
# D2.7: PROFESSIONAL TRAINING COURSE DESIGN

Methodological Framework

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## Project Information

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# EXECUTIVE SUMMARY

The current document constitutes the methodological framework regarding the design and development of the professional VET training courses within the APPLY project.

**UNIVERSITIES PER COUNTRY**:

- **INDIA:** MAHE / MUJ / VIT
- **MALAYSIA:** UM / UiTM
- **THAILAND:** NU / CMU

**WORKLOAD:** As the application states each country will develop 1 new course. For Malaysia and Thailand, there are 2 Universities assigned **that must both undertake the creation of the same course** and for India, there are 3, thus making the total number of the professional VET training courses to be created three (3)

# 1. INTRODUCTION

The current methodological framework aims to introduce the Asian Universities participating in the *APPLY project* to the design and development of professional VET training courses. It will provide details following the results from Deliverable 1.3 «**Needs analysis report**» on which the professional VET courses design will be based upon.

More specifically, the idea of the creation of the APPLY professional training courses lies in the very heart of the project. APPLY aims not only to develop a Master's program in order to develop new CFD innovation professionals ready to enter the labor market but also to help already professionals working in the sector in order to cover any skills gaps and enhance their knowledge and competencies in accordance with the market's needs. The needs that have already been identified in Deliverable 1.3

**A SHORT SUMMARY OF THE D1.3 REPORT** is that it includes the findings of extensive desk research that our Team Members have conducted as well as those of qualitative research. Our analysis was aligned with the main guidelines stated out in the APPLY application. More specifically, we have reported the existing professional training courses (where available) in the three regions in terms of required professional skills in Applied Computational Fluid Dynamics and we have mapped the training needs of existing personnel aiming at the future participants of the Applied Computational Fluid Dynamics training courses and internship. Our approach has included the study of related occupational profiles in the three countries, with the intention of understanding the differences in the profiles and their relation to skills, i.e. Digital Skills.

Having structured a solid background of knowledge, based on the above analysis we made a step further into answering the key question of whether the existing VET Course in the three countries were aligned and provide adequate skills and knowledge to cover new sectoral needs. Below are the main findings per country.

- **MALAYSIA**

In the **Country Report of Malaysia,** there were a wide variety of VET courses offered by educational institutions, as well as, governmental and vocational enterprises. Most of these programs were centered around new technologies and their applications in different fields.

In the *Focus Groups in Malaysia* there are several challenges that face each of the fields included in the interviews

- **THAILAND**

In Thailand country report, it was found that curricula used in the country do not stimulate creativity, problem-solving, or prepare graduates for the challenges of modern industries. This is because it is more theory-based than practical. Quite a number(five) of government and private institutions were identified to be offering VET courses focused on CFD.

In the *Focus Groups in Thailand,* few sectoral challenges were identified from the interview analyses.

*Table 1 Skill gaps in each sector in Thailand*

| Metrology sector | Energy Sector | Manufacturing sector |
|---|---|---|
| Solid and fluid computational skills needed | Companies actively seeking data scientists as they seek to grow databases | Analysis and innovativeness are key skills<br>Design thinking, deep-basic, and simulation are demanded but in short supply |

- **INDIA**

Several institutions, both private and public, were identified to be offering VET courses. The curricula fall short of meeting engineering market labor needs and should always be revised to meet modern industry challenges. Computational skills should also be prioritized in educational curricula because demand for them is rising. Demand for applications solving engineering problems will continue to be a phenomenon in the industry.

**FOLLOWING THE RESULTS**, each country has identified both common and different necessities in terms of digital skills and competencies needed. As the application states, each country will develop 1 new course. For Malaysia and Thailand, there are 2 Universities assigned **that must both undertake the creation of the same course** and for India, there are 3. The workload for the implementation of the template was not allocated by Metropolitan College – MC nor assigned to a specific university of each country. Therefore for the benefit and better performance and management of all universities involved in the task, each university in the same country based on their own judgment, experience, and preferences has decided the allocation of the workload and the content that is required from the implementation of the task.

Worth noting is that the to-be-designed courses will be designed and available fully online via a MOOC platform. Regardless of the learners' nationality, (s)he will be available to express his/her interest and participate in any of the developed courses.

**The professional courses' profile is:**

- ✓ ***Professionals already working within the CFD sector***
- ✓ ***Graduates who aim to get into the sector's labor market***

### *1.1 COURSES' OUTLINES*

Based on the findings of deliverable 1.3 of the working package 1. The research conducted for the implementation of task 1.3 indicated that the demands are not met due to the identified skills mismatches.

**Having this as a compass, the Asian partners have selected to design the courses below:**

**MALAYSIA**

1. APPLICATION OF COMPUTER FLUID DYNAMICS IN INDUSTRIAL 4.0

**THAILAND**

2. THEORY AND COMPUTATIONAL MODELING ON TWO FLUIDS & TWO PHASES FLOW

**INDIA**

3. A COMPREHENSIVE CFD TRAINING COURSE FOR PRACTICAL APPLICATIONS

A first step to the courses' design is the formation of the course outline. For this reason, a template has been shared to all partners via the online internal platform Bacemacp, where all the Asian HEIs had access to the template found below:

*Table 2 template allocated: Professional Courses' Outline*

The completed Outlines as prepared by the Asian HEIs can be found in the Annex → here

| PROFESSIONAL COURSE OUTLINE | | | | |
|---|---|---|---|---|
| No | TASK | DESCRIPTION | | |
| 1 | COUNTRY | ☐ India | ☐ Malaysia | ☐ Thailand |
| 2 | COURSE TITLE | *Please write the official title that will be shown on the platform* | | |
| 3 | COURSE DESCRIPTION | *Please describe briefly (no more than 3 lines).* | | |
| 4 | KNOWLEDGE DOMAIN | *Please list below the domains of knowledge of the course.*<br>•<br>•<br>• | | |
| 5 | COURSE ADDRESSED TO | *Please list below the target group the course addresses.*<br>•<br>•<br>• | | |
| 6 | LEARNING OBJECTIVES | *Please list below what learners will be able to do at the end of this course. Make sure that the learning objectives align with the WP1 needs analysis.*<br>•<br>•<br>• | | |
| 7 | COURSE LENGTH | *Please describe the duration of the course* ***(in weeks)*** | | |
| 8 | COURSE MODULES | MODULE 1 | | |
| | | Title: | | |

| | |
|---|---|
| Short description: | |
| Learning Outcomes: | |
| Duration (in weeks): | |
| Sections of the module (Lessons): | |
| Subsections of the lesson (Units): | |
| Teaching material: | ☐ Videos (10 mins max each) ☐ PowerPoint presentations ☐ Pdf files<br>☐ Other (please specify): |
| Assessment: | ☐ Multiple choice/Checkbox/Dropdown questions<br>☐ Staff-graded assessment<br>☐ Other (please specify): |

| | |
|---|---|
| MODULE 2 | |
| Title: | |
| Short description: | |
| Learning Outcomes: | |
| Duration (in weeks): | |
| Sections of the module (Lessons): | |
| Subsections of the lesson (Units): | |
| Teaching material: | ☐ Videos (10 mins max each) ☐ PowerPoint presentations ☐ Pdf files<br>☐ Other (please specify): |
| Assessment: | ☐ Multiple choice/Checkbox/Dropdown questions<br>☐ Staff-graded assessment<br>☐ Other (please specify): |

| | |
|---|---|
| MODULE 3 | |
| Title: | |
| Short description: | |
| Learning Outcomes: | |
| Duration (in weeks): | |
| Sections of the module (Lessons): | |
| Subsections of the lesson (Units): | |
| Teaching material: | ☐ Videos (10 mins max each) ☐ PowerPoint presentations ☐ Pdf files<br>☐ Other (please specify): |
| Assessment: | ☐ Multiple choice/Checkbox/Dropdown questions<br>☐ Staff-graded assessment |

| | | |
|---|---|---|
| | | ☐ Other (please specify): |
| | | MODULE 4 |
| | | Title: |
| | | Short outcomes: |
| | | Learning Outcomes: |
| | | Duration (in weeks): |
| | | Sections of the module (Lessons): |
| | | Subsections of the lesson (Units): |
| | | Teaching material: ☐ Videos (10 mins max each) ☐ PowerPoint presentations ☐ Pdf files ☐ Other (please specify): |
| | | Assessment: ☐ Multiple choice/Checkbox/Dropdown questions ☐ Staff-graded assessment ☐ Other (please specify): |
| | | *If you plan to deliver more than 4 modules for this course, please add more module tables.* |
| 9 | PARTICIPATION PREREQUISITES | *Please describe possible prerequisites of those who will enroll in the course **(if any)*** |

# 2. EDUCATIONAL MATERIAL

After examining thoroughly the research results of deliverable 1.3 «Needs analysis report» of the working package 1, it has been proven that despite being more or less technologically advanced, employees in the sector of CFD in Malaysia, India, and Thailand lack various soft and fluid Digital skills that are needed in their profession varying from Analysis and innovativeness being the key skills, to specific skills such as Design thinking, deep-basic CFD, simulations that are in high demanded but in short supply.

In order to address the above issue, the APPLY project will be providing learners with professional training courses which will cover the identified skills gaps in the CFD sector.

**The Professional VET courses within the APPLY project will consist of the following**:

- **INNOVATIVE E-LEARNING:** Up to 40 hours of e-learning material and self-study
- **ASSESSMENT:** Up to 5 hours of assessment

All Asian HEIs will lead the design of these activities, each one developing one Course, resulting to 3 overall for the APPLY project.

## *2.1 BASIC CONCEPTS WHEN DESIGNING A VET COURSE*

Similarly, to the Master's Course, in order to design the core material, the Asian HEIs should take into consideration the below key points:

- **LEARNING OBJECTIVES**: What participants (target groups identified in the introduction) will be able to know/do after the completion of each module.
- **TRAINING MATERIALS**: What training materials need to be developed and what the materials will include, in order to achieve the program's goals.
- **TRAINING METHODS**: The methods that will be used so that participants meet the learning objectives and acquire necessary skills and competencies.

*Table 3 APPLY VET courses hours' allocation*

| EDUCATIONAL MATERIAL | COURSE |
|---|---|
| CORE MATERIAL | 30 hours |
| ASSESSMENT | 1 hours |

# 3 MODULARITY

Learners may find compactly structured relevant material about a topic more easily without scrolling through a lot of texts or scrubbing through an hour-long video to find the one piece of information they were searching for.

**Training modules are arranged in such a way that training material (e.g. video clips / reading material / PowerPoint presentations) alternates with exercise content. This will also allow a modular course content or exercise to be easier to change, reorganize, substitute, or enhance because it minimizes the effect on neighboring material.** Modularity will also facilitate sharing of content by virtue of being easier to link to.

**The Modular approach** basically means that a two-phase training process will take place:

- **First**, the "**foundational knowledge"** which underlies a specific skill. The aim here is to "bring" all students to the same level of knowledge.
- **Second**, the "**performance of the skill**" reliably and under varying conditions. This can be realized either online (*test cases, self-assessments, real work problems*) or even in-person training. In any case, the critical part here is that all students have acquired the needed knowledge in an efficient and cost-effective manner through the MOOC online platform.

**NOTE*** Towards supporting flexibility, the **existence of mandatory and optional modules** is a good practice in organizational pieces of training.

In this context, **the material will be organized as follows**:

- **COURSE OUTLINES** will contain all the course content.
- **COURSE SECTIONS** (***Modules/Weeks***) will be at the top level of the course and typically represent a time period. A section contains one or more subsections.
- **COURSE SUBSECTIONS** (***Lessons***) will be parts of a section, and usually represent a topic or other organizing principle.
- **COURSE UNITS** will be lessons in a subsection that students view as single pages. A unit can contain one or more components.
- **COURSE COMPONENTS** (**Teaching Material**) will be objects within units that contain the actual course content: Videos, reading material, problems/quizzes, and discussion forums.

**NOTE*** *Please see relevant tables provided in the Annex* → here

# 4 TEACHING MATERIAL

## *4.1 CORE MATERIAL*

The core material of the courses focuses on **offering different levels of experience and abilities** to learners. The curricula will offer flexibility and a personalized learning experience.

The idea is that the learners will be able to be engaged in the training activities regardless of time and location via the VLE platform. More specifically they will be able to:

- Participate from any location
- Participate in multiple concurrent discussions
- Follow asynchronous discussions where participants do not need to be conversing at the same time in order to participate.

Each module consists of educational material and half an hour of assessment (see practical assignments chapter → here) *e.g. if a module's indicative hours are 3, it should include 2,5 hours of learning material and half an hour for the assignment).*

**The core material of the course will consist of lessons** (*self-running presentation - PowerPoint presentation with or without voice-over*) **and material of any kind for self-study** (*papers, videos, e-books, etc.*). The author of each module is free to use any type of material (s)he finds more appropriate. The content of the tables found in the appendix of this document should be completed by the authors and revised by Metropolitan College - MC before the finalization of the task.

The number of teaching modules of all courses as well as the units for each module are summarized in the Annex → here in order to understand the focus and time given in specific training areas.

## *4.2 LEARNING OBJECTS*

**A Learning Object** is any entity, digital or non-digital, that can be used, re-used, or referenced during technology-supported **learning**. Examples of **learning objects** include **multimedia content**, **instructional content**, **instructional software**, and **software tools** that are referenced during technology-supported learning.

Examples of smaller reusable digital resources include *digital pictures or photographs, animation and video clips, small pieces of text, animations, and smaller applications available via the Web*. Examples of bigger reusable digital resources include *entire web pages that combine text, pictures, and other means, or applications that offer a complete educational experience*.

**A typology of several kinds of learning objects may include:**

- **PRESENTATION OBJECT:** Direct instruction and presentation resources designed with the intention to transmit specific subject matter.
- **PRACTICE OBJECT:** Drill and practice with feedback, educational game, or representation that allows practice and learning of certain procedures
- **SIMULATION OBJECT:** Representation of some real-life system or process
- **CONCEPTUAL MODEL:** Representation of a key concept or related concepts of subject matter
- **INFORMATION OBJECT:** Display of information organized and represented with modalities
- **CONTEXTUAL REPRESENTATION:** Data displayed as it emerges from the represented authentic scenario

**The template for the mapping of the technical materials:**

- ✓ Have been identified for each country in the Annex → here
- ✓ Have been analyzed by the template in the Annex → here

# 5 LEARNING OUTCOMES

The APPLY project will develop the Curricula using the **Learning Outcomes approach**. According to **Cedefop,** the learning outcomes approach shifts the emphasis from the duration of learning and the institution where it takes place to the actual learning and the knowledge, skills and competencies that have been or should be acquired through the learning process" (*Cedefop 2013: USING LEARNING OUTCOMES. European Qualifications Framework Series)*[1].

The learning outcomes approach is of significant importance in designing common curricula for different countries because it functions as a common tool for interlinking the VET relevant tools such as EQF, ECVET, and EQAVET.

Appropriate assessment methods and procedures are used to check whether the learning outcomes have been achieved. The alignment between learning outcomes, teaching, learning, and assessment helps to make the overall learning experience more coherent, transparent, and meaningful for learners, and all other stakeholders.

**Learning outcomes are directly connected to learning assessment**. They clearly define what and how is to be assessed. They enable harmonization in assessing the learner's performance therefore, the learning outcomes affect the process of teaching and learning through assessment.

**In this understanding the purposes of integrating the learning outcomes in the Curriculum Design are:**

- **To define the expectations of each learning activity.**
- **To guide trainers in the teaching process, choice of methods, etc.**
- **To inform learners about what they are expected to be able to do/know after a specific learning activity.**

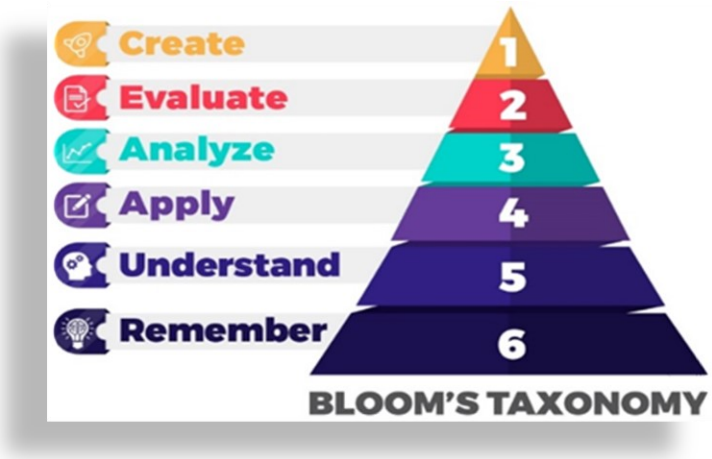
Summarizing, the learning outcomes **explain what the learner is expected to know** and be **able to do**, after having completed the training program. They describe the learning process itself and clarify what to expect during the assessment.

Throughout the teaching and learning process as well as in assessment arrangements, well-written learning outcomes allow both teachers and learners to have a clear picture of the results of the course and each unit.

→ **The methodology selected for the development of the APPLY learning outcomes is the Bloom's Taxonomy** broken into the six levels of objectives, as shown in the picture:

[1]Learning Opportunities and Qualifications in Europe, Available at: https://ec.europa.eu/ploteus/content/descriptors-page

*Figure 1 BLOOMS taxonomy*




Bloom's Taxonomy uses action verbs in a framework for understanding the different levels of learning, also inspired by the structure and vocabulary of the European Qualification Framework (EQF).

Each statement, after the common statement on the audience ("A learner …"), should begin with a precise action (active) verb, followed by the object of the verb followed by a phrase that gives the context. It is generally beneficial to use only one verb for one statement of learning outcomes, except in the cases when the complexity of specific learning outcomes additionally needs to be described.

**UPON COMPLETION OF THIS COURSE, THE LEARNER WILL BE ABLE TO:**

- ✓ **DEFINE** future developments in the xxx sector

**EVALUATION QUESTIONS WHILE DEVELOPING LEARNING OUTCOMES ARE:**

- ✓ **What knowledge was gained?**
- ✓ **What skills were developed?**
- ✓ **Did attitudes/tendencies change?**

It is suggested to write Learning Outcomes of the three upper levels of the Bloom taxonomy (**4. Analysis**, **5. Synthesis**, **6. Evaluation**) **and use verbs like:**

- ✓ **For the Analysis level**: arrange, classify, compare, differentiate, distinguish, infer
- ✓ **For the Synthesis level**: construct, create, design, develop, generate, integrate, reconstruct
- ✓ **For the Evaluation level**: assess, criticize, decide, evaluate, grade,

**The template for the identification of the learning outcomes:**

- ✓ Have been identified for each country in the Annex → here
- ✓ Have been summarized by the template in the Annex → here

# 6 ASSESSMENT

Assessment is a process that helps focus attention towards what matters most in education, beyond just access and participation: the actual learning outcomes of each student. Gathering information on where students stand in their learning and the progress that they have made is key to designing strategies for the further improvement of teaching and learning. Sharing such information with stakeholders across the education system is essential to meet information needs and support decision-making at the classroom, school, and education system level (OECD, 2013[2]).

According to (Cedefop,2015[3]) assessment is understood as a process of identifying the extent to which a learner has attained particular knowledge, skills, and competencies (relating to part of a qualification or the whole qualification). Assessment standards have to answer the question **"How will we know what the learner/learner has learned and is able to do in employment?"**

## *6.1 THE APPLICABLE EUROPEAN FRAMEWORK – THE QUALITY CYCLE*

As APPLY is an Erasmus+ project, we decided to adopt the **Common Quality Assurance Framework (CQAF)** for the assessment of the VET courses as it constitutes a European reference framework to ensure and develop quality in vocational education and training (VET), building on the key principles of the most relevant existing quality assurance models, It allows for capturing and classifying best practices.

The CQAF comprises a model to simplify planning, implementation, evaluation, and review of systems at appropriate levels in the Member States;

**The model includes:**

- PLANNING,
- IMPLEMENTATION,
- EVALUATION AND ASSESSMENT,
- REVIEW

[2] 912013021fin.indd (oecd.org)

[3] Handbook for VET providers (europa.eu)

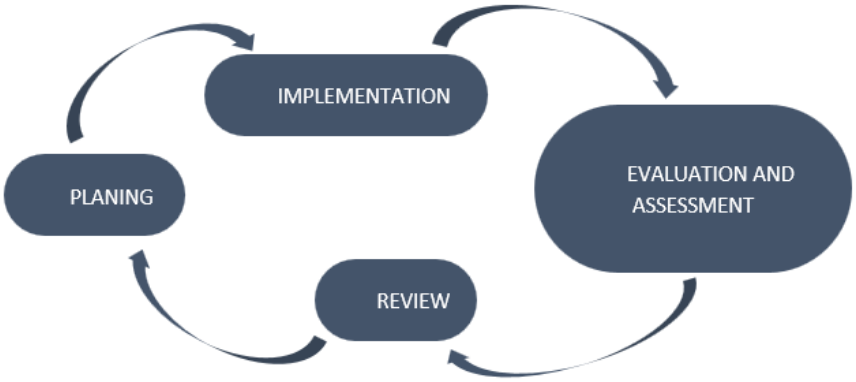



*Figure 2 CQAF STRATEGY*

For each of these elements, core quality criteria have been identified. Considering the various choices made by the Member States to deal with quality assurance and development in VET, the core criteria are presented as possible answers to specific questions which are transversal to any VET system or provider when reviewing policies.

**PLANNING (PURPOSE AND PLAN)**

This relates to the setting up of clear and measurable goals regarding policies, procedures, tasks, and human resources.

**IMPLEMENTATION**

It is essential to establish key, coherent principles that underpin the implementation of the planned actions to ensure effectiveness in achieving the set goals and objectives.

**EVALUATION AND ASSESSMENT**

This covers the continuous evaluation of program provision by objectives (including learner data) and assessment of outcomes achieved at the system and individual levels. In general, the assessment and evaluation phase consists of two parts, data collection and processing, and discussions on results achieved.

**REVIEW (FEEDBACK AND PROCEDURES FOR CHANGE)**

Quality assurance and development is a continuous and systematic process. It must undergo constant review combining self-assessment with evaluation by an external body, processing feedback, and organizing procedures for change.

## *6.2 LINKAGE OF ASSESSMENT STANDARDS TO THE DESIGN OF VET CURRICULA*

During the design of the APPLY professional training courses, the assessment standards will be taken into consideration. The backbone of the assessment standards is the **learning-outcome-based approach** in designing a training program. Learning outcomes specify the criteria for success/failure and learners' performance and enable the assessment process to become more transparent and fit for purpose since learning outcomes define what behavior is supposed to be assessed.

**Learning outcomes have three major characteristics:**

- They specify an action by the learner that is **observable**;
- They specify an action by the learners that are **measurable**;
- They specify an action that is done by the learner.

Learning outcomes are perceived as adding value for several purposes, as will be outlined in the following chapters. However, they are not to be taken for granted: any benefits eventually depend on the way learning outcomes are understood, defined, written, and applied. The learning outcomes approach supports learners' assessment by clarifying the criteria for success/failure and performance. While most frequently linked to summative assessments, learning outcomes can help with formative assessment throughout the learning process.

### *6.3 AN OVERVIEW OF ASSESSMENT IN VET*

The assessment literature has traditionally made a distinction between assessment for summative purposes and assessment for formative purposes.

- **SUMMATIVE ASSESSMENT**, or assessment of learning, aims to summarise learning that has taken place, in order to record, mark or certify achievements (EPPI, 2002). The goal of summative assessment is to evaluate learner learning at the end of an instructional unit by comparing it against some standard or benchmark.
- **FORMATIVE ASSESSMENT**, or assessment for learning, aims to identify aspects of learning as it is developing in order to deepen and shape subsequent learning. Formative assessment helps learners identify their strengths and weaknesses and helps teachers and trainers support learner progress. Learning outcomes should be written in ways that also support formative assessment.

Designing assessments in a way that they are fit for the intended purpose is important to ensure their reliability, validity, transparency, usability, and impartiality.

- **VALIDITY:** refers to how accurately a conclusion, measurement, or concept corresponds to what is being tested. It is defined as the extent to which an assessment accurately measures what it is intended to measure.
- **RELIABILITY:** refers to the extent to which the assessment is consistent in measuring what it sets out to measure. An exceptionally reliable assessment ensures that the assessment is accurate and not influenced by the particular assessor or assessment occasion.
- **TRANSPARENCY:** information, rules, and regulations on assessment should be clear, accurate, consistent, and accessible to all staff, learners, teachers, trainers, examiners that are taking part in the assessment process.
- **USABILITY:** refers to how policymakers, school leaders, teachers, parents, and learners make sense of and respond to assessment results.
- **IMPARTIALITY:** assessment is not based on the grounds of race, gender and does not disadvantage candidates. It also means that the personal views of the assessor have not influenced the assessment.

Ensuring appropriate definition and use of learning outcome-based standards is of key importance to assessment. In addition to the teaching and learning process, learning outcomes constitute a common

reference for assessment, clearly defining what and how is to be assessed. They enable harmonization in assessing learners' performance.

The formulation of learning outcomes and their assessment and certification are elements of the same cycle. Below a basic model of the feedback mechanism between VET and the labor market is presented.

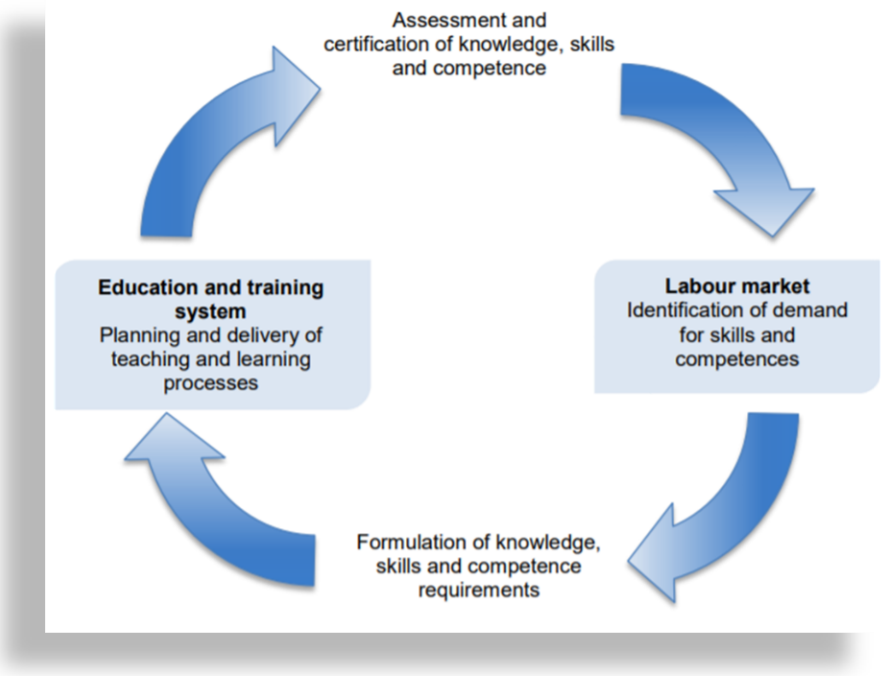



*Figure 3 Feedback mechanism between VET and labor market – Source Cedefop 2013*

Appropriate assessment methods and procedures are used to check if the learning outcomes have been achieved. The alignment between learning outcomes, teaching, learning, and assessment helps to make the overall learning experience more coherent, transparent, and meaningful for learners, and all other stakeholders.

### *6.4 THE STAGES OF THE ASSESSMENT PROCESS*

**The assessment process is comprised of the following Stages:**

**Stage 1:** Establishing expected learning outcomes for the courses;

**Stage 2:** Create or choose teaching/learning activities.

**Stage 3:** Create assessment tasks.

**Stage 4:** Transform judgments into standard grading criteria.

**Stage 5:** Review of the process.

**The evidence/assessment of learner learning is used to:**

- Provide feedback to learners about their learning and

- Adjust the teaching methods and/or learners' learning behaviors to ensure greater learner learning.

### *6.5 ASSESSMENT METHODS*

Effective assessment methods put the learner at the center, are carefully planned and aligned with learning goals.

Assessment methods are tools and techniques used to determine the extent to which the stated learning outcomes are achieved. Assessment methods (also called techniques or instruments) include both direct and indirect approaches. A further distinction that may be made is between quantitative methods that rely on numerical scores or ratings and qualitative methods that rely on descriptions rather than numbers.

**In general, methods of assessment can include the following:**

- ✓ Unseen examination, with or without choice questions;
- ✓ Open-book examination;
- ✓ Examination where information is provided in advance;
- ✓ Multiple-choice questions;
- ✓ Coursework assignment;
- ✓ Assessment questionnaire;
- ✓ Online quiz;
- ✓ Written report;
- ✓ Presentation;
- ✓ Oral examination;
- ✓ Assessed report, dissertation or thesis;
- ✓ Self- and peer assessment;
- ✓ Group assessment

### *6.6 LEARNERS' SELF-ASSESSMENT*

- Self-assessment is a relevant method to assess and evaluate quality, to ensure and develop quality at system and provider levels. It may cover one, several, or all of the factors that have an impact on the quality of VET provision, including organization of the VET system/institution, mechanisms, and resources, pedagogical expertise, as well as relations with external environments.
- Self-assessment is defined as 'the involvement of learners in making judgments about their achievements and the outcomes of their learning and is a valuable approach to supporting student learning, particularly when used formatively. Self-assessment supports student learning and is one of the most important skills that students require for future professional development and life-long learning, as it develops their capacity to be assessors of learning.
- There are several different purposes of self-assessment: to evaluate the understanding of the content, to demonstrate the achievement of outcomes and goals, and the self-development of the learner. These three aspects of self-assessment are all interlinked and will receive different emphases at different times during the process of learning.

- Self-assessment is the assessment of learners by themselves. In order to perform meaningful self-assessment, you need to give students clear criteria by which they can assess themselves. This could be in the form of a scoring rubric. Once the students possess clear and written performance criteria, they can continuously assess their own performance and make improvements. Almost all self-assessment is formative in purpose.
- Self-assessment helps VET providers analyze their responses to these challenges and provide adequate feedback on areas needing change. At a system level, self-assessment helps improve good governance which is necessary to provide adequate statutory provisions, allocate necessary resources, check results, and provide feedback in due time, enabling VET providers to respond and carry out necessary changes.

The template of the identification of the assessment strategy is summarixed in Annex here

# 7 A PRACTICAL GUIDE

While developing assessment criteria and procedures it should be ensured that behavioral verbs within learning outcomes are well linked to them. It is important that each assessment not only reflects learning outcomes but that the assessment is targeted at the complexity level of learning outcomes.

It is also important to choose suitable assessment tools for the learning outcomes, such as: **exercise, quiz, exam, demonstration, project, paper, report, presentation, team participation, homework, etc.** Some learning outcomes may be assessed by using a combination of assessment tools.

- In order to align learning outcomes to assessment, the below questions should be taken into consideration:
- How will I know if my students have achieved the desired learning outcomes?
- How will I measure the extent to which they have achieved these learning outcomes?
- How can we design our examination system so that it tests if learning outcomes have been achieved?
- Have we included a good balance of learning outcomes in our modules? (e.g. Bloom's Taxonomy)
- How do we know if students have achieved the intended learning outcomes: is there a good match between learning outcomes and assessment?
- How can we improve assessment so that it tests the intended learning outcomes?
- When writing learning outcomes the verb is often a good clue to the assessment technique.

**Assessment should be:**

- Learner-centered: inclusive, acknowledging diversity;
- Linked to learning outcomes;
- Linked to performances of understanding or active learning methods;
- The multiplicity of modes, techniques, formats to suit different learners;
- Transparent, fair, and equitable to all users;
- Valid, authentic, and reliable.

### *7.1 USING DIFFERENT KINDS OF ASSESSMENT METHODS IN VLE*

In recent years, the potential of information and communication technologies (ICT) to influence and shape assessment approaches has been increasingly recognized across European countries. While the systematic use of ICT to transform central assessment systems is still limited, many public and private actors are increasingly investing in research and development in this area.

These programs use natural-language processing, artificial intelligence, and/or information retrieval technologies to detect textual features of essays (for example, variety in use of syntax, quality of content, and organization of ideas). These ICT models are still in the relatively early stages of development, however, and while they may facilitate the scoring of large-scale assessments, cannot replace human raters.

### *7.2 PRACTICAL ASSIGNMENTS*

**Practical assignments are linked to the assessment** and will be designed on the learner level or to a group of learners and could include *case studies, problem-solving situations,* etc. The general idea is that the **practical assignments should help enhance the quality of learning.**

For each of the three curricula, multiple practical assignments will be developed customized, and adjusted:

**Practical assignments may include activities such as:**

- **CASE STUDY**: A case study is an extensive example describing an actual case where the learner examines what he/she has learned in practice. It starts with a description of the facts of the case, followed by a critical analysis of how it was implemented in practice what the learner learned, and a description of alternative ways of dealing with the situation.
- **PROBLEM-SOLVING**: Problem-solving focuses on the presentation of a real or hypothetical problem of direct interest to the learners, involving them in their analysis and in finding solutions, urging them in parallel to work out ways to implement the solution they have chosen.
- **TEXT COMPOSITION**: The text composition activity describes a subject and asks the learners to study and criticize texts – that is provided to them, or they asked to search for them and choose – in order to compose their own documented text for the description/analysis/interpretation/processing of the topic under study.
- **OPEN TYPE QUESTION**: An open-ended question that usually requires a wider and more complex treatment for its response than a question in self-assessment exercises.

For activities, there is no single correct answer (or course of action of the learner) accepted for all learners. It is neither possible for the author of the material to provide all the possible answers and all the possible mistakes of the learners, in order to discuss them under a template answer. This is the main difference between activities and self-assessment exercises.

The above, of course, does not mean that the activities must stay unanswered by the author. The author of the material should always provide a typical correct answer or provide the key points of subjects or sentences a correct answer should include, when this is not possible, a description of the actions the learner should follow in order to implement correctly the activity.

### *7.3 APPLICATION OF ASSESSMENT METHODS IN APPLY*

The assessment standards document has the scope of a practical guide for the Asian HEIs, ensuring that the applied assessment methods aiming at measuring the performance of learners will be based on learning outcomes and will relate to a particular occupational standard.

**The assessment standards and methods that are developed in line with the learning outcomes approach have two major objectives:**

1. **Firstly**, to **provide a verification** that the learner at the end of the learning process has achieved the expected learning outcomes (LOs);
2. **Secondly**, to serve as a **review mechanism** and to be part of the quality improvement cycle of the curricula.

- **QUIZZES** consisting of a number of questions that can be categorized in:
- **OPEN-ENDED QUESTIONS** which are hard to assess automatically, but can be used to initiate some individual activity (e.g. read this article and comment…) or some group activity (e.g. after reading this article, join the forum discussion about the "X" topic and present your opinion).
- **CLOSED-ENDED QUESTIONS** which are ideal for an automated assessment. The most common types of this kind of questions are: Multiple Choice Questions (MCQ), fill-in-the-blank, matching, yes/no (or true/false), drag and drop into text, drag and drop onto image etc.
- **PRACTICAL ASSIGNMENTS (as above)**

### *7.4 SUCCESS RATE*

Further to the analysis of the APPLY assessment, in order for a learner to have successfully completed the course (s)he has taken, a percentage of 60% should have been accomplished.

Should (s)he succeeds, (s)he will be able to directly download his/her certificate from the APPLY VLE.

To succeed the percentage, the grade is to fulfill will be 40% from the quizzes and 60% from the practical assignments.

# 8 THE ROLE OF THE TRAINERS AND MATERIAL REVIEW

Following the completion of the educational material of the APPLY Professional Training courses, a final review will be needed, assuring that the content is ready to be uploaded to the VLE platform.

The review will be made on a partnership level. Each Asian HEI will assume the role of reviewing one developed course and provide any comments it deems important.

Following the review, the material will be ready for population to the APPLY VLE by ReadLab.

## *8.1 TRAINERS*

During the piloting of the Courses, the learners will be available to contact a trainer from the Asian HEI that developed the material in order to ask him/her questions or require guidance for the practical assignments.

**From their side, the trainers will:**

- The trainer will be able to monitor the progress of the learners on a regular basis, taking corrective actions, making adjustments, or resolving issues of concern on time;
- The trainer will observe in practice the progress of the learner and how the theoretical knowledge he/she has gained is transformed into a professional skillset. This will offer them a sense of continuity and enhance their feeling of gratitude for their work;
- The trainer will be asked to post in the VLE forum and engage in conversation between the learners as well as to report back to the APPLY partnership any potential issues for correction and mitigation.

## *8.2 IDENTIFICATION OF LEARNERS*

The Asian HEIs will identify potential businesses of the sector willing to promote the project within their working environment in order to engage their staff in the offered classes.

In addition, the APPLY partnership and the Asian HEIs will promote the courses via promotional events in social media and events, aimed to identify CFD sector professionals willing to upgrade their competencies.

# 9 Conclusions

The current document was set to be used as a methodological guide for the APPLY Professional Training Courses.

Within the framework of the APPLY project, **each Asian partner HEI will develop 1 new professional** training course tailor-made to the training needs of the CFD industry of the local or regional industry and special characteristics of their region based on the deliverable 1.3 of the working package 1**, i.e. a total of 3 new professional training courses will be created**.

**UNIVERSITIES PER COUNTRY:**

**INDIA:** MAHE / MUJ / VIT
**MALAYSIA:** UM / UiTM
**THAILAND:** NU / CMU

**ALLOCATION OF THE WORKLOAD:**

As the application states, each country will develop 1 new professional VET training course. **For Malaysia and Thailand**, ***there are 2 Universities assigned that must both undertake the creation of the same course*** and **for India**, ***there are 3.*** The workload for the implementation of the template is not allocated by Metropolitan College – MC nor assigned to a specific university of each country. Therefore for the benefit and better performance and management of all universities involved in the task, each university in the same country will cooperate and communicate with each other for the allocation of the workload and the creation of the content that is required from the implementation of task 2.7 of the working package 2, based on their own judgment, experience, and preferences. For the implementation of this task each Asia HEi will use the template located in the Annex → here

**REGARDING THE ACTUAL TEACHING MATERIAL:**

The actual teaching material (Modules + Learning units + Teaching materials) will be developed and organized by the partner HEis based on the VLE storyboard template that is located in the Annex → here

# Annex. Templates

## *TEMPLATE ALLOCATED*

Below you will see the template provided by Metropolitan college to all Asian Partner Universities for the implementation of task 2.7.

| PROFESSIONAL COURSE OUTLINE | | | | |
|---|---|---|---|---|
| No | TASK | DESCRIPTION | | |
| 1 | COUNTRY | ☐ India | ☐ Malaysia | ☐ Thailand |
| 2 | COURSE TITLE | *Please write the official title that will be shown on the platform* | | |
| 3 | COURSE DESCRIPTION | *Please describe briefly (no more than 3 lines).* | | |
| 4 | KNOWLEDGE DOMAIN | *Please list below the domains of knowledge of the course.*<br>•<br>•<br>• | | |
| 5 | COURSE ADDRESSED TO | *Please list below the target group the course addresses.*<br>•<br>•<br>• | | |
| 6 | LEARNING OBJECTIVES | *Please list below what learners will be able to do at the end of this course. Make sure that the learning objectives align with the WP1 needs analysis.*<br>•<br>•<br>• | | |
| 7 | COURSE LENGTH | *Please describe the duration of the course **(in weeks)*** | | |
| 8 | COURSE MODULES | MODULE 1 | | |
| | | Title: | | |
| | | Short description: | | |
| | | Learning Outcomes: | | |
| | | Duration (in weeks): | | |
| | | Sections of the module (Lessons): | | |
| | | Subsections of the lesson (Units): | | |

| | |
|---|---|
| Teaching material: | ☐ Videos (10 mins max each) ☐ PowerPoint presentations ☐ Pdf files<br>☐ Other (please specify): |
| Assessment: | ☐ Multiple choice/Checkbox/Dropdown questions<br>☐ Staff-graded assessment<br>☐ Other (please specify): |

| MODULE 2 | |
|---|---|
| Title: | |
| Short description: | |
| Learning Outcomes: | |
| Duration (in weeks): | |
| Sections of the module (Lessons): | |
| Subsections of the lesson (Units): | |
| Teaching material: | ☐ Videos (10 mins max each) ☐ PowerPoint presentations ☐ Pdf files<br>☐ Other (please specify): |
| Assessment: | ☐ Multiple choice/Checkbox/Dropdown questions<br>☐ Staff-graded assessment<br>☐ Other (please specify): |

| MODULE 3 | |
|---|---|
| Title: | |
| Short description: | |
| Learning Outcomes: | |
| Duration (in weeks): | |
| Sections of the module (Lessons): | |
| Subsections of the lesson (Units): | |
| Teaching material: | ☐ Videos (10 mins max each) ☐ PowerPoint presentations ☐ Pdf files<br>☐ Other (please specify): |
| Assessment: | ☐ Multiple choice/Checkbox/Dropdown questions<br>☐ Staff-graded assessment<br>☐ Other (please specify): |

| MODULE 4 | |
|---|---|
| Title: | |

| | | |
|---|---|---|
| | | Short outcomes: |
| | | Learning Outcomes: |
| | | Duration (in weeks): |
| | | Sections of the module (Lessons): |
| | | Subsections of the lesson (Units): |
| | | Teaching material: ☐ Videos (10 mins max each) ☐ PowerPoint presentations ☐ Pdf files ☐ Other (please specify): |
| | | Assessment: ☐ Multiple choice/Checkbox/Dropdown questions ☐ Staff-graded assessment ☐ Other (please specify): |
| | | *If you plan to deliver more than 4 modules for this course, please add more module tables.* |
| 9 | PARTICIPATION PREREQUISITES | *Please describe possible prerequisites of those who will enroll in the course **(if any)*** |

*ACTUAL TEACHING MATERIAL TEMPLATE*

| **MODULE 1** | Please write here a title for Module 1 | | | |
|---|---|---|---|---|
| **LESSONS** | **UNITS** | **TYPE** | **TITLE/SOURCE DESCRIPTION** | **NOTES** |
| **LESSON 1**<br>*Please provide a Title for the LESSON 1* | 1ST PART<br>"ECH. INTRODUCTION"<br>*Please provide YOUR OWN Title for the 1st part* | TEXT | **TITLE:** Please state the topic that is addressed<br>**DESCRIPTION:** Please provide the Full text or link to the external doc addressing the topic | |
| | | VIDEO | **Please provide a 3 minutes short video addressing the sector**<br>**VIDEO TITLE:** Please provide a title of the video<br>**VIDEO LINK:** Please provide a link for the video | |
| | 2ND PART<br>"ECH | TEXT | **TITLE:** Please state the topic that is addressed<br>**DESCRIPTION:** Please provide the Full text or link to the external doc addressing the topic | |

| | | | | |
|---|---|---|---|---|
| | LECTURE 1<br>*Please provide YOUR OWN Title for the 2nd part* | VIDEO | **Please provide a 3 minutes short video addressing the sector**<br>**VIDEO TITLE:** Please provide a title of the video<br>**VIDEO LINK:** Please provide a link for the video | |
| | 3RD PART<br>"ech LECTURE 2"<br>*Please provide YOUR OWN Title for the 3rd part* | TEXT | **TITLE:** Please state the topic that is addressed<br>**DESCRIPTION:** Please provide the Full text or link to the external doc addressing the topic | |
| | | VIDEO | **Please provide a 3 minutes short video addressing the sector**<br>**VIDEO TITLE:** Please provide a title of the video<br>**VIDEO LINK:** Please provide a link for the video | |
| | 4th PART<br>ASSESSMENT | TEXT | **TYPE:** Please state the type of the assessment<br>**DESCRIPTION:** Please provide the Full text or link to the external doc of the assessment | |
| | | PROB | Please write the number of MCQ, retry limit, feedback information | |
| | DISCUSSION | FORUM | | |
| **LESSON 2**<br>*Please provide a Title for the LESSON 2* | 1ST PART<br>"ECH. INTRODUCTION"<br>*Please provide YOUR OWN Title for the 1st part* | TEXT | **TITLE:** Please state the topic that is addressed<br>**DESCRIPTION:** Please provide the Full text or link to the external doc addressing the topic | |
| | | VIDEO | **Please provide a 3 minutes short video addressing the sector**<br>**VIDEO TITLE:** Please provide a title of the video<br>**VIDEO LINK:** Please provide a link for the video | |

| | | | | |
|---|---|---|---|---|
| | 2ND PART<br>"ECH LECTURE 1"<br>*Please provide YOUR OWN Title for the 2nd part* | TEXT | **TITLE:** Please state the topic that is addressed<br>**DESCRIPTION:** Please provide the Full text or link to the external doc addressing the topic | |
| | | VIDEO | **Please provide a 3 minutes short video addressing the sector**<br>**VIDEO TITLE:** Please provide a title of the video<br>**VIDEO LINK:** Please provide a link for the video | |
| | 3RD PART<br>"ech LECTURE 2"<br>*Please provide YOUR OWN Title for the 3rd part* | TEXT | **TITLE:** Please state the topic that is addressed<br>**DESCRIPTION:** Please provide the Full text or link to the external doc addressing the topic | |
| | | VIDEO | **Please provide a 3 minutes short video addressing the sector**<br>**VIDEO TITLE:** Please provide a title of the video<br>**VIDEO LINK:** Please provide a link for the video | |
| | 4th PART<br>ASSESSMENT | TEXT | **TYPE:** Please state the type of the assessment<br>**DESCRIPTION:** Please provide the Full text or link to the external doc of the assessment | |
| | | PROB | Please write the number of MCQ, retry limit, feedback information | |
| | DISCUSSION | FORUM | | |

Thaliand Professional Course – Course Decriptor

| | |
|---|---|
| COURSE TITLE | Theory and Computational Modeling on Two Fluids & Two phases flow |
| COURSE DESCRIPTION | *Please describe briefly (no more than 3 lines).*<br>This course introduces the fundamentals and applications of Computational Fluid Dynamics (CFD) for two-phase flows. The primary emphasis of this course is to provide hands on experience to participants on practical industrial and research problems using commercial CFD softwares. |
| KNOWLEDGE DOMAIN | *Please list below the domains of knowledge of the course.*<br>• Knowledge<br>• Comprehension<br>• Application<br>• Practical experience |
| COURSE ADDRESSED TO | *Please list below the target group the course addresses.*<br>• Engineers<br>• Scientists<br>• Researchers & students who wish to use CFD during their research project<br>• Companies who wish to train their employees to use of CFD codes<br>• Academic faculty who wish to advance their practical approach to CFD |
| LEARNING OBJECTIVES | *Please list below what learners will be able to do at the end of this course. Make sure that the learning objectives align with the WP1 needs analysis.*<br>• Explain the fundamental and concept of two-fluids dynamics, heat transfer and CFD algorithms used to solve them<br>• Apply CFD to solve two-phase flow problems<br>• Set up CFD model for practical applications |
| COURSE LENGTH | **Duration (4 Week): Lecture+hands on: 12h on 2 days + 60h self-study as evening course** |
| COURSE MODULES | MODULE 1<br>Title: Fundamentals of Two-Fluids Dynamics with Heat Transfer<br>Short description: Introduction to physics and governing equations including fundamental mathematics model related to fluid-fluid two-phase flow.<br>Learning Outcomes:<br>1. Explain the fundamental and concept of two-fluids dynamics and heat transfer<br>2. Understand the physics and governing equations of two-phase flow<br>**Duration (1 Week): Lecture+hands on: 3h, self-study 15h as evening course**<br>Sections of the module (Lessons):<br>1. Physics of two-fluids and heat transfer<br>2. Lubricated pipelining<br>3. Miscible liquids |

Subsections of the lesson (Units):

Teaching material: ☐ Videos (10 mins max each) ☑ PowerPoint presentations ☑ Pdf fi

☐ Other (please specify):

Assessment: ☐ Multiple choice/Checkbox/Dropdown questions

☐ Staff-graded assessment

☑ Other (please specify): Course Assignments

MODULE 2

Title: Computational Multiphase flow and heat transfer

Short description: The basic concepts of CFD for two-phase flow and heat transfer

Learning Outcomes:

1. Describe the CFD algorithms used to solve two-phase flow
2. Apply CFD to solve simple 2D cases

**Duration (1 weeks): Lecture + hands on: 3h, self-study 15h as evening course**

Sections of the module (Lessons):

1. Introduction to CFD and state of the art
2. Fundamentals of CFD
3. Physical and Mathematical Discretization Initial conditions and Boundary conditions
4. Meshing and domain decomposition
5. Workshop on 2D CFD cases

Subsections of the lesson (Units):

Teaching material: ☐ Videos (10 mins max each) ☑ PowerPoint presentations ☑ Pdf fi

☐ Other (please specify):

Assessment: ☐ Multiple choice/Checkbox/Dropdown questions

☐ Staff-graded assessment

☑ Other (please specify): Course Assignments

MODULE 3

| | |
|---|---|
| | Title: Two-phase flow with ANSYS Fluent |
| | Short description: Learn advanced features of ANSYS Fluent to simulate industrial and research two-phase flow problems. |
| | Learning Outcomes:<br>1. Set up CFD model for practical applications<br>2. Post processing and interpreting of results |
| | **Duration (2 Week): Lecture+hands on: 6h, self-study 30h as evening course** |
| | Sections of the module (Lessons):<br>1. Rotating grids<br>2. Volume of fluid model (VOF)<br>3. Discrete phase model (DPM)<br>4. Hybrid multiphase model<br>5. Visualization and interpretation<br>6. Case studies for two-phase flow problems |
| | Subsections of the lesson (Units): |
| | Teaching material: ☐ Videos (10 mins max each) ☑ PowerPoint presentations ☑ Pdf fi<br>☐ Other (please specify): |
| | Assessment: ☐ Multiple choice/Checkbox/Dropdown questions<br>☐ Staff-graded assessment<br>☑ Other (please specify): Course Assignments |
| | |
| PARTICIPATION PREREQUISITES | *Please describe possible prerequisites of those who will enroll in the course* ***(if any)*** |