A new Master Course in Applied
Computational Fluid Dynamics

D3.2 TRAINING WORKSHOPS IN ASIA

WP 3 APPLY development and academic staff training

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Executive Summary

This deliverable relates to the academic staff training relating to the work package 3, Deliverable 3.2 "Academic Staff Training". The aim of this activity was to prepare the Asian partners for the delivery of the programme. The training activities were split into 2 sessions, an online and a face-to-face session. The online training took place in August 2022 and the face-to-face training took place in Chiang Mai in February 2023. Representatives from all European and Asian partners attended these workshops.

1. Introduction

The objective of this activity was to train the teaching and administrative staff intended to deliver and manage the programme at their respective institutions. The academic staff training was split into 2 sessions. The online training workshop, summarised in Section 2, took place in August and lasted for 2 days, while the face-to-face training workshop, summarised in Section 3, took place in Chiang Mai and lasted for 5 days. Participants of the events included representatives from all Asian and EU partner institutions. After the training workshop, the trained academic and administrative staff, upon return to their universities will deliver in-house trainings for broader outreach at the faculty that will deliver the programme. The training workshops were aimed at raising awareness on new styles of leadership and the trainees were exposed to innovative teaching and learning methods, student assessment methods, research methods and effective class management as well as learning outcome methodologies usage of ICT tools in teaching processes. The course material developed in WP2 was overviewed as part of the training. The full list of participants can be found in the appendix.

2. Online Training Workshop

The online training workshop focused on the course overview of a core and an elective course from the APPLY course material, as well as innovative methods for teaching 'hands-on CFD'. Below is an outline of the online training workshop agenda.

Online Training Seminar Agenda

All times are shown in UTC+1 (British Summer Time)

To convert in other time zones:

Spain	UTC+2
Greece	UTC+ 3
India	UTC+ 5 :30
Thailand	UTC+ 7
Malaysia	UTC+ 8

DAY 1: 08/08/2022		
Time	**Presentation title**	**Delivery**
9 :00 – 9 :55	Course overview for C1 - Linking PDEs with Multiphysics problems	University of Patras
10 :00 – 10 :55	Advanced Programming with OpenFOAM	University of Patras
11 :00 – 11 :55	Implementation of APPLY Program at Chiang Mai University	Chiang Mai University

DAY 2: 09/08/2022		
Time	**Presentation title**	**Delivery**
9 :00 – 9 :55	Course overview of E4 - Linking Experiments with CFD	Cranfield University
10 :00 – 10 :55	Teaching numerical methods to solve the Navier-Stokes equations	Polytechnic University of Catalunya
11 :00 – 11 :55	Implementation of APPLY Program at Naresuan University	Naresuan University

Figure 1 Agenda reflecting the timeline of activities undertaken in the online training seminar

Day 1 of Online Training Workshop

The first day commenced with a presentation from Prof Polycarpos Papadopoulos from University of Patras outlining the course overview of C1, titled "Numerical Methods for PDEs". He discussed the course description, the modules and assignments relating to the course. He further explains how PDEs can be linked to Multiphysics problems and the incremental programming embedded in the C1 course.

Figure 2 Training material presented by representatives of University of Patras

The session continued with a presentation from Georgios Vafakos from University of Patras, who discussed advanced programming techniques using OpenFoam CFD solver, starting from a basic overview of OpenFoam and the available utilities as well as the solver manipulation capabilities. The first day of the online training finished with a presentation by Prof Arpiruk Hokpunna who summarized an outline of the implementation approach of the APPLY program taken by the Chiang Mai University.
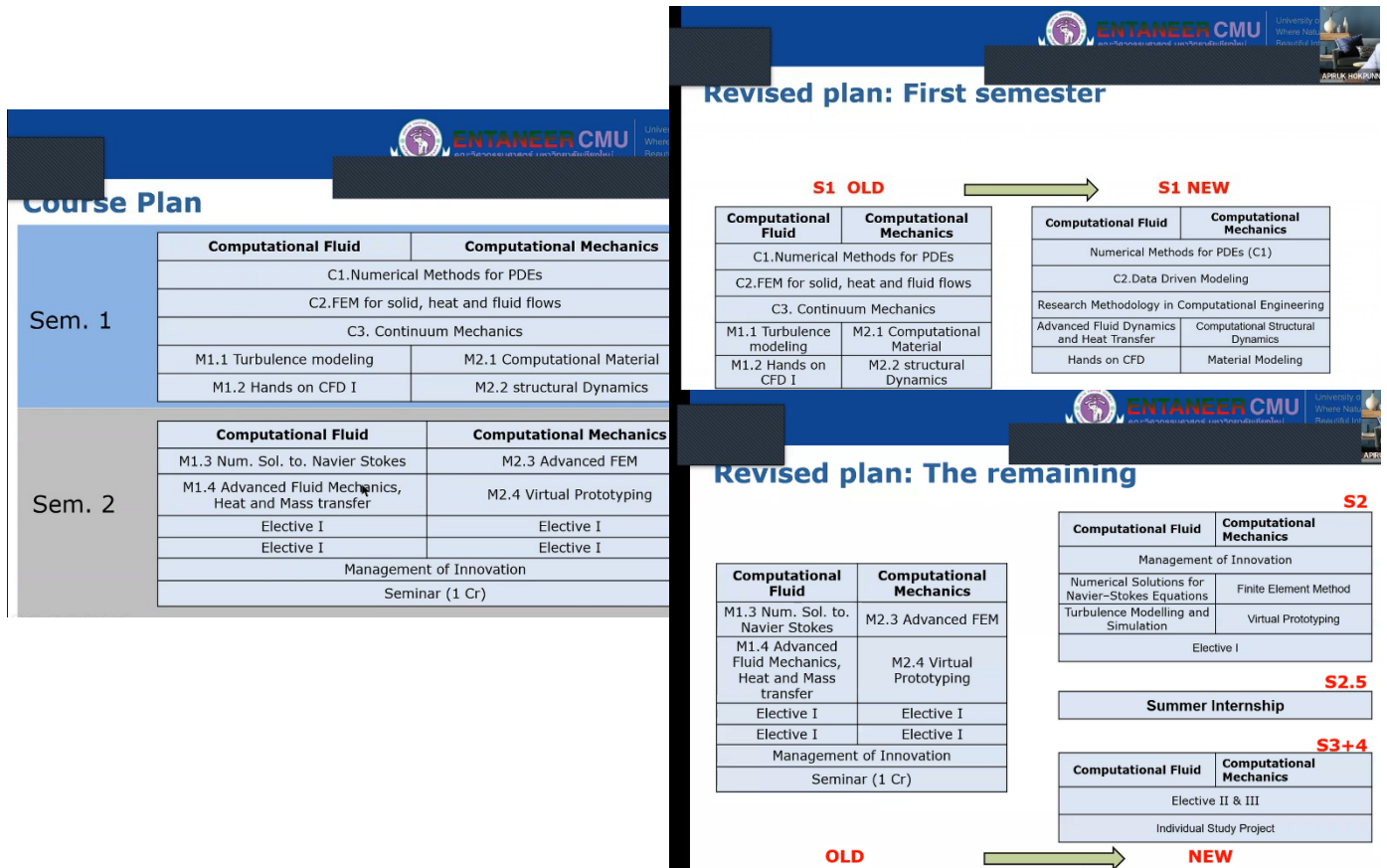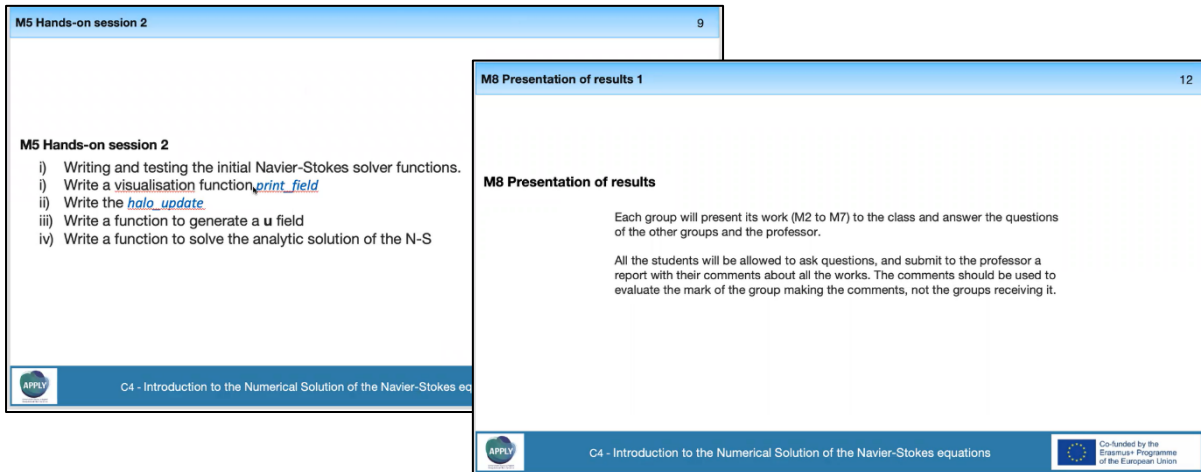
Figure 3 Training material presented by representatives of CMU

Day 2 of Online Training Workshop

The second day of the online training workshop begun with a presentation by Aristia Philippou from Cranfield University, who summarized the E4 elective course titled "Linking Experiments with CFD" as well as the teaching methods and assessment techniques embedded in this course. She showed several teaching techniques that can be used in class to keep high student engagement with consistent interaction that ensures rapport with the students. The workshop continued with Dr Manel Soria from Polytechnic University of Catalunya, who presented teaching methods relating to the C4 course, titled "Introduction to the Numerical Solution of the Navier-Stokes equations". He introduces the concept of CFD solver development which is implemented in the C4 course as part of an assignment, beginning from the basics and gradually increasing the level of complexity as the students can apply concepts and techniques taught in class.

Figure 4 Training material presented by representatives of University of Catalunya

The online training workshop closed with a presentation by Dr. Kwanchai Kraitong outlining the implementation approach of the APPLY programme taken by the Naresuan University. Two curriculum plans are presented, both with a two-year duration and a total of 36 number of credits.

The recordings of the online training workshop for both days are found in the **supplementary materials.**

3. Training Workshop in Chiang Mai

The 3 consecutive training workshops meant to take place in Asia were merged into a single workshop taking place at Chiang Mai University, with all European and Asian partners present. The workshop lasted for 5 days, and an outline of the agenda can be found below. The event involved training activities, institutional visits of the Chiang Mai University, research collaboration discussions, project review and feedback meetings.

Table 1 Agenda reflecting the timeline of activities undertaken during the study visit at Chiang Mai University

APPLY CONFERENCE - CHIANG MAI UNIVERSITY STUDY VISIT AGENDA					
	Scientific Staff Training Day	**Teaching Staff Training Day**	**Bidding Strategy and Reflection Workshop Day**	**Project Planning Day**	**Team-Building Activity Day**
	13-Feb	14-Feb	15-Feb	16-Feb	17-Feb
09:00-09:30	Arrival & coffee - Registration	Arrival & coffee	Arrival & coffee	Arrival & coffee	Social Activities
9:30 - 10:00	Welcome by CMU (Coordinator)	Innovative approaches to learning through Course Overview by UPatras	Industry Engangement by external speaker (CMU)	Project Review Chaired by CMU	
10:00 - 10:30	Introduction - Objective of the Study Visit by CMU				
10:30 - 11:00	Coffee break	Coffee break	Coffee break	Coffee break	
11:00-11:30	Innovative Teaching and Learning Methods by Metropolitan College	Innovative teaching practices through 'Hands-on' Course Overview by UPatras	Introduction to Research Proposals by ReadLAB	Project Plan for Next Steps Chaired by CMU	
11:30 - 12:00	Effective internships' placements within institutions by Metropolitan College				
12:00 - 14:00	BREAK				
14:00-14:30	Post-grad research methods workshop by Dr Theo Nikolaidis	Innovative approaches to learning through Elective Course Overview by Aristia Philippou	Programme Overview Feedback-CMU		
14:30-15:00			Programme Overview Feedback-NU		
15:00-15:30	Overview of CPD, Internships by Dr Suresh Sampath	Innovative approaches to learning through Course Overview by UPC	Programme Overview Feedback-VIT representatives		
15:30-16:00			Programme Overview Feedback-Manipal Jaipur representatives		
16:00 - 16:30	VLE platform demonstration by ReadLAB	Innovative teaching practices through Lab Workshop Overview by UPC	Programme Overview Feedback-MAHE representatives		
16:30 - 17:00			Programme Overview Feedback-MARA representatives		
17:00 - 17:30	END OF DAY		Programme Overview Feedback-UM representatives	END OF DAY	

Activities of 13th of February

The first day of the training workshop was aimed towards the scientific staff training with presentations focusing on innovative teaching and learning methods, research methods and internships programs. Additionally, a demonstration of the virtual learning platform was provided.

More specifically, representative of the Metropolitan College gave an overview on innovative teaching and learning methods and effective internship placements within institutions.

After a short break Dr Theoklis Nikolaidis representing Cranfield University gave an overview of MSc Thermal Power and Propulsion programme, its benefits and criteria for selection. He apprised the partner institutions on the availability of suitable scholarships for students with good academic credentials and calibre.

Dr. Nikolaidis also gave an interesting presentation on research methods in engineering, how they can be embedded in a higher education programme and its importance in student development and experience.

Figure 5 Representative from Cranfield University delivering a talk on Research Led Teaching

A presentation by Dr. Suresh Sampath, representing Cranfield University was followed where he provided details of the standard short courses delivered by Propulsion and Thermal Power Engineering Centre at Cranfield and bespoke courses delivered for prestigious clients. Dr. Sampath also explained the internship programmes at Cranfield and how it can be beneficial for the students and strengthening the relationship between partner institutions. He also highlighted the importance of tapping on region specific research grants for joint projects, internships and faculty mobility.

The day ended with a demonstration of the VLE platform by Petros Chondros, representing ReadLab.

Activities of 14th of February

The second day was aimed towards the teaching staff training, with three European partners (UPatras, CU, UPC) delivering presentations relating to innovative approaches to learning trough an outline of the several courses developed for the APPLY programme.

Dr Polycarpos Papadopoulos from Patra's University provided a presentation relating to Innovative approaches to learning and the role of projects in CFD teaching. He discussed several effective methods of teaching CFD, such as, using CFD simulation software's to provide hands-on experience, utilizing interactive visualizations and animations to help students understand complex CFD concepts, assigning projects that involve applying CFD to real-world problems, incorporating gamification elements and encouraging students to working in small-groups to enhance their learning and problem-solving skills. He went on to introduce the concept of multi-course assignments and collaborative assignments to encourage student engagement and development of teamwork and communication skills. Georgios Vafakos also representing University of Patras gave an overview on programming techniques and specifically the use of open-source software for educational and research purposes. The presentation was focused on the OpenFOAM platform, which is an open source

C++ library for problems governed by partial differential equations, and more specifically for fluid mechanics. It included a basics overview with as introduction on the code, basic usage, and the paraview tool which is used to view results. It also included the main utilities of OpenFOAM: blockMesh for creating simple computational meshes, snappyHexMesh for adapting a grid to a complex geometry and programming with codeStream to create customized modules. Furthermore, the presentation offered some insight into solver structure, highlighting the main parts of the code, and proposed ways to add fields and equations to already existing solvers. Finally, it presented information on multiregion solvers, which can be very useful when simulating problems involving conjugate heat transfer and other phenomena that require fluid-solid coupling.

The workshop continued with a presentation by Aristia Philippou, representing Cranfield University, who gave an overview of innovative teaching approaches and practices implemented in the elective course titled "Linking Experiments with CFD". The presentation was focused on an overview of the 'Linking Experiments with CFD' course material, including lecture notes, lab workshops and assignments and sharing key tips on the teaching practices and effective formative and summative assessment techniques that allow students to evidence the learning outcomes. This was followed by a presentation from UPC representatives, where in the first session they discussed high performance computing relating to the Aerospace Engineering and an overview of a course delivered at the UPC relating to an introduction to HPC programming which aims to consolidate basic knowledge of programming and teach the basics of parallel computing according to the state-of-the-art. This was followed by a presentation relating to project-based learning as a new approach of teaching CFD fundamentals which is aimed at increasing student engagement that keeps their focus for longer and deepens their understanding on the subject.

Activities of 15ᵗʰ of February

On the third day, industry expert Mr. Wasan Tanavitayakorn, R&D manager from Siam Compressor Industry gave the first talk on their related activities and the areas where CFD is applied at their line of work. The second talk is given by Asst. Prof. Pruk Aggarangsi, the director of the Energy Research and Development Institute of Nakornping (ERDI). He explain how ERDI could turn the fundamental research into a self-sustainable semi-commercial research institute. Petros Chondros representing ReadLab presented an introductory session to writing research proposals. It was an interesting session highlighting the mechanisms and the opportunities of potential EU funding schemes among the partners. The section focused on the CBHE calls for proposals while the conversation also covered HORIZON topics and funding opportunities after the active contribution of the session's participants. The session ended by providing some practical tips structured around the main steps needed to successfully submit and deliver an EU funded project: Define the project idea, establish the partnership, perform a clear needs analysis in line with the call's objectives and priorities, develop a consistent methodology and present a clear and realistic workplan and create a cost effective and properly allocated budget. After the lunch break every partner institution was given opportunity to present their institutional activity beyond the scope of the project to enable partners institutions to engage in other areas beyond the current theme.

Figure 6 Group photo of the participants with the speakers. First-row-front-center-left: Mr.Wasan Tanavitayakorn .
Second-row-front-center-left: Asst. Prof. Dr. Pruk Aggarangsi

Activities of 16ᵗʰ of February

During the project review meetings, discussions took place between partner institutions with an aim of developing future partnerships and endure bonds between institutions and nations, enabling collaborations on technology and management research projects and gain new perspectives on research and build relationships with others in the field.

In the afternoon institutional facilities at Chiang Mai University took place at Mahae campus, 5 km South of the main campus. First, the group visit Prof.Nakorn Tippayawong, an expert in biomass and renewable energy. The pellet production machine and gasification laboratory were the two main attraction of his Lab. On the later half of the afternoon, the group visit the Energy Research and Development Institute of Nakornping. The research staff demonstrate the pilot plant and several commercial version of biogas system targeting husbandry and cassava farm.

Figure 7 the Energy Research and Development Institute of Nakornping visit.

Activities of 17th of February

The training workshop finished with a team-building activity with Chiang Mai University providing a guided tour around the old city.

Figure 8 Team Building Activity.

Appendix

Institute	Participants
CMU	Arpiruk Hokpunna, Warangkana Arpornchayanon
VIT	Bibin John, Vasudevan Rajamohan, Padmanathan Panneerselvam, Satheesh Anbalagan, Thundil Karuppa Raj Rajagopal, Ashok K
UM	Ramesh T Subramaniam, Sachin Sharma Ashok Kumar, Ramesh Kasi, Shahid Bashir, Sachin Sharma Ashok Kumar, Goh Zhi Ling, Pershaanaa Manogran, NurFathiah Kamarulazam
NU	Kwanchai Kraitong, Arwut Lapirattanakun, Pongpun Othaganont, Ninnart Rachapradit, Sattaya Yimprasert, Nuttapong Khianoi, Eakrit Kaewcharoen, Kanat Wiangbunpot, Suttinon Panyadibwong
MAHE	Mohammad Zuber, Chandrakantha Bekal, Pramod Balwantrao Salunkhe, Shah Mohammed Abdul Khader
Manipal	Ravi Kumar Sharma, Santosh Patil, Rahul Goyal, Reema Jain, Rakesh Kumar
MARA	Jamil Hamali, Margaret Chan Kit Yok, Hazman Bin Seli, Ling Siew Eng, Lau Lee Chung, Faizal Bin Mohamad, Hafiz Bin Mohd Noh
CU	Theoklis Nikolaidis, Suresh Sampath, Aristia Philippou
UPC	Manel Soria Guerrero
UPatras	Polycarpos Papadopoulos, Georgios Vafakos
ReadLab	Petros Chondros
AKMI Metropolitan College	Angelos Ampatzis, Katerina Stergiopoulou