



A new Master Course in Applied  
Computational Fluid Dynamics

# D2.2 STUDY VISITS TO EUROPE FOR CURRICUAL DEVELOPMENT

WP 3 APPLY development and academic staff training



Co-funded by the  
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of the European Union

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## Project Information

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## Document Information

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## Executive Summary

This deliverable describes the actions taken for “WP 2.2 Study visits to Europe for Curricula development”. These actions include online meetings with presentations from the EU and Asian Institutions and in person visits to the participating institutions in the three EU partner countries.

The first section of this report presents the online meetings that took place during the COVID period. Their aim was to acquaint the partners, since the COVID pandemic restricted travel and had the arranged kick-off meeting canceled. The meetings carried out on the 17<sup>th</sup> and 19<sup>th</sup> March 2021 in the framework of the work package 2.2 “Study visits to Europe for Curricula development”. During the meetings, UPC took the minutes of the meeting which are recapitulated in this document.

After the COVID restrictions were lifted, the normal operation of the program resumed, and the in-person visits took place in the EU partner Institutions. This deliverable provides a summary of the APPLY consortium study visit and meeting at Cranfield University , UK between the 21st and 23rd of November 2022, at the University of Patras, carried out on 31st May, 1st and 2nd June and at the Universitat Politècnica de Catalunya (UPC), carried out on 6th, 7th and 8th June.

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## 1. Cranfield University Study Visit

### 1.1 Introduction

The study visit lasted for 3 days, and the participants of the event included representatives from all Asian Institution partners as well as the EU partners. The full list of participants can be found in the appendix. Below is an outline of the agenda of the study visit. The event involved training activities, institutional visits within Cranfield University's state of the art facilities and project review meetings.

Table 1 Agenda reflecting the timeline of activities undertaken during the study visit at Cranfield University.

	21-Nov	22-Nov	23-Nov
09:00-09:30	Arrival & coffee - Registration	Arrival & coffee	Arrival & coffee
9:30 - 10:00	Welcome by Professor Dame Helen Atkinson, SATM Pro VC	Overview of Centre for Propulsion and Thermal Power Eng - Prof Vassilios Pachidis	Gas Turbine Testing Laboratories visit
10:00 - 10:30	Welcome by Prof Iain Gray - Director of Aerospace, SATM	Overview of Thermal Power MSc - Dr Theo Nikolaidis / Dr Devaiah Nalianda	
10:30 - 11:00	Programme overview and current status - Chiang Mai University (Coordinator)	Overview of CPD, Internships and double degrees - Dr Sampath / Dr Nikolaidis	
11:00 - 11:30	Coffee break	Coffee break	Coffee break at IMEC
11:30 - 12:00	Presentation by Naresuan University representatives	Presentation by VIT representatives	Presentation by Dr. Ruben Sakrabani - Overview of School of Water, Energy and Environment
12:00 - 12:30	The role of European Universities in capacity building - Dr Papadopoulos	Presentation by Manipal Jaipur representatives	Presentation by University Teknologi Mara representatives
12:30 - 13:00	Project management and virtual learning platform demo - Petros Chondros (ReadLAB) - TEAMS	Presentation by MAHE representatives	Presentation by University of Malaya representatives
13:00-14:00	<b>LUNCH</b>		
14:00-16:00	AIRC VISIT - Group 1 at 14:45-15:15 Group 2 at 15:20 - 15:50	DARTEC VISIT 2 groups	Feedback and way forward - Eirini Aggeli
16:00 - 16:30	<i>buffer time</i>	Open discussion on future research and teaching activities	Closing discussions
16:30-17:00	Overview of International engagements - Prof. Simon Pollard		
	End of Day	End of Day	End of visit and departures
1830 for 1900	Dinner at Mitchell Hall	Buffet Dinner at CMDC	



*Figure 1 Representatives from all APPLY partners during the study visit at Cranfield University.*

### *1.2 Activities of 21st of November*

On the first day of the study visit, the APPLY delegation was welcomed by Professor Dame Helen Atkinson, the Pro-Vice-Chancellor of the School of Aerospace, Transport and Manufacturing at Cranfield University as well as the Director of Aerospace, Professor Iain Gray. They discussed the expertise available at Cranfield University in the sectors of Aerospace, Environment and Agrifood, Manufacturing and Materials, School of Management and Water as well as the facilities including the Aerospace Integration Research Centre (AIRC), the air traffic management and gas turbine engineering laboratories. Professor Iain Gray provided a brief overview of the Aerospace Research Collaborations involved with Cranfield University.

Following on, the project coordinator Professor Arpiruk Hokpunna gave an overview of the APPLY project including the challenges this project is addressing and the potential impact of meeting the needs of the rapid growth of industry and infrastructure in Asian countries. He summarised the outcome of work package 1 and summarised the upcoming project activities for 2023.

The day continued with a presentation from the Naresuan University representatives summarising the accreditation procedure they undertook in the institution to gain approval and accreditation of the programme. They also shared information on the CFD laboratories they have set up at their institution, supported by the APPLY project.



Associate Professor Polycarpus Papadopoulos from the University of Patras, Greece gave an overview on the role of European Universities in capacity building. More specifically, he presented an overview of the three work packages consisting of the Identification of similar curricula, capacity building and Curriculum development and the APPLY development and academic staff training. Moreover, Petros Chondros from ReadLab presented the virtual learning platform developed by ReadLab for the APPLY project.

After a lunch break, the consortium was given a tour of the AIRC facilities, which aims to conduct cutting-edge and applied research by integrating advanced technologies in the areas of autonomous systems and intelligent automation. We first visited the flight simulator which enables pilots to gauge the effect of aircraft design modifications on performance, handling and safety. The tour continued with a visit to the intelligent automation laboratory which is home to several of Cranfield's industrial robot cells as well as the Open Laboratory dedicated for research into future propulsion, mission systems and Urban Air Mobility. The Open laboratory facility included an automated assembly rig which currently uses full size A320 wings to develop automated wing assembly lines of the future, as well as a retrofitted fire truck with a mounted electric vertical take-off and landing aircraft designed to test forces acting on the rotors during transition by accelerating the truck on the airfield.

Before the end of the day, Professor Simon Pollard shared an overview of Cranfield's involvement in international engagements.

### *1.3 Activities of 22nd of November*

The second day commenced with an introduction from Professor Vasilios Pachidis, Head of Centre for Propulsion and Thermal Power Engineering, who provided an overview for the Centre for Propulsion and Thermal Power Engineering at Cranfield University. This was followed by a presentation from Dr Theoklis Nikolaidis, Program Director of the MSc Thermal Power and Propulsion programme. He gave an overview of the Master's course, discussed the taught modules focusing on gas turbine, the course delivery and assessment and the individual research projects associated with the course aiming to integrate research and education.

Dr Suresh Sampath, Head of Gas Turbine Systems Engineering and Operations Group, presented details of the standard short course delivered by the Propulsion and Thermal Power Engineering Centre at Cranfield and bespoke courses delivered for prestigious clients. He 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.

After a short coffee break, representatives of VIT, MAHE and Manipal Jaipur presented a status update of the APPLY labs and on the partner institutions' progress.

In the afternoon, the APPLY delegation visited the Digital Aviation Research and Technology Centre (DARTEC) which aims to address research challenges facing the aviation industry such as the integration of drones into civilian airspace, increasing the efficiency of airports through technological advances and creating a secure shared airspace through secure data communication infrastructures. The tour discussed ongoing human behaviour studies taking place in the facility, and research on innovative methods to monitor aircraft maintenance using drones.



The day finished with an open discussion on the progress of the project and future steps in line with the project plan. An evening dinner followed.

#### *1.4 Activities of 23rd of November*

The last day of the Cranfield University Study visit began with a guided tour to the Gas Turbine experimental testing facilities of the University. More specifically, the participants visited the Pebble Bed Air Heater Combustion and Thermal Management Research facility which provides non-vitiated air with temperatures in excess of 1700K and pressure of 15 bars, used to test hydrogen-fuelled micromix burners for aero gas-turbines. The tour continued with a visit at the facility aimed at investigating unsteady intake flow distortion with the use of time-resolved Particle Image Velocimetry (PIV). At last, the testing facility visit finished with a tour of the experimental wind tunnel for compressor degradation and washing research consisting of thermodynamic modelling of engine system performance, engine fault diagnostics, prognostic predictions of engine degradations and many more.

After a short coffee break, the presentations commenced with Dr Ruben Sakrabani, Associate Professor in Soil Chemistry, who gave an overview of the Environment Programme at Cranfield consisting of five MSc courses (1) Geographical Information Management, (2) Environmental Engineering, (3) Environmental Management for Business, (4) Global Environmental Change and (5) MSc in Sustainability. This talk was followed by a presentation from Dr Jitka MacAdam, the Director of Sustainable Water Futures MSc Programme who presented Cranfield's Research Facilities relating Water and Wastewater treatment and some research project examples.

University of Technology MARA and University of Malaya representatives provided some status update and feedback on the programme. Lastly, Eirini Angeli gave an overview on the future steps and growth of APPLY including some tips for the preparation of the info days and the potential impact it would have on the programme. The study visit finished with some final discussions relating the project status, plan and an action plan for the upcoming deliverable reports.



Institute	Participants
CMU	Arpiruk Hokpunna, Warangkana Arpornchayanon
VIT	Vasudevan Rajamohan, Padmanathan Panneerselvam, Devendrakumar Pater, Satheesh Anbalagan
UM	Ramesh T Subramaniam, Sachin Sharma Ashok Kumar
NU	Kwanchai Kraitong, Arwut Lapirattanakun, Pongpun Othaganont
MAHE	Mohammad Zuber, Chandrakantha Bekal, Chandrakant Ramanath Kini
Manipal	Ravi Kumar Sharma
MARA	Jamil Hamali, Margaret Chan Kit Yok, Hazman Seli, Ling Siew Eng
CU	Theoklis Nikolaidis, Pavlos Zachos, Suresh Sampath, Aristia Philippou
UPC	Manel Soria Guerrero
UPatras	Polycarpos Papadopoulos, Georgios Vafakos
ReadLab	Petros Chondros
AKMI Metropolitan College	Eirini Angeli

## 2. University of Patras Study Visit

### 2.1 General information of UPatras meeting on 31st May until 2nd June

The study visit begun on May 31st at 09:30, and the venue was the Conference Center of the University of Patras. The participants included representatives from all the Asian institutions, as well as University of Cranfield, Universitat Politècnica de Catalunya and ReadLab.

Specifically, the list of participants is:

Institute	Participants
CMU	Arpiruk Hokpunna, Warangkana Arpornchayanon
VIT	Vasudevan Rajamohan, Sekarapandian N, Bibin John
MUJ	Reema Jain
UM	Ramesh T Subramaniam, Ramesh Kasi, Shahid Bashir
NU	Kwanchai Kraitong, Arwut Lapidattanakun
UiTM	Margaret Chan Kit Yok, Ling Siew Eng, Hazman Seli, Azli Bin Abd Razak
MAHE	Mohammad Zuber, Satish Shenoy B, Chandrakanta Bekal
CU	Theoklis Nikolaidis
UPC	Manel Soria Guerrero
UPatras	Polycarpos Papadopoulos, Georgios Vafakos
ReadLab	Petros Chondros



## 2.2 Development of 31st May meeting

The study visit commenced on May 31, 2023, at 10:00, led by Prof. V. Kostopoulos, the head of the Department of Mechanical Engineering and Aeronautics at the University of Patras. Prof. Kostopoulos provided an introduction to the University of Patras, highlighting the operations of the Department of Mechanical Engineering and Aeronautics (MEAD). He discussed the undergraduate and postgraduate programs offered by the department, emphasizing the opportunities available for pursuing a Master's or Ph.D. degree in Greece. Furthermore, he presented the activities of the Laboratory of Applied Mechanics and Vibrations, which he oversees, including the scientific subjects it focuses on, its funding sources, and its collaborations with other national and international educational institutions and companies. Following Prof. Kostopoulos' presentation, he engaged in discussions with the participants and received gifts.



The next presentation, at 11:00, was conducted by Assoc. Prof. P. Papadopoulos from MEAD, providing an overview of the Division of Energy, Aeronautics & Environment, one of MEAD's four divisions, and presenting the activities of the Laboratory of Fluid Mechanics. He introduced the division's faculty, student and staff numbers, and showcased the laboratories and their activities. He also discussed the teaching improvement strategies implemented by the University of Patras to enhance the learning experience of students. Additionally, Assoc. Prof. Papadopoulos delved into the research activities of the Fluid Mechanics Laboratory, emphasizing its close connection to Computational Fluid Dynamics (CFD), which is at the core of the program being developed by Asian countries. He explained how undergraduate students can engage in research projects and tailor their work to meet the requirements of these projects.



After a short coffee break, the participants visited the main laboratories of MEAD starting at 12:00. First, they visited the Laboratory of Mechanical Technology, where Asst. Prof. Angelos Philippatos and Prof. Pantelis Nikolakopoulos provided a brief overview of the laboratory's activities. The participants were then given a tour of the laboratory, gaining insight into the operation of the teaching labs, the number of participating students, and other teaching-related matters. At 12:30, the group moved on to the Laboratory of Technology and Strength of Materials, where they received an overview of the lab's research and teaching activities. They were shown the experimental facilities and introduced to the lab staff.

The next visit, scheduled for 13:00, was to the Laboratory of Manufacturing Systems and Automation, where Assistant Professor Panayiotis Stavropoulos explained the lab's research activities and provided information about its experimental facilities. The final visit of the day, at 13:30, took the participants to the Laboratory of Fluid Mechanics. Assoc. Prof. Papadopoulos presented the facilities, and the participants engaged in a comprehensive discussion on improving the state of the experimental labs, enhancing students' hands-on experience, and advancing the teaching of fluid mechanics.

After a break for lunch, the proceedings resumed at 15:00 with a presentation by Prof. Zuber from MAHE. Prof. Zuber updated the participants on the status of the APPLY labs, and there was a discussion on utilizing the computational power of the infrastructure obtained through program funding. Additionally, Prof. Zuber introduced an initiative to increase project dissemination by organizing a CFD competition for undergraduate students.

At 15:30, Prof. Vasudevan Rajamohan from VIT delivered a presentation on the latest developments regarding the establishment of the internship program in the partner countries. The presentation included information on effective implementation of internships and updates on the partner institutions' progress in this area.

The last presentation of the day took place at 16:00 and was conducted by P. Chondros from ReadLab. The presentation focused on practical aspects related to program implementation, including the population of teaching materials on the APPLY distance learning platform and the inclusion of project updates and useful information about partner activities on the APPLY website.

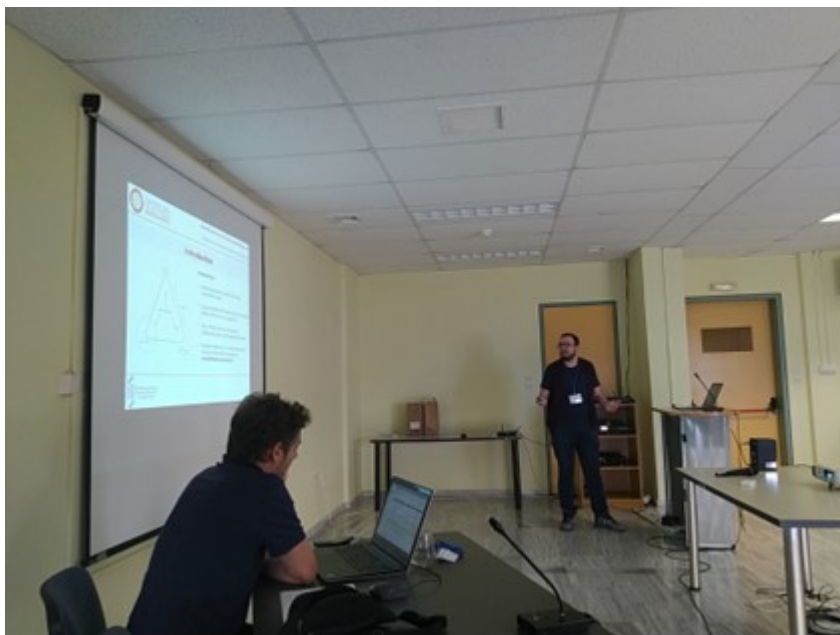




### *2.3 Development of 1st June meeting*

The second day of the Patras study visit began at 10:00 on 1/6/2023 with a presentation by Mr. Dimitriou, a Ph.D. candidate. He discussed the activities of the Laboratory of Applied Mechanics and Vibrations, specifically highlighting advancements in structural mechanics. Prof. Saravanos from MEAD joined the APPLY teams for this session.

At 10:30, Ph.D. candidate A. Kafkas gave a presentation on the activities of the Laboratory of Technology and Strength of Materials. The talk centered around advances in Fluid Structure Interaction, covering new methods in structural mechanics and flow calculations. It also explored the effective coupling of algorithmic solvers to capture fluid-structure interaction accurately.

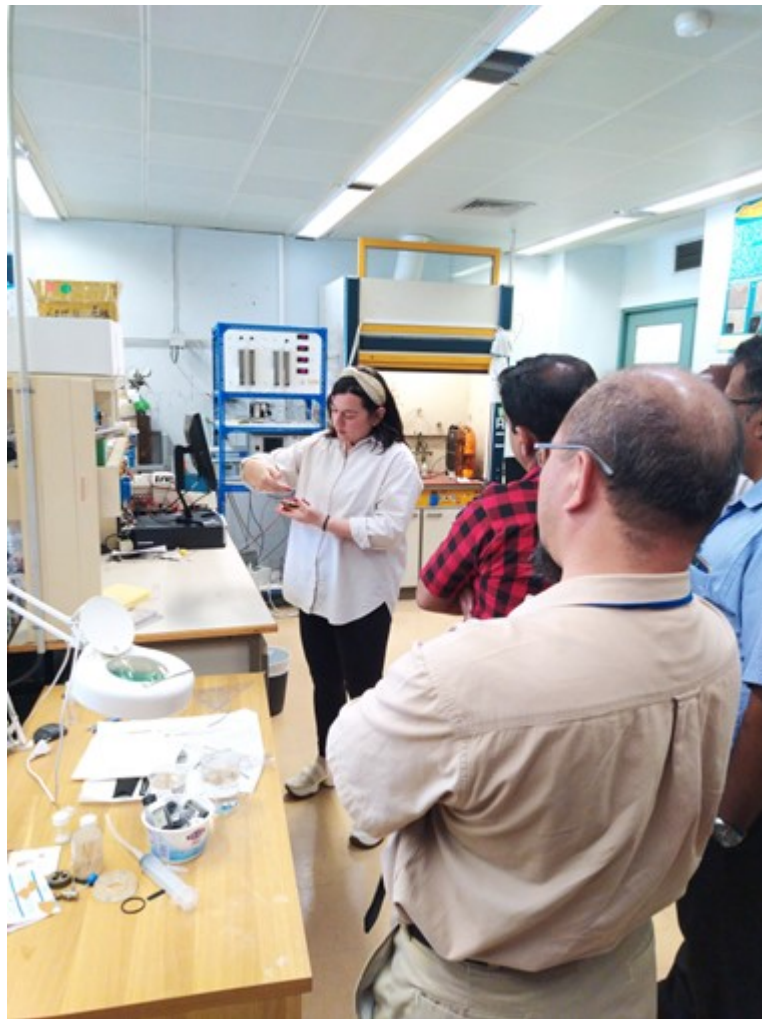






The final session presentation took place at 11:00 by a startup company called FEAC engineering, specializing in CFD and simulation of engineering systems. The presentation highlighted the company's activities and provided information about the STAR CCM+ commercial code offered by Siemens. Participants were informed about the code's capabilities and how it could be tailored to meet various application needs.

After a short coffee break, the study visit resumed at 12:00 with a guided tour organized by Assoc. Prof. P. Vafeas from the Department of Chemical Engineering. Prof. Vafeas showcased the teaching facilities and labs of the department, concluding with a visit to the Laboratory of Chemical & Electrochemical Processes. Prof. Alexandros Katsaounis, the head of the laboratory, presented the ongoing activities, including experiments and the development of hydrogen fuel cells.



At 13:00, the APPLY delegation returned to the Conference Center for a presentation on the teaching and research activities of the Laboratory of Thermodynamics. Prof. Th. Panides and Asst. Prof. K. Souflas from MEAD discussed effective methods of teaching thermodynamics and provided insights into current state-of-the-art research on combustion and material reactions to fire.

Following a lunch break, the next session began at 15:00, featuring presentations from various APPLY partners regarding program implementation. The first presentation, by Prof. Hazman Seli, focused on the accreditation process in Asian institutes. It included valuable updates on progress made in related operations across different institutions.

The final presentation of the day started at 15:30 and was delivered by Assoc. Prof. Arpiruk Hokpunna. It provided a concise overview of the current status of the APPLY project. The presentation covered completed tasks, submitted deliverables to European authorities, and pending program operations. This talk concluded the second day's presentations of the study visit.



### *2.4 Development of 2st June team building activities*

The third and final day of the study visit comprised team-building activities and explorations of Greece's cultural history. Participants had the opportunity to visit ancient ruins, museums, and immerse themselves in the history of ancient Greece. These visits sparked discussions about the diverse cultures represented by the study visit participants and fostered understanding of the unique aspects of teaching and offering courses in different countries. The study visit concluded with a group photo of the APPLY team and plans for the next study visit to Spain.



## **3. Universitat Politècnica de Catalunya Study Visit**

### *3.1 General information of UPC meeting on 6th May until 8th June*

The study visit begun on June 6 at 09:30, and the venue was the Vertex Building, room VS208, in Campus Nord (Barcelona) of the UPC. The participants included representatives from all the Asian institutions, as well as University of Cranfield and Universitat Politècnica de Catalunya.



Campus Nord and the Vertex Building (brick building at the right hand side).



A moment during one of the presentations in room VS208.

Specifically, the list of participants was:

Institute	Participants
CMU	Arpiruk Hokpunna, Warangkana Arpornchayanon, Watchapon Rojanaratanangkule
VIT	Vasudevan Rajamohan, Sekarapandian N
MUJ	Reema Jain
UM	Ramesh T Subramaniam, Ramesh Kasi, Shahid Bashir
NU	Kwanchai Kraitong, Arwut Lapirattanakun
UiTM	Margaret Chan Kit Yok, Ling Siew Eng, Hazman Seli, Azli Bin Abd Razak
MAHE	Mohammad Zuber, Satish Shenoy B, Chandrakanta Bekal
CU	Aristia Philippou
UPC	Manel Soria Guerrero, Daniel García Almiñana, Enrique García Melendo, Jordi Gutiérrez*, Ivette Rodríguez*, Manuel Domínguez*, Ignasi Gil*
UPatras	Polycarpos Papadopoulos

Note: Jordi Gutiérrez\*, Ivette Rodríguez\*, Manuel Domínguez\* and Ignasi Gil\* from UPC gave a talk and attended only a few presentations.

Moreover, the Start-Up company Kreios, started by former UPC students, carried out a presentation in order to illustrate the support that UPC gives to this type of initiatives.

The Study Visit was carried out during three days. The participants could talk and exchange ideas in a cooperative and positive mood. This was the last of the Europe meetings of the project. Overall, it was a very satisfactory experience that helped to forget the very difficult beginning of the project during COVID 19 pandemic, when many of participants had to endure restrictions to their mobility.

09:30 - 10:00	Arrival & Registration	Arrival	
10:00 - 10:30	Prof. Jordi Boronot (UPC). Director of Physics dept	Prof. Enrique García-Melendo (UPC)	TEAM Building activities
10:30 - 11:00	Prof. Ignasi Gil (UPC) Student Exchange programs	Prof. Ivetle Rodriguez (UPC)	
11:00 - 11:30	Vellore Institute of Technology	PhD. Student Paula Betriu (UPC)	Barcelona visit
11:30 - 12:00	Coffee-break and open discussion	Coffee-break and open discussion	
12:00 - 12:30	Prof. Daniel Garcia-Almiñana (UPC)	Prof. Jordi Gutiérrez (UPC)	or
12:30 - 13:00	Prof. Manel Soria Guerrero (UPC)	Chiang Mai University	
13:00 - 13:30			Guided tour to Montserrat Mountain summit
13:30 - 14:00	Lunch break and open discussion		
14:00 - 14:30	Universiti Teknologi MARA	Manipal Institute of Technology - Competition CFD	
14:30 - 15:00	Krelos Start-up company	Manipal University Jaipur	
15:00 - 15:30	Malaya University	Cranfield University	
15:30 - 16:00	Naresuan University	Open discussion	
16:00 - 16:30	APPLY project status	Prof. Manuel Domínguez (UPC)	Visit to Mare Nostrum Super Computer
16:30 - 17:00	Open discussion	APPLY project status	
19:00 - 19:30		Spring garden dinner	
19:30 - 20:00		Dress code: feel free	
<b>KEY:</b> GREEN: Fixed time activities ORANGE: Catering GREY: APPLY status and discussion (can be moved) BLUE: Presentations by Meeting attendants (can be moved)			

APPLY Barcelona Study Visit agenda.



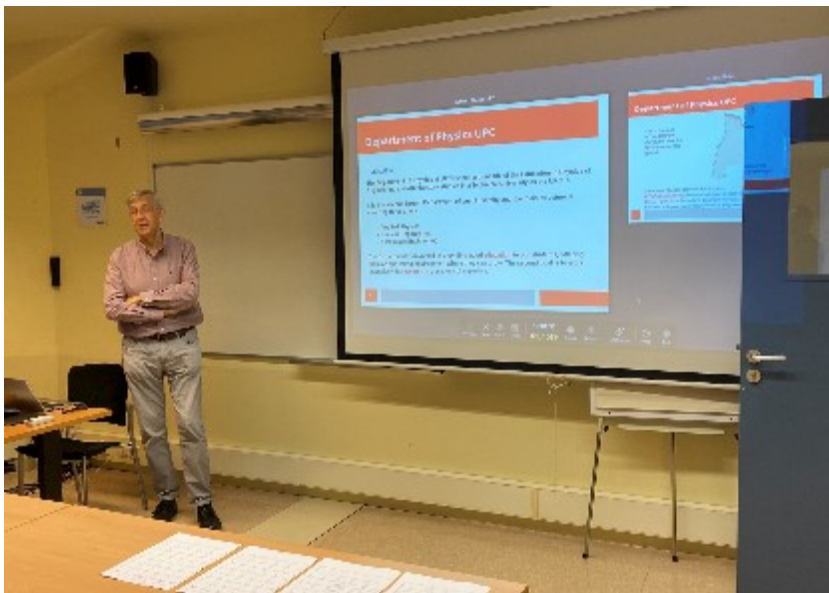
A moment during the Spring garden dinner. The weather was perfect for the event and the food offered, mainly vegan (with the exception of Spanish jamón serrano), was appreciated by all participants.

### 3.2 Development of 6th June meeting

The study visit commenced on June 6, 2023, at 9:30. After arrival and registration, the talks began at 10:00.

#### **UPC - Welcome by the head of the Physics Department of UPC, Prof. Jordi Boronat**

Professor Jordi Boronat, as head of the Physics department, welcomed the participants of the meeting. The project APPLY is being carried out by the Aerospace Engineering division of UPC, part of the Physics department.



Intervention of Prof. Jordi Boronat.

#### **UPC - Student Exchange Programs, Prof. Ignasi Gil, vice-dean of ESEIAAT faculty**

Prof. Ignasi Gil, vice-dean of UPC ESEIAAT faculty, located in Terrassa (about 30km from Campus Nord) explained the organization of UPC as well as all the student exchange programs, paying special attention to possible ways to continue the cooperation between the partners after the end of APPLY project. UPC is a multi-campus University, with faculties in different cities including Barcelona. ESEIAAT Aerospace Engineering division has been in charge of the APPLY project.



Intervention of Prof. Ignasi Gil.

### Vellore Institute of Technology

VIT talk discussed the APPLY project outcomes as well as their current research projects.



Key Stakeholder of Computational Fluid Research

## COMPUTATIONAL FACILITIES



Co-funded by the Erasmus Programme of the European Union

- Newly established HPC**
- For CFD group of SMEC
  - 1 master node + 8 compute nodes + 1 visualization node
  - 384 cores



Project number: 600068-BFP-2-2019-1-TH-BFPK2-CENE-IP (2019-2021/001-001)

One of the slides of the Vellore Institute of technology intervention.

### UPC - Prof. Daniel García-Almiñana, vice-dean of ESEIAAT faculty

Prof. Daniel García-Almiñana carried out two presentations in one session. First, as vice-dean of ESEIAAT (ESEIAAT is one of UPC faculties, and Aerospace Engineering division has been in charge of the APPLY project), he described the faculty, with special emphasis in the Aerospace Engineering Master and Degree courses offered. Then, he described the results obtained in the FET European project Discoverer.

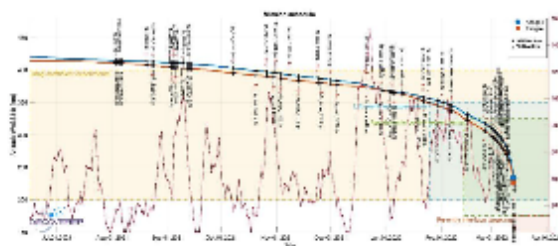




UNIVERSITAT POLITÈCNICA DE CATALUNYA  
 BARCELONA  
 Escola Superior d'Enginyeria Industrial  
 de Barcelona de Terrassa



### Satellite for Orbital Aerodynamics Research



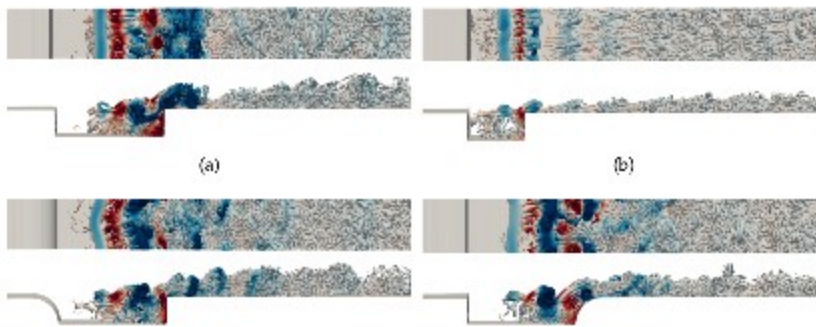
Launched via [Nanoracks](#) to the ISS on 3 June 2021  
 Deployed into ~420km altitude orbit 14 June 2021 into a naturally decaying orbit  
 Reentered 14 March 2022



Two slides in the presentation of Prof. D.García-Almiñana.

#### UPC - Prof. Manel Soria

Prof. Manel Soria of UPC presented a summary of his research work in CFD.



Small changes in geometry may decrease significantly the noise level

One slide in the presentation of Prof. M. Soria, concerning aeroacoustics.

### Universiti Teknologi MARA

Universiti Teknologi MARA focused the presentation on APPLY Workpackage 4.2.



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MARA



APPLY  
A new Master Course in Applied  
Computational Fluid Dynamics

**WP4.2 TOOLKIT FOR THE EVALUATION OF THE APPLY PROGRAMME**

**EVALUATION AND IMPROVEMENT OF THE PROGRAMME**

**Objective**  
for the effective assessment of the delivery of the APPLY Master's program

**Benchmarking**

1. European Standards & Guideline for Quality Assurance in Higher Education:
  - (a) Standards & Guidelines for Internal Quality Assurance;
  - (b) Standards & Guidelines for External Quality Assurance; and
  - (c) Standards & Guidelines for Quality Assurance Agencies.
2. ASIAN Higher Institution Standards & Guideline for Quality Assurance

Two slides of the presentation of Universiti Teknologi MARA.

### Malaya University

Malaya University delegates described their participation in the project.



A slide of the Malaya University presentation.

### Naresuan University

Naresuan University delegates described their participation in the project.



A slide of the Naresuan University presentation.

### APPLY project status and open discussion

A long discussion of the project status, as well as the tasks remaining, directed by Prof. Arpiruk Hokpunna, closed the first day session.

### 3.3 Development of 7th June meeting

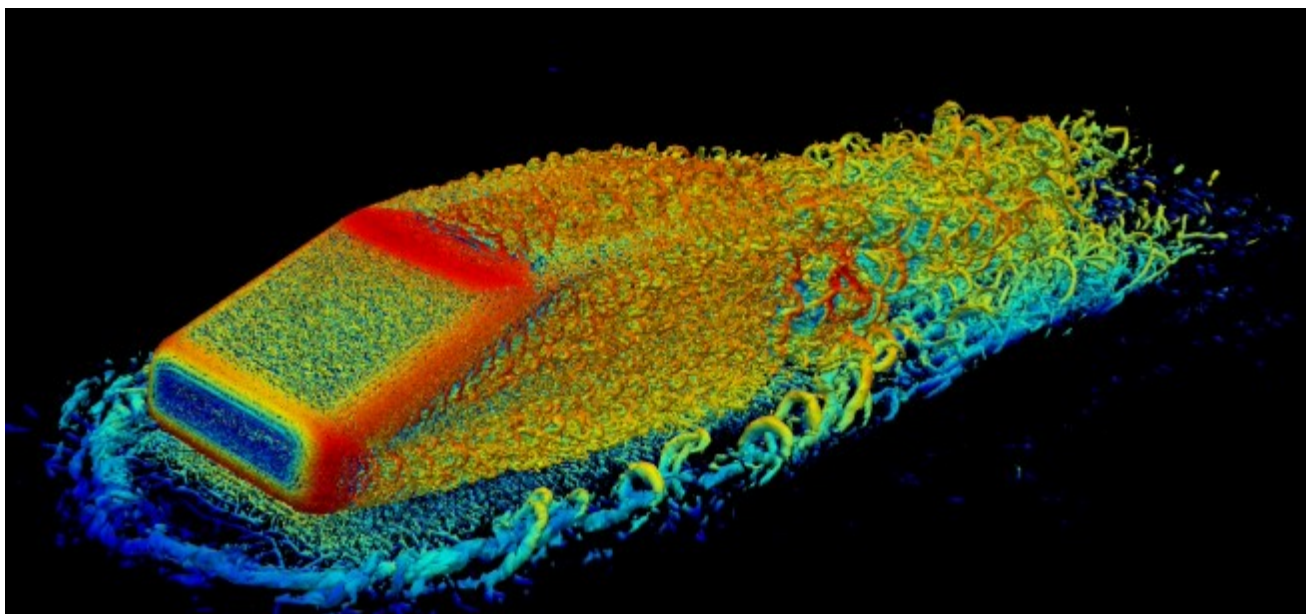
#### UPC - Prof. Enrique García-Melendo

Prof. Enrique García-Melendo discussed the Shallow Water model, the core of one of the subjects developed for APPLY projects contents, as well as its research applications.

One of the slides of Prof. Enrique García-Melendo.

#### UPC - Prof. Ivette Rodríguez

Prof. Ivette Rodríguez from UPC presented her work in Turbulence and Aerodynamics,



A slide of Prof. Ivette Rodríguez presentation.

### UPC - PhD Student Paula Betriu

UPC delegates considered interesting to present an overview of the PhD of a student. With this aim, Paula Betriu work in Mission Planning for Robotic exploration the Solar System missions was presented.

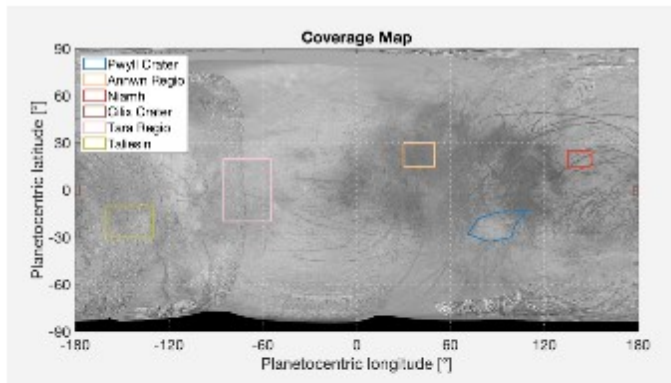


Figure 3. Sidewinder tiling algorithm

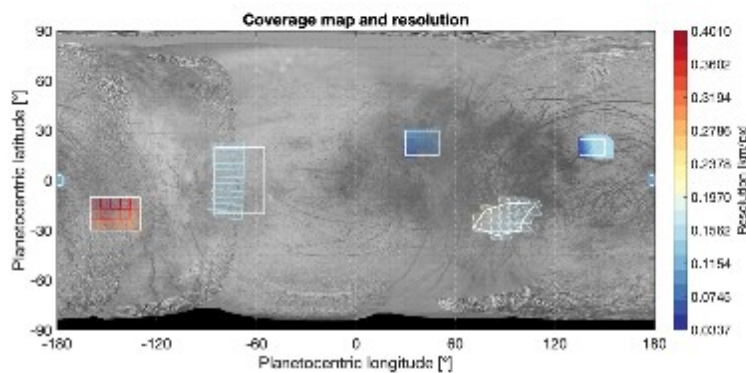


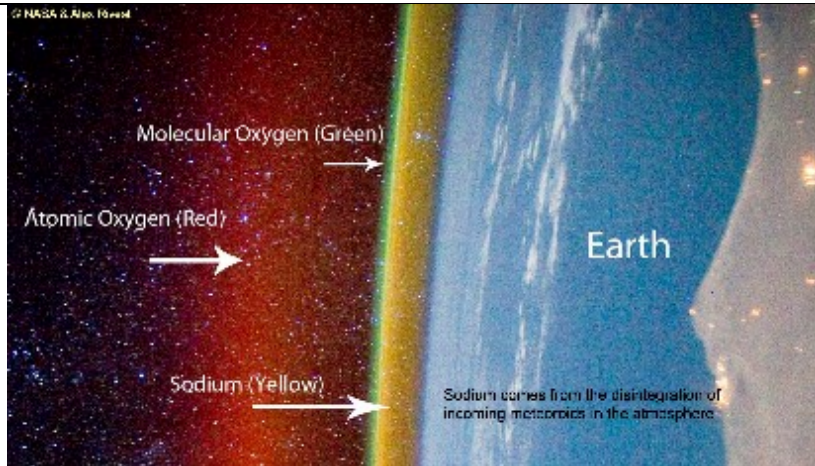
Figure 4. Mosaic resolution [km/px]

A slide of Paula Betriu presentation.

### UPC Prof. Jordi Gutiérrez

Prof. Jordi Gutiérrez of UPC described his work in Thermosphere study.





Two slides of Prof. Jordi Gutiérrez presentation.

### Chiang Mai University

Presentations by Chiang Mai University were carried out by the APPLY project coordinator, Prof. Arpiruk Hokpunna.

### Manipal Institute of Technology - Competition CFD

Manipal Institute of Technology used their presentation to start an interesting CFD challenge.

### Cranfield University

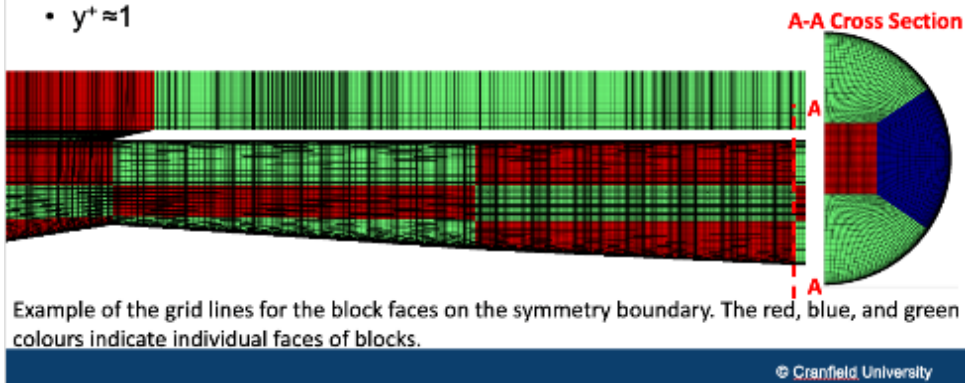
Cranfield University delegate described her research on supersonic intakes.





### Computational Grid

- Multiblock Structured Strategy
- $y^+ \approx 1$



Two slides of Cranfield University prestation.

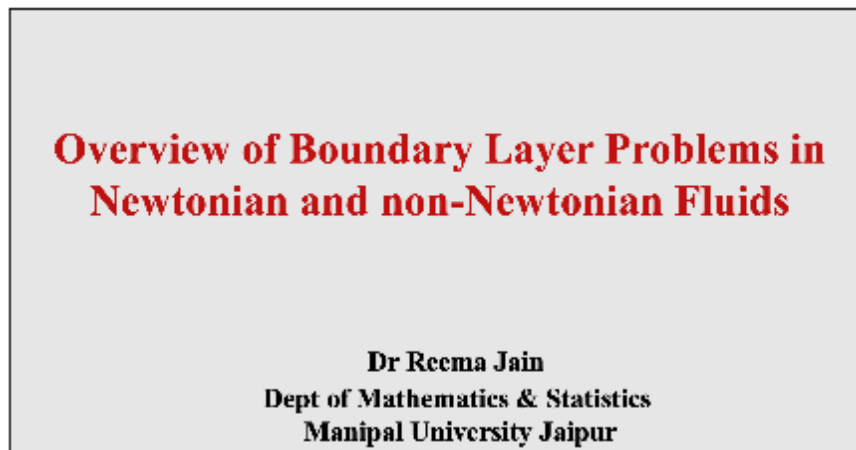
### Manipal University Jaipur

After an overview of Manipal University Jaipur, a discussion on non-Newtonian flows was carried out.

### Introduction : MUJ

*Dr. Thammiah CS*  
Pro-President, MUJ

*Dr. Nita Bhatnagar*  
Registrar, MUJ



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Two slides in the presentation by Manipal University Jaipur.

#### **UPC - Prof. Manuel Domínguez**

Prof. Manuel Domínguez from UPC presented his design for a new wind sensor intended to be used for the Mars Sample Return mission.



A slide in the presentation of Prof. Domínguez, the Curiosity Rover with the wind sensor designed and built by his group in UPC.

#### **APPLY project status and open discussion**

A long discussion of the project status, as well as the tasks remaining, directed by Prof. Arpiruk Hokpunna, closed the first day session.



### *3.4 Development of 8st June team building activities*

The third and final day of the study visit comprised a visit to the Marenostrum supercomputer plus team-building.

#### **Morning activities.**

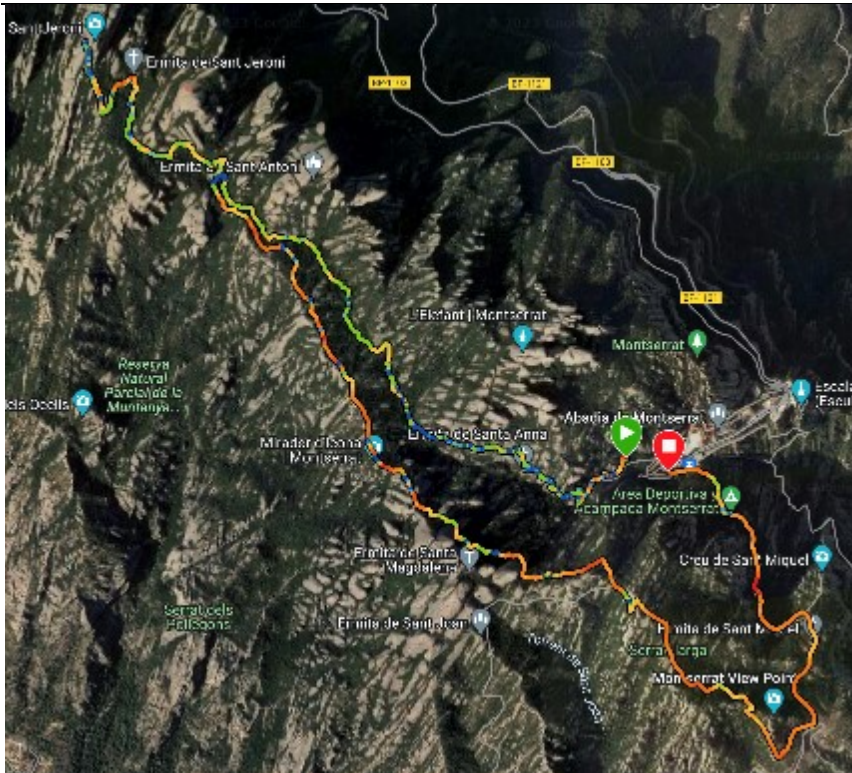
Barcelona is a very touristic city and it is not easy to arrange a visit for such a large group to any of the main sites (Sagrada Familia, La Pedrera, Sta. Maria del Mar, etc). Thus, two options were given:

- Visit any of these locations in small, self-arranged groups.
- A hiking event to the summit of Montserrat mountain.



The visits to the touristic sites were very successful. Here, interior of Sagrada Familia.

Only two brave participants, plus a local delegate of UPC joined the hiking event. Starting from Montserrat Abbey, that can be reached using public transport, a distance of 10.07 km, with a positive ascent of 542 was covered. The participants, going back by car, arrived to Barcelona in time for the visit to the Marenostrum Supercomputer.



Hiking event trajectory.



Margaret Chan Kit Yok reaching the summit.

### 3.5 Visit to the Marenostrom super computer

In the afternoon, the participants visited the Marenostrom super computer. This facility belongs to a consortium with participation of the UPC and the computer is in a former chapel. In addition of being a world-class facility, [it won the price for the most beautiful data center in 2018](#).



Two moments in the visit to Marenostrom Supercomputer.

