

ABSTRACT

The main objective of WP3 is to build the capacities of the professors who will teach the diploma in the Partner Universities, hence it has three tasks. Task 3.1 consists of the Capacity Building Plan, Task 3.2 focuses on the development of the training material and Task 3.3 includes the Workshops that will be performed in order to build the capacities of the professors in the field of EV/HEV. In this report (Task 3.1) the scope and the objectives of the ECO-CAR project capacity building plan are stated. Then the steps of the capacity building process are described in details. This report concludes with the scheduling of the workshops for the academic staff that will take place within Task 3.3 and are the main part of the capacity building activities.

ECO-CAR Vocational Training Diploma on Electrical and Hybrid Vehicles

ECO-CAR Vocational Training Diploma on Electrical and Hybrid Vehicles	
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1 Background

Jordan is adopting renewable energy due to the scarcity of fossil fuels to reduce Government spending on energy imports and moving towards a low-emission or zero-emission transport sector. The Government is aiming to make the consumers aware and provide them incentives for the usage of electric vehicles. Moreover, increasing the number of charging stations to help the end-users to recharge their vehicle's batteries easily would act as a key driver for the growth of the electric vehicle market in the country.

In 2019, the Government reduced the taxes on Electric vehicles and Hybrid Electric vehicles (EV/HEV) which in turn will increase their sales in Jordan market. The size of Electric Vehicle Market in Jordan is projected to grow at a Compound Annual Growth Rate (CAGR) of 34.0% during 2019-2025. The significant investment being made for the implementation of the Jordan National Vision 2025 initiative by the Government to support green and clean energy projects such as the installation of 3,000 charging stations in several parts of the country and lower taxes as compared to conventional and hybrid vehicles.

The ECO-CAR project is meeting the two important National priorities, the first aims at developing Curriculum in the field of EV/HEV, electronics and automation and the second aims to improve the University – Enterprise cooperation. Erasmus+ program brings the opportunity to transfer the European experience in this field, as the consortium includes many high-level European universities who are experts in the project field. The support under Erasmus+ program is very necessary and required for the project to induce and secure the needed equipment and facilities to enhance teaching and training skills.

This project focuses on building the capacities of Teaching, and Technical staff (lab technicians) who will teach the diploma through implementing training workshops by the European partners and conducting visits to their facilities. The established EV/HEV labs will support the diploma teaching. Some modules of the developed courses will be integrated in the existing programs. It is predicted that these specific objectives will contribute to a sustainable outcome that will promote curriculum reforms in technical vocational education and training institutes and colleges, through graduating trainers in the field of EV/HEV.

1.1 Aims and objectives of the ECO-CAR project

The main aims and objectives of ECO-CAR project can be summarized as follows:

1. Increase the employability of Engineers in Local and International Market through training them on the needed skills in the field of EV and HEV
2. Reduce air pollution and mitigate climate change impact on Jordan, through increasing the attention for using EV/HEV
3. Enhance the quality of vocational training provided in the vocational training centers, through employing the trained engineers in those centers, this could be achieved within the project through signing cooperation agreements with these training centers.
4. Improve the level of provided services for repairing and maintaining EV/HEV in Jordanian enterprises.
5. Satisfying industry and economical needs by empowering engineers.
6. Helping to move Jordan forward to become a host for EV/HEV industry in future.

1.2 Organization of Work Package 3 (WP3)

The Leader of WP3 is Vehicles Laboratory of the National Technical University of Athens (NTUA) and the co-leaders are Applied Science Private University (ASU), RWTH Aachen University (RWTH) and Budapest University of Technology and Economics (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. Furthermore, a group of students will have the opportunity to attend a two-week workshop in each of the participating European Countries.

This WP is divided into three (3) tasks. The first task (3.1) deals with the preparation of the capacity building plan. Task 3.2 includes the preparation of the teaching materials for the workshops that will be conducted to build the capacities of the teaching and technical staff. The workshops for the teaching and technical staff will be conducted within the second year before piloting the diploma and are part of Task 3.3. In more details, six (6) training workshops will be conducted by the European partners (TH-OWL, RWTH Aachen, UD, BME, NTUA). Task 3.3 also includes the two-week training workshops that will be conducted for students in partner European universities.

1.3 Scope of Task 3.1

The scope of Task 3.1 is the preparation of the Capacity Building Plan. In order to do so, the basic aspects and key points of capacity building plans were reviewed. Then, a methodology for the specific Capacity Building Plan is established and followed.

Within this task and based on discussions with the Project Coordinator, a questionnaire was produced by WP3 leader in order to track the expertise of the European Universities as well as their time availability to conduct the workshops. The draft questionnaire was sent to the quality committee in ECO-CAR to ensure the eligibility and the compliance with Erasmus+ spirit and regulations. WP3 leading University distributed the questionnaire to all the Partner European Universities.

2 Capacity Building Plan

The term “Capacity Building” stands for the efforts made to improve the problem-solving capability of organizations, institutions or individuals. This includes, that donor organizations are not going to solve existing problems on their own. Instead, their work should be of an educational, consultative and supportive nature. Within the ECO-CAR project, the capacity building is defined as enhancing the capacities of university professors to undertake and disseminate high quality teaching in the field of EV/HEV Technology. Following this definition, the term of Capacity Building can be considered as human resource development that involve the educational development of academics to instruct relevant academic courses.

A good Capacity Building Plan (CBP) should display the following characteristics and should be built upon the following principles:

- *Capacity Building is a process* that needs to be dynamic and requires continuous planning, action and adaption of experiences in order to be effective.
- *Capacity Building should be based on existing processes to strengthen them.* Therefore, the CBP should be built upon existing strengths and assets.
- *Capacity Building should pay attention to the context.* The capacity building strategy must be linked to the context of the organization. The needs for its skills and resources have to be regularly assessed.

2.1 Scope of the ECO-CAR CBP

The scope of CBP is to build the capacities of professors who will teach the diploma in Jordanian universities, on:

- different topics of EV/HEV,
- modern teaching methodologies and
- how to actively collaborate with enterprises.

Therefore, the CBP which is designed by NTUA in close cooperation with the Co-Leaders of WP3 Universities (ASU, RWTH, BME) as well as all other project partners, it includes:

- 6 Training workshops for teaching and technical staff which will be conducted within the second year with duration of 1 week.
- Training workshops for students with duration of 2 weeks.

All workshops will be conducted in the participating European Countries. Workshops for professors will be conducted before piloting the diploma while the students will be selected during the piloting phase of the diploma. Within the CBP, also the selection criteria for staff and students who will participate in the workshops have to be defined.

The focus of the workshops will be to upgrade the skills and the capacities in the field of EV/HEV concepts by providing exposure to theoretical and practical training, experiments and equipment. The activities related to capacity building will include actual training on experiment and laboratory running which will be organized for professors, technicians and students.

2.2 Objectives of the ECO-CAR CBP

The objectives of the CBP include:

- Development of a Long-Term Capacity Building Plan to build human resource capacity including university professors, technical assistants and students with upgraded skills in the field of EV/HEV.
- Selection of training staff and students.
- Training sessions for teaching staff from Jordan at European partner universities.
- Training sessions for students from Jordan at European partner universities.

2.3 Partners of the ECO-CAR CBP

To achieve the project's objectives, the main focus of the activities will be on developing human resources and upgrading skills and capacities by providing exposure to practical training, experiments and equipment. This will include actual training on experiment and laboratory running which will be organized for professors, technicians and students. The partners who will be trained are shown as shaded in the table below (Table 1).

Table 1. Participating organizations

University	Country	Acronym
University of Jordan	Jordan	UJ
Jordan University of Science and Technology	Jordan	JUST
Mutah University	Jordan	MUTAH
Tafila Technical University	Jordan	TTU
AlBalqa'a Applied University	Jordan	BAU
AlHussein Technical University	Jordan	HTU
Applied Science Private University	Jordan	ASU
Al-Zaytoonah University of Jordan	Jordan	ZUJ
Technische Hochschule Ostwestfalen-Lippe / Standort Höxter	Germany	TH OWL
RWTH Aachen University	Germany	RWTH
University of Deusto	Spain	UD
Budapest University of Technology and Economics	Hungary	BME
National Technical University of Athens	Greece	NTUA
L' Aquila University	Italy	UNIVAQ

2.4 Roles and Responsibilities in the ECO-CAR CBP

The following table (Table 2) summarizes the roles and responsibilities of the partners involved in the project's CBP.

Table 2. Roles and Responsibilities during Capacity Building

Role	Responsibility
Project Coordinator (UJ)	Review and approve the Capacity Building Plan
	Coordinate and manage the project activities and insure the implementation of the activities
WP Leader (NTUA)	Development of a Capacity Building Plan

	Definition of the selection criteria for staff and students who should be taught at European partner universities
	Preparation of a timetable for the training workshops
WP Co-leaders (ASU, RWTH, BME)	Review the Capacity Building Plan and assist in its development
	Implement action items from quality reviews

2.5 Duration of ECO-CAR CBP

ECO-CAR CBP will run for almost the entire project duration. It starts at 15th May, 2021 and ends at 14th November, 2022.

2.6 Language of ECO-CAR CBP

The main language to be used for internal communications is English. Furthermore, the produced teaching material within this work package will be prepared in English.

2.7 Maintaining the ECO-CAR CBP

The capacity building plan should be at a current stand over most of the project lifetime. Therefore, it is necessary, that the leader of WP3 identifies and implements required revisions for the plan. The leader also has to be in constant communication with all European partners to check the availability for hosting the workshops. This is a true challenge for the ECO-CAR CBP under the current situation with the COVID-19 pandemic.

3 Capacity building process for ECO-CAR Project

For the development of the ECO-CAR CBP an effective five-step approach based on the approach of the United Nations Development Program (UNDP) has been followed.

The first step in an effective capacity building process is to *encourage participation by all those who are involved* (stakeholders). Given that, the aims and the strategy of the plan can be brought into line with the stakeholder's expectations. The second step includes the *assessment of capacity assets and needs*. In order to build the desired capacity on an individual and an institutional level, the main strengths and weaknesses should be identified on both levels. The *formulation of a capacity development response* is the third step. This step is based on the preceding capacity and needs assessment since the response should build on existing capacity assets to address the gaps identified in a capacity assessment. The response is a collection of capacity development actions that need to be formulated (defined and planned). In order to proceed in this step, the following questions have to be answered:

- What skills and knowledge (capacity) are needed to reach the aims?
- What are the proper capacity development actions?
- How many individuals have to participate in the capacity development actions?

In the fourth step *the capacity building plan is implemented* and start action. The key roles of all partners are defined and the planned actions are executed. During the fifth and final step *the effectiveness of the capacity building plan and the capacity development are monitored and evaluated*. The framework of monitoring and evaluation has to be comprehensive enough to capture the key issues, yet not too extensive to handle them. In order to sustain the CBP this approach has to be implemented in an iterative way as it is displayed schematically in the following figure (Figure 1).

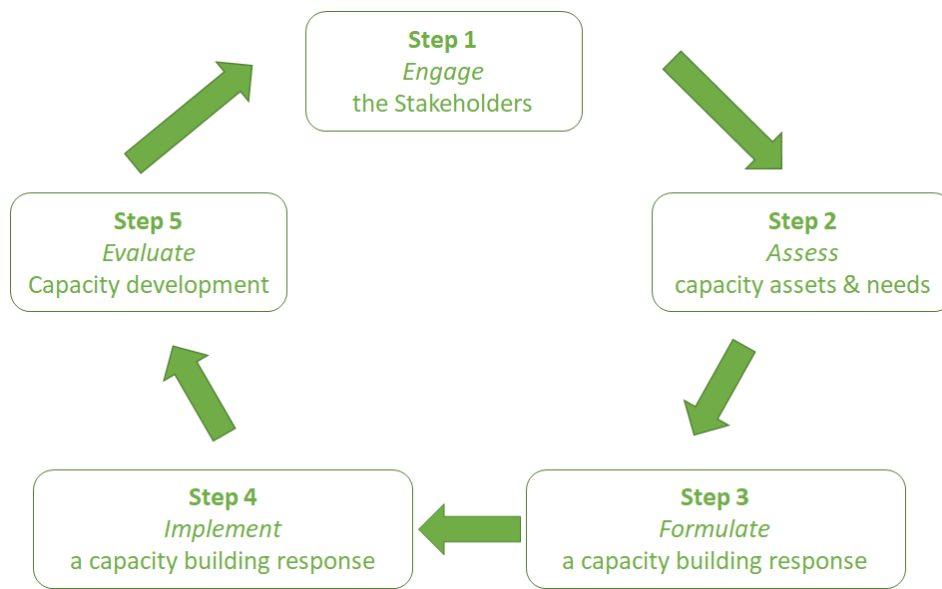


Figure 1. Capacity Building Process schematic

The iterative nature of CB must be reflected both in implementation and in a greater degree of flexibility in M&E approaches.

Capacity building should always be characterized by local ownership; hence, the European partners will act advisory and supportive. There will be distance consultations as well as face to face consultations within the project. For the face-to-face consultations there will be academic and study visits to the European host organizations.

3.1 Step 1: Engage stakeholders on capacity development

The engagement of the stakeholders to the ECO-CAR project was carried out in WP1 with a developed and disseminated partnership agreement. The agreement includes an explanation of the project's aims and benefits and it was provided in English and Arabic Languages. All partners were informed about the stakeholders who signed the agreement.

3.2 Step 2: Assess capacity assets and needs

The appraisal of the current situation was performed in WP2 and specifically during Task 2.1. Within this task a scoping and needs analysis has been developed. The investigation did commence with surveys and interviews with faculties and students, focusing on the academic programs offered in the Partner Universities in the field of engineering, and appropriate stakeholders, including enterprises and Governmental bodies. These analyses have been shared with all partners and integrated into the present capacity building plan. The most helpful findings for the CPB are summarized below.

3.2.1 Partner survey

Seven partners prefer to have vocational diploma while University of Jordan (UJ) prefer to have higher diploma. Majority of the partners agreed to the proposed suggestions about the content and duration of the four programs that can be established by ECO-CAR. In addition, majority of the partners agreed to the suggested roles that the programs graduates may participate in enhancing the services related to EV/HEV.

3.2.2 Faculty survey

The main findings through the faculty survey concerned the teaching and laboratory staff. Through the delivered questionnaires it was shown that ECO-CAR project is important to improve the curriculum structure and to help design EV/HEV courses that can be used by the faculty members to teach the students up to date technology. Furthermore, this project can contribute to the capacity building with specialized training courses that will enhance the practical training of the faculty members.

3.2.3 Stakeholders' Surveys (Employers and Employees)

The stakeholders' survey showed that the programs that will be established by the ECO-CAR Project are important for most HEV/HV Companies since they mainly depend on the knowledge and skills gained by the employees from the available study programs at universities. Nearly 64% of the employers mentioned that they need employees with the knowledge, training, and skills that the program graduates will have. Furthermore, nearly 77% of the surveyed employers mentioned that the graduates will add value to their company.

3.2.4 Student Survey

The student survey showed that ECO-CAR project will fulfill students' needs by increasing employment opportunities when opening the programs and creating training courses that target EV/HEV. Furthermore, through this program the labs are going to be equipped with up to date technologies, opening opportunities for students and lecturers to have practical training in local and international enterprises.

3.3 Step 3: Formulate the capacity building response

The main objective of ECO-CAR project was formulated before its start, and it consisted of the establishment of a vocational training Diploma on EV/HEV. Within the detailed description of the program ten scientific areas concerning EV/HEV Vehicles are mentioned, as follows:

1. Hybrid and Electric Vehicle Basics
2. Battery technology, Charging safety, and Recharging infrastructure
3. EV&HEV technology and hazardous material
4. Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair
5. Automotive Climate Control Systems and Vehicle Lighting system
6. Internal Combustion Engines in Hybrid vehicles
7. Well to wheel LCA calculations
8. Automotive Electricity, Electronics, Sensors, and Actuators
9. Construction of vehicle manufacturing systems
10. Dynamics of vehicle, active and passive safety

During the project, the European Universities are going to host academic visits in order to train the teaching and laboratory staff of the Partner Universities on the aforementioned scientific areas to enforce the capacity building process. In order to schedule the academic visits and decide on the expertise of the European Universities, a questionnaire via Google Forms (Annex 1) was created and answered in the period of 15/05 – 20/06. The preferred periods for the workshops in the European Universities are provided in the following table.

Table 3. Preferred periods for the academic staff workshops

Project Dates	BME	UD	RWTH	TH-OWL	UNIVAQ	NTUA
July 2021 (online)						
October 2021 (online)						
January 2022						
April 2022						
July 2022						
September 2022						

According to Table 3 no partner was available to host the first training workshop on July 2021. This fact along with the fact that the first two workshops were planned to be performed online due to the COVID-19 pandemic, lead the Project Coordinator to propose a shift on the dates of the workshops. The current timetable for the training workshops is presented in Table 4.

Table 4. Final dates and Host Universities for the workshops described in Task 3.3

Dates	Host University
January 2023	TH-OWL
May 2022	BME
November 2022	RWTH
January 2023	UD
May 2023	UNIVAQ
February 2023	NTUA

During each 1 - week training workshop 16 persons (2 teaching staff members from each Jordanian University) will be trained. The criteria for selecting the teaching and laboratory staff for the visits should consider the following:

- Professional background / academic degree
- Time of apprenticeship
- English skills
- Plans for the professional future at the university

- Gender

The contents for the workshops at the European universities have to be developed according to the compiled needs and the strengths and experiences of the hosting universities and the training material that is going to be used is part of Task 3.2. An outline of the program of each 1-week training workshop for each European University is provided in Annex 3.

Moreover, during the 4th Management meeting it was decided that additional, online 2 hours workshops are going to take place between June 2021 and December 2021 in order to train more faculty members on the basics of the scientific areas mentioned above. The current plan for the 2 hours on-line workshops is listed below (Table 5) along with the host university and the subject of each workshop. The subjects were decided using data from the questionnaires presented in Annex 1.

Table 5. Dates, Host Universities and Subject of the 2 hours workshops

Dates	Universities	Subject
23 June 2021	RWTH	Battery Technology, charging safety and Recharge infrastructure
13 September 2021	UNIVAQ	Internal combustion engines in hybrid vehicles / Well to wheel LCA Calculation
5 November 2021	NTUA	Dynamics of vehicle, active and passive safety
17 November 2021	BME	Internal combustion engines in hybrid vehicles / Dynamics of vehicle, active and passive safety
2 December 2021	UD	Vibroacoustic Comfort in Road Vehicles
6 December 2021	TH-OWL	Charge transport in Batteries and Hydrogen vehicles

Finally, in order to promote an international exchange and to enhance the capacities of future staff, there will be also student visits to the European Universities. In more details, each EU university will host 4 students, for a two-week training in order to train them in their labs and conduct visits to enterprises and manufacturers. The student visits will take place during the last year of the project (15/06/2023 - 14/09/2023), one year after the completion of the staff training workshops. A total number of 24 students from Jordan is expected to participate in these workshops.

3.4 Step 4: Implement the capacity building response

During this step the planned actions in Step 3 will be executed. The implementation stage must balance the requirement to build ownership, motivation, professional pride and respect for high research standards with the specific inputs and outputs identified in the planning stage. Successful implementation requires considerable skills, particularly in the field of Organizational Development (OD) which may be defined as the systemwide application of behavioral science knowledge to the planned development, improvement, and

reinforcement of the strategies, structures, and processes that lead to organization effectiveness (Organization Development and Change by Cummings and Worley. Pub: Thomson Learning, 2000).

During the implementation of the capacity building response particular attention needs to be paid to the following:

- Skills and resources: It is vital to establish early credibility by taking action to help remedy the skills and resources priority gaps identified during the assessment of capacity assets and needs.
- Consolidating change: this involves ensuring that the motivation for change is maintained and, later, advice on mainstreaming the new way of working as part of normal procedure. It should also involve supporting networks and partnerships by creating incentives for inter-organizational collaboration. Networks should include not only universities and research institutes, but all relevant actors, such as consumers/users, including policy makers, and the private sector.
- Developing an enabling environment: it is crucial to foster an environment which supports the production of high- quality research and, typically this will involve addressing the incentive structure which supports the production of high quality training.

To ensure the sustainability of the capacity building process, implementation should be managed through national systems and processes, rather than parallel systems like project implementation units.

3.5 Step 5: Monitor & Evaluate capacity development

Monitoring of the capacity development should inform the implementation process on a regular basis and should allow managers to adapt and change as necessary to achieve results. On the other hand, evaluation is the collection of feedback information about the capacity development and its outcomes, that assesses its success and analyses lessons learnt. The approach to monitor and evaluate a capacity building plan must be flexible in order to adapt to all the changes inherent in Capacity Building and must ensure that learning is captured. Moreover, it should be able take account of the process as well as the outcomes. At the same time, the used approach needs to be kept simple in order to avoid burdening organizations with complex and time-consuming demands that may lose support.

Possible ways to monitor and evaluate the capacity building process are:

- Self-assessment: encouraging the recipients of research funding to conduct their own rigorous assessment of impact is an important step in capacity building. This could, for example involve a repeat of the baseline and mapping studies carried out in step one. As long as the criteria were established and updated in the inception phase, this should provide a view of impact over the life of the program.
- Case studies: case studies and other qualitative evaluation such as interviews and story gathering are an important complement to quantitative monitoring and can be a useful tool in demonstrating the effective use of research funds. They also provide learning for donors as well as evidence about the effectiveness of certain processes and activities.
- End user surveys: these could be carried out at key points in the program to collect opinions on outcomes and CB impact from key stakeholders. Electronic means of collection should facilitate this process.



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ANNEXES

Annex 1: Questionnaires Content

ECO-CAR: Vocational Training Diploma on Electrical and Hybrid Vehicles

WP3: Capacity Building - 3.3 Training workshops in Europe for staff

Questionnaire for the determination of expertise of EU partners

The NTUA team, as project leader of WP3, has prepared a questionnaire that would be helpful for the organization of the workshops, scheduled in WP3, in the best possible way.

We kindly ask you to answer it as soon as possible.

Partner number *

Organization Name & Acronym *

- Technische Hochschule Ostwestfalen - LIPPE (TH OWL)
- Rheinisch-Westfaelische Technische Hochschule Aachen (RWTH)
- Universidad de la Iglesia de Deusto (UD)
- Budapesti Muszaki es Gazdasagtudomanyi Egyetem (BME)
- National Technical University of Athens (NTUA)
- Università dell' Aquila (UNIVAQ)

Preferred subjects to contribute with lectures

Select at least 3 subjects

- Hybrid and Electric Vehicle Basics
- Battery Technology, Charging safety and Recharge infrastructure
- EV & HEV technology and hazardous material
- Electric Vehicle Diagnosis for maintenance and repair
- Automotive climate control system and vehicle lighting system
- Internal combustion engines in hybrid vehicles
- Well to wheel LCA Calculations
- Automotive electricity, Electronics, Sensors and Actuators
- Construction of vehicle manufacturing systems
- Dynamics of vehicle, active and passive safety
- Teaching methodology

Short description of your contribution for each subject (Lecture) *

Maximum 10 lines per subject



Are there any other relevant topics where you would like to contribute with lectures within the workshops



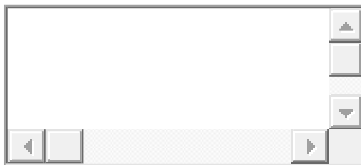
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Preferred subject to contribute with Laboratory Training

- Hybrid and Electric Vehicle Basics
- Battery Technology, Charging safety and Recharge infrastructure
- EV & HEV technology and hazardous material
- Electric Vehicle Diagnosis for maintenance and repair
- Automotive climate control system and vehicle lighting system
- Internal combustion engines in hybrid vehicles
- Well to wheel LCA Calculations
- Automotive electricity, Electronics, Sensors and Actuators
- Construction of vehicle manufacturing systems
- Dynamics of vehicle, active and passive safety

Short description of your contribution for each subject (Laboratory Training)

Maximum 10 lines per subject



Are there any other relevant topics where you would like to contribute with laboratory training within the workshops



Is there the possibility of visits to enterprises and manufacturers during workshops *

If the answer is YES provide an indicative description onf 10 lines maximum



Preferred date to host an 1-week workshop

Select up to 3

- July 2021 (On-line)
- October 2021 (On-line)
- January 2022
- April 2022
- July 2022
- September 2022

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Annex 2: Questionnaires Responses

In Figure 2 the responses concerning the preferred subjects to contribute with (a) lectures and (b) laboratories are presented

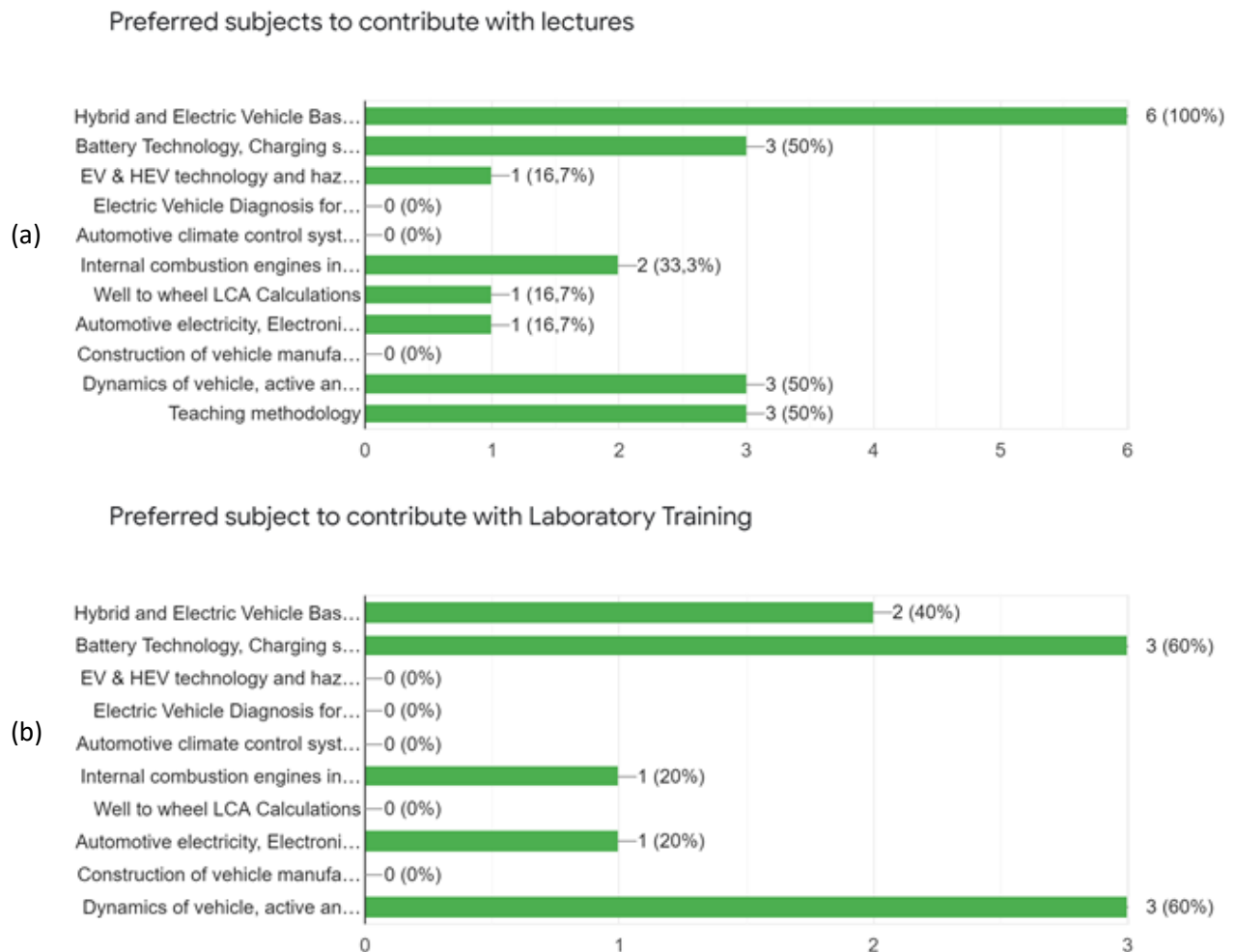


Figure 2. Preferred subjects to contribute with (a) lectures and (b) laboratories

The University of Deusto has proposed to contribute with lectures the following subjects:

- Vibroacoustic Comfort in Road Vehicles
- Simulation Techniques

Annex 3: Proposed content for the 1-week workshops

RWTH Workshop (According Questionnaire)

Lessons

- Short lecture on the Fundamentals of Electromobility
- Extensive lecture on the fundamentals of Batteries and their Application in Electromobility (Principles, aging, battery packs, battery management systems, etc.).
- Digitalization of teaching.

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Laboratory A laboratory training on battery fundamentals can be provided.

Visits Under investigation (Ford production plant / Etron production of Audi in Brussels)

TH-OWL Workshop

Lessons & Laboratory

- Hybrid and Electric Vehicle Basics
- Battery Technology, Charging safety and Recharge infrastructure
- Teaching methodology

Visits: To local manufacturer

BME Workshop (Accordinging Questionnaire)

A 5 day training is going to be set up.

- Each day will have a focal topic:
 - Trends in automotive sector
 - Vehicle Dynamics
 - Drivetrain elements
 - NVH in e mobility
 - Infrastructural questions

Possible visits to enterprises & manufacturers during workshops

One of the days can be substituted with visit at ZalaZONE brand new proving ground and another day could be in Bosch Research Center Budapest.

UD Workshop (Accordinging Questionnaire)

Lessons

- Hybrid & Electric Vehicle Basics
- Dynamics of Vehicles
- Teaching methodology

MORE: Vibroacoustic Comfort in Road Vehicles; Vehicle Dynamics; Simulation Techniques

Laboratory

- Vehicle modelling using Matlab Simulink Vehicle modelling using Carmaker Vehicle components modelling using ANSYS Vehicle dynamics characterization by means of experimental measurements

MORE: Vibration measurement

Visits: the Automotive Intelligence Center

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UNIVAQ Workshop (According Questionnaire)

Lessons

- Hybrid and Electric Vehicle Basics
- Internal combustion engines in hybrid vehicles
- Well to wheel LCA Calculations

NTUA Workshop (According Questionnaire)

Lessons

- Hybrid and Electric Heavy Vehicle Basics
- EV & HEV Technology and hazardous material
- Dynamics of vehicle, active and passive safety

Laboratory

- Vehicle dynamic measurements
- Vehicle modeling using Matlab
- Vehicle modeling using TruckSim

Visits Local Manufacturer of heavy vehicle's superstructures