



# ECO-CAR NEWSLETTER

2<sup>nd</sup> Issue - July 15, 2021 - January 15, 2022

## Vocational Training Diploma on Electrical and Hybrid Vehicles / ECO-CAR 2021- 2024

### Project Facts

Type: Erasmus+ Programme

Grant Holder: The University of Jordan (UJ)

Duration: 3 Years

Start Date: 15 January 2021

UNDER "ERASMUS+ CAPACITY BUILDING IN THE FIELD OF HIGHER EDUCATION"

### Project Profile

**ECO-CAR** ECO-CAR is a 3-years project that started on the 15th January, 2021 and is co-funded by the Erasmus+ programme of the European Union. It is coordinated by The University of Jordan (UJ) with 13 Jordanian and European partners.

The main objective of ECO-CAR project is to develop a multidisciplinary diploma in the field of Electrical and Hybrid cars as well as to bring together and strengthen the cooperation between companies and HEIs.

The primary purpose of this project is to develop the capacities in the field of Electrical and Hybrid cars in Jordan, and bring together and strengthen the cooperation between companies and HEIs through empowering the engineers with needed skills that meet the market need. This include providing specialized engineers to work in servicing and maintaining EV/HEV companies and also providing the vocational training centers with qualified trainers to graduate qualified technicians that able to meet market needs.

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 Eco-Car



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# WORK PACKAGES

**WP1: Establishing university-enterprise cooperation**

**WP2: Baseline Study**

**WP3: Capacity Building**

**WP4: Establishment of EV/HEV labs**

**WP5: Developing ECO-CAR Professional Diploma**

**WP6: Quality and Impact Evaluation**

**WP7: Dissemination and Sustainability**

**WP8: Project Management**

# WP1:

## ESTABLISHING UNIVERSITY-ENTERPRISE COOPERATION

**Duration:** M1 to M6

**Lead University:** Jordan University of Science and Technology (JUST)

**Co-Lead University:** Mutah University (MU), Al-Hussein bin Abdullah II Technical University (HTU) & Universidad de la Iglesia de Deusto Entidad Religiosa (UD)

This work package aims to establish strong and lasting cooperation between universities, enterprises, and vocational training centers. These type of cooperation will help universities better understand what the expertise and qualifications for their students in HEV/EV issues should be in order to succeed and get hired once graduating. Another goal is to understand what steps and tools to be implemented in order to further advance the adoption of clean technologies in Jordan.

### WP Achievements

- Network members were identified from different locations.
- The network members were provided with the needed information about the project aims and activities.
- Creating EV/HEV Network of Community Support professionals, enterprises, vocational training centers, and organizations, it includes 74 members form Jordan and 11 EU members.
- A workshop has been conducted at The University of Jordan on 02.09.2021 with the network members to include them in the design and implementation of the project, to understand stakeholders' interests, concerns and culture, and to agree on the courses list and content.
- A visit has been conducted to one of the local maintenance centers for hybrid and electrical vehicles (Abu Khader Automotive) on 17.08.2021 to exchange knowledge and understand the market needs to be considered in the diploma development.



# WP2:

## BASELINE STUDY

**Duration:** M1 to M6

**Lead University:** Applied Science University (ASU)

**Co-Lead University:** Tafila Technical University (TTU), Al-Balqa Applied University (BAU) & Universita Degli Studi Dell'Aquila (UNIVAQ)

This WP aims to prepare and publish a guiding report that summarizes the list of needed competencies in the market in the field of EV/HEV in Jordan, the potential clean technologies in the field of transportation and their regulations. The report has been prepared based on previous studies and a questionnaire that has been prepared by the WP leader.

### WP Achievements

- A workshop with enterprises has been conducted at The University of Jordan on 02.09.2021 to review the survey analysis report that summarizes the list of needed competencies in the market in the field of EV/HEV in Jordan and agree on the final list of courses for the professional diploma.



Figure 1: Workshop with enterprises at The University of Jordan

- Based on the 5- surveys outcomes and recommendation, a research paper has been prepared by the following partners:
  - Applied Science Privet University (ASU),
  - Al-Balqaa Applied University (BAU),
  - Tafila Technical University (TTU), and
  - The University of Jordan (UJ)

**International  
Journal  
of Integrated Engineering**

Figure 2: ECO-CAR research paper is submitted to International Journal of Integrated Engineering

with title: Importance and Barriers of Establishing Educational/Training Programs in Electric Vehicles/Hybrid- Electric Vehicles EV/HEV in Jordan submitted to the International Journal of Integrated Engineering (under review).



# WP3:

## CAPACITY BUILDING

**Duration:** M5 to M33

**Lead University:** National Technical University of Athens (NTUA)

**Co-Lead University:** Co-Lead University: Applied Science University (ASU), Rheinisch-Westfaelische Technische Hochschule Aachen (RWTH Aachen) & Budapesti Muszaki es Gazdasagtudomanyi Egyetem (BME)

WP3 aims to build the capacities of professors who will teach the diploma in partner universities on different topics of EV/HEV, modern teaching methodologies, and how to actively collaborate with enterprises. Also; a group of students will have the opportunity to attend a two-week workshop in one of the participating European Countries. The students will be selected during the piloting phase of the diploma and courses integration in existing programs. Selection will be based on a prepared selection criterion.

### WP Achievements

- A long-term capacity building plan has been prepared and submitted. The plan aims to update and upgrade the skills and capacities of university professors, and technical staff, and students, in order to deliver the desired objectives. The plan includes a programme for the proposed trainings in European partner's institutions, and a quality and impact assessment prepared in cooperation with the Quality committee.
- Invite Jordanian partners to prepare online workshops in electrical and hybrid vehicles and in cooperation with their network members.
- Each European partner has presented a 2-hours online workshop (workshop topics in electrical and hybrid vehicles) to the following targeted groups: ECO- CAR project team members, academics and students in the field of Mechanical, Electrical, and Mechatronics Engineering, ECO-CAR networking members, and stakeholders in the field of EV/HEV vehicles. The presented workshops subjects were selected according to the expertise of each European University in the field of EV / HE vehicles, as shown in Table 1:

Table 1: ECO-CAR Online Workshops

Universities	Subject	DATES
UNIVAQ	Introduction on Internal Combustion Engines in Hybrid Vehicles and Well to Wheel LCA Calculation	13th of September, 2021
NTUA	Dynamics of Vehicle, active and passive safety	5th of November, 2021
BME	Internal Combustion Engines in Hybrid Drivetrain Systems	17th of November, 2021
UD	Vibroacoustic Comfort in Road Vehicles	2nd of December, 2021
TH-OWL	Charge Transport in Batteries and Hydrogen Vehicles	20th of December, 2021





# INTRODUCTION ON INTERNAL COMBUSTION ENGINES IN HYBRID VEHICLES AND WELL TO WHEEL LCA CALCULATION WORKSHOP

**ECO-CAR WORKSHOP**  
"Introduction on Internal Combustion Engines in Hybrid Vehicles and Well to Wheel LCA Calculation"  
Presented by UNIVAQ - Italy

Monday 13/09/2021

9:45-10:00 : Registration  
10:00-10:10 : Welcoming Speech, by: Prof. Ahmed Al-Salaymeh, General Project Coordinator at The University of Jordan  
10:10-11:10 : "Internal Combustion Engines in Hybrid Vehicles" by: Prof. Michele Anacone, UNIVAQ  
11:10-12:10 : "Well to Wheel LCA Assessment" by: Prof. Carlo Viazani, UNIVAQ  
12:10-12:30 : Discussion and Closing

Join us & Register here:  
<https://bit.ly/3DS6Ek0>  
E-mail: [eco-car@ju.edu.jo](mailto:eco-car@ju.edu.jo)

The workshop was conducted on 13th of September, 2021 by University of L'Aquila (UNIVAQ) from Italy.

The 2-hours workshop was conducted via ZOOM and titled "Introduction on Internal Combustion Engines in Hybrid Vehicles and Well to Wheel LCA Calculation" with more than 80 participants.

# DYNAMICS OF VEHICLE, ACTIVE AND PASSIVE SAFETY WORKSHOP

**ECO-CAR Workshop**  
Vehicle Dynamics Fundamentals  
Presented by: NTUA - Greece

Friday, November 05, 15:00-17:00 PM (Amman time)

14:45 - 15:00 : Registration  
15:00 - 15:10 : Welcoming Speech, by: Prof. Ahmed Al-Salaymeh, General Project Coordinator at The University of Jordan  
15:10 - 16:00 : "The Role of Vehicle Dynamics in Ground Vehicles Development" by: Assoc. Prof. D. Koulocheris, NTUA  
16:00 - 16:50 : "Introduction to Applications for Vehicle Dynamics: TruckSim" by: Dr.-Ing. Clio Vossou, NTUA  
16:50 - 17:00 : Discussion and Closing

Join us & Register here:  
<https://bit.ly/3BB3Sgx>  
E-mail: [eco-car@ju.edu.jo](mailto:eco-car@ju.edu.jo)

The workshop was conducted on 5th of November, 2021 by National Technical University of Athens (NTUA) from Greece.

The workshop 2-hours workshop was conducted via ZOOM and titled "Dynamics of Vehicle, active and passive safety" with more than 65 participants.

# INTERNAL COMBUSTION ENGINES IN HYBRID DRIVETRAIN SYSTEMS WORKSHOP

**ECO-CAR Workshop**  
Internal Combustion Engines in Hybrid Drivetrain Systems  
Presented by: BME University - Hungary

Wednesday, November 17, 11:00 AM (Amman time)

10:45-11:00 : Registration  
11:00-11:15 : Welcoming Speech, by: Prof. Ahmed Al-Salaymeh, General Project Coordinator at The University of Jordan  
11:15-12:00 : Modelling and Design of up-to-date Internal Combustion Engines  
12:00-12:05 : Break  
12:05-12:45 : Hybrid Drivetrain Systems  
12:45-13:00 : Discussion and Closing

Presenter: Adam Nerves, Vehicle Engineer, BME

Join us & Register here:  
<https://bit.ly/3n3U76E>

The workshop was conducted on 17th of November, 2021 by Budapest University of Technology and Economics (BME) from Hungary.

The 2-hours workshop was conducted via ZOOM and titled "Internal Combustion Engines in Hybrid Drivetrain Systems" with more than 66 participants.



# VIBROACOUSTIC COMFORT IN ROAD VEHICLES WORKSHOP

**Deusto** **ECO-CAR Workshop**  
**Vibroacoustic Comfort in Road Vehicles**  
 Presented by: University of Deusto (UD) - Spain

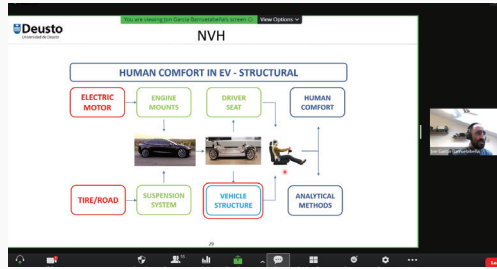
Thursday, December 02, at 17:00 (Amman time)

16:45-17:00 : Registration  
 17:00-17:15 : Welcoming Speech, by: Prof. Ahmed Al-Salaymeh, General Project Coordinator at The University of Jordan  
 17:15-18:00 : Vibroacoustic Comfort in Road Vehicles using CarMaker-Simulink  
 18:00-18:05 : Break  
 18:05-18:45 : Vibroacoustic Comfort in Road Vehicles using CarMaker-Simulink  
 18:45-19:00 : Discussion and Closing

Presenter: Jon Garcia-Barriola, Director of the Master's Degree in Automotive Design and Manufacturing - University of Deusto

Co-funded by the Erasmus Programme of the European Union

Join us & Register here: <https://bit.ly/3xfadV9>

The workshop was conducted on 2nd of December, 2021 by University of Deusto (UD) from Spain. The 2-hours workshop was conducted via ZOOM and titled “Vibroacoustic Comfort in Road Vehicles” with more than 58 participants.

# CHARGE TRANSPORT IN BATTERIES AND HYDROGEN VEHICLES WORKSHOP

**TH OWL** **ECO-CAR Workshop**  
**Charge Transport in Batteries and Hydrogen Vehicles**  
 Presented by: Technische Hochschule Ostwestfalen-Lippe (TH-OWL) - Germany

Monday, December 20, at 16:00 (Amman time)

15:45-16:00 : Registration  
 16:00-16:15 : Welcoming Speech, by: Prof. Ahmed Al-Salaymeh, General Project Coordinator at The University of Jordan  
 16:15-17:15 : Hydrogen Vehicles; State of the Art and Perspectives, by: Prof. Salman Ajib, TH-OWL  
 17:15-18:15 : Charge Transport in Batteries, by: Dr. Sabine Brunklaus, TH-OWL  
 18:15-18:30 : Discussion and Closing

Co-funded by the Erasmus Programme of the European Union

Join us & Register here: <https://bit.ly/3DQv04L>




**Hydrogen vehicles**

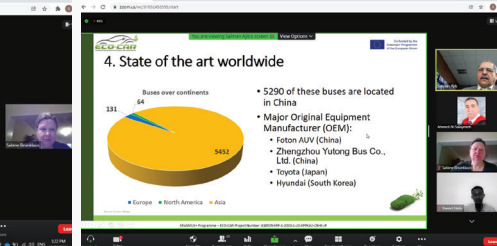
Prof. Dr.-Ing. habil. Salman Ajib (TH OWL)  
 in cooperation with  
 Ba.-Eng. Henrik Magnus Harmeling  
 Höxter, 20th December 2021

The workshop was conducted on 20th of December, 2021 by Technische Hochschule Ostwestfalen-Lippe - University of Applied Sciences and Arts (TH-OWL) from Germany.

**Requirements: Batteries in Electrical Vehicles**

- Energy density: > 750 Wh/L & > 350 Wh/kg for cells (currently: <)
- Cost: ≤ \$100/kWh for cells (currently: ~\$200/kWh per pack)
- Fast Charge and Power: 80 % state of charge (ΔSOC) in 15 min (currently: hours)
- Life: 15 years
- Power capability: differs for vehicle type (compromise cost/energy density)
- Performance: Minimum impact by environment
- Safety: No fire/flame/rupture/explosion

Reference: Juchacz et al., 2019, A. Buss, 3 (2020), Pages 113-119



The 2.5-hours workshop was conducted via ZOOM and titled “Charge Transport in Batteries and Hydrogen Vehicles” with more than 52 participants.





# WP4:

## ESTABLISHMENT OF EV/HEV LABS

**Duration:** M6 to M21

**Lead University:** Al-Balqa Applied University (BAU)

**Co-Lead University:** The University of Jordan (UJ), Jordan University of Science and Technology (JUST) & National Technical University of Athens (NTUA)

The aim of this work package is to establish 8 EV/HEV labs at each partner university to support the diploma teaching for students. The aim of this work package is to set up the needed scientific labs and smart classrooms to be used by the students during their study.

The established laboratories will bring on the following activities:

- 1) Assisting teaching of ECO-CAR diploma Students
- 2) Research, in collaboration with the other faculties and/or industry
- 3) Vocational training for external experts
- 4) External services: advices for industries and final users

### WP Achievements

- A list of the needed equipment for ECO-CAR centers has been prepared for each local partner country.
- Field Visit to the local maintenance centers for hybrid and electrical vehicles (Abu Khader Automotive) on 17.08.2021 to study the requested skills by the local market in the field of EV/HEV maintenance.
- ECO-CAR equipment central tender was published and studied by The University of Jordan. Finally, it is now in the level of officially purchasing the equipment.
- Start preparing for ECO-CAR centers/labs that will host the equipment in each university. Also, BAU Provided each partner by the equipment list they will receive.



Figure 3: ECO-CAR field visit to Abu Khader Automotive maintenance centers

## WP5:

# DEVELOPING ECO-CAR PROFESSIONAL DIPLOMA

**Duration:** M4 to M34

**Lead University:** Budapesti Muszaki es Gazdasagtudomanyi Egyetem (BME)

**Co-Lead University:** The University of Jordan (UJ), Technische Hochschule Ostwestfalen-LIPPE (TH-OWL), Rheinisch-Westfaelische Technische Hochschule Aachen (RWTH Aachen) & Universita Degli Studi Dell'aquila (UNIVAQ)

This WP aims to develop and pilot ECO-CAR Professional Diploma in each partner university in Jordan; the activities will start by developing the study plan with courses descriptions to be submitted for accreditation purposes. The accreditation will be done according to the national accreditation system and the specific instruction in each university. The diploma will consist of 8 courses in (24 Credit Hours= 40 ECTS) that will be implemented in each participating university. The courses will be developed by establishing committees consisting from representatives from European universities, partner universities, and Enterprises. During the period of preparing the study plan, the workshop with enterprises in WP2 will be conducted with enterprises to get their feedback on the study plan and courses list.

### WP Achievements

- The final list of courses has been selected for ECO-CAR diplomas: Professional, Community College, and Vocational diploma based on WP2 report results
- Prepared Program Learning Outcomes (PLOs) for ECO-CAR 3 diplomas
- Developed diploma study plan and courses description by establishing courses clusters (courses mapping upon the study area)
- Prepared a course outline template include ECTS component and learning outcomes
- Prepared the courses outlines for the 3 diplomas



# WP6:

## QUALITY AND IMPACT EVALUATION

**Duration:** M1 to M36

**Lead University:** Universidad de la Iglesia de Deusto Entidad Religiosa (UD)

**Co-Lead University:** Tafila Technical University (TTU), Al-Zaytoonah University of Jordan (ZUJ) & Budapesti Muszaki es Gazdasagtudományi Egyetem (BME)

A Quality Assurance and Evaluation Plan will be elaborated by the Quality Committee, that has been established during the Kick-Off meeting. The plan will investigate the quality standards of the different partner universities and standardize them in a shared approach. The detailed plan will be a reference to manage the project effectively and to assess the performance. Quality control for all work packages will be applied. Evaluation surveys will be developed within this work package to guarantee a high level of quality at the different universities.

### WP Achievements

- Online evaluation links for all meetings, workshops and they were circulated to partners and participants after each event
- ECO-CAR project will count on the support of an External Evaluator to provide constant and independent information about the development and implementation of project activities. The External Evaluator will conduct constructive evaluation by working according to the terms of reference and the criteria defined in the Quality Assurance and Evaluation Plan. The terms of reference have been prepared and published. Technical and financial offers received and evaluated. Selection process ongoing.



## WP7:

# DISSEMINATION AND SUSTAINABILITY

**Duration:** M1 to M36

**Lead University:** Al Hussein Technical University (HTU)

**Co-Lead University:** Mutah University (MU), Al-Zaytoonah University of Jordan (ZUJ) & Technische Hochschule Ostwestfalen-LIPPE (TH-OWL)

The aim of this work package is to effectively disseminate information of the activities of the project and to communicate its outcomes to multiple audience including the media and the public. A variety of dissemination activities will be conducted that include webpage, social networks, courses video presentation, electronic and printed material, dissemination seminars (2 in each partner university), participation in events to promote the diploma.

### WP Achievements

- Dissemination and Sustainability Plan have been updated
- A tender for ECO-CAR dissemination materials has been published and best offer was selected. Therefore, the process of printing and producing ECO-CAR dissemination materials has started.
- Tester course workshop was established at The University of Jordan on 02.09.2021 with more than 50 participants from stakeholders and ECO-CAR local partners



ECO-CAR workshop with Stakeholders and enterprises at the University of Jordan





# WP8:

## PROJECT MANAGEMENT

**Duration:** M1 to M36

**Lead University:** The University of Jordan (UJ)

To ensure an accurate and effective management on a daily basis, a project management team, responsible for financial, operational and day-to-day management and keeping track records of all project activities.

### WP Achievements

- Five management meetings were conducted from mid of July till mid of January
- Regular communication is conducting by e-mail and shared electronic database
- 2nd progress report for the second half of the first year of ECO-CAR project is collected from each WP leader
- Start preparing for Steering and Scientific Committee meeting in National Technical University of Athens (NTUA) in Greece in March, 2022







# MANAGEMENT MEETINGS

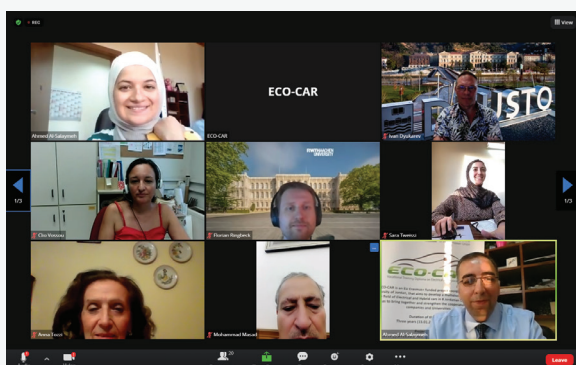
**The 5th online Management Meeting**  
**The 6th online Management Meeting**  
**The 7th online Management Meeting**  
**The 8th online Management Meeting**

# THE 5TH ONLINE MANAGEMENT MEETING

A 2-hours online meeting was conducted on 26th of July, 2021 with the project partners. The meeting started by a welcome speech from the project coordinator and viewing the agenda of the meeting by Prof. Ahmed Al-Salaymeh.

Each WP leader presented the progress of the work package and its action plan. Each WP leader listed with the other partners the upcoming tasks under the presented WP. The main focus points were:

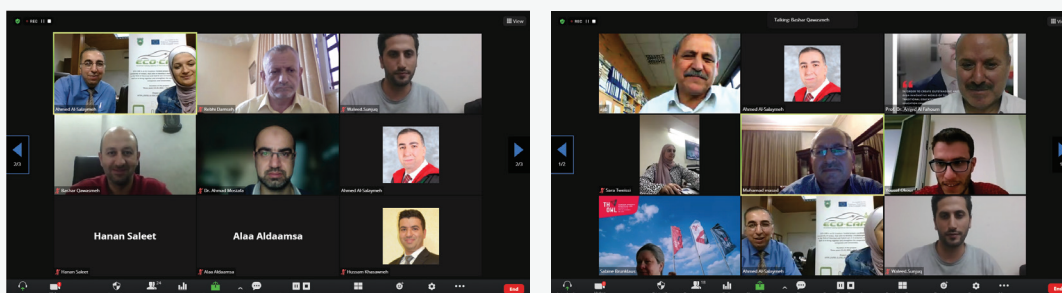
- More stakeholders are needed from Jordanian and European partners
- Schedule the 3rd networking workshop (to approve the selected courses)
- Start for preparing the scientific paper based on the survey analysis results
- Next online capacity building workshop will be by UNIVAQ
- The tendering process is now in the level of announcement (publishing in newspapers)
- Focus Groups has to submit the final list of the courses. In addition to prepare the 1st draft of the short description of the courses
- A workshop will be conducting with the focus groups to set the final lists of the courses based on WP2 results with their description, courses outlines, and outcomes
- WP leader will prepare a study plan template with learning outcomes
- Preparing a course outline template include ECTS component and learning outcomes
- Conduct online meeting with the quality committee for the purpose of Hiring External Evaluator
- Collect feedback on the Quality Assurance and Evaluation Plan
- Collect feedback on the Dissemination and Sustainability plan
- Establish regulations for Steering and Scientific Committees



# THE 6TH ONLINE MANAGEMENT MEETING

A 2-hours online meeting was conducted on 8th of September with the project partners. Each WP leader presented the progress of the work package and its action plan. Each WP leader listed with the other partners the upcoming tasks under the presented WP. The main focus points were:

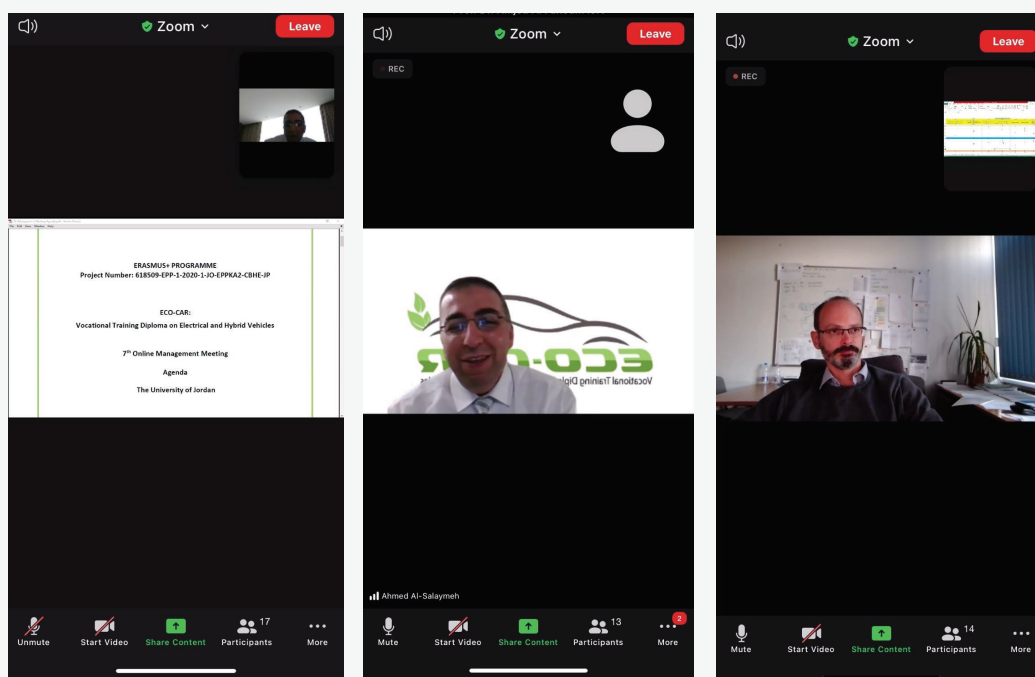
- Final version of the surveys analysis report has been submitted and approved by all partners and stakeholders
- Submit updated “Capacity Building Plan” report
- The tendering process is now in the level of starting studying the submitted offers.
- UJ has started the process of hosting the server
- The 3 focus groups have submitted their courses lists and the short description of the courses and were approved by the partners and stakeholders
- A meeting was conducted with the focus groups at UJ to start the courses clustering process
- A total of 9 clusters were created and distributing the courses among the clusters with the responsible team members
- An email will be sent to the project officer to select the EE



# THE 7TH ONLINE MANAGEMENT MEETING

A 2-hours online meeting was conducted on 4th of October with the project partners. Each WP leader presented the progress of the work package and its action plan. Each WP leader listed with the other partners the upcoming tasks under the presented WP. The main focus points were:

- Update the registered members in ECO-CAR network
- Start preparing for the teaching material for staff workshops (Set outlines, objectives, goals, teaching methods, etc.)
- Next online capacity building workshop will be by NTUA
- Start selecting the location of ECO-CAR centers at each local participated partner to host the equipment
- Submit the Quality Assurance and Evaluation Plan after collecting the feedback
- Submit the 1st newsletter and will distribute it to the partners to collect their feedback
- Schedule the upcoming steering committee meeting at NTUA – Greece

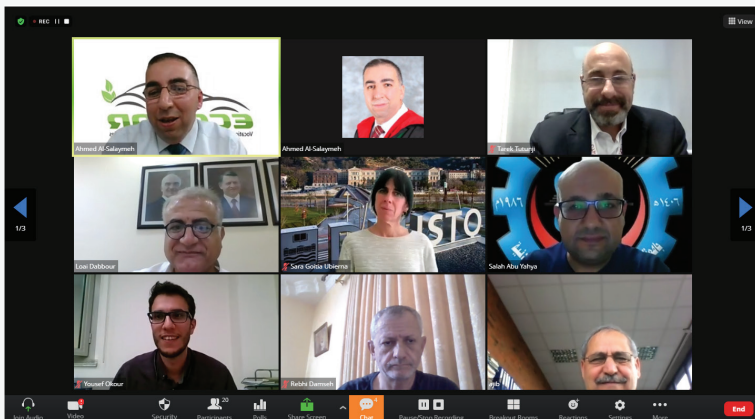


# THE 8TH ONLINE MANAGEMENT MEETING

A 2-hours online meeting was conducted on 9th of November, 2021 with the project partners. Each WP leader presented the progress of the work package and its action plan. Each WP leader listed with the other partners the upcoming tasks under the presented WP.

The main focus points were:

- Most of Jordanian partners have closed the target for ECO-CAR Network and more members are needed by EU partners
- Sign collaboration agreements with enterprises and training centres for internships, hiring graduates, lecturing in university etc. to achieve the benefit for both parties
- ECO-CAR scientific paper will be finalized
- Next online capacity building workshops will be by BME, UD, and TH-OWL
- The tendering process is now in the level of officially selecting and announcing the awarded company from the three received offers and purchasing the equipment
- Start preparing for the manual (depends on the received equipment)
- Prepare a template for collecting data of the ECO-CAR centers/labs that will host the equipment in each university contains collecting information of the location, center area, staff, other equipment (already exist in the lab/center) and department
- Provide each partner by the equipment list they will receive
- Prepare ECO-CAR courses outlines by filling the ECO-CAR template
- HTU will update the website content in cooperation with UJ
- Start preparing for marketing plan in cooperation with other co-leaders

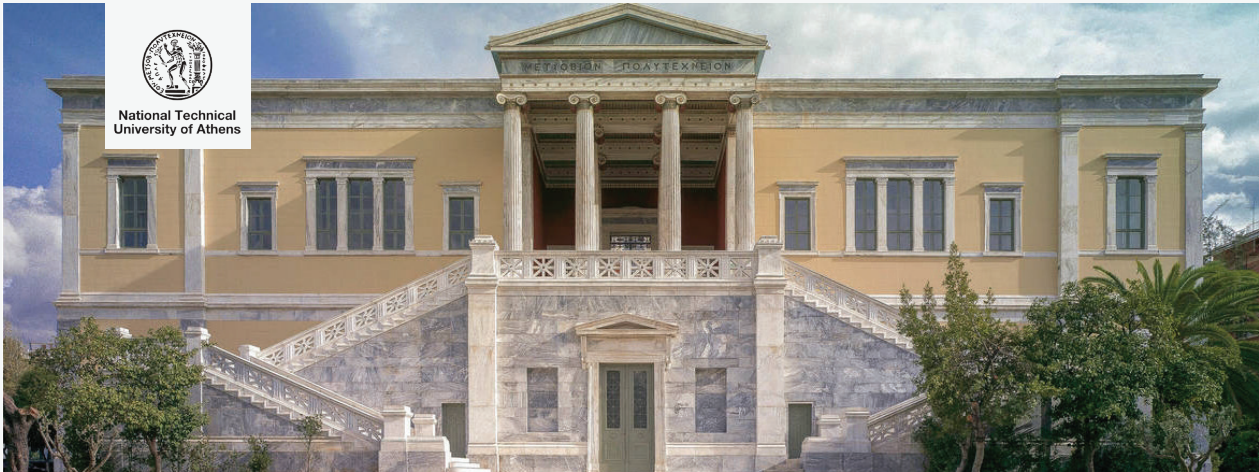






# UPCOMING MEETINGS

The Second Steering Committee meeting will take place at Athens- Greece at our partner university National Technical University of Athens (NTUA) in March 2022. The meeting will be held to discuss and follow-up the project deliverables. Also, special session will be conducted for ECO-CAR Diploma Work package and taking decisions about the activities to be implemented as well as on the Action as a whole.



# ACHIEVEMENTS

Project partners conducted Baseline case study in order to identify the necessary competencies in the field of Electrical and Hybrid Vehicles in Jordan. 5 Surveys were distributed to students, academic staff members, and stakeholders and final report was prepared. EV/HEV Network was created for enterprises, vocational training centers, and organizations involved in the field. It includes 74 members from Jordan and 9 EU members. Also, 5 capacity building and networking workshops were held online by EU partners in the field of EV/HEV, in addition to a physical workshop with local stakeholders in which ECO-CAR project was presented and list of courses was confirmed to meet the market need. Capacity building plan and Quality Assurance and Evaluation Plan are submitted. Equipment list was identified and tendering process is in the level of officially selecting and announcing the awarded company from the three received offers and purchasing the equipment. Eight EV/HEV centers will be established at partner universities in Jordan. Each partner university will establish at least one diploma (professional, community-college, and vocational) and update already existing engineering courses and integrate them within the curricula.

