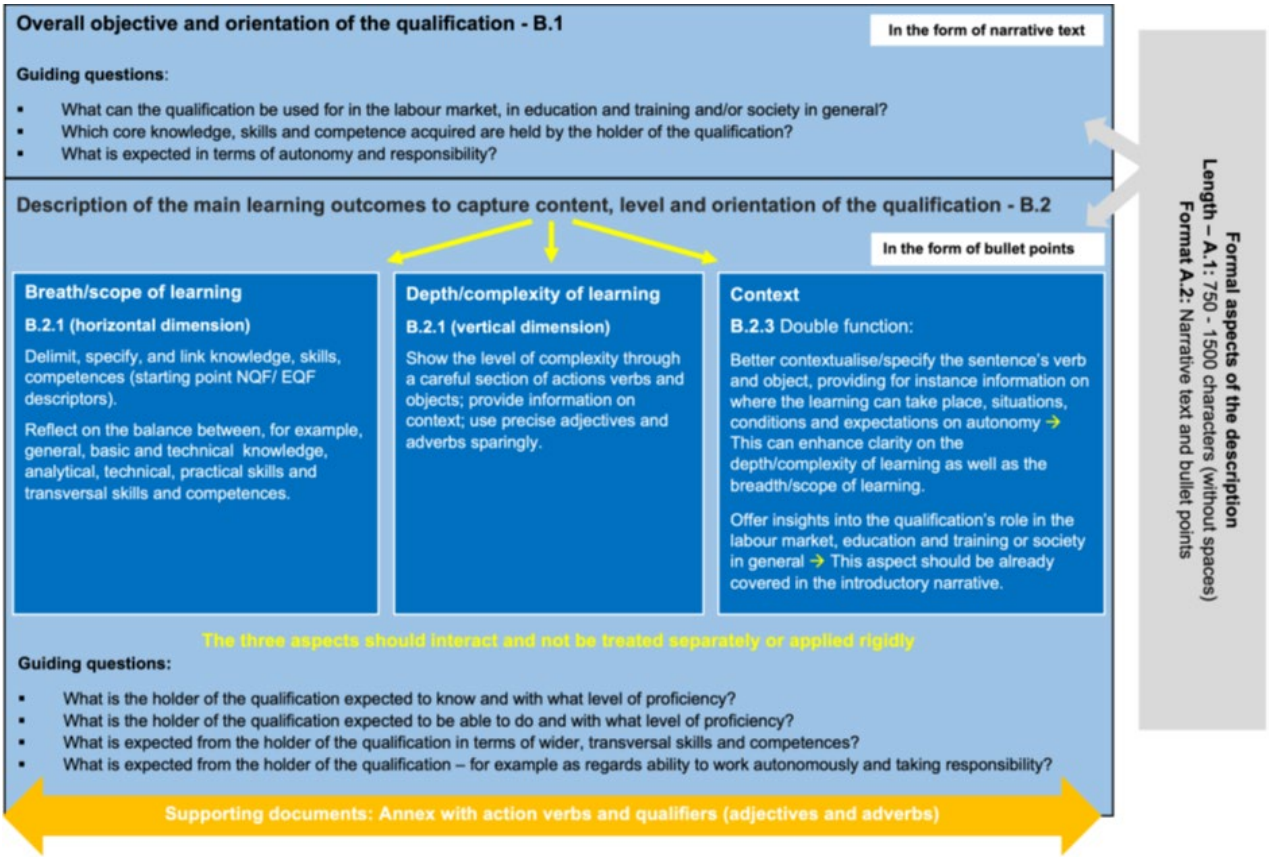


Figure 9. Common Module Descriptions: main building blocks

The following principles should be considered when developing and writing short descriptions:

A. Formal aspects

(a) A.1 Length of the description (750 to 1500 characters without space);

(b) A.2 Format of the description (narrative and bullet points).

B. Content aspects

(a) B.1 Overall objectives and orientation of the qualification (in the form of narrative text);

(b) B.2 Main learning outcomes (in the form of bullet points) to capture orientation, content and complexity of the qualification by covering the following aspects:

(i) B.2.1 Breadth/scope of learning acquired;

(ii) B.2.2 Depth/complexity of learning acquired;

(iii) B.2.3 Context information.

Table 6. Structure and format of the short description (narrative and bullet points)

Narrative presenting the overall objectives and orientation of the qualification.	The holder of the qualification…….
Bullet points expressing learning outcomes	He/she is able to: 1) 2) 3) …

Source: EQF and Europass project group on short descriptions of learning outcomes of qualifications.

B – Content aspects

B1. Overall objectives and orientation of the qualification in the form of a narrative

The description should start with a concise introduction in the form of a narrative expressing the overall objective and orientation of the qualification, including information on context. This should enable the reader to grasp the essence of the qualification and understand its role and position in relation to the labour market, education and training systems and/or society in general.

Examples of narratives introducing overall objectives and orientation of qualifications

Example E: The holder of the qualification 'Surgery assistant' (EQF/NQF 6) has a crucial role in surgical care with many reserved, surgical and risky operations and complex technological developments in rapid succession. He/she can be part of a multidisciplinary team consisting of cutting medical specialists, anaesthesiologists, anaesthesia assistants and operating assistants. He/she can assist the attending specialist in his/her activities and coordinates and directs the care process surrounding the patient during the perioperative period. In addition, he/she can collaborate with the support services of the surgery department, such as the central sterilisation department, the nursing departments, the radiology department and laboratories.

Guiding questions

The purpose of the questions below is to facilitate reflection on aspects that can be brought forward when developing narratives expressing overall objectives and orientation of qualifications. The purpose is not to answer all questions directly or mechanically.

(a) What can the qualification be used for in the labour market, in education and training and/or society in general? What can the holder of the qualification do with the qualification?

(i) Is the qualification preparing for specific tasks, functions and/or occupations?

(ii) Does the qualification give a specific entitlement, for example by licensing occupational practices? Does it give access to a regulated profession? Does the qualification entitle or enable the receiver to initiate specific business or entrepreneurial activities?

(iii) If the qualification is not linked directly to specific tasks, occupations, or professions, what is the purpose of the qualification in relation to: employment; initial education and training; continuing education and training; or personal development?

(iv) Does the qualification give access to specific further learning? Is it relevant to mention possible progression routes?

(v) Are there specific requirements to access the qualifications that are worth being mentioned to clarify their role and position?

(b) Which core knowledge, skills and/or competences are held by a holder of this qualification?

(c) What is expected from the holder of the qualification, for example as regards ability to work independently?

(d) What is expected from the holder of the qualification – for example as regards taking responsibility for processes and managing others?

3.2.3 Comparable descriptions of Learning Outcomes

The EQF-Europass project (EuroPass, 2024) also proposes a common description of modules incorporating short learning-outcomes based descriptions of qualifications.

B2 – Learning outcomes in bullet points

Following the introductory statement on the overall objectives and orientation of the qualifications, the description should proceed with a bullet point list of the main learning outcomes.

The basic structure of learning outcomes statements should:			
• address the learner	• use an action verb to signal the level of learning expected.	• indicate the object and scope (the depth and breadth) of the expected learning.	• clarify the occupational and/ or social context in which the qualification is relevant.
Examples			
The student…	• is expected to present …	• …in writing the results of the risk analysis	• …allowing others to follow the process replicate the results.
The learner…	• is expected to distinguish between…	• …the environmental effects…	• …of cooling gases used in refrigeration systems.

Source: Cedefop.

Figure 90. The basic structure of learning outcomes statements (Cedefop, 2022)

The main learning outcomes listed as bullet points should address three key aspects:

B.2.1. Breadth/scope of the learning acquired.

B.2.2. Depth/complexity of the learning acquired.

B.2.3. Context.

Breadth/scope of learning means to clarify the *scope* of the learning acquired with the qualification, and therefore delimit and point to the borderlines and boundaries of the achieved learning outcomes. This means to convey information on the types of knowledge acquired as well as to describe the skills and competences mastered by the holder of the qualification.

The learning domains (also called the horizontal dimension of qualifications frameworks) outlined in EQF/NQF level descriptors are a starting point to reflect on the breadth of learning.

Depth/complexity of learning is about clarifying the complexity and sophistication of learning acquired. Within the same learning domain (e.g. theoretical knowledge or practical skills), varying degrees of expertise and proficiency can be achieved.

The EQF/NQF level descriptors for each level (also called the vertical dimension of qualifications frameworks) are a starting point to define the depth and complexity of learning.

Context

When writing the specific learning outcomes sentences (in the form of bullet points), information on context serves to specify further the learning outcomes acquired. In addition to verbs and objects composing a basic sentence, additional information on context serves to provide further details, for example on situations, methods and conditions: verbs or objects alone are not sufficient to capture the breadth and depth of learning outcomes. To support this process, the guidelines also provide recommendations on the syntactical structure of sentences expressing learning outcomes.

Detailed guiding questions and recommendations in the formulation of Learning Outcomes are included in the Annex I.

3.2.4 DigiWind Module Learning Outcomes

For module development in DigiWind, it is recommended that a common Number of Learning Outcomes be defined, based on the number of Learning Outcomes defined.

For example:

- For a 5 ECTS Module – there should be 5 Learning Outcomes, with each one linked to a clear assessment. The LOs should clearly be mapped to the EQF level descriptors of Knowledge, Skills and Autonomy & Responsibility.
- For a 2 to 4 ECTS Module – there should be a minimum of three Learning Outcomes, with each one linked to a clear assessment. The LOs should clearly be mapped to the EQF level descriptors of Knowledge, Skills and Autonomy & Responsibility.
- For a 6 to 10 ECTS Module – there should be a maximum of seven Learning Outcomes, with each one linked to a clear assessment. The LOs should clearly be mapped to the EQF level descriptors of Knowledge, Skills and Autonomy & Responsibility.

Guidance on writing Learning Outcomes

The following is a list of guidelines (Kennedy, 2007) to assist you in writing learning outcomes for your modules. Treat the list as just that – a set of guidelines rather than

a set of hard and fast rules. For example, while the second guideline says to try to use one verb only, you may sometimes find it more logical to run two closely related actions into one learning outcome, such as "Compare and contrast…" or "Construct and test…".

1. Begin with an active verb.
2. Use just one verb per learning outcome.
3. Ensure that each learning outcome is assessable, i.e. observable and measurable.
4. Avoid vague terms like know, understand, learn, be familiar with and similar – these verbs are not observable or measurable, which means they are difficult to assess with clarity and precision.
5. Avoid complicated sentences. If necessary, use more than one sentence for clarity. Bear in mind that a learning outcome does not need to be as specific as an assessment question.
6. Aim for about five learning outcomes per module (1 LO per ECTS Credit).
7. When writing learning outcomes in the cognitive domain, avoid overuse of knowledge- and comprehension-based verbs. Ensure to include some outcomes based on application, analysis, synthesis and evaluation.

Note: It is commonly stated that learning outcomes should be measurable, and that the learner needs to be able to demonstrate achieved learning in an observable way. This measurability requirement should be treated with some caution (Cedefop, 2022). Experiences from criterion-referenced assessment and validation point to the important distinction between content and construct validity. While content validity refers to a phenomenon (for example tasks or skills) which can be directly and unambiguously observed, construct validity measures performance indirectly and in relation to a theoretically constructed reference. When writing learning outcomes for assessment, this distinction needs to be kept in mind. Overlooking it may create a bias towards easily observable tasks and skills, and away from the more complex (and sometimes more important) underpinning competences.

3.2.5 Active Verbs for Learning Outcomes

For the DigiWind Modules that are predominantly set at Masters level on the EQF, the correct action verbs mapped to the level descriptors of Analysis, Synthesis and Evaluation are grouped in the tables below.

Analysis Module Learning Outcomes

Analysis may be defined as the ability to break down information into its component parts, e.g. look for inter-relationships, patterns, trends, ideas; understand organisational structure; make inferences; find evidence to support generalisations. Action verbs used to assess analysis include:

Table 7 Analysis Verbs

Analyse	Appraise	Arrange	Break down	Calculate	Categorise	Classify
Compare	Connect	Contrast	Criticise	Debate	Deduce	Detect
Determine	Develop	Differentiate	Discover	Discriminate	Distinguish	Divide
Draw conclusions	Examine	Experiment	Group	Identify	Illustrate	Infer
Inspect	Investigate	Order	Outline	Point out	Question	Relate
Recognise	Separate	Simplify	Subdivide	Test		

Here are some examples of analysis-based learning outcomes:

1. Analyse the potential consequences of certain actions for wind farm operation.
2. Compare and contrast the different electronic business models.
3. Deduce the economic and environmental effects of a given energy conversion process.

Synthesis Module Learning Outcomes

Synthesis may be defined as the ability to put parts together, e.g. create new patterns or structures or propose alternative solutions. Action verbs used to assess synthesis include:

Table 8 Synthesis Verbs

Argue	Arrange	Assemble	Categorise	Collect	Combine	Compile
Compose	Construct	Create	Design	Develop	Devise	Establish
Explain	Formulate	Generalise	Generate	Group	Integrate	Invent
Make	Manage	Modify	Order	Organise	Originate	Plan
Prepare	Prescribe	Propose	Rearrange	Reconstruct	Relate	Reorganise
Revise	Rewrite	Set up	Summarise	Synthesise		

Here are some examples of synthesis-based learning outcomes

1. Organise a wind energy stakeholder education programme.
2. Propose verbal and written solutions to complex energy management problems.
3. Devise a three-year business plan for a tech solution provider start-up company.

Evaluation Module Learning Outcomes

Evaluation may be defined as the ability to judge the value of material for a given purpose, e.g. present and defend opinions; identify strengths/weaknesses; make convincing arguments. Action verbs used to assess evaluation include:

Table 9 Evaluation Verbs

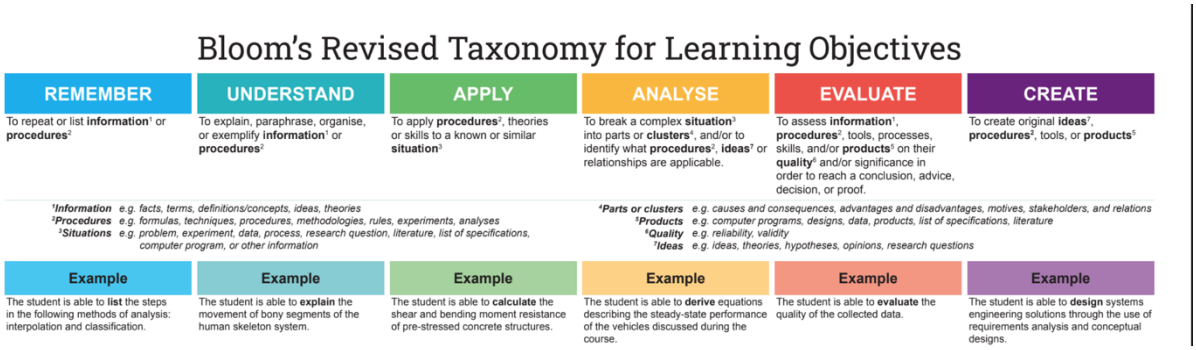
Appraise	Ascertain	Argue	Assess	Attach	Award	Choose
Compare	Conclude	Consider	Contrast	Convince	Criticise	Critique
Decide	Defend	Detect	Determine	Discriminate	Estimate	Explain
Evaluate	Grade	Interpret	Judge	Justify	Measure	Monitor
Predict	Persuade	Rank	Rate	Recommend	Relate	Resolve
Revise	Score	Select	Standardise	Summarise	Support	Test
Validate	Value	Verify				

Here are some examples of evaluation-based learning outcomes:

1. Assess the importance of key participants in bringing about change in the floating offshore wind sector.
2. Evaluate marketing strategies for different electronic business models.
3. Predict the effect of temperature change on the position of equilibrium.

DigiWIND

TUD Revised Blooms Taxonomy:
https://drive.google.com/file/d/1ll4FvPkUsdGM_NGLpLHmMOJUc116j0iS/view



4 Quality Assurance & Feedback

4.1 Quality assurance principles - (EQF)

Quality assurance principles for qualifications are an essential component of national qualifications frameworks and of systems referenced to the European Qualifications Framework (EQF). All qualifications with an EQF level should be quality assured to enhance trust in their quality and level. These common principles are fully compatible with the European Standards and Guidelines (ESG) for Quality Assurance in the European Higher Education Area and with European Quality Assurance in VET (EQAVET).

4.1.1 Common Principles

In accordance with national circumstances and taking into account sectoral differences, quality assurance of qualifications with an EQF level should:

1. Address the design of qualifications as well as the application of the learning outcomes approach;
2. Ensure valid and reliable assessment according to agreed and transparent learning outcomes-based standards and address the process of certification;
3. Consist of feedback mechanisms and procedures for continuous improvement;
4. Involve all relevant stakeholders at all stages of the process;
5. Be composed of consistent evaluation methods, associating self-assessment and external review;
6. Be an integral part of the internal management, including sub-contracted activities, of bodies issuing qualifications with an EQF level;
7. Be based on clear and measurable objectives, standards and guidelines;
8. Be supported by appropriate resources;
9. Include a regular review of existing external monitoring bodies or agencies, carrying out quality assurance;
10. Include the electronic accessibility of evaluation results.

The accreditation and quality assurance of the DigiWind lifelong learning modules will be carried out by each of the HEI partners following their well-established academic procedures and policies, and by the non-HEI partners through following the norms, standards, regulations and requirements established in their country.

Qualitative and statistical data will be gathered from each iteration of the modules executed, and feedback from the learners will be incorporated into subsequent delivery of the modules. The quality assurance approach and best practices will be refined continuously as modules are rolled out and will be coordinated through Task 4.2 - Execution and quality assurance of lifelong learning modules.

4.2 Kirkpatrick Evaluation Model

The initial approach to the evaluation of the effectiveness of the learning will be based on the well-known Kirkpatrick Evaluation Model, which proposes four levels at which the partners could evaluate the learning.

Figure 11. Levels of Kirkpatrick Evaluation Model (The L&D Academy, 2024)

4.2.1 Level 1 Reaction

Level 1 is all about first impressions: Did the learners enjoy the learning/training? At this level, we are evaluating the 2 E's: Engagement and Experience.

Generally, at this level, immediate participant reactions are assessed. It gauges how participants feel about the training, coaching, or mentoring experience. Capturing emotions and engagement levels provides a foundation for understanding the initial impact. This helps trainers and facilitators to adjust their approach or environment for better participant buy-in.

4.2.2 Level 2 Learning

Level 2 focuses on measuring the extent to which participants acquire new knowledge and skills, i.e. assessing if the training met the learning objectives. The question at this level is: "What knowledge and skills did the learners acquire in this programme?" The approach usually involves assessments, quizzes, and evaluations to ensure that the participants have gained a solid understanding of the content. Level 2 validates the alignment between training objectives and participant understanding.

4.2.3 Level 3 Behaviour

The third level focuses on the behavioural changes that happened because of the training. This level delves into the application of acquired knowledge and skills in real-world scenarios. By assessing behavioural changes, organisations can

determine the practical impact of the training on participants' job performance. Level 3 assesses the transfer of knowledge from the training environment to practical application.

4.2.4 Level 4 Results

The fourth level is used to evaluate the broader organisational impact of the training, i.e. what business results have been achieved when the training goals were met. We are looking to answer: "How did the training impact the business?". Level 3 measures the sustained positive outcomes resulting from the training, coaching, or mentoring initiatives and may assist in demonstrating the return on investment (ROI) of the training program.

The Kirkpatrick approach is widely used, frequently cited, tested over time, and perhaps the simplest among training evaluation approaches (Sudipta et al, 2004). However, there are a number of conceptual and methodological criticisms of the approach (Bates, 2004). Whilst the model is a good process for evaluation after industry-based training, such as the DigiWind LLLMs, it is acknowledged that it is limited in assessment of prior and concurrent learning experiences and inputs, and how to link the results with strategy. Thus, it is recommended, where possible, to complete a Baseline Assessment of the learners' prior knowledge, experience and expectations, as preparation for the delivery of a LLLM.

4.3 Module Qualitative Feedback

For the DigiWind Project, each partner is committed to the development of a range of relevant lifelong learning modules and the delivery of these modules at least twice, incorporating learner feedback to improve the delivery of the module.

As a pilot for this approach, TUS developed and implemented a new online course in Leadership in Offshore Renewable Energy (LORE). This is a Short Education Programme (SEP) designed to address the growing demand for skilled professionals in the renewable energy sector, specifically in offshore renewable energy systems. Delivered at Level 9 (EQF7) on the Irish National Framework of Qualification and comprising 10 ECTS credits, this Master's-level programme offers a unique blend of theoretical knowledge and practical insights. The programme is structured around 8 industry-relevant topics such as offshore wind, wave, tidal energy, storage systems, and emerging innovations. Learners engage in online workshops comprising weekly lectures and breakout discussion sessions with 'industry-seasoned' academics, fostering the development of leadership skills necessary for driving the renewable energy agenda forward. Each week's topic is supported by technical presentations from Industry representatives, ensuring the knowledge gained is at the cutting edge of technological research and development.

The course was accredited through the TUS Flexible Learning procedures and approved by Academic Council in January 2024. As part of the course design, a learner evaluation exercise was developed, and the learners were encouraged to give

their feedback. Two iterations of the course have been delivered to date, and the feedback from the first iteration was used to improve the second delivery of this course. The survey form used is included in Annex IV.

DigiWind Feedback Example (TUS)
Certificate in Leadership in Offshore Renewable Energy Systems
https://tus.ie/courses/leadership-offshore-renewable-energy-systems/
NFQ Level 9 (EQF7), 10 ECTS. 10 Week Course – Online Lectures
Two Cohorts – 48 Learners - 20 Guest Lecturers.

Summary of Learner Feedback (Cohort 2)
How would you rate the content of the course? (Score 1-5) - 83%
How would you rate the operation of the course? (Score 1-5) - 84%
How would you rate the benefit of the course to your career? - 74%
Do you feel that this course has enabled you to perform your role better? (Yes/No) 83% YES
Do you feel that this course has enabled you to add value to your company? (Yes/No) 94% YES

Selection of Learner Testimonials

- "Wonderful course. Lots of interesting guest speakers and great content. Would highly recommend."
- "The course was superb. All facets of the course were well run, the online platform easy to use, staff interacted in a timely/diligent manner. The course content was appealing and the lecturing of such materials exceptionally well facilitated"
- "Excellent delivery by experienced and competent contributors , excellent content ; relevant and up to date"
- "An insightful course with industry leading speakers on the current state of offshore renewable energy development in Ireland"
- "Very relevant, informative and well run course with interesting content and guest speakers "
- "A great course to gain wider understanding of the offshore renewable energy industry, including its opportunities and challenges."
- "This course gave me an excellent overall knowledge and understanding of the offshore renewable energy sector. "
- "A course led by people with real first-hand industry knowledge."

4.4 Module Statistical Reporting

The DigiWind project implements reporting mechanisms in compliance with the requirements of Article 5, Section 2 of the Digital Decade Policy Programme 2030 and how it pertains to the Digital Europe Programme. This requires reporting to the Commission "the necessary statistics and data required for the effective monitoring of the digital transformation and the degree of achievement of the digital targets.

Those data shall, where possible, be disaggregated by gender and by region, in accordance with Union and national law.".[1]

The data gathered comprises gender information and learner feedback on the impact of their experiences. The survey data is compiled in conjunction with anonymised registration data from each institution to build a picture of effectiveness and reach in the context of the programme.

For each module / course, learner details are compiled in the following manner:

Survey indicator A:

Persons who have received training to acquire advanced digital skills.

	Start of the project until now				Comment – type of training activity (if possible)
	Male	Female	Non-binary	Total	
Number of enrolments in training activities					

Survey indicator B:

People reporting improved employment situation after the end of the training.

As DigiWind Lifelong Learning Modules can be of short duration, the following pair of questions are used:

Do you feel that this course has enabled you to add value to your company?

Do you feel that this course has enabled you to perform your role better?

	Start of the project until now				
	Male	Female	Non-binary	Total	Number of participants who provided feedback
Number of people reporting improved employment situation after the end of the in training activities					

[1] Decision (EU) 2022/2481 of the European Parliament and of the Council of 14 December 2022 establishing the Digital Decade Policy Programme 2030, OJ L 323, 19.12.2022, p. 4, art 5(2).

For each learning module or activity, a record will be uploaded to the project folder (in DigiWind repository) for DigiWind Deliverable D1.5 for compilation.

5 Summary

5.1 Conclusions

Ongoing discussion and contributions from the partners have established key values and definitions in the DigiWind project to date. To the extent possible, these discussion points are codified in this deliverable as guidance to Module developers. The deliverable aims to set out some examples of good practice, standards and approaches that are recommended and experiences with the pilot modules already implemented. The accreditation process and norms at each of the partners will be followed, with consideration of the common definitions and alignment where possible. The proposed common module descriptor approach will support the later mapping of the micro-credentials (T4.3) and the potential for integrated transfer and recognition of modules and credits (T4.4)

Key elements of the Lifelong Learning Module Development Guide include;

- Description of the scope of LLLMs
- Definition of the range and level of credits for LLLM
- Recommended adoption of a 5 ECTS Module definition structure
- Elements required in a DigiWind Module
- Definition of the strategic approach to Digitally Enhanced Learning, Teaching, and Assessment
- Instruction design and best practice in developing online learning modules for industry Learners
- Definition of LOs in line with ECTS credits
- Best practice in Module description and definition of Learning Outcomes, linked to the EFQ general level descriptors
- Data definitions for Micro-credentials embedded in the Module Descriptor
- Discussion on qualitative and quantitative feedback needed
- Outline of partner resources to support the Train-the-Trainer Toolkit

5.2 Further work

- Update of the Development Guide to incorporate changes reflective of practice as modules roll out to Learners
- Development of a suite of courses to support module developers in adopting best practice and designing successful modules
- Development of the Module Descriptor as a dynamic form on the DigiWind campus, facilitating the mapping and analysis of Modules
- Connection of the Learners completed modules in a ‘Learning Passport’ to facilitate automated guidance on learning pathways and opportunities.

DIGIWIND

ANNEXES

Annex I

DigiWind Module Descriptor

Module Name

In English, Max 100 Characters

e.g. Maintenance and Operations in Wind Turbines

Transcript Title

In English, shorter module title where necessary for transcript or certificate, max 30 Characters

Module Description

Learner-focused description of who the module is for, what to expect and what range of occupations would be accessible to the holder of the certificate. Description should address; the Breadth/scope of learning acquired, the Depth/complexity of learning acquired; and the Context information (CEDEFOP, 2024). (200-300 words)

Module Pre-Requisite

Any identified pre-requisite knowledge or skills, or required modules. Reference to availability of recognition of prior learning.

Academic Level

Note National Level of Qualifications, if relevant, (and EQF Level), e.g. NFQ 9 (EQF 7)

Academic ECTS Credits

Number of ECTS Credits

Recommended – Units of 5 ECTS Credits or multiples of 5 (10, 15, 20)

Microcredentials – Range 2-30 ECTS – ideally subdivided into smaller units (2-10 ECTS))

Module Status

Select from: Draft / Submitted / Approved, where relevant include datre range for approval.

Module Code

Partner assigned reference number

Module Owner

Authority or Body awarding the certificate: University / Partner – include relevant details on the Academic or functional unit, faculty or school, collaborating unit, campus/location of origin, postcode, Country.

Module Contact Details

Author(s), co-authors – contact details

Subject Area

Select the relevant code for the specific subject area, suggested examples below.

Subject Areas

ALGO - Algorithms	ANLY - Analytical	CADD - Computer Aided Design	COMM - Communications
DATB - Databases	CRYP - Cryptography	DIGL - Digital	APPS - Applications
IPHY - Applied Instr Physics	CELE - Electric	ELET - Electrical	TRON - Electronics
NRGY - Energy	ENGR - Engineering	INFO - Information	INST - Instrument
INTL - Intelligence	POWR - Power	PSCM - Process Control & Measurment	TRNS – Transmission Applications
ADVS - Audio Visual	CPNG - Computer Engineering	CPGR - Computer Graphics	REEN - Renewable Energy

Subject Classification

Select the relevant classification for the specific subject area, from the ISCED (International Standard Classification of Education), suggested examples below.

ISCED-F Code (2013)

0540 – Maths	0541 – Mathematics	0542 – Statistics	
0610 - Info and Comm Technologies	0611 - Computer use	0612 - Database & network des & admin	0613 - Software & app dev & analysis
0710 - Eng & eng trades	0713 - Electricity and energy	0714 - Electronics and automation	0720 - Manufacturing and processing

Grading

Select from: N - Numeric/Percentage, P - Pass/Fail

Grading - Coursework Assessment Percent

Select from Percentage (0 – 100%)

Grading - Final Exam Assessment Percent

Select from Percentage (0 – 100%)

Grading Scale - Final Exam Assessment Percent

Grading scale / Pass requirements - Example: Pass / Merit / Distinction

Module Schedule

Indicative schedule of module in normal full-time operation, e.g. 8 weeks, 1 semester, 1 academic year, etc

Delivery Mode

Indicative duration of module in normal operation, e.g. 24 hours (2 hrs per week)

Deliver Modes – select all that may apply

FT - Full Time	PT - Part Time	DL - Distance Learning	OL - Online Learning
OP - Open Learning	BL – Blended Learning		

Mode of Learner Engagement

Select from: Synchronous / Asynchronous / Hybrid

Module Duration – Direct Learner Contact

Indicative duration of module in normal operation, e.g. 24 hours (2 hrs per week)

Module Overview:

Description of module, learning and context. Detailed description of the modules content.

Example: This module provides an in-depth exploration of the strategies, technologies, and best practices involved in the operations and maintenance of wind turbines. It covers the entire lifecycle of wind energy systems, emphasizing reliability, predictive maintenance, remote monitoring, and the integration of digital technologies to optimize performance and reduce costs.

Module Learning Outcomes

On completion of this module the Learner will be able to;

- *Learner Outcome Number 1 ….*
- *Learner Outcome Number 2 ….*
- *Learner Outcome Number 3 ….*
- *Learner Outcome Number 4 ….*
- *Learner Outcome Number 5 ….*

Mapping of learning outcomes to Profile of skills and competences

List the skills and competences acquired by completion of the module. This list should start as follows: "On completion of this module the Learner will be able to:" and should include a list of about 3-7 Learning Outcomes using action verbs to describe skills, knowledge and competences.

Example

		On completion of this module the learner will be able to;
	1	Evaluate the role of operations and maintenance in the lifecycle of wind energy systems, including reliability and availability metrics
	2	Apply condition-based and predictive maintenance techniques using sensor and SCADA data
	3	Analyse remote monitoring systems and data acquisition frameworks for wind turbines and wind farms
	4	Develop strategies to optimise maintenance planning and reduce lifecycle costs through digital technologies
	5	Critically assess the organisational, logistical, and cybersecurity considerations in implementing advanced O&M practices

Progression / further study opportunities

Access to education programme, link to related modules

Module Syllabus & Assessment Strategies

Detail the indicative syllabus, with main headings and detailed content (2,000 to 3,000 characters)

Teaching and Learning Strategy

Assessment strategy

Repeat strategy

A description of the repeat assessment procedure

Coursework Assessment Breakdown

Map assessments to Module Learning Outcomes

Title	Type	Form	Percentage	Must Pass	Week	MLO's Assessed

Examples of form of assessment: Portfolio assessment, self assessment, essay, final written exam, final practical exam, open book exam, other exam, interview, multiple choice, individual project, group project, oral exam, performance evaluation, project, written report, case study, etc

Approved Module Schedule

Example of Average Weekly Contact Time, and Total Module Contact Time

Module Booklist

List ISBN or ISBN 13 Number

Module Learning Resources

Journals, Online links, Other resources, Additional documents

Annex II

Additional T&L Resources from Partners

The resources identified in the document and annex will form the basis for the development of the Train-the-Trainer Toolkit due for development under T5.4

Gdańsk University of Technology's e-learning platform, eNauczanie

eNauczanie (eLearning) - Gdańsk University of Technology e-learning platform

Note that most resources on this site require creation of a local Moodle account and some are limited to users within Politechnika Gdanska. This platform offers a range of resources designed to support module designers and teachers in creating and delivering effective online courses. These resources cover a wide range of requirements, including initial course setup, engaging students and assessing their progress.

The "Designing e-courses" program is designed to equip educators with key skills and methodologies for developing online modules. This includes various activity modules that enable diverse content presentation and interaction methods, such as automatically evaluated tests, the ability to incorporate SCORM-compliant educational content, and discussion forums for student communication and interaction.

The platform emphasizes the importance of a well-structured and interactive e-learning experience. The platform also offers support through an "Information Portal about eLearning" and "eLearning Platform Support" to assist teachers with any technical or pedagogical queries they may have.

As further reference, a dedicated Teach the Teacher section (ENHANCE) runs presentations from 2024 to cover topics such as New Technologies in Education, Gamification and Assessment and Feedback.

TU Delft Online Learning Hub

Online Learning HUB – TU Delft online learning community

These resources are presented in four main areas, Plan, Produce, Run and Evaluate.

Plan

In the Plan phase, the course development team defines foundational elements such as learning objectives, activity design, resource allocation, and assessment strategies. Key deliverables include forming a multidisciplinary course team, drafting an About Page/course description, developing a comprehensive storyboard outlining weekly modules, creating a pilot week in the platform, and formulating a promotion strategy. Core steps involve onboarding, team kick-off meetings, promotional planning, participatory design workshops, targeted training for team members, and initial platform setup.

Supporting materials comprise a detailed roadmap and templates for blueprints, storyboards, syllabi, Bloom's taxonomy, accessibility checks, and promotion plans. These tools are complemented by guidance on assessment alignment and teaching assistant engagement. Training modules available include scriptwriting, video production, platform familiarisation, and community management, while tours of the New Media Centre prepare teams for content.

Produce

During the Produce phase, the course team transforms design outputs into tangible learning materials and implements them within the chosen platform. Deliverables include a detailed syllabus, scripts and slides for recorded content, assignments, quizzes, and at least 90% of course activities deployed a month before launch. This stage also incorporates beta testing with external participants to identify issues and gather preliminary feedback.

Guidance is provided on structuring courses within the platform, creating rich learning activities, and adhering to copyright best practices by reusing or adapting Open Educational Resources. Video production is supported through a comprehensive video roadmap, factsheets, scripting tools, and access to facilities like the New Media Centre. Teams are also advised to generate narrative "glue" text that ensures coherence across modules.

Run

The Run phase focuses on delivering the course through active facilitation and community management. While specific steps are not detailed in the request's linked run page, the HUB outlines the use of e-moderation techniques, communication planning, forum moderation, and ongoing learner support as central components. Teams are advised to schedule announcements, track learner engagement, and employ motivational strategies and feedback mechanisms throughout the course.

Additional resources include training workshops in online course delivery and community moderation. The HUB emphasises the importance of monitoring learner progress, maintaining open channels for learner-staff interaction, and leveraging platform analytics to inform timely interventions. Forums serve as vital spaces for peer collaboration, while staff curate and respond to queries to enhance learning experience and course coherence.

Evaluate

In the Evaluate phase, systematic review and enhancement of the course are conducted to prepare for future iterations. Deliverables include an evaluation summary, confirmed scheduling for re-runs, content revisions guided by a quality assurance framework, and the publication of MOOC materials on the Delft OpenCourseWare platform. Input from pre- and post-course surveys—available via dashboard or upon request—forms the basis for reflection.

Evaluation processes involve structured meetings with Extension School staff to analyse learner satisfaction, pedagogical effectiveness, and business outcomes. The resulting action plan prioritises content updates, technical refinements, and

logistical improvements. Teams use checklists and rubrics to validate enhancements, confirm re-run dates, and ensure the About Page remains current. Publication on OCW expands open access to course materials, reinforcing TU Delft's commitment to educational transparency and reuse.

NTNU Resources

Teaching resources - NTNU

Most resources are available without registration and many materials are available in Norwegian, with accessibility options (i.e. English subtitles available on videos).

The NTNU teaching resources offer robust digital learning environments and production support, enabling the creation of high-quality multimedia like video lectures, interactive tutorials, and podcasts. Designers can benefit from production assistance, making professional content achievable even without prior media experience.

The focus on Digital Twin Lab (DTLab) projects and related research directly provides foundational content and practical blueprints for module design, especially for hands-on, project-based learning. This includes research in AI, machine learning, and Big Data. Pedagogically sound design and interactive learning are emphasised. This focus on interactivity is key for fostering deeper understanding. The platform aids in holistic module development and quality assurance, guiding module design through planning, administration, and evaluation.

Also within NTNU, SEED (Center for Science and Engineering Education Development) offers advice and mediates contact with pedagogical developers for further support. Courses are also available for tutors within the courses hub.

DTU Resources

DTU Learning Lab supports course module creators and teachers with pedagogical expertise and practical tools to enhance engineering education. Their website offers (among others):

Courses & Events: A calendar of workshops and programs like UDTU (University Didactic Teacher Training), a year-long deep dive into teaching and learning, and courses on "How to teach and test in the light of AI." This helps educators within DTU develop their pedagogical skills and stay updated on emerging trends.

Tools & Resources: Self-directed learning materials covering various teaching themes e.g.:

- Video in Teaching: Guidance on using video to convey complex concepts dynamically.
- Quizzing and Polling: Inspiration and strategies for incorporating quizzes to boost student engagement, provide feedback, and identify knowledge gaps.
- All Inclusive: A game designed to help teachers create inclusive classrooms for diverse student cohorts.

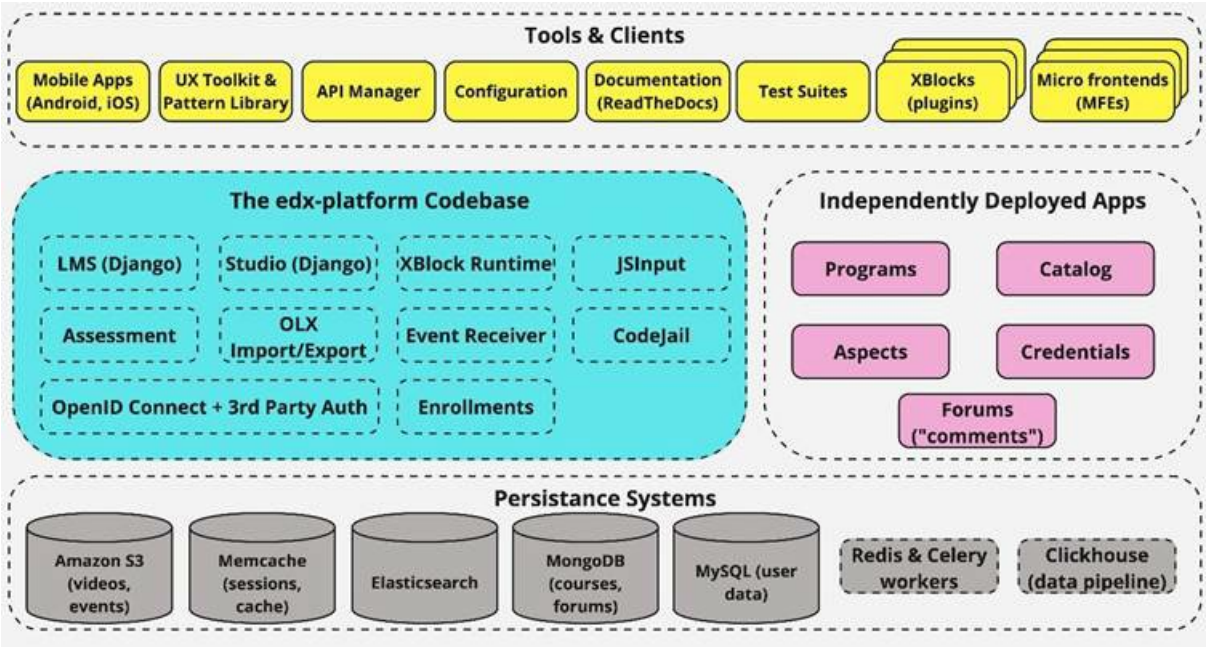
Annex III

Get Started Guide to Module Building in Open edX

Overview

There are a handful of major components in the Open edX project. Where possible, these communicate using stable, documented APIs. The centrepiece of the Open edX architecture is edX-platform, which contains the learning management and course authoring applications (LMS and Studio, respectively).

This service is supported by a collection of other autonomous web services called independently deployed applications (IDAs). Over time, we plan to break out more of the existing edX-platform functions into new IDAs and MFEs (micro front-ends). This strategy will help manage the complexity of the edX-platform code base to make it as easy as possible for developers to approach and contribute to the project.



Open edx Platform Architecture

Almost all the server-side code in the Open edX project is in Python, with Django as the web application framework.

Learning Management System (LMS)

The LMS is the experience that learners on Open edX sites see. It consists of various functionalities such as a dashboard of courses, views of various problem types, and progress pages for each course. Much of the LMS functionality, such as the in-course experience, Open Response Assessment (ORA) grading, and user profiles, is

implemented via micro front-ends (MFEs). LMS course content is written to a Mongo database.

Studio

Studio is the course authoring environment. Course teams use it to create and update courses. Studio writes its courses to the same Mongo database that the LMS uses.

Discussions

Course discussions are implemented in the Discussions MFE. The discussions app allows learners and course staff interact with one another within a course run.

Mobile Apps

The Open edX project includes a mobile application, available for iOS and Android, that allows learners to watch course videos and more. The Open edX community is actively enhancing the mobile apps.

When you have finished designing and setting up your course, you are ready to build your course content on the LMS. This section provides an outline of the steps involved in developing your course content, with links to more details.

1. Understanding Course Building Blocks
2. Creating New Course Content
3. Making Course Content Visible to Students
4. Making Course Content Searchable
5. Revising Content

Understanding Course Building Blocks

Before you begin, you should understand the building blocks of courses built on the Open edX® platform.

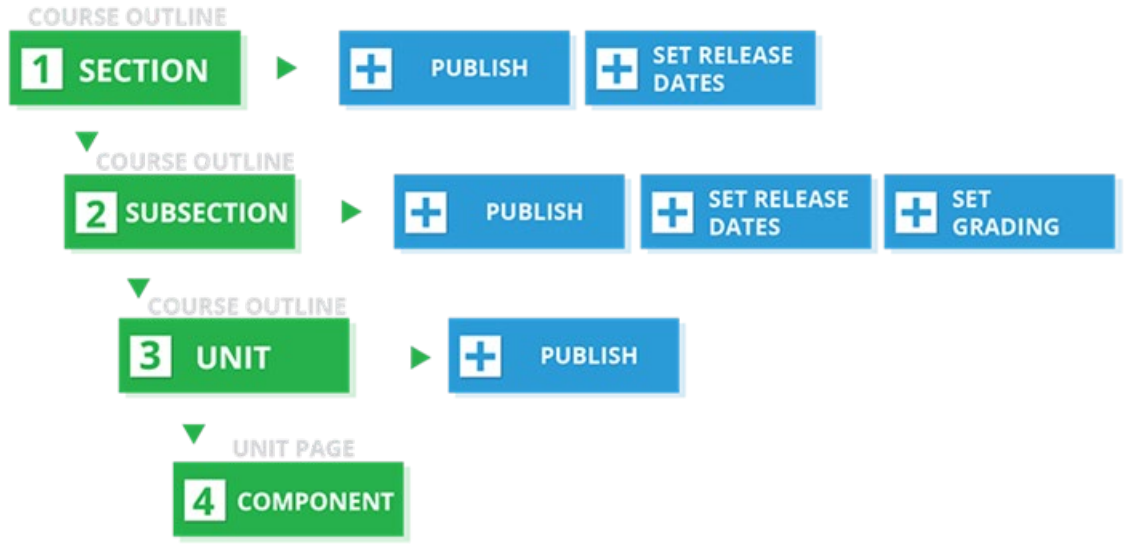
- The course outline is the container for all your course content. The outline contains one or more sections.
- Course sections are at the top level of your course and typically represent a time period. A section contains one or more subsections.
- Course subsections are parts of a section and usually represent a topic or other organizing principle. A subsection contains one or more units.
- Course units are lessons in a subsection that learners view as single pages. A unit contains one or more components.
- Course components are objects within units that contain your actual course content.

Creating New Course Content

Once you understand the way courses are structured on the Open edX® platform, you can start organizing your content and entering it into Studio. You can create sections, subsections, and units in the course outline. For graded subsections, you also set the assignment type and due date. You create components in the unit page.

In addition, you control content visibility by setting release dates on the outline and publishing units.

The following diagram summarizes the content creation workflow:



Creation Workflow

It is recommended that you test course content throughout the creation process, including making sure that the content is available for learners who access courses using the mobile apps. For more information, see design for mobile.

Note: Keep in mind that course updates that you make might take longer to appear in the mobile apps than on your course website. In particular, newly published content can take up to an hour to update on the Android app.

Making Course Content Visible to Students

Course content visibility depends on the following factors.

1. The course start date.
2. The release dates of the section and subsection.
3. The prerequisite subsections that you configure.
4. The publishing status of the unit.
5. The Hide content from learners setting.
6. The content groups or enrolment track groups that you have allowed to access the content.
7. The use of the Results Visibility setting.

For more information, see the Guide to Controlling Content Visibility and Access.

Making Course Content Searchable

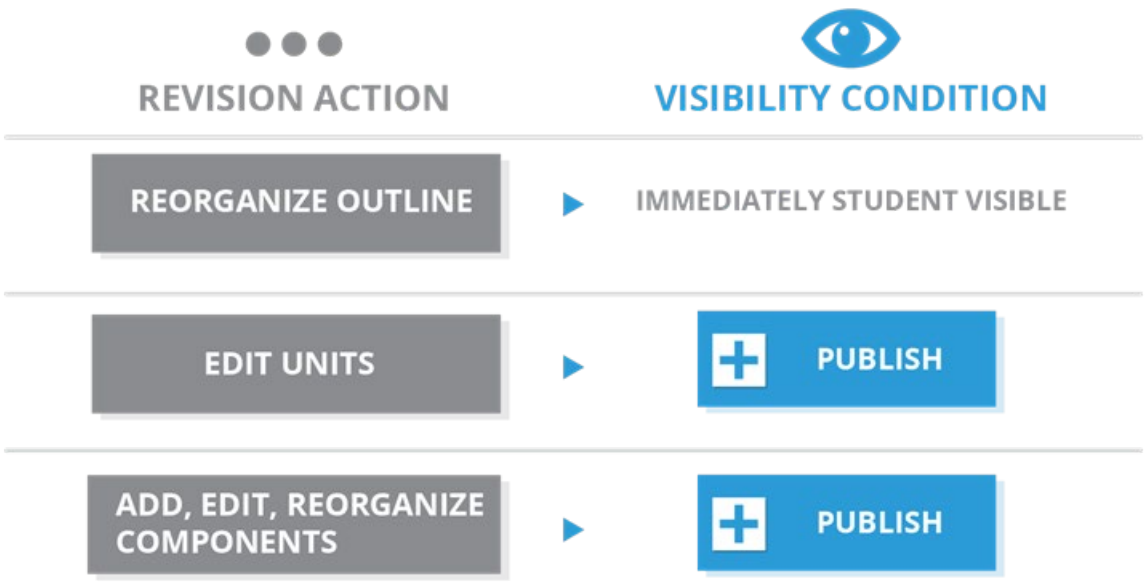
Learners can search course text in Text components and video transcripts by using the **Search** box at the top of the **Course** page. Before learners can search your course, Studio must index the content. Studio indexes all new course content automatically when you publish the content. If necessary, you can manually reindex all of the content in your course at any time. Typically, you would only manually reindex your course content if learners see unexpected search results. To reindex your course content, select **Reindex Content** at the top of the **Course Outline** page. Reindexing usually takes less than 30 seconds.

Revising Content

You can revise your course content at any time.

When you reorganize sections, subsections, and units in the outline, the new order is immediately visible to learners if the section and subsection are released.
When you edit a unit, or components within a unit, you must publish those changes to make them visible to learners.

The following diagram summarizes the content revision workflow and content visibility:



Revision Workflow

It is recommended that you also test course content during the revision process, including making sure that the content is available for learners who access courses using the mobile apps.

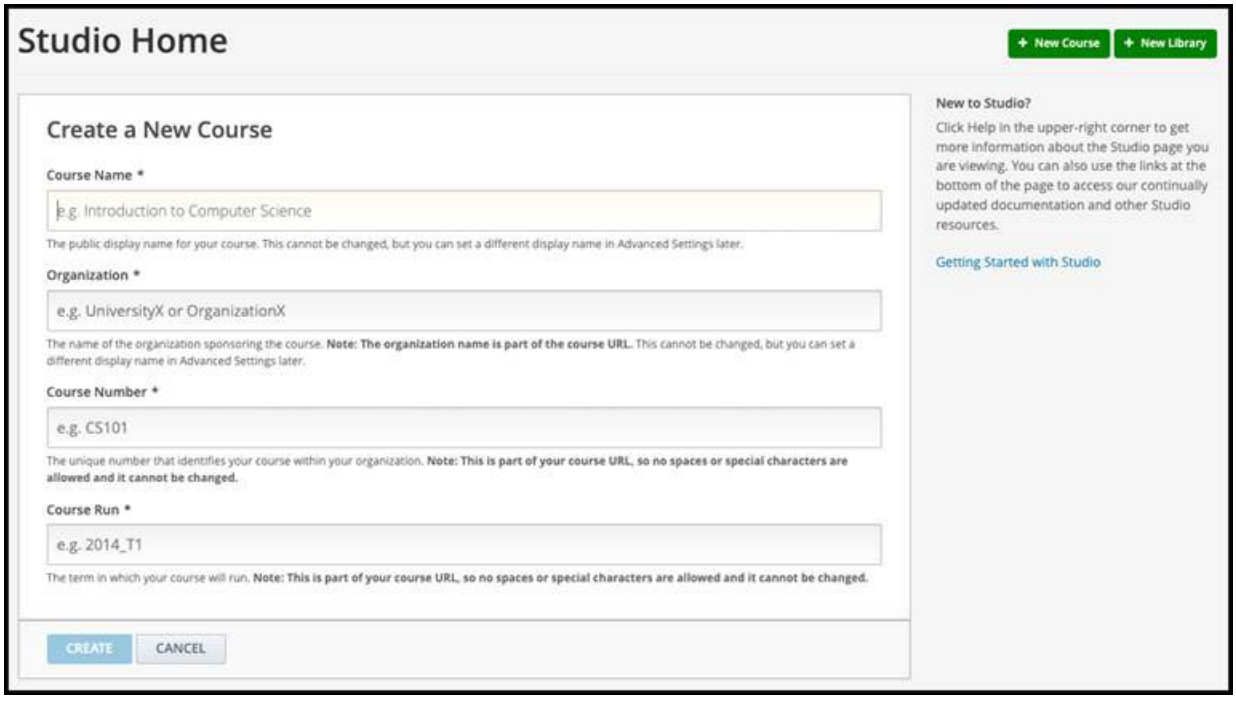
Using Studio?

Create a New Course in Studio

Studio is the tool you use to build your courses. You use Studio to create a course structure, and then add problems, videos, and other resources for learners. With Studio, you can also manage the course schedule, identify members of the course team, set the grading policy, publish your course, and more. You use Studio directly through your browser. You do not need any additional software.

This topic describes how to use Studio to create and set up a course. You can also export and import courses as XML files. You can do this when you need to back up a course or edit the course in XML.

Create a Course



Creating a new course

Note

The Organization, Course Number, and Course run values you enter when creating a course are part of the learner-visible course URL and cannot be changed. The base URL for the new course is in the format:

https://your-domain/courses/course-v1:ORGANIZATION+COURSE_NUMBER+COURSE_RUN/

So, take care when entering values for the new course.

1. Open Studio at the URL provided by your administrator.
2. Click **New Course**. The Create a New Course screen opens.
3. Enter information for the new course:
4. **Course Name**: The public display name of the course. You can override the name later in the Advanced Settings.
5. **Organization**: Your school or organization. This value becomes part of the course URL and cannot be changed. You can override how the organization is displayed to learners in Advanced Settings.
6. **Course Number**: The unique number that identifies your course. Note: This value becomes part of the course URL and cannot be changed. No spaces or special characters are allowed.
7. **Course Run**: The term or unique run of the course. This value part of your course URL, so no spaces or special characters are allowed and it cannot be changed.
8. Click **Create**.

Schedule a Course

With the course open in Studio, from the **Settings** menu, select **Schedule and Details**. For course pacing, select **Instructor-Paced** or **Self-Paced**.

Enter date and time information for the course:

Course Start Date and **Course Start Time**: The date and time that learners can access and begin the course.

Course End Date and **Course End Time**: The date and time that learners must end the course, and after which they no longer have access.

Enrolment Start Date and **Enrolment Start Time**: The date and time that learners can begin to enroll in the course. This must be before or the same as the date and time you set the course to start.

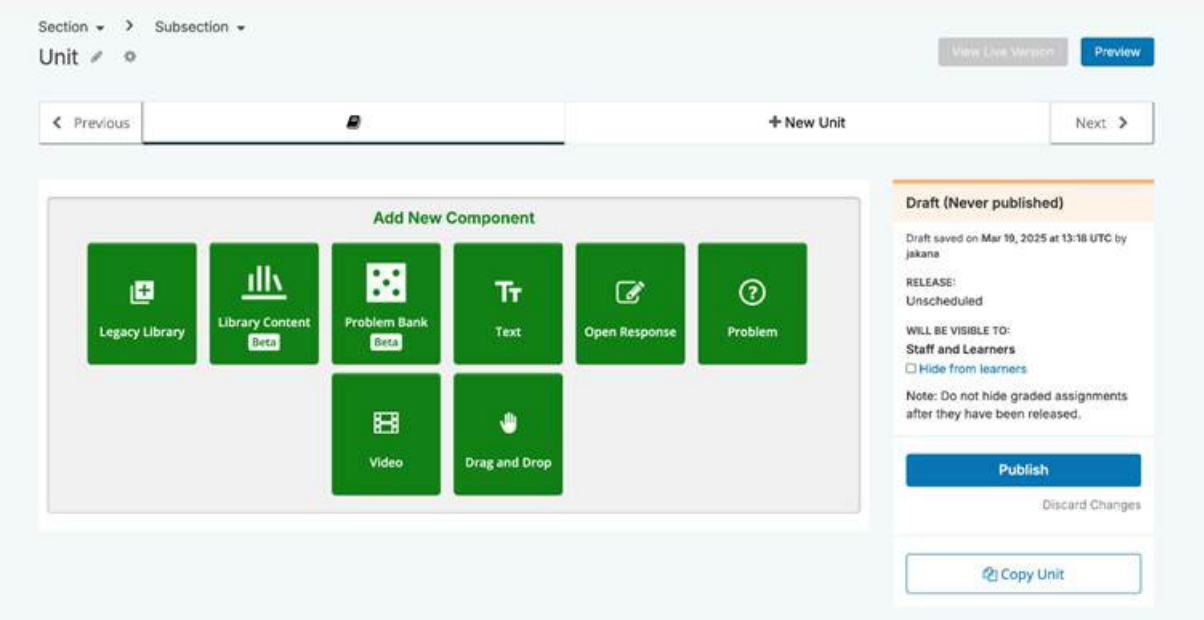
Enrolment End Date and **Enrolment End Time**: The date and time deadline for enrolment. This must be before or the same as the date and time you set the course to end.

At the bottom of the screen, click **Save Changes**.

Create a Unit

To create a unit from the outline, follow these steps.

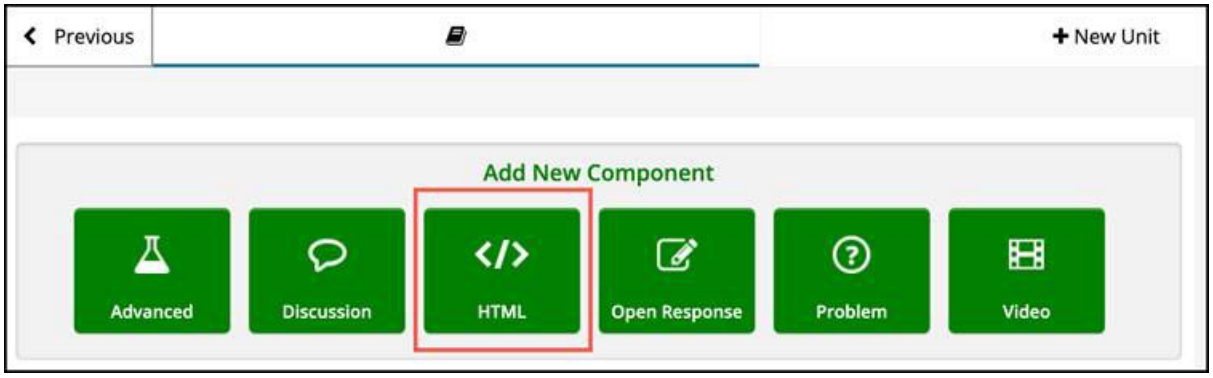
In the outline, expand the subsection in which you want to create a new unit. Select **New Unit** at the bottom of the expanded subsection. A new unit is created at the end of the subsection and the blank unit editor opens.



Click the pencil icon to edit and enter the name for the new unit .A descriptive name can help learners locate content in the course. It can also help you select content when you analyze performance in reporting and analytics systems. Add components to the new unit as needed.

Add written content to a Unit

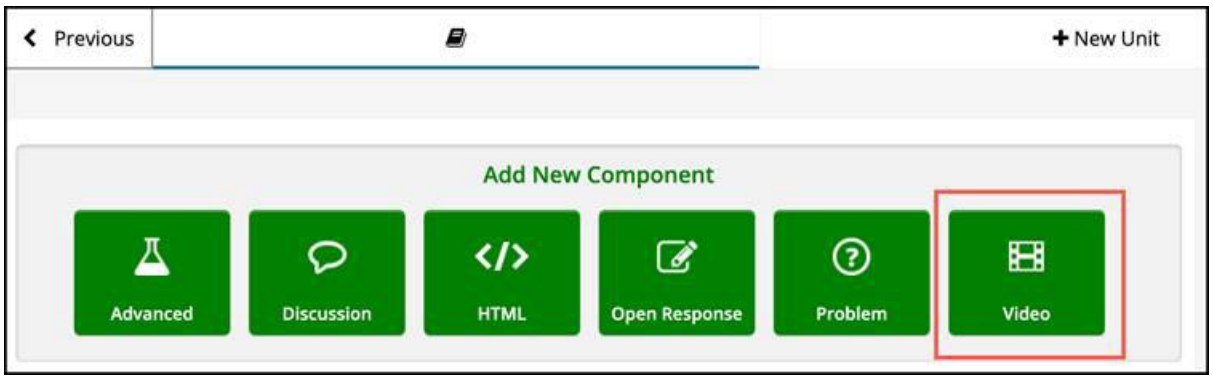
In the unit where you want to place the text, select **Text** at the bottom of the page.



Select the **Text** template to add a blank component. The component is added at the end of the unit. The empty component opens in the visual editor. Enter and format your content. To enter a display name for the component, select the **pencil icon** next to the component name, and then enter text in the **Display Name** field. Click **Save** to save the text in the unit.

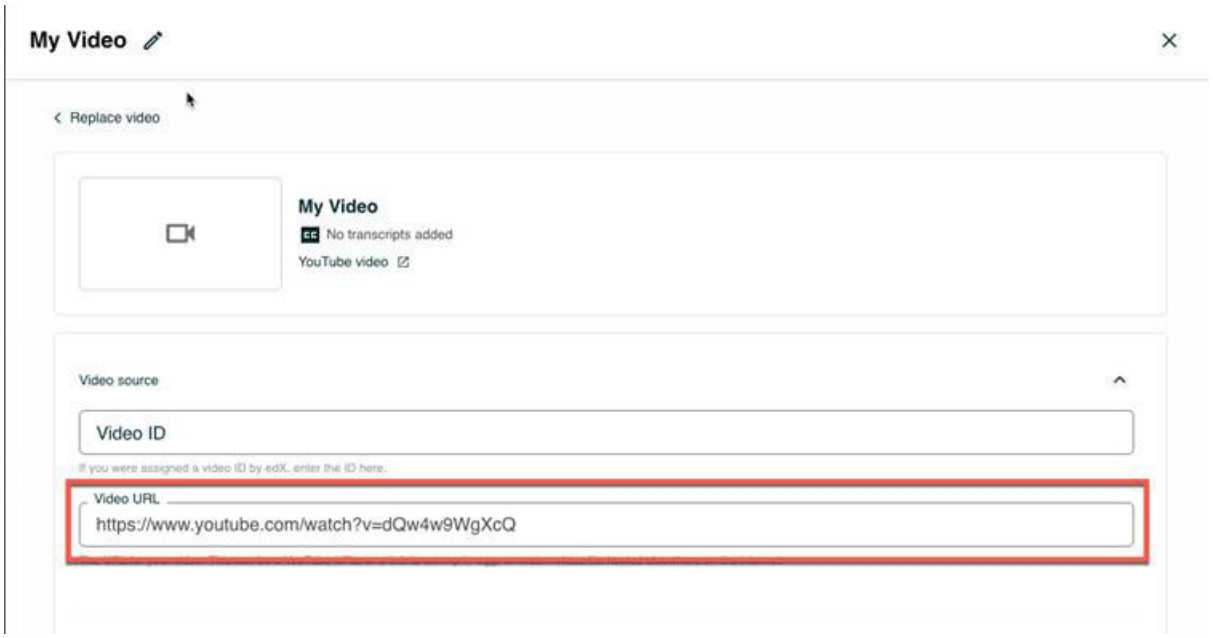
Add a Video

From Studio, in the unit where you want to place the video, under **Add New Component** select **Video**.



A video with default settings is added to the unit. The video component opens in the visual editor. In the **Component Display Name** field, click the pencil icon and enter the name that you want learners to see for this video. This name appears as a heading above the video in the LMS, and it identifies the video for you in reports and analytics. If you do not enter a display name, the platform specifies "video" for you.

Paste the video URL in the default Video URL field, and then enter the location of your video. This is the URL that was created when you uploaded the video to the hosting site.



Note: Youtube videos can be added by pasting the Youtube URL into the Video URL field.

Note: If you have created multiple versions that use different encodings or hosting services, add the URL for each video by selecting **Add a vido URL** below the **Fallback Videos** field and enter the URL in the **Video URL** field. The first listed video that is compatible with the learner's device plays.

For the best experience for mobile users, make sure that the URL for the 360p version of the video is the first URL in the list. Optionally, you can set more options for the

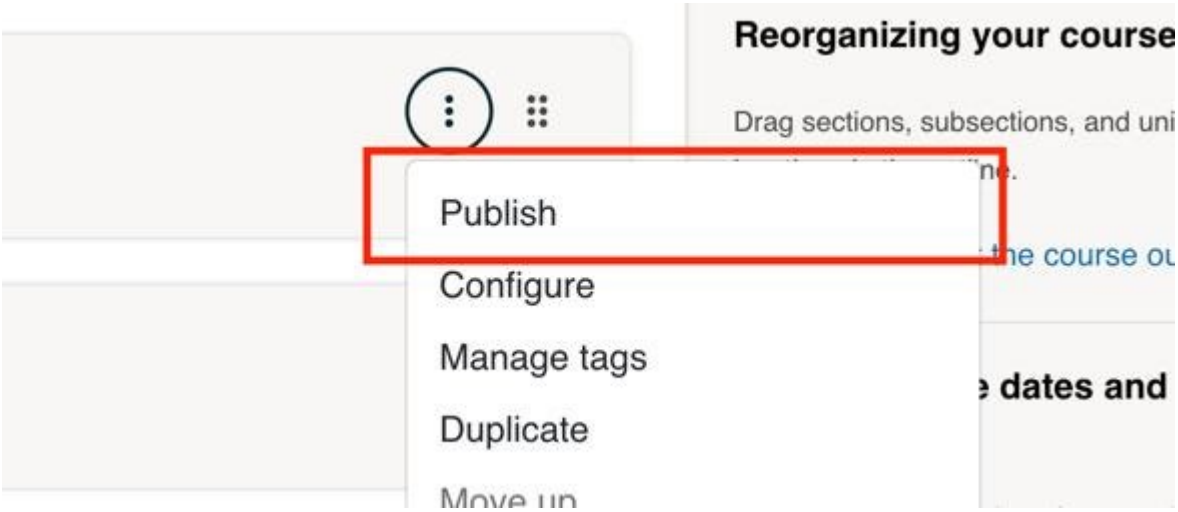
video. For a description of each option, see Set Video Settings. Click **Save** to save the video in the unit.

Add a Multiple-Choice Question to a Unit

You add multi-select problems in Studio by selecting the **Problem** component. In the problem editor, select **the multi-select** option. Fill in the fields on this screen to create your problem.

Creating a multi-select problem is as simple as: Editing the **Display Name**. Click the pen icon to edit. Filling in the **Question** field. Filling in the **Explanation** field. When this is shown to learners is based on the selection in the **Show answer** panel on the right. Filling in the **Answer** fields. Select the correct answer(s) by ticking off the checkbox(es). Additional answers can be added by clicking the **Add answer** button. Answers can be deleted by clicking the trash can icon. Feedback can be provided for each answer. More information on feedback can be found in the following section. Selecting and filling in any desired settings on the right.

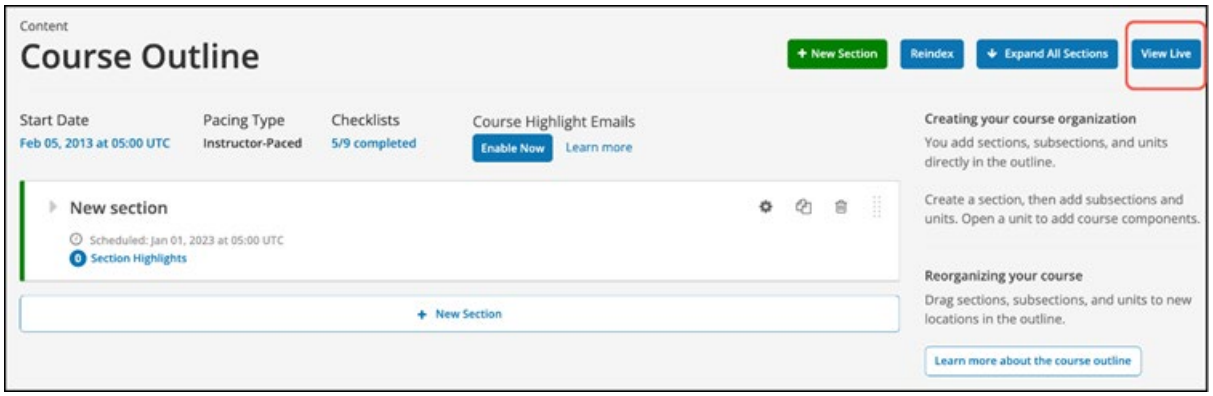
Publish your Module



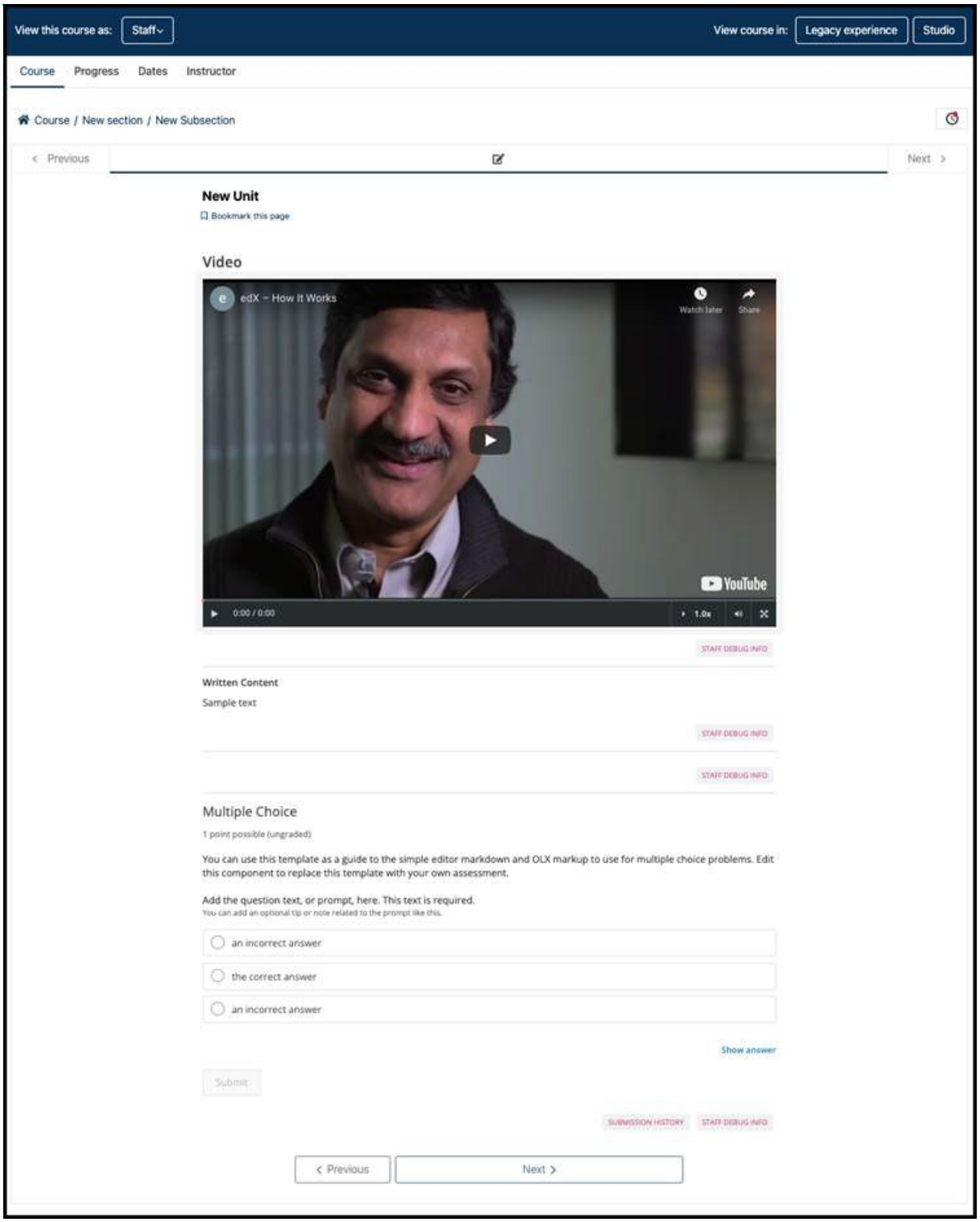
Go back to the course outline. You see the unit you created, within the subsection and section, in an unpublished state. For the section, select the **Publish** option from the kebab menu.

View as a Learner

After you have published content, you should view it in the LMS, as a learner will. In the course outline, click **View Live**.



The course opens in the LMS, in a new tab. Go through the content you created and check for accuracy. You can edit the content in Studio, then publish your changes, to fix any issues.

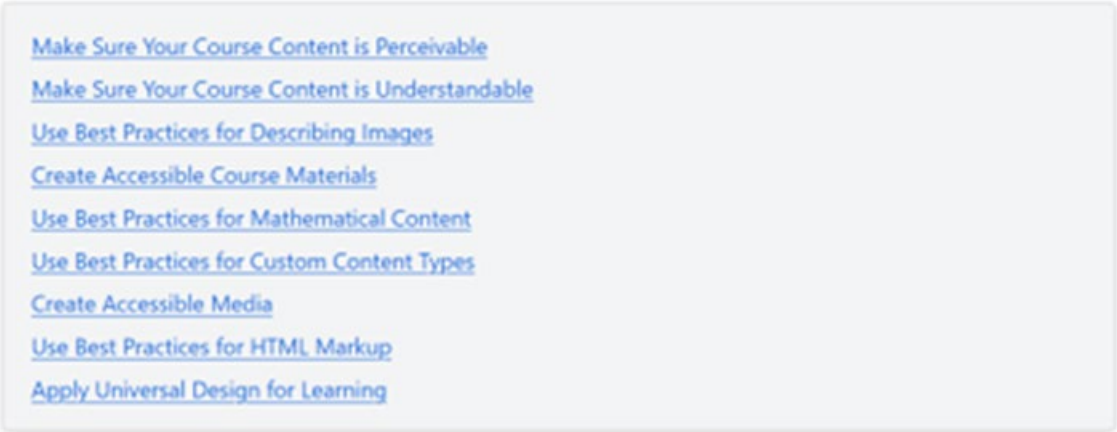


Congrats! You have built your first course 🎉!

Designing Your Course For a Mobile Experience#

Keep in mind that the courses and course content that you create should be accessible to everyone, regardless of any physical limitation that they might have, and regardless whether they are accessing your course using a Web browser or using mobile apps.

For information about accessibility best practices, see Accessibility Best Practices Checklist.



The percentage of learners who access online courses using smartphones is increasing every day. Courses on your instance may be viewed on smartphones using the Android app and iPhone app, although we still recommend that learners complete graded assignments on a desktop computer, depending on the type of assessments that their courses include. For information on which exercises and tools are mobile-ready, see the table in the Mobile-Ready Problem Types section.

To make the course experience for mobile learners as rewarding as it is for learners using desktop computers, keep the following best practices in mind as you design, test, and run your course.

1. Course updates that you make might take longer to appear in the mobile apps than on your course site.
2. Display names are critical for navigating through courses on smartphones. As you create course content, make sure you replace the default display names for every component with useful course component names.
3. Keep display names and labels concise. Long display names and labels might wrap on smaller screens, or might not be easily viewable. For example, if several components have names that all start with the first five words and differ only after that, learners using smartphones to access your course might have difficulty distinguishing between components.
4. Do not use Flash, which is not supported on mobile platforms, to create course content.

5. Only use iFrames in course content where necessary, because iFrame content might not be responsive and cannot be optimized for viewing on a range of devices.
6. If you develop course components in HTML, including course announcements, make sure you set relative rather than explicit sizes for objects such as images, tables, text, and so on, so that they will scale appropriately when viewed on displays of different sizes.
7. Learners might be viewing your course materials on screens as large as a high-resolution 4K display, or as small as a 5 inch smartphone screen, so it is difficult to size an image so that it displays well at all resolutions. In general, it is recommended to keep most images under 0.5MB in size so that learners who have low Internet bandwidth will not have trouble downloading the images. If you have a large image that requires zooming to view the full detail, in addition to providing an image that can be easily downloaded, link to a full resolution copy that can be opened separately from the course.
8. When you make choices about the problem types to use for graded and ungraded assignments in your course, or which problem types to present in a single unit, keep the mobile experience in mind. Whenever possible, use mobile-ready assessment types. If you use assessment types that are not supported on smartphones, notify learners in the body of your course that they will not be able to complete assignments that contain unsupported assessment types using the iPhone and Android mobile apps.
9. Timed and proctored exams cannot be completed using the mobile app.
10. When learners access your course using the Android and iPhone apps, they progress from component to component by swiping through them. It might seem useful to include a Text component in a unit for the purpose of providing a demarcation point or guiding learners to the next unit, but having to swipe through too many “markers” with no real course content is not a good experience for mobile users.
11. Make sure your JavaScript and CSS are compliant. You should verify that all components render correctly in the Android and iPhone apps as well as directly in the LMS.

Testing Your Course for Mobile Devices

If you have included some of the more complex problem types, or have highly customized the way course content displays, it is recommended that you test your course for multiple devices and displays.

To test the mobile experience of your course, sign in to your course using the Android or iPhone app, and view each course unit to make sure that it renders as you expect it to. You can preview content that is not yet available to learners by publishing units that are within sections that are not yet released.

Best Practice in using Video content

Videos in a course supplement active learning component, such as discussions and problems. Videos can be effective for presenting motivating material, showing experiments, reducing cognitive load for complex content, and other purposes.

When you create video content, you need to keep various guidelines in mind. This section describes these guidelines, as well as video technical specifications, how to add video content to your course, and how to specify options for your videos.

For more information about how learners can interact with course videos, see Watching Videos on the Open edX Video Player.

Note: It is very important that all of your videos are accessible to learners with disabilities. Be sure to review Create Accessible Media before you create videos for your course.

Working with Video Components

You use video components to add videos to your course in Studio. In video components, you add the name and location of your video, as well as the video transcript. Learners view your videos in the LMS.

For information about the way learners interact with videos, see Watching Videos on the Open edX Video Player.

For more information about adding videos to your course, see Add a Video.

For more information about options in the video component, see Specify Additional Video Options.

Adding a Video to a Course

To make a video visible in your course, you create a video component in a Unit in Studio, and then you add information for the video to the video component.

Third Party Hosting

To upload a video to a third party hosting site, follow the instructions for that site. Keep the following guidelines in mind.

1. If you host your videos on YouTube, you must follow all rules and restrictions that are associated with YouTube.
2. The URL for the video that you upload on a third party hosting site must end in .mp4, .mpeg, .webm, or .ogg. The video player cannot support videos that you upload on sites such as Vimeo, Dailymotion, or other sites that use their own player.
3. To ensure that all standard browsers can play your video, you should use the .mp4 format.
4. If you have copies of a video in multiple resolutions, you must upload each copy to the hosting site. For more information, see Video Technical Specifications.
5. After you upload a video on a hosting site, you must make sure you have the URL for that copy of the video. If you upload copies of your video on more than

one hosting site, make sure you have the URL for each video location.

Manage Video Components

Video Technical Specifications: When you create a video component, you can customize additional settings such as specifying download options for the video and transcript, video license options, and a start and stop time for the video. Your videos can contain whatever content you want to include in the course. The following resources can help you to create good video content that is based on extensive experimental research in student learning. Review the Creating Video for the edX Platform course.

When you create video files, keep the following guidelines in mind.

General Guidelines

1. Videos should be as short as possible. Learners are more likely to finish watching videos that are no more than 5-10 minutes long.
2. Each video file that you upload must be less than 5GB in size.
3. Each video should follow established file naming conventions and video compression specifications.
4. The video player supports videos in .mp4, .mov, .mpeg, .webm, and .ogg format. However, to help make sure all standard browsers can play your video, it is recommended that you use the .mp4 format.
5. It is recommended that you create copies of your videos in the following resolutions. When multiple resolutions are available, the video player automatically plays the best video for each learner's device and internet connection. (1080p/720p/Mobile 360p)

File Naming Conventions

To facilitate identifying and tracking video files, it is recommended that organizations define and use a naming convention for all video files in all courses. At a minimum, your naming convention should include these elements.

1. A course identifier.
2. The year of the initial course run.
3. A revision or version number.

For example, you might use the following naming convention.

```
{course number}_{year}_{section}_{subsection}_{unit}_{version}.{type}
```

This convention might yield the following file name.

```
SPU27_2015_S1_SS3_U4_v2.mp4
```

Additionally, when you name your video files, it is recommended that you follow these guidelines.

1. Make sure that each video file in your organization has a unique name.
2. Include only alphanumeric characters and underscores in video file names.
3. Make sure that the video file name contains no special characters, such as ç, å, or ó.
4. Do not use periods except for the period before the file name extension (for example, .mp4).

Video Compression Specifications

The following video compression specifications are strongly recommended but not required.

Codec	H.264 .mp4
Resolution & Frame Rate	1920x1080, progressive, 29.97 fps Note: Typically, you export at the same frame rate that was used when you created the media file. For example, if you create the file in a country that uses the PAL system, you export at 25 fps instead of the NTSC standard of 29.97 fps.
Aspect	1.0
Bit Rate	VBR, 2 pass
Target VBR	5 mbps
Max VBR	6 mbps
Audio	AAC 44.1 / 192 kbps

See also

https://learning.edx.org/course/course-v1:edX+VideoX+2T2021/home

Annex IV

Feedback Sample

6/23/25, 2:30 PM Leadership in Offshore Renewable Energy Systems: Student Survey (Group 2)

Leadership in Offshore Renewable Energy Systems: Student Survey (Group 2)

Please take the opportunity to provide some feedback on the 'Leadership in Offshore Renewable Energy Systems ' course. This information will be used to improve and promote the course. Thanks for your participation!

johncosgrovelit@gmail.com Switch account

Not shared

* Indicates required question

Name (Optional)

Your answer

Your company/organisation (Optional)

Your answer

Funded by the European Union

Your current Industry sector (Required) *

Your answer

Which of the following would best describe your company? *

- ○ Micro (Less than 10 employees)
- ○ Small (Between 10 and 50 employees)
- ○ Medium (Between 50 and 250 employees)
- ○ Mid-Caps (Between 250 and 3000 employees)
- ○ Large (More than 3000 employees)
- ○ Other:

How did your career pathway lead you to this course? *

Your answer

How did you hear about this course? *

Your answer

Using the rating 1-5 (1 being the lowest and 5 being the highest), how would you rate the **content of the course**? *

1	2	3	4	5
○	○	○	○	○

Using the rating 1-5 (1 being the lowest and 5 being the highest), how would you rate the **operation of the course**? *

1	2	3	4	5
○	○	○	○	○

Using the rating 1-5 (1 being the lowest and 5 being the highest), how would you rate the **benefit of the course to your career**? *

1	2	3	4	5
○	○	○	○	○

Which topics did you find most interesting/useful? *

- [ ] Wind Resource and Site Selection
- [ ] Design and Engineering
- [ ] Offshore Wind Development and planning
- [ ] Enviromental Impacts and Mitigation Strategies
- [ ] Smart Maintenance
- [ ] Grid Intergration and Energy Transistion
- [ ] Operations and Maintenance
- [ ] The Role of Energy Storage in Offshore Wind
- [ ] Other: _____

Are there any other thematic areas not covered by the course that are relevant and important to you and/or your organisation in relation to Offshore Renewable Energy?

Your answer

Do you feel that this course has enabled you to perform your role better? *

- ○ Yes
- ○ No

If no, please provide a short explanation for further insight on your answer. *

Your answer

If yes, please provide a short explanation for further insight on your answer.

Your answer

Do you feel that this course has enabled you to add value to your company? *

- Yes
- No

If no, please provide a short explanation for further insight on your answer. *

Your answer

If yes, please provide a short explanation for further insight on your answer.

Your answer

What will be the next step in your professional development following the completion of this course? *

Your answer

Can you add a comment on the course that we could use as a testimonial?

Your answer

Annex V

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