ECO-CAR Vocational Training Diploma on Electrical and Hybrid Vehicles

WP 2 (PREPARATION)

ABSTRACT

The objectives in WP-2 were to generate a guiding report that includes 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. As result, it will furnish guidelines for developing curriculum in the field of electric and hybrid vehicles EV/HEV, Electronics, and automation by transferring European experience in this field.

Several surveys with different orientations were designed and distributed to collect data about the current and future needs to improve the EV/HEV education and training in Jordan.

The outcomes of the study indicate that the majority of the educational institution in Jordan are willing to establish vocational training centers for EV/HEV technology. Some institutions are willing to establish higher education programs in the same field besides vocational training.

This report includes a comprehensive analysis of the surveys and their results.

ECO-CAR_Vocational Training Diploma On Electrical and Hybrid Vehicles

ECO-CAR Vocational Training Diploma on Electrical and Hybrid Vehicles	
WP 2: Baseline Study	
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1 INTRODUCTION

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 vehicles which in turn will increase their sales in Jordan. Jordan Electric Vehicle Market size is projected to grow at a 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 priority aims at developing a curriculum in the field of electric and hybrid vehicles EV/HEV, Electronics, and automation. The second priority aims to improve the University-enterprise cooperation. The Erasmus+ program will bring 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 the Erasmus+ program is very necessary and required for the project to induce to secure the needed equipment and facilities to enhance teaching and training.

This project will focus on building the capacities of Teaching, and Technical staff (lab technicians) who will teach the diploma by 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 into the existing programs.

All project partners have rich experience and successful track record and active participation in Erasmus projects which will ensure that the consortium will achieve ECO-CAR objectives.

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 ECO-CAR Objectives

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 increase 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 electric and Hybrid vehicles in Jordanian enterprises.

5. Satisfying industry and economical needs by empowering engineers.
6. Helping to move Jordan forward to become a host for the Electrical and Hybrid vehicles industry in the future.

1.2 Scope of The First Questionnaire and Procedure

The major activity of the project is to achieve the two important National priorities, the first aims at developing a Curriculum in the field of Motor vehicles, Electronics, and automation. The second aims to improve University-enterprise cooperation. The Erasmus+ programme will bring the opportunity to transfer the European experience in this field, as the consortium includes many European universities who are experts in the project field. The support under the Erasmus+ programme is very necessary and required for the project to induce to secure the needed equipment and facilities to enhance the provided training.

The project will commence in a scoping and needs analysis by prepare and publish a guiding report that summarizes the list of competencies needed in the market in the field of the EV/HEV in Jordan, the potential clean technologies in the field of transportation, and their regulations. The investigation will commence with:

- Survey with appropriate stakeholders, including enterprises and governmental bodies, focusing on all academic programs being on offer in Jordan in the EV/HEV field, actual market demands, trends, and needs as well government policies and regulations.
- Survey on teaching and management facilities and on the structure of the partner universities to make sure that the project training content can be carried out successfully.
- Survey to understand the capacities and skills of the students in EV/HEV field.
- The employability rate of graduates after getting the diploma will be monitored and feedback from enterprises for the performance of the engineers who got the diploma through surveys will also be investigated.
- Integration of the 5 survey analysis results about the EV/HEV market needs and partner management facilities with the European methodology and experience and then drafting a final report about the methodology. This is a crucial document to elaborate on the didactic contents and select the EV/HEV course.

1.3 Organization of WP2

Applied Science Private University (ASPU) was defined as the leader for work package 2 and the co-leaders are TTU, BAU, UNIVAQ. Based on the directions of the kick-off meeting and discussions with EU partners, the first draft of all questionnaires was produced by the WP-2 leader organization. The draft surveys presented for the ECO-CAR management meeting for feedback and modifications were done accordingly. All surveys were sent to the quality management team in ECO-CAR to ensure eligibility and compliance with Erasmus+ spirit and regulations.

WP-2 leader organization distributed the surveys in sequence and specific timing for all Jordanian partners. The responses were analyzed and discussed in this report.

2 QUESTIONNAIRES RESULTS AND ANALYSIS

2.1 Questionnaire Overview

To fulfill the objectives of WP-2, 5 surveys were prepared by WP-2 leader and co-leaders. Before releasing the surveys, their content was presented and discussed in the kick-off management meetings and sent to the quality team to ensure their eligibility and compliance with Erasmus+ regulations.

The surveys include questions that are related to four programs proposed and approved by the ECO-CAR management committee during their meetings. The four suggested programs are the following:

1. Vocational diploma (9-month study and training, including around 300 hours). Including Comprehensive theoretical and practical lectures that include diagnosing, checking, and maintaining all Electric and Hybrid vehicle systems and parts.
2. Diploma degree (2-year study and training, includes around 90 credit hours). A student with a secondary school certificate can join this program.
3. Higher Diploma (1-year theoretical study with 30 credit hours) including lectures, assignments, group work, exams, and final research project. This program is designated for students with engineering backgrounds such as Mechanical, Electrical, Mechatronics Engineers. (Bachelor degrees' holders)
4. Bachelor's technical degree (4-years Engineering plan with a focus on Hybrid and EV, total 130 credit hours required by the ministry of higher education in Jordan). **Appendix A** shows details of the different programs.

The five surveys are:

Survey-A: The “partner survey” was sent out to the eight Jordanian partner universities. Given 20 days to respond. The survey requests that each partner shall estimate their needs and select the suitable program for their students from the list of 4 suggested programs.

Survey-B: the “Faculty survey” looks for competencies in the faculty members who teach in the partner universities. And review the content of the suggested proposed programs. 140 responses were received from faculty members of Mechanical, Electrical, and Mechatronics Engineering in the partner's institutions during the time span of 1.5 months.

Survey-C: the “student survey” questionnaire analyzes the requirements of the students from different education levels: filled by 791 students in both English and Arabic survey of different secondary, Diploma, Bachelor's, Master levels. The respondents were given 2 months to respond (Their opinions about the suggested programs, what they prefer, the expected gained skills…)

Survey-D: the “Private and public Organization survey” analyzes the needs of the employees who work in companies that are related to EV/HEV. **And** estimate the most wanted skills (theoretical and practical), the shortage in some skills, the weaknesses of the existing engineering or technical staff, the level of experience and knowledge they employ, the economic outcome …)

More than 200 agencies and individuals in the public and private sectors filled the survey. The respondents were given 45 days to respond.

Survey-E: the "Stakeholder's survey" which was targeting public and private organizations in Jordan to predict the necessary skills needed in the market, the future of the Hybrid and EV market in Jordan, the governmental plans toward clean technology which have a direct impact on the regulations that affect the automobile market in Jordan. 121 responses were received during the time plan of 45 days to respond. The public and private organizations include:

- Ministry of Transport, Energy.
- Jordan Engineer associations.
- EV/HEV Jordan's Vocational Training centers.
- EV/HEV Jordan maintenance and trading companies.

The surveys were conducted through March, April and some of them extended to the first week of May 2021. All Jordanian partners participate in distributing and collecting answers every one on his region in the country:

1. Al-Balqa Applied University (BAU), covered Al-Salt-Irbid
2. Al-Hussein Bin Abdullah II Technical University (HTU), covered parts of Amman (Albayader area)
3. Al-Zaytoonah University of Jordan (ZUJ), covered west Amman, (Abu-Alanda, Al- Yadodeh, Al-Jomrok)
4. Applied Science Private University (ASU), covered north Amman, (Shafa-Badran, Al-Jubiha)
5. Jordan University of Science and Tech (JUST) North Jordan, (Irbid, Al-Ramtha)
6. Mutah university (MU) West Jordan (Maan, Karak)
7. Tafila Technical University (TTU) West Jordan (Tafila, Aqaba)
8. University of Jordan (UJ) covered parts of Amman and Aqaba

2.2 Part A: Partner Survey

This survey was distributed to the 8 partners in Jordan to evaluate the following:

- Their current capabilities in teaching and training of HEV and EV.
- The existence of facilities and laboratories needed in teaching and training HEV and EV.
- The capabilities of current teaching and training staff in the field of HEV and EV.
- The program they will select establish or improve in their institutions.

Analysis below

2.2.1 Existing Programs and Required Programs for Each Partner

The eight coordinators of each partner institution responded by one evaluation as shown in Figure-1.

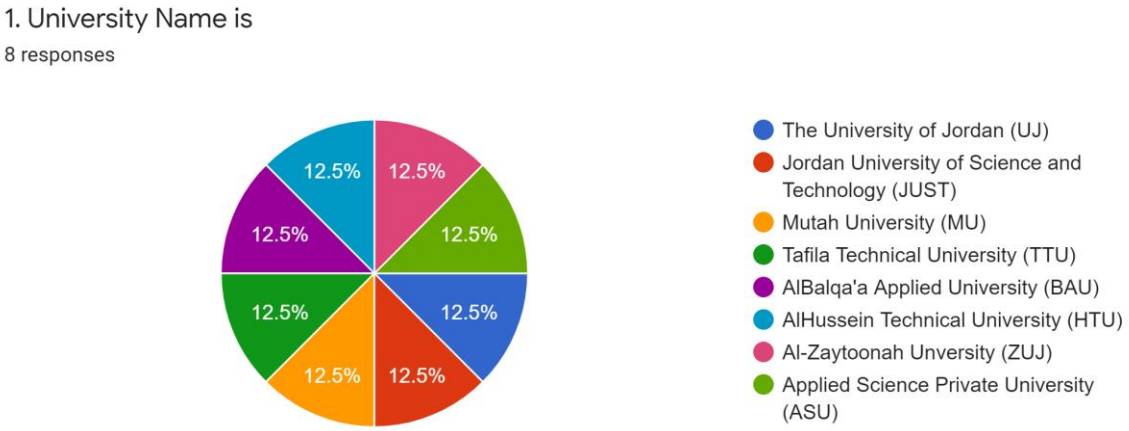


Figure 1: Partners Responses

In addition, they listed the preferred program, out of the four suggested programs, that will be established in their university as shown in Figure 2. where seven of the partners prefer to have vocational Diploma while the University of Jordan(UJ) prefer to have higher Diploma.

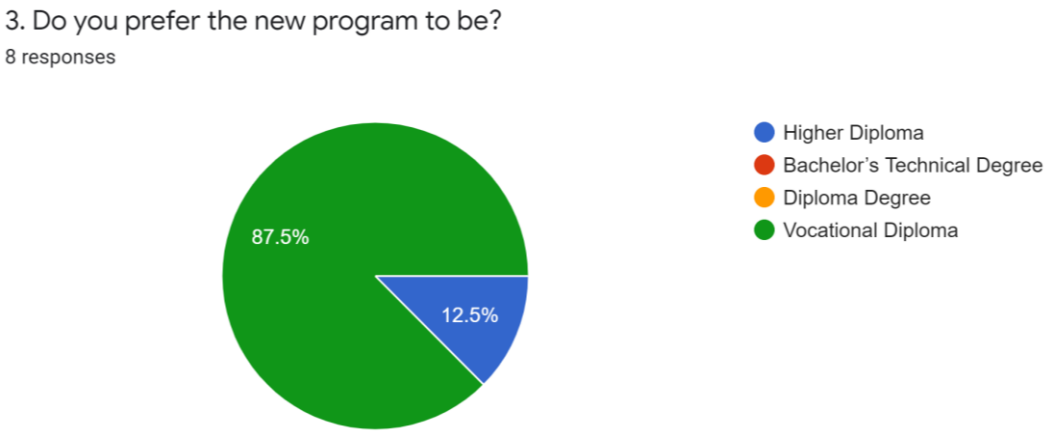


Figure 2: The Required Programs

Table 1 below shows a summary of the Exiting and required programs for each partner.

Table 1: summary of the responses about the existing and required program for each partner university

	Vocational training Diploma	Diploma Degree	Bachelors Technical Degree	Higher diploma	Other
(TTU)	New	Existing (Improve)			Mec.Eng. Automobile (Bachelor)
(BAU)	New	Existing (Improve)	Existing (Improve)		
(ASPU)	Existing (Improve)				
(JUST)	New				NA
(UJ)	Existing (Improve)			New	
(MU)	New			Existing (Improve)	
(ZUJ)	Existing (Improve)				
(HTU)	New	Existing (Improve)			

2.2.2 Contents of Program and Its Relevance to The Needs of the Partner University

Figure-3 shows the percentage of partners who answered "YES" to the questions about the course content of the different programs that may be established by the ECO-CAR project **[Appendix A].** The majority of the partners agreed to the fact that the content covers the needed practical skills and that most of the course content is relevant to the program and helps build a strong program. Partners who answered "NO", suggested adding/removing courses from the different programs as listed in Table 2.

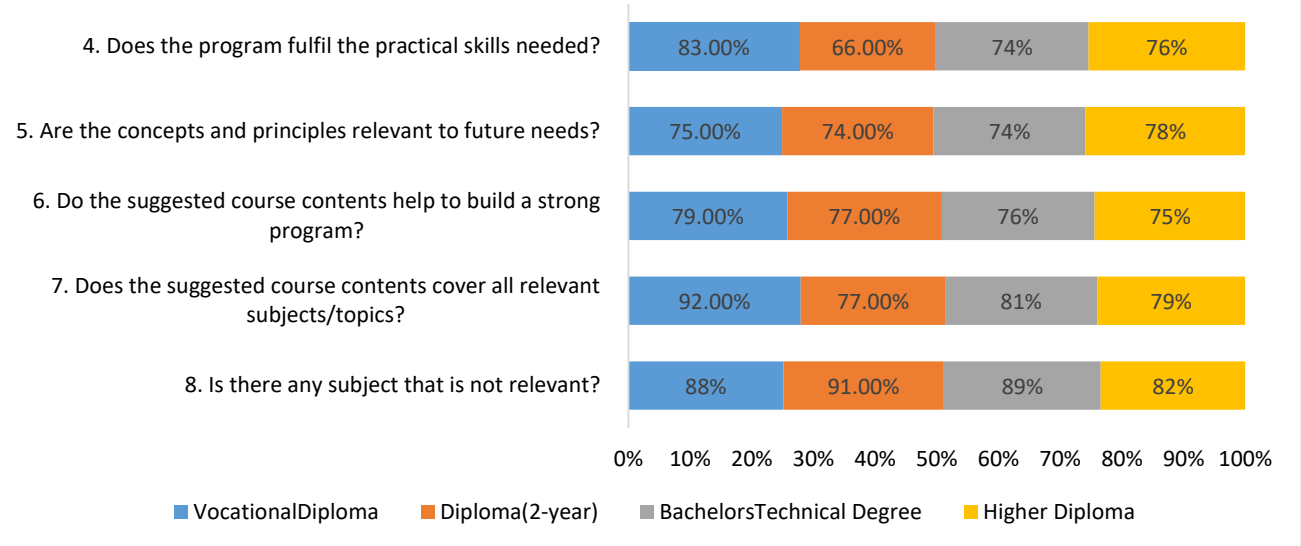


Figure 3: Percentage of Partners who Answers "YES"

Table 2: list of courses to be added or removed based on the partner's answers

Program	Suggested courses to be added	Suggested courses to be removed
Vocational Diploma	Electrical Machines (Motors)	
Diploma degree	Electrical machines	
Higher diploma	Autopilot system, Engineering drawing, Internal Combustion Circuit, Sensors, CAN, Vehicle Assemblies	
Bachelor's Technical Degree	basic courses in mechanical and electrical engineering	Thermodynamic 2

Figure-4 shows the percentage of partners who answered "YES" to the questions related to the different programs. As shown, the majority of the partners agreed to the following: suggested content of each program, suggested program duration, and suggested practical training duration. Partners who answered "NO", suggested the following modifications:

1. vocational training duration should be one year plus six months of training.
2. A higher diploma should have at least three months of practical training.

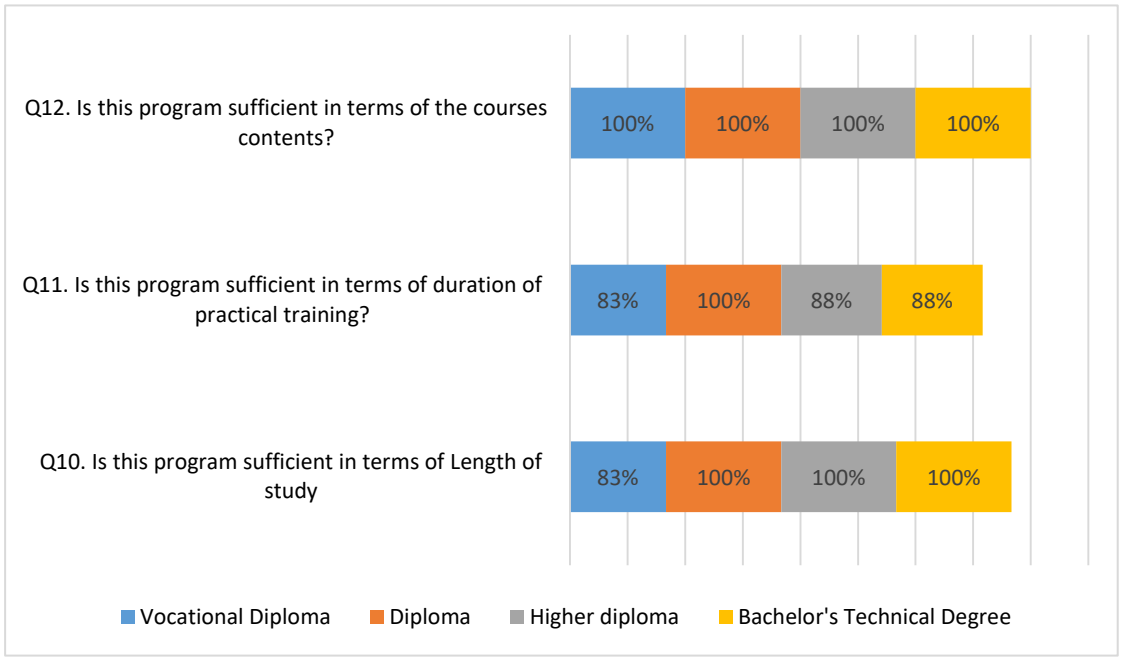


Figure 4: Percentage of Partners who Agreed to the Suggested Content and Duration of the Different Programs

2.2.3 Role of the Graduates of Planned Program in Fulfilling the Future Needs

The majority of the partners agreed to the role that the program graduates will play in meeting the expanding market needs in the future; either the program is Vocational Diploma, Diploma (2-years), Higher

Diploma, or Bachelor's Technical Degree. Graduates will get the needed skills to maintain, operate, and repair Electric and Hybrid vehicles with appropriate knowledge in the fields of transportation and logistics. The graduates will have the practical skills needed for expanding EV and HEV market which increase their employability in Local and International enterprises. In addition, the majority of the partners mentioned that the program will help to move Jordan forward to become a host for the Electrical and Hybrid vehicles industry in the future.

Table 3: partner response to the questions about the role of the program graduates

Statements	Program	Fully agree	Partially agree	None
Build the practical skills of engineers in this field to meet the needs of expanding EV and HEV market in Jordan	Vocational Diploma	83.3%	16.7%	0.0%
	Diploma (2-years)	100.0%	0.0%	0.0%
	Higher Diploma	87.5%	12.5%	0.0%
	Bachelor's Technical Degree	87.5%	12.5%	0.0%
Increase the employability of graduates in Local and International Market	Vocational Diploma	83.3%	16.7%	0.0%
	Diploma (2-years)	57.1%	42.9%	0.0%
	Higher Diploma	75.0%	25.0%	0.0%
	Bachelor's Technical Degree	62.5%	37.5%	0.0%
Through this program, students will get the needed skills to maintain operate and repair Electric and Hybrid vehicles with appropriate knowledge in the fields of transportation and logistics	Vocational Diploma	66.7%	33.3%	0.0%
	Diploma (2-years)	85.7%	14.3%	0.0%
	Higher Diploma	50.0%	50.0%	0.0%
	Bachelor's Technical Degree	100.0%	0.0%	0.0%
Improve the level of provided services for maintaining, operating and repairing electric	Vocational Diploma	66.7%	33.3%	0.0%
	Diploma (2-years)	85.7%	14.3%	0.0%
	Higher Diploma	87.5%	12.5%	0.0%

and Hybrid vehicles in Jordanian enterprises.	Bachelor's Technical Degree	75.0%	25.0%	0.0%
Helping to move Jordan forward to become a host for Electrical and Hybrid vehicles industry in future	Vocational Diploma	66.7%	33.3%	0.0%
	Diploma (2-years)	57.1%	42.9%	0.0%
	Higher diploma	75.0%	25.0%	0.0%
	Bachelor's Technical Degree	75.0%	25.0%	0.0%

We should highlight on the statements which have 100% percentage, all participants Fully agreed that the **2-years Diploma** build the practical skills of engineers in this field to meet the needs of expanding EV and HEV market in Jordan. Moreover, all participants Fully agreed that the **Bachelor's Technical** Degree will give students the needed skills to maintain operate and repair Electric and Hybrid vehicles with appropriate knowledge in the fields of transportation and logistics.

2.2.4 Summary

This report presents the partner universities' response to the "Partner Survey". Seven partners prefer to have a vocational diploma while the University of Jordan (UJ) prefers to have a higher diploma. The 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, the majority of the partners agreed to the suggested roles that the program's graduates may play in enhancing the services related to EV/HEV. All participants agreed on the role of the [diploma and bachelors] program graduates in build good practical skills; We must strive to develop study plans for their existing programs.

2.3 Part B: Faculty Member Survey

This survey targeted academic members in partner's universities to evaluate their competencies and needs for training and improving, also to review the content of the suggested programs, add or remove courses, training.

2.3.1 The Capability and Responsibility of the Faculty Members

The faculty members within the partner universities were surveyed to know their competencies, needs, and wants that are related to the proposed program. Some results are presented in Figure 5 and below summary:

1. faculty member's responses cover all partner universities.
2. 40% of faculty members are between 30 to 45 years old.
3. About 50 of them are either assistants or associate professors.
4. More than 70% of them have more than 5 years of teaching experience.
5. About 57.9% of them used HEV/EV technology during teaching.

6. More than 50% of them are Mechanical Engineers, 24% Electrical Engineers, also some of them are from different fields like Energy and Mechatronics engineering.

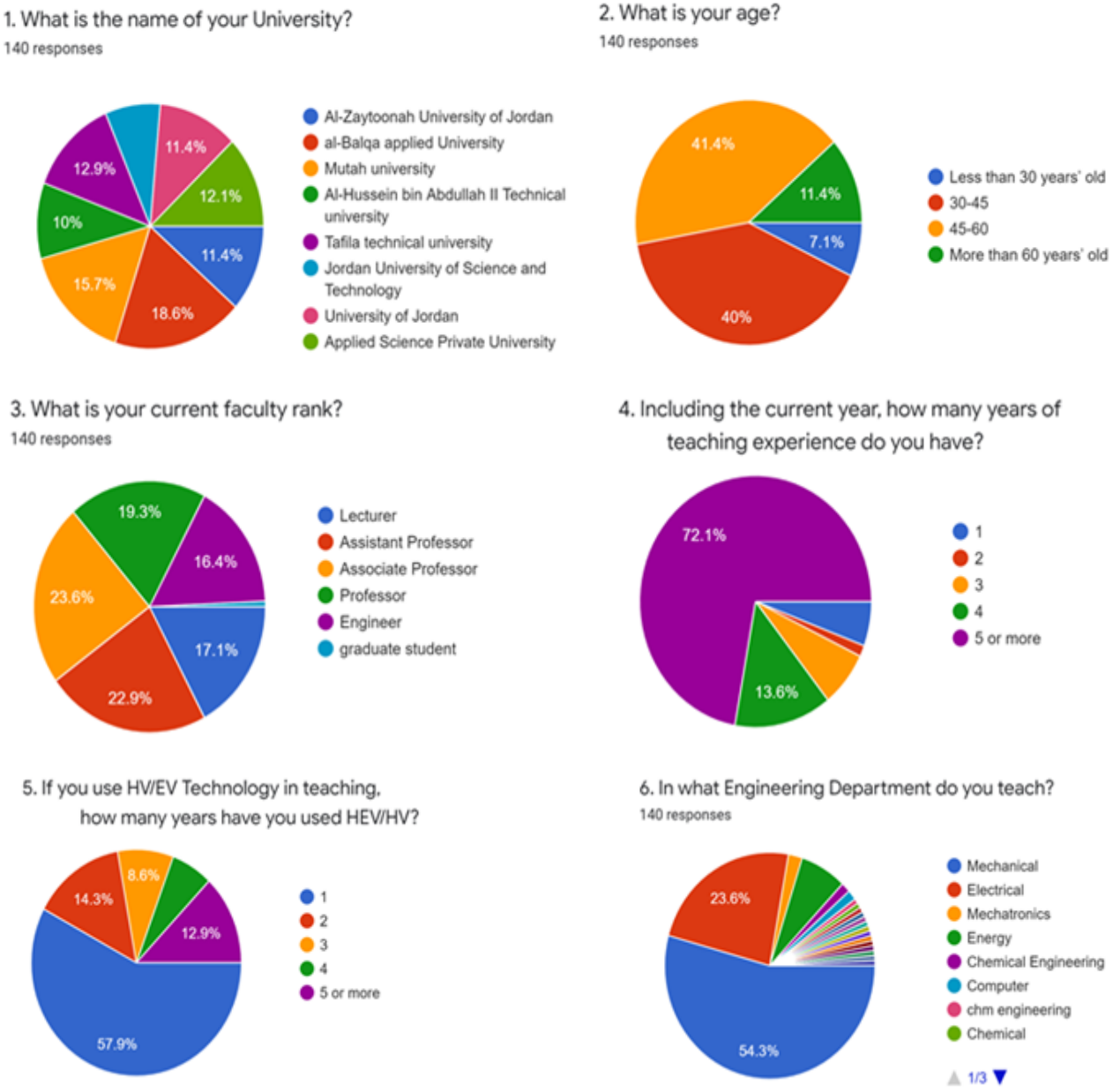


Figure 5: Distribution of the Surveyed Faculty Members

In responding to the question: (Q7) more than 60% of the staff are either planning to teach or already teaching courses related to HEV/EV, and about 35.7% of them do not do. While only 10.7% of the faculty members currently teaching a course utilizing best practices in EV/HEV and only 12.1% have done this in the past. On the other hand, 52.1% of them are planning to use EV/HEV.

Figure 7 shows that 82.1% of faculty that had attended specialized HEV/HV training sessions, WHILE 17.9% did not do.

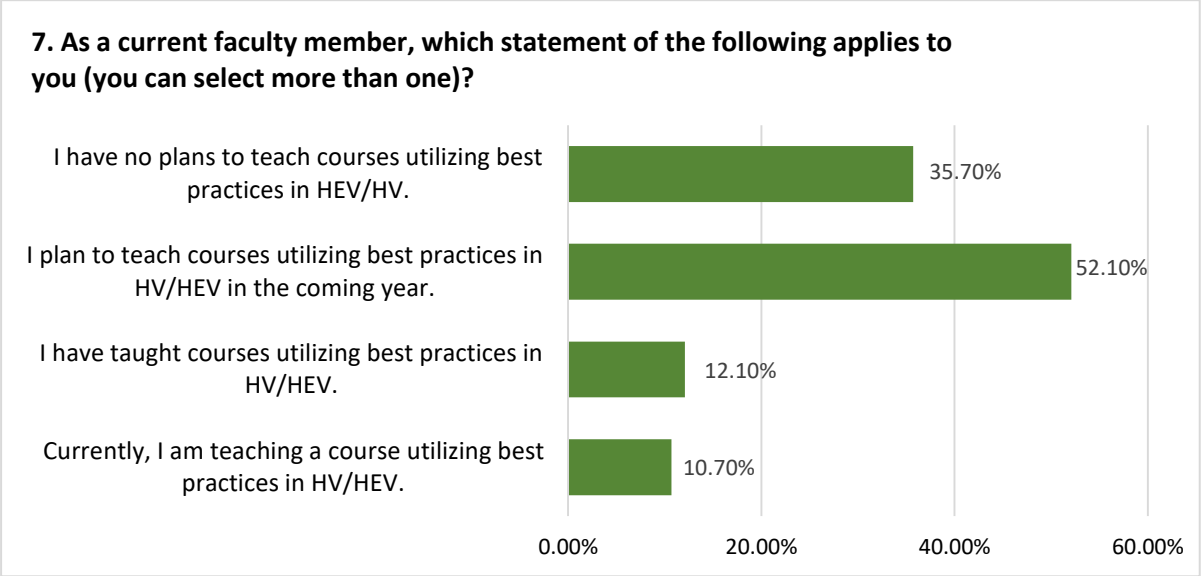


Figure 6: Faculty Members Competences

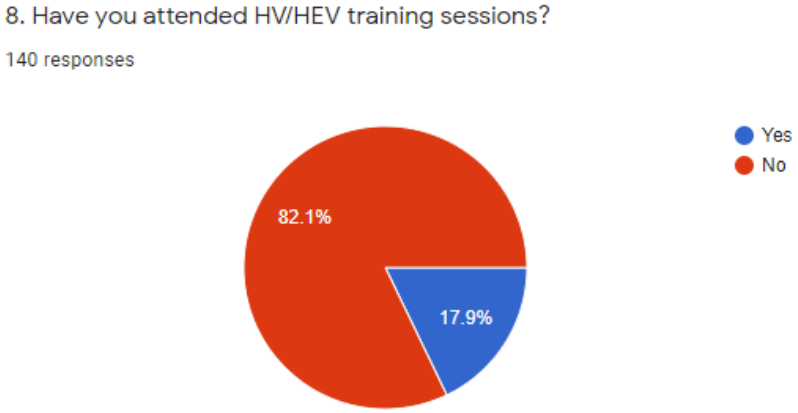


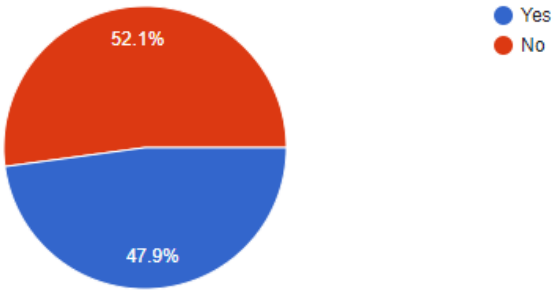
Figure 7: Percentage of Faculty that had Attended Specialized Training Sessions

2.3.2 Contents of Program and Its Relevance to The Needs of the University

Figure-8 shows the responses of faculty members to questions about the course content. Only 47.9% of the surveyed faculty, mentioned that their curriculum has courses related to vehicles technology. Those courses mainly are the internal combustion engine and/or autotronics. When they are asked about courses that deal with electric or hybrid vehicles Technology, 65.7% of faculty answered "NO". Those who answered "YES", mentioned that the curriculum includes general introductory courses that are usually not mandatory (optional) courses about Hybrid Vehicles technology or EV Engineering. Thus ECO-CAR project is important to help design EV/HEV courses that can be used by those faculty members to teach the students up-to-date technology. In addition, Figure 8 shows that there is a minimal number of labs in the partner universities. Thus there is an urgent need for the ECO-CAR project in order to equip those universities with specialized laboratories (so that they have up-to-date equipment) to enable both faculties and students to gain practical experience.

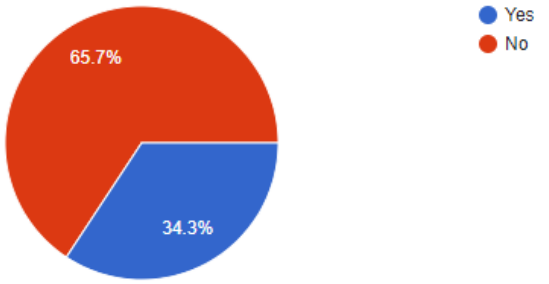
9. Does your department curriculum include Courses that deal with Vehicles Technology?

140 responses



10. Does your department curriculum include Courses that deal with Electric and Hybrid Vehicles Technology?

140 responses



11. Does your department have special Electric and hybrid Vehicles Laboratories?

140 responses

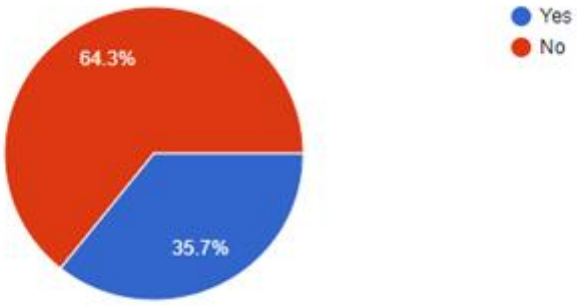


Figure 8: Faculty Opinion About Course Content Related to EV/HEV

Figure 9 shows that 73.6% of the surveyed faculty members mentioned that there are no professors specialized in EV/HEV, and those who answered yes, most of them actually have one professor. Most of the faculty mentioned that if there are electric and hybrid vehicles technologies labs, they will be of great help in teaching/research/learning and curriculum design engagement. Thus ECO-CAR project is very important to help professors to build specialty in EV/HEV and to prepare the labs for researchers, teachers, students, and the community as well. This will also enable hands on teaching/learning opportunities by creating cooperation between faculty members, students, and EV/HEV enterprises; as currently there is only a 33.6% chance of cooperation between partner universities and HV/HEV enterprises; as shown in Figure 9.

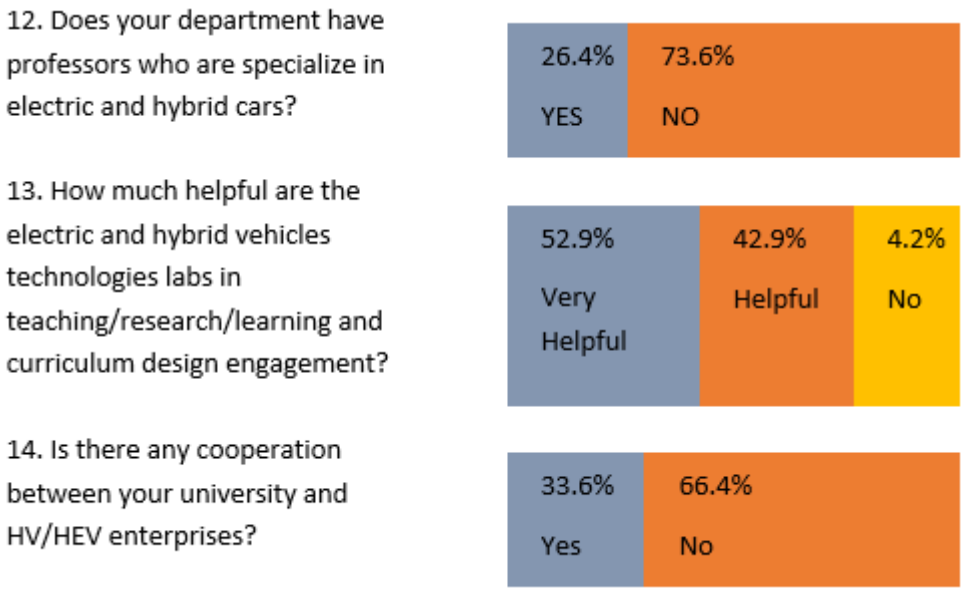


Figure 9: Faculty Member Responses to Question 12,13,14.

Table-4 shows the votes of the faculty members about the course content for the different programs that may be achieved by the ECO-CAR project. The majority of the faculty members agreed to the fact that the content covers the needed practical skills and that most of the course content is relevant to the program and helps build a strong program. They suggested to increasing the lab work and to add the courses listed in Table-5.

Table 4: faculty votes about the course content for different programs

Program	17. Does the program fulfil the practical skills needed?	18. Are the concepts and principles relevant to future needs?	19. Do the suggested course contents help to build a strong program?	20. Does the suggested courses contents cover all relevant subjects/topics?	21. Are the subjects relevant
Vocational Diploma (9-months, 300 hours)	66.7%	69.7%	75.8%	90.1%	90.9%
Diploma (2-years after high school)	62.1%	71.2%	75.8%	78.8%	89.4%
Higher diploma (For Mechanical, Electrical and Mechatronics engineers),30-credit hours	73.2%	73.2%	73.2%	80.5%	81.7%
Bachelor's Technical Degree (4-years)	70.5%	70.5%	71.2%	77.7%	88.5%

Table 5: suggested courses to be added to the different programs

Program	Suggested courses
Diploma (2-years after high school)	Maintenance of HEV Autopilot Battery replacement/remanufacturing and end of life strategies Electrical machines Braking system, Steering system
Higher diploma (For Mechanical, Electrical and Mechatronics engineers),30-credit hours	HEV maintenance Battery end life strategies Electrical machines Charger stations
Bachelor's Technical Degree (4-years)	Battery production/ remanufacturing, end of life, waste, and battery cost, battery charging station related decision making Automotive Electric and Electronic Systems, Automotive Steering and Braking Systems

2.3.3 Contents of Program and Its Relevance to The Needs of the Market

The majority of the surveyed faculty agreed to the role that the graduates will play in meeting the expanding market needs in the future as shown in Table-6. The graduates will have the practical skills needed for maintaining, operating, and repairing electric and Hybrid vehicles and other tasks, like improvement and operation, taking into account safety, environment, and energy management; which increases their employability. In addition, the program will help Jordan to be involved in the EV/HEV industry.

Table 6. role of the graduates of planned program in fulfilling the future needs

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
Statements	Faculty	Students	Faculty	Students	Faculty	Students	Faculty	Students	Faculty	Students
Build the practical skills of engineers to meet the needs of expanding EV and HEV market in Jordan	56.3%	51.4%	35.3%	37.1%	6.7%	9.4%	0.8%	1.4%	0.8%	0.7%
Increase the employability of graduates in Local and International Market	51.3%	50.2%	38.7%	35.5%	8.4%	10.6%	0.8%	3.0%	0.8%	0.7%
Improve the level of provided services for maintaining, operating and repairing electric and Hybrid vehicles.	52.1%	43.6%	39.5%	42.5%	6.7%	10.8%	0.8%	2.6%	0.8%	0.5%
Helping to move Jordan forward to become a	43.7%	44.9%	45.4%	35.5%	9.2%	14.6%	0.8%	3.8%	0.8%	1.0%

host for Electrical and Hybrid vehicles industry in future										
Fulfill roles of vehicle engineering tasks, like improvement and operation, taking into account safety, environment and energy management.	45.4%	46.2%	47.1%	40.1%	6.7%	10.6%	0.0%	2.6%	0.8%	0.5%

2.3.4 Summary

In summary, based on the faculty survey, the following needs are required to be achieved by ECO-CAR:

- ECO-CAR project is important to improve the curriculum structure and to help design EV/HEV courses that can be used by faculty members to teach the students upto-date technology. In addition, there is a minimal number of labs in the partner universities, thus there is an urgent need for to ECO-CAR project to prepare those universities with specialized laboratories to enable both faculties and students to gain practical experience.
- ECO-CAR project has specialized training courses that will enhance the practical training of the faculty member.
- ECO-CAR project is important to help professors to build specialty in EV/HEV and to prepare the labs for researchers, teachers, students, and community as well. This will also enable hands on teaching/learning opportunities by creating cooperation between faculty members, students and EV/HEV enterprises
- The graduates will have the practical skills needed for maintaining, operating, and repairing electric and Hybrid vehicles and other tasks, like improvement and operation of EV/HEV, taking into account safety, environment, and energy management; which increases their employability.

Thus ECO-CAR project is important to improve the curriculum structure and to help design EV/HEV courses that can be used by these faculty members to teach the students up to date technology; this project also has a specialized training course that will enhance the practical training of the faculty member where only 17.9% has attended training courses as shown in figure 7.

2.4 Part C: Student Survey

This survey was distributed in both Arabic and English languages. The below analysis after merging both surveys

2.4.1 Profile and level of Students Who Responded to the Survey

Figure-10 shows that the surveyed students come from different educational backgrounds and mainly they have a bachelor's degree. Figure-11 shows that they come from different partner universities.

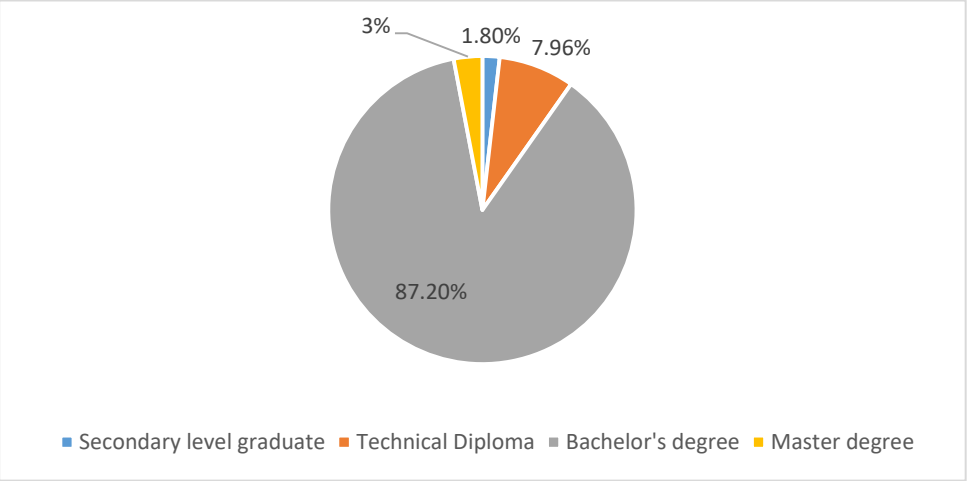


Figure 10: Student Level of Study

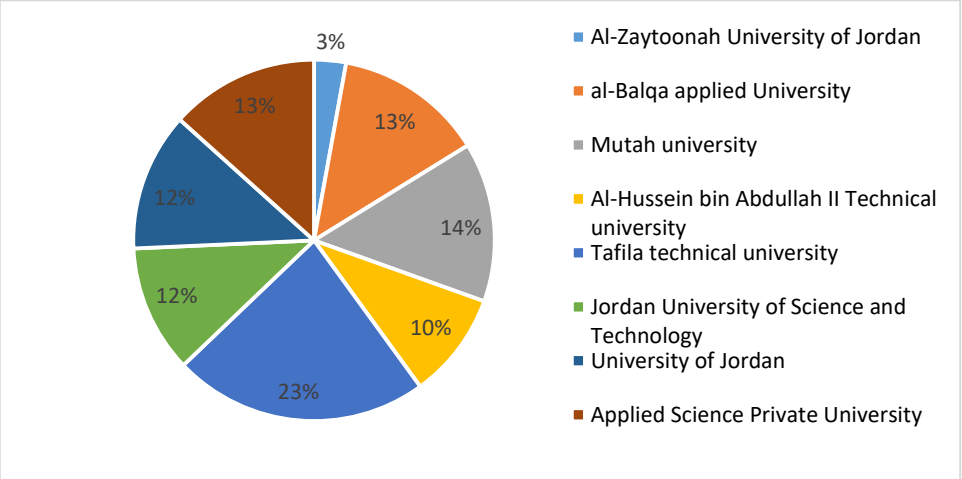


Figure 11: Student University

2.4.2 Contents of Program and Its Relevance to The Needs of students

Figure-12 shows That nearly 40% of surveyed students prefer higher diploma (14.6%) and vocational training diploma (29.1%) in the proposed programs,

Figure 13 shows that nearly 70% of surveyed students have high interest (31.1%) or somewhat high interest (39.1%) in the proposed program, and there is a high probability that they will submit an application to study the program when it is launched. On the other hand, Figure 14 shows that 60% of the student searched for similar programs in Jordan and abroad. In addition, Figure 14 shows that the majority of the surveyed students believe that the program graduates will have more employment opportunities

and then they recommend others to enroll in the program. Thus ECO-CAR project would increase employment opportunities by opening the new programs and/or creating training courses that target EV/HEV.

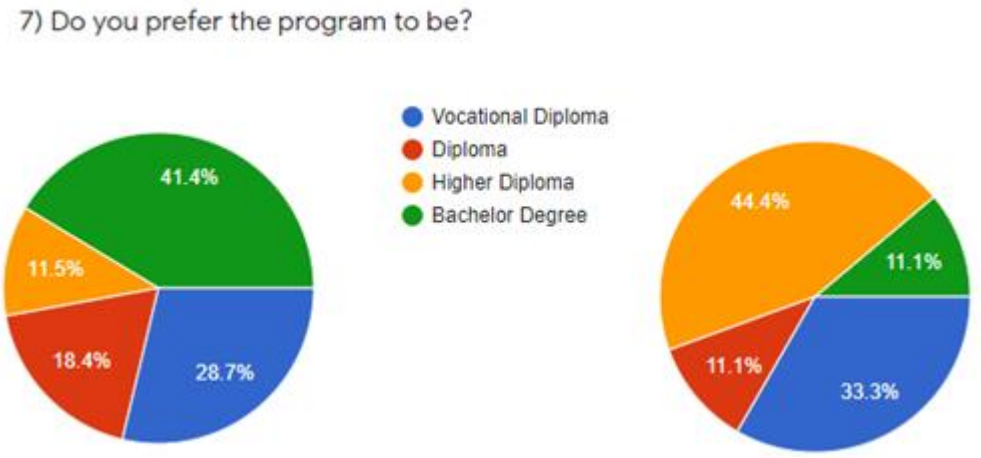


Figure 12: Prefer Program for Students In Both Survey

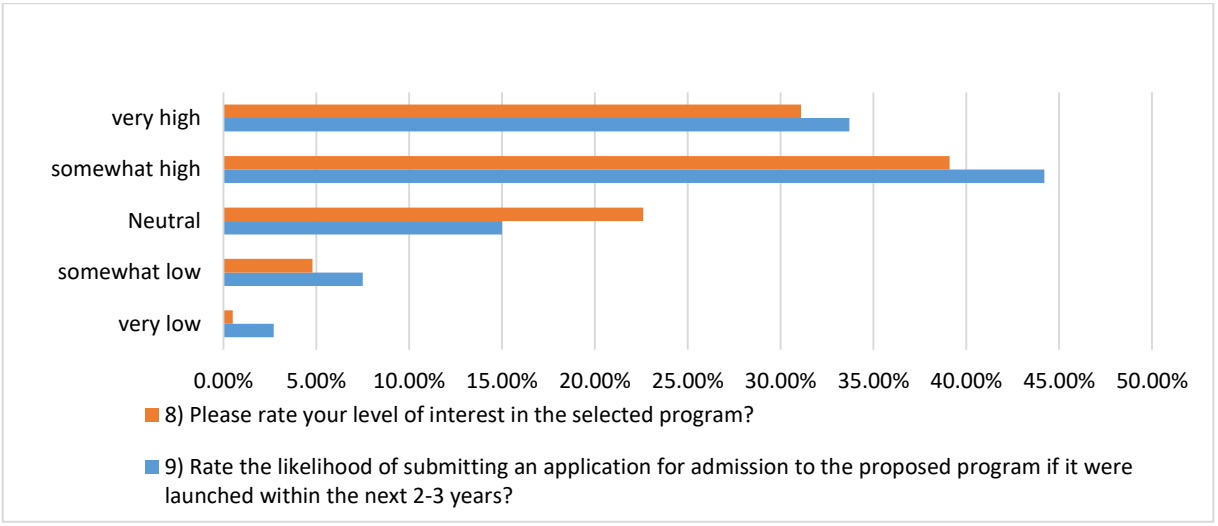


Figure 13: Part 1 of Questions Related to the Students Interest in the Proposed Programs

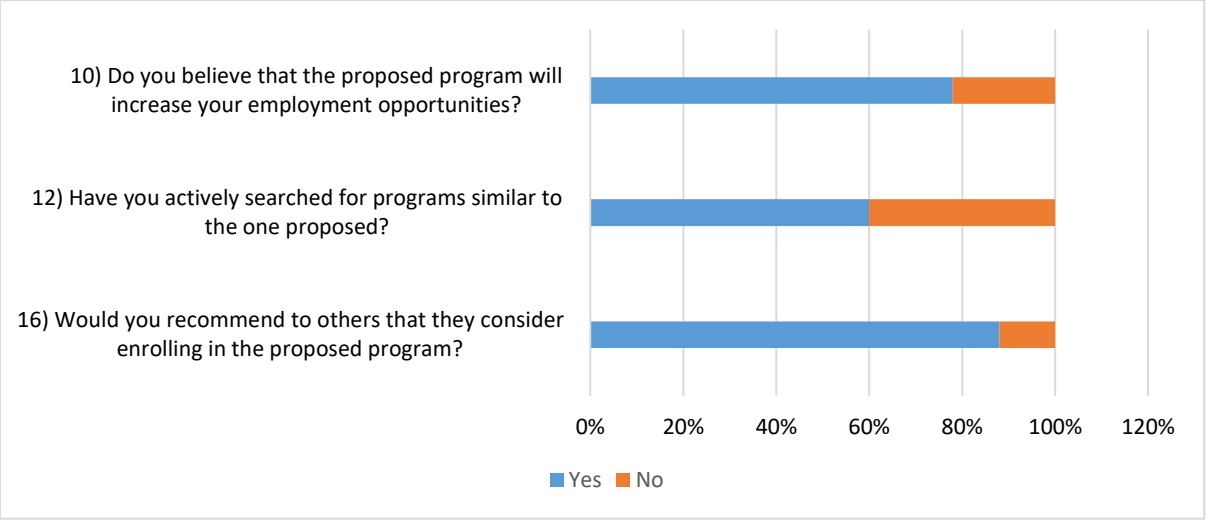


Figure 14: Part 2 of Questions Related to the Students Interest in the Proposed Programs

Figure 15 shows that 52% of the students prefer to have on site (face to face lecturing mode; mainly because of the practical and experimental work requirements to study EV/HEV either through laboratories or through training. Thus ECO-CAR will help equip the labs with equipment that has up to date technologies, and the project will open opportunities for students and lecturers to have practical training in local and international enterprises. On the other hand, 36% of students prefer to have a blended mode of delivery since most likely they live far and this will save them time and effort. Thus ECO-CAR will create an online platform to enable the students to access the course material and learn some courses online.

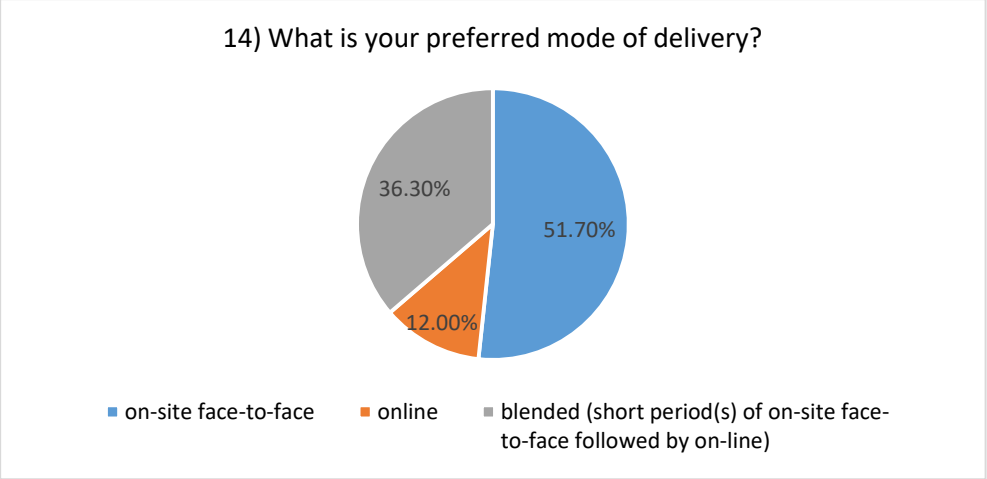


Figure 15: Preferred Mode of Delivery

Figure-16 shows that 60% of the students assured that there should be a blended learning mode to increase the interest of students in the proposed program. In addition, factors such as providing funding, reasonable price per credit hour, and flexible enrolment schedule do affect their interest in the program.

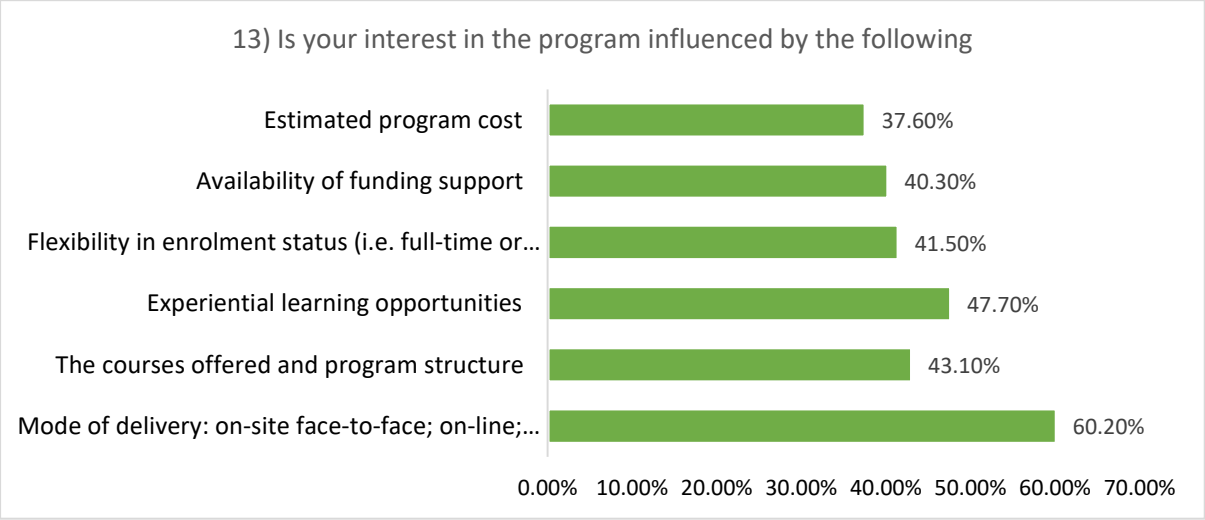


Figure 16: Factors That Affect Students' Interest in the Program (Student Can Choose More than One Point)

2.4.3 Summary

In summary, based on the student survey, the following competencies are required to be achieved by ECO-CAR:

- ECO-CAR project will full fill students' needs by increasing employment opportunities when opening the programs and creating training courses that target EV/HEV.
- ECO-CAR will help equip the labs with equipment that has up to date technologies, and the project will open opportunities for students and lecturers to have practical training in local and international enterprises.
- ECO-CAR will create an online platform to enable the students to access the course material and learn some courses online
- ECO-CAR project is important to help design EV/HEV courses that can be used by faculty members to teach the students up to date technology. In addition, there is a minimal number of labs in the partner universities, thus there is an urgent need to ECO-CAR project to prepare those universities with specialized laboratories (so that they have equipment with up-to-date technologies) to enable both faculties and students to gain practical experience.

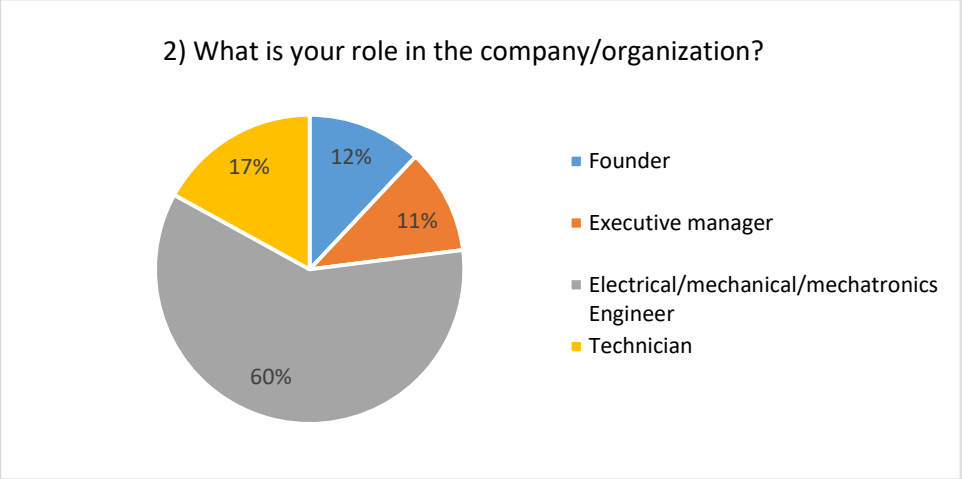
The graduates will have the practical skills needed for maintaining, operating, repairing electric and Hybrid vehicles, and other tasks, like improvement and operation, taking into account safety, environment and energy management; which increases their employability

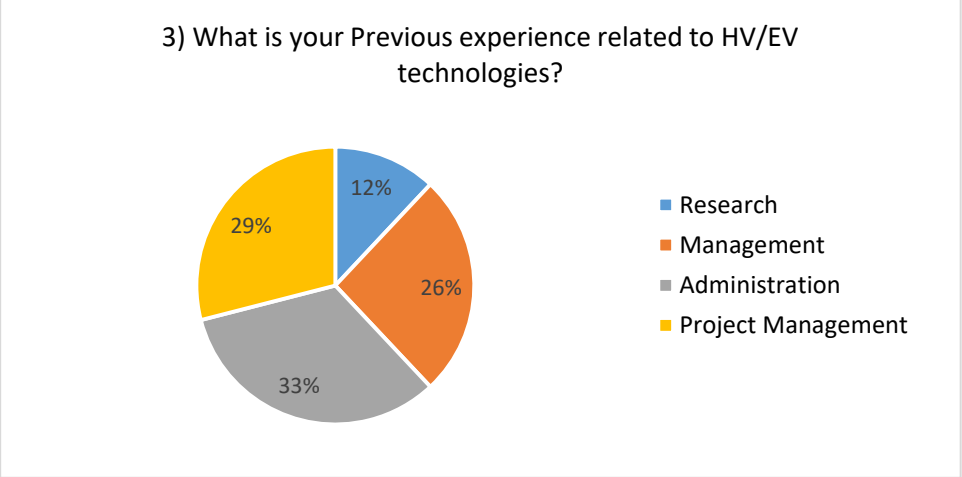
2.5 Part D: Private and Public Organization Survey

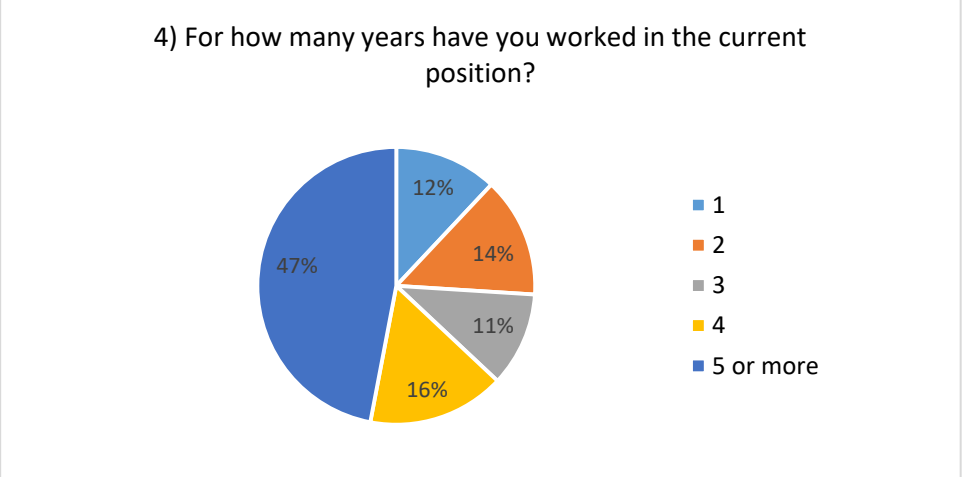
This survey was conducted in order to understand the level of knowledge and skills fresh graduates must have in the field of EV/HEV technologies in order to enable them to meet the current job market needs. A minimum requirement on a filled questionnaire was defined with 25 questionnaires per Partner University. This survey was distributed in both Arabic and English languages. The below analysis after merging both surveys.

2.5.1 Profile of Employees

The surveyed companies come from different sectors that are related to EV/HEV. Figure 17 shows their background. Many of the respondents are either engineer who worked as managers or researchers. In addition, more than half of the respondents spent 5 years in their current position and their work is related to the cooperation between their company and universities. Thus their responses to the questions in the surveys will help us to know the EV/HEV competencies and needs.







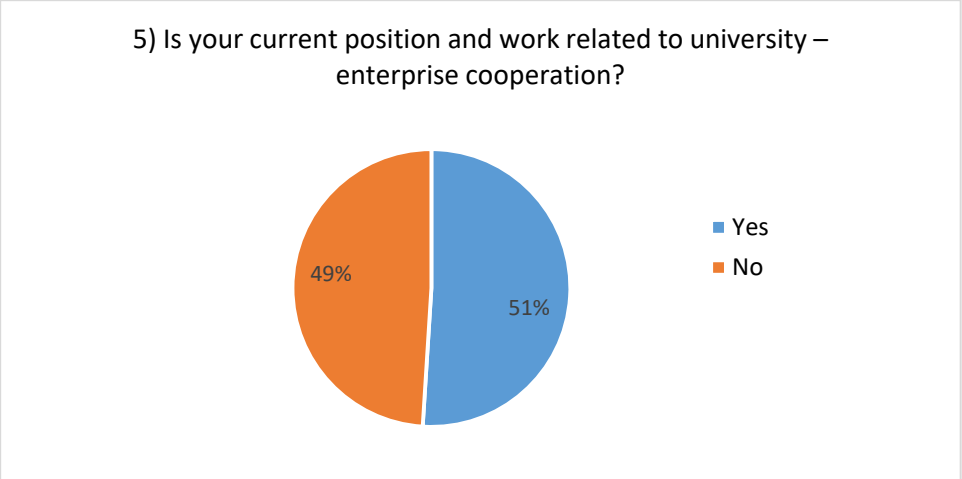


Figure 17: Background of Employees (223 votes)

2.5.2 Feedback of Employees Coming from Different Sectors

Figure 18 shows an overview of the distribution of employees in the different sectors. They have the same distribution as that of stockholders where the majority comes from the "maintain, operate and repair workshop" workshop.

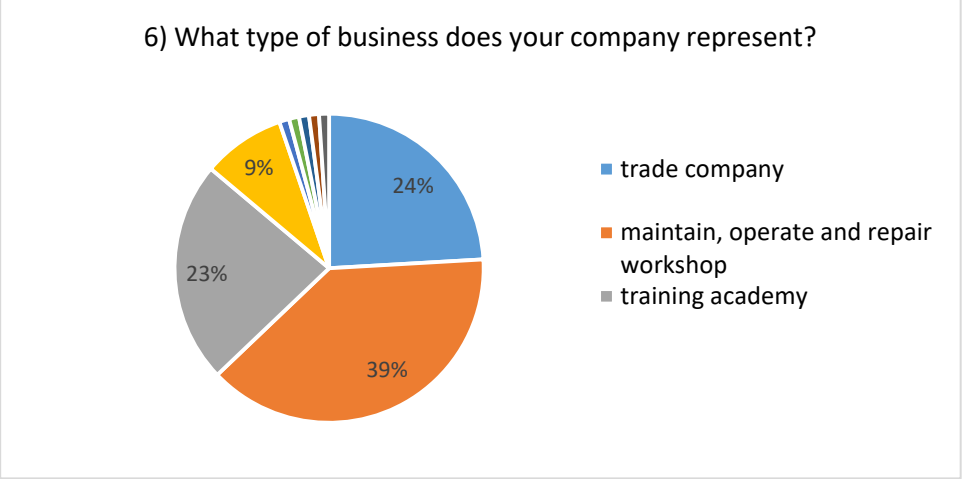


Figure 18: Employees Working in the Different Sectors

2.5.3 Number of Employees

Figure 19 shows that the majority of companies have employees less than 50. This is due to the fact that the majority of the employees who filled the survey are from the sector: "maintain, operate and repair workshop"; which mostly have a medium number of employees. Those are from the "training academy" and the "trade company". Therefore, nearly 65 % of the involved agencies or training centers have headcounts less than 50.

The second largest parts, which are the headcounts represent larger than 100, and those with headcounts between 51 and 100 form equal parts. In addition, the majority of the surveyed companies have 1-3 vacancies for the graduates from the proposed programs as shown in Figure 20.

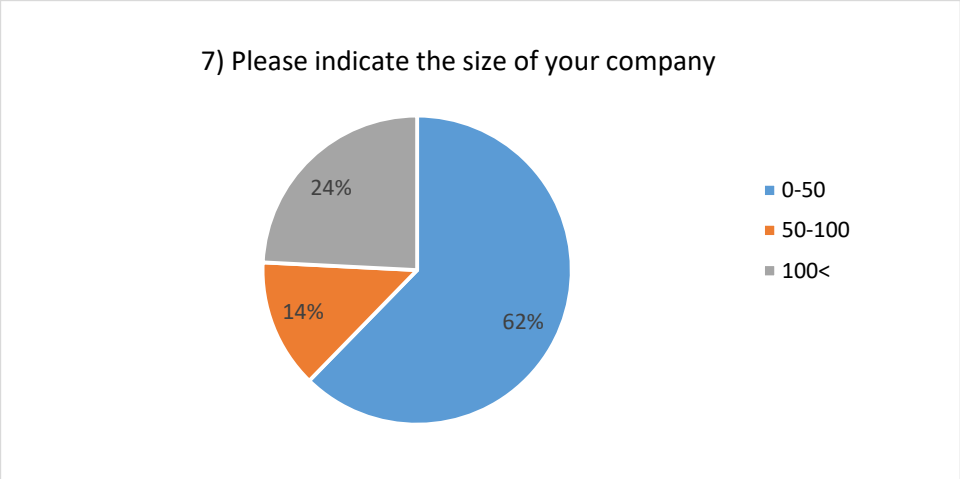


Figure 19: Number of Headcounts Listed

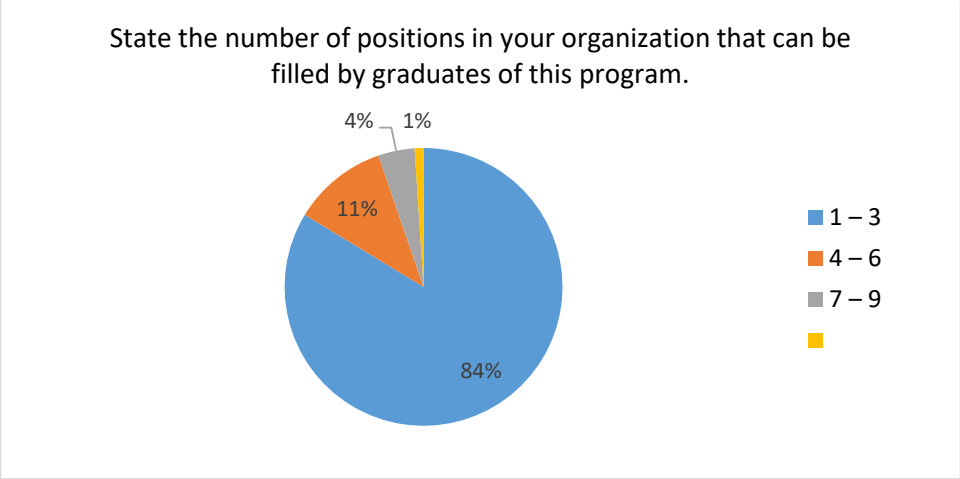


Figure 20: Expected No. of Positions for the Graduates of the Proposed Program

2.5.4 Technologies and Knowledge Gaps That Are Related to EV/HEV

Table 7 shows an overview of the distribution of employee's answers about the type of improvements that their organization seeks in order to utilize EV/HEV technologies in daily processes successfully. The values represent the employee votes. It can be concluded that they nearly agree on the required competencies in the area of EV/HEV where the "Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair" is placed first. Then "both battery and Battery technology, charging safety, and Recharging infrastructure" comes in the second place. This is reasonable since most of the employees own or work in workshops or training centers. In addition, this Figure identifies the main gaps in knowledge and/or skills that they have compared to newly hired employees with the same educational background.

Table 7. employees' answers about the required competences in the area of EV/HEV

EV/HEV	What type of improvements does your organization seek in order to utilize EV/EHV technologies in daily processes successfully	Identify the main gaps in knowledge and/or skills that you have compared to newly hired employees with same educational background
Battery technology, Charging safety, and Recharging infrastructure	24.6%	25.1%
Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair	50.3%	50.3%
Automotive Climate Control Systems	8%	9.6%
Construction of vehicle manufacturing systems	9.6%	7%

For the questions about the availability of training courses, Table 8 shows the results. The answer "very high" takes 5 then "high" takes a score of 3, "some" takes 3, "very little" takes 2, and "none" takes 1. The overall score for this question is less than 3.5 which means that: the majority of the companies sometimes offer appropriate in-house training for their employees, and then they mainly depend on the knowledge and skills the employees gain from the available study programs at universities. In addition, the majority of employees sometimes take training courses outside their companies. Therefore, the employees lack the required skill and experience in EV/HEV technologies; they are somewhat satisfied with the HV/EV technical skills services and courses offered by your organization. Thus ECO-CAR will develop programs that equip its graduates with both theoretical and practical skills in EV/HEV technologies.

Table 8. availability of training courses

Response	Has your organization dedicated EV/HEV courses (Hardware, Software) available to help its employee to accomplish their work?	Have staff from your organization participated in particular activities aiming at improving their knowledge of maintain and operate HV/EHV?	Overall, as an employee, how satisfied are you with the HV/EV technical skills services and courses offered by your organization?
Very high	0.82	0.50	0.79
High	1.45	1.00	1.15
Some	0.90	1.16	0.89
Very little	0.12	0.25	0.24

None	0.10	0.14	0.14
Average (overall score)	3.39	3.05	3.20

Figure 21 displays the main attributes, skills, and specialized knowledge that is considered essential to the employees in the organization. Approximately, 50% of employees mentioned that there is a need for knowledge and skills related to vehicle fault diagnostics, 46% of respondents mentioned that there is a need for technical skills related to EV/HEV, and 36% of them believe that there is a need for experience in maintenance. In addition, respondents mentioned the need for personal skills such as critical thinking, ethics, teamwork, and gentle behavior, especially with customer.

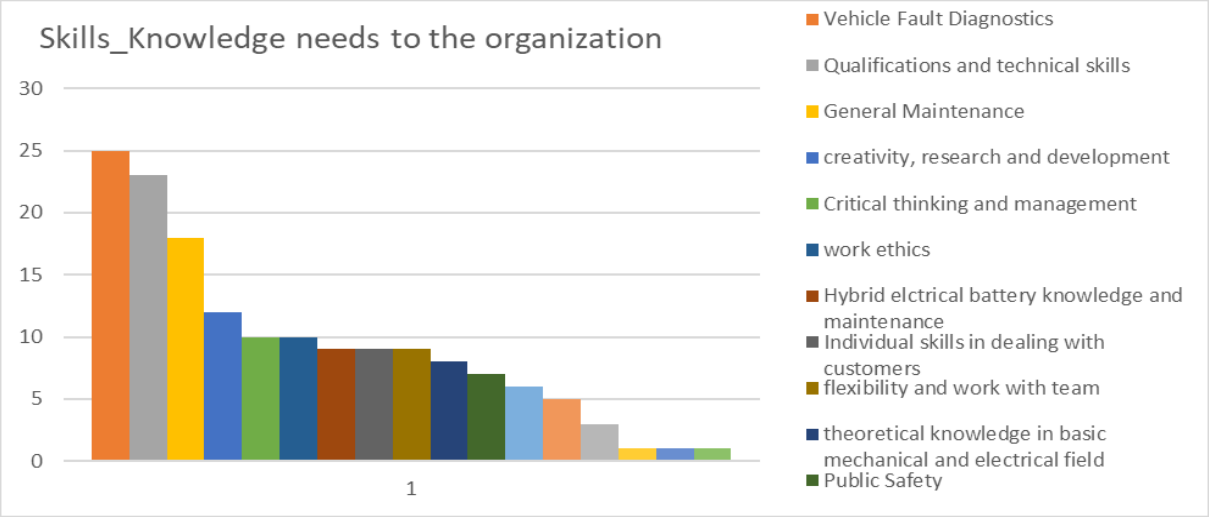


Figure 21: Employees' Skills and Knowledge Required

2.5.5 Role of Graduates of the Program in the Market

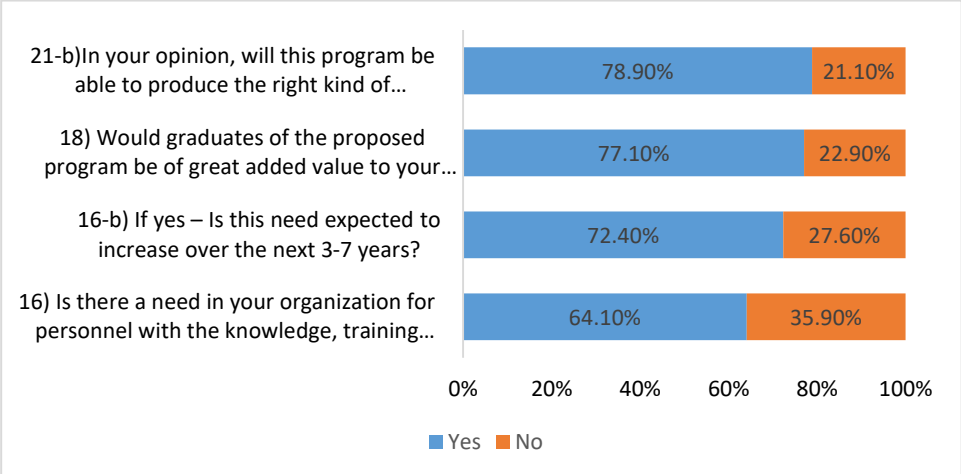


Figure 22: Role of The Program Graduates In The Market-Employees Point of View

Figure 22 shows the role of program graduates in the market as seen by employees. Nearly 64% of the employees mentioned that they need personnel with the knowledge, training, and skills that the program graduates will have; i.e. the skills acquired by those who complete a degree in the proposed program. where 77% of the surveyed employees mentioned that the graduates will add value to the company. The majority of the respondents (78.9% of employees) assured that this program will be able to produce the right kind of graduates who are needed by the market.

Table 9 summarizes some of the statements that are repeatedly mentioned in the comments part of the employees-survey. They assure that there is a trend towards renewable energy locally and globally, which opens a wide range of employment opportunities. Thus ECO_CAR project is essential to help support the market with professionals in EV/HEV

Table 9: statements repeated by EV/HEV employees

HEV sector needs more trainers with high and professional qualifications in the theoretical and technical side in this field.
the HEV Market is developing continuously. So, there is a need for new science and research
The new generation needs to get the experience to handle the market shift towards renewable energy
There is a need for professionals as an outcome of these programs.
The urgent and accelerated growth of EV/HEV market.
The vehicle's market in Jordan is requiring these types of programs. Job opportunities regarding this field are increasing
There is a trend in the whole world towards renewable energy

Figure 23 summarizes the responses of the employees when asked if they agree or disagree with the listed statements; when relating the statement to their organization.

The majority of the respondents assured that their companies need graduates to have practical experience in addition to the theoretical knowledge in the following fields: automotive electricity, electronics, sensors, and actuators, internal combustion engines in hybrid vehicles, automotive climate control systems and vehicle lighting system EV/HEV, battery technology, charging safety, and recharging infrastructure, and electric or hybrid vehicles diagnosis for maintenance and repair.

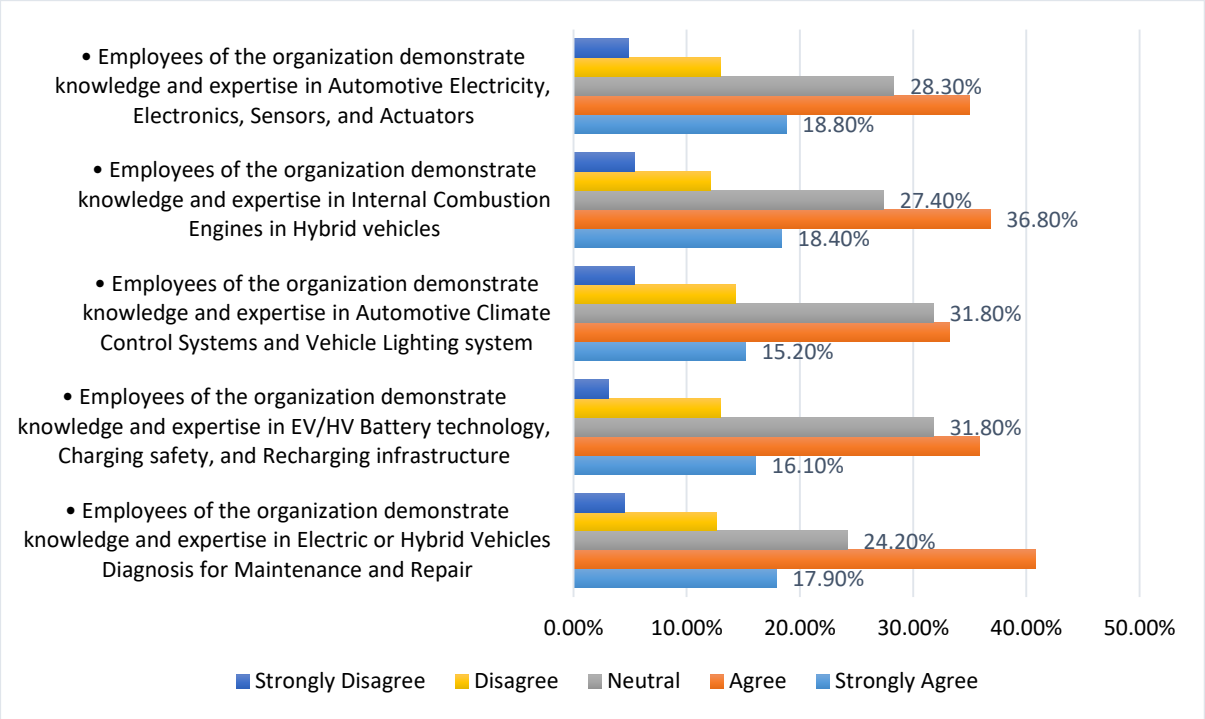


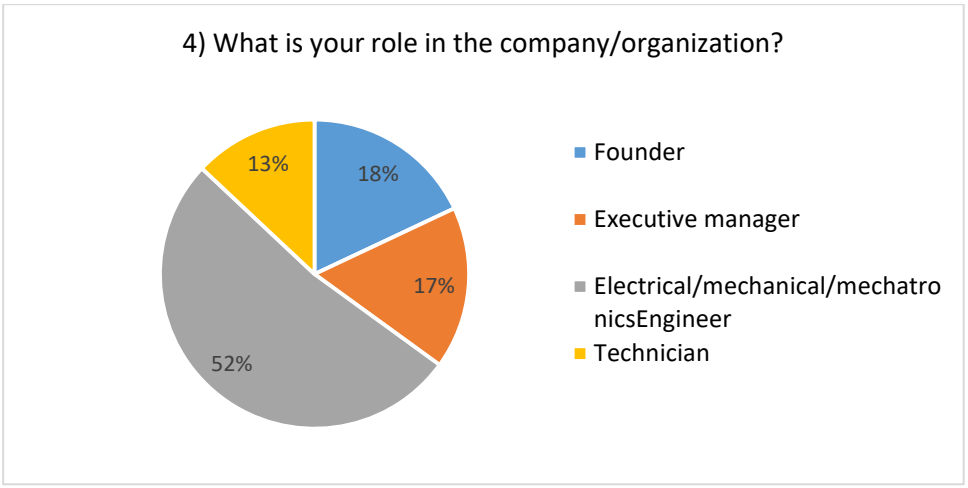
Figure 23: Employees Response In Regard to Questions about Their Organization

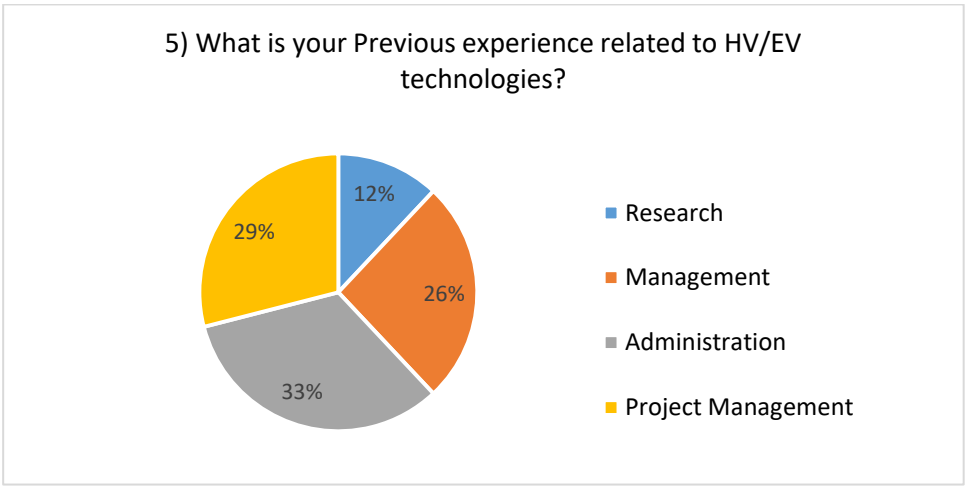
2.6 Part E: Stakeholders Survey

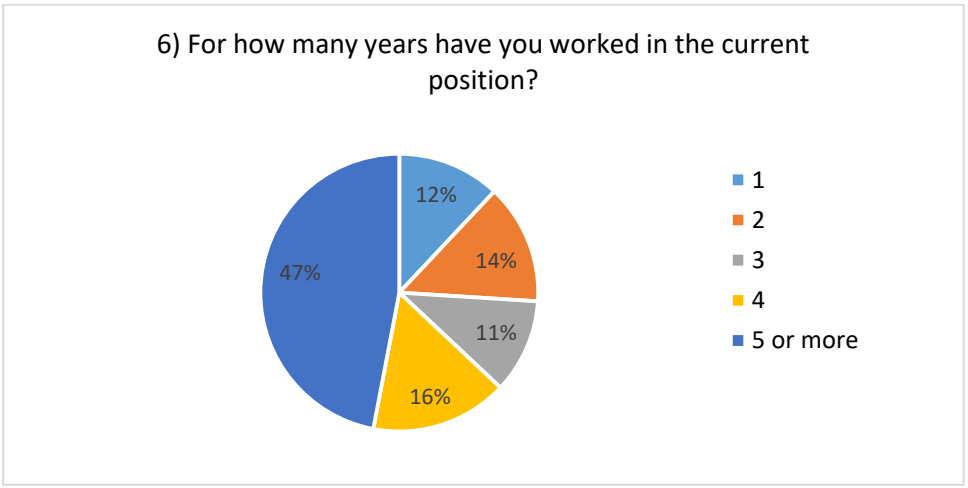
This survey was conducted in order to understand the level of knowledge and skills fresh graduates must have in the field of EV/HEV technologies in order to enable them to meet the current job market needs. More specifically, responses help to investigate the impact of employing a graduate with EV/EV Technical skills on the overall performance of his/her job and the impact on operations and success of his/her organization. A minimum requirement on filled questionnaires was defined with 10 questionnaires per Partner University. This survey was distributed in both Arabic and English languages. The below analysis after merging both surveys.

2.6.1 Profile of Employers

The surveyed companies come from different sectors that are related to EV/HEV. Figure 24 shows their background. Many of the respondents are either engineer who worked previously as managers or researchers. In addition, more than half of the respondents spent 5 years in their current position and their work is related to the cooperation between their company and universities. Thus their responses to the questions in the surveys will help us to know the EV/HEV competencies and needs.







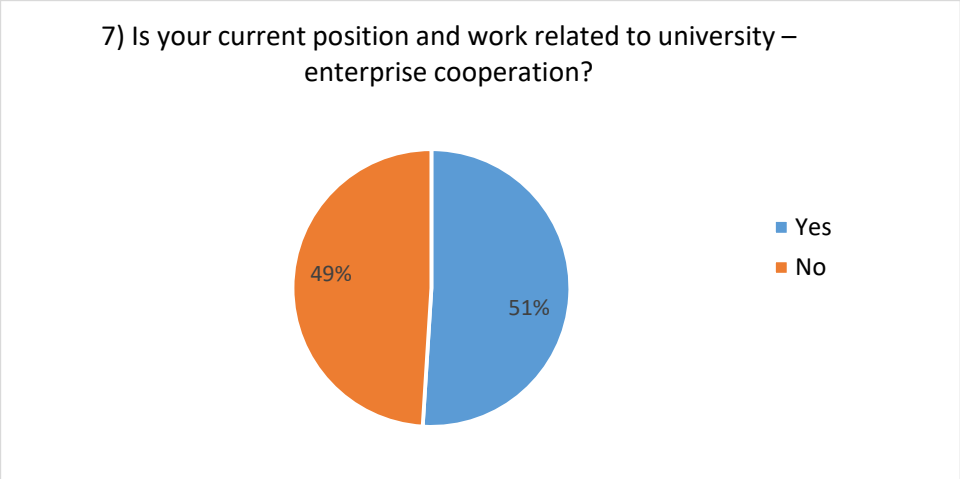


Figure 24: Background of Stakeholders (121 votes)

2.6.2 Feedback of Stakeholders Coming from Different Sectors

Figure 25 shows the distribution of surveyed stakeholders who comes from different sectors. It shows that "Maintain, operate and repair workshops" have major participation. Additionally, there is quite a high number of stakeholders from "training academy" as well as "trade companies". The engineering consultancy, construction companies, and governmental companies cover minor parts. Overall, the stakeholder surveys show a good mix of different sectors and allow therefore achieving representative results out of the survey analysis.

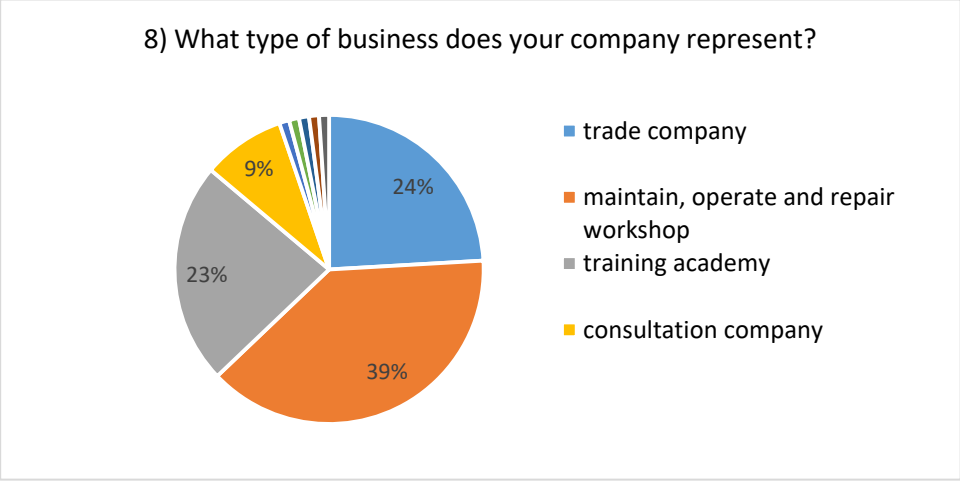


Figure 25: Stakeholders Coming from Different Sectors

2.6.3 Number of Employees

Figure 26 shows that the majority of stakeholders have employees less than 50. This is due to the fact that the majority of the stakeholders who filled the survey are from the sector: "maintain, operate and repair workshop"; which mostly have a medium number of employees. The second largest parts, which are the headcounts represent larger than 100, and those with headcounts between 51 and 100 form equal parts. Those are from the "training companies" and the "trade companies". Therefore, nearly 70% of the involved

stakeholders have headcounts less than 50. Larger companies may be less represented, as they take a minor part. This aspect should be taken into account for interpreting the outcomes.

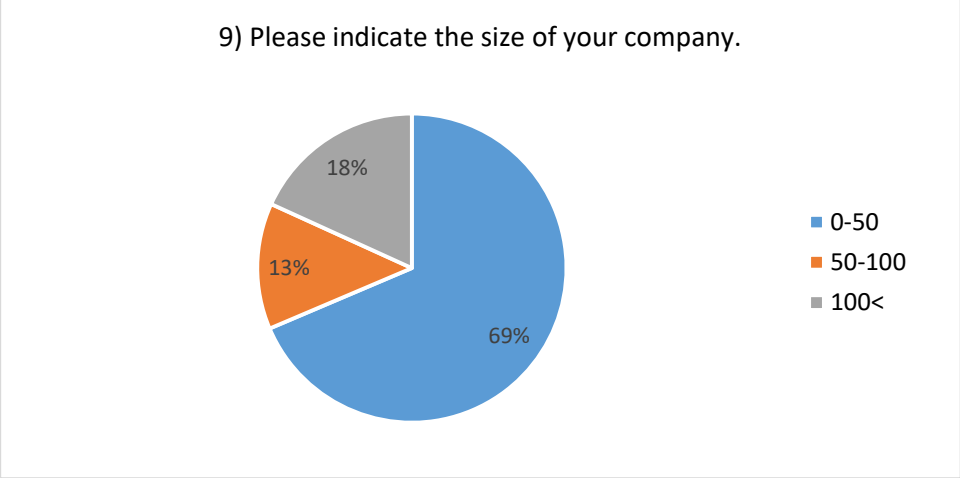


Figure 26: Number of Headcounts Listed by The Stakeholders

2.6.4 Technologies and Knowledge Gaps That Are Related to EV/HEV

Table 10 shows an overview of the distribution of stakeholder's answers about the type of improvements that their organization seeks in order to utilize EV/HEV technologies in daily processes successfully. The values represent the employer's votes. It can be concluded that they nearly agree on the required competencies in the area of EV/HEV where the "Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair" is placed first. Then "both battery and Battery technology, charging safety, and Recharging infrastructure" comes in second place. This is reasonable since most of the employers own or work in workshops or training centers. In addition, this Figure identifies the main gaps in knowledge and/or skills that they have compared to newly hired employees with the same educational background.

Table 10. stakeholders answer about the required competences in the area of EV/HEV

EV/HEV	What type of improvements does your organization seek in order to utilize EV/EHV technologies in daily processes successfully	Identify the main gaps in knowledge and/or skills that you have compared to newly hired employees with same educational background
Battery technology, Charging safety, and Recharging infrastructure	13.4%	20.6%
Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair	63.9%	51.5%
Automotive Climate Control Systems	12.4%	11.3%

Construction of vehicle manufacturing systems	6.2%	8.2%

For the questions about the availability of training courses, Table 11 shows the results. The answer “very high” takes 5 then “high” takes a score of 3, “some” takes 3, “very little” takes 2, and “none” takes 1. The overall score for this question is less than 3.5 which means that: the majority of the stakeholder companies sometimes offer appropriate in-house training for their employees, and then they mainly depend on the knowledge and skills the employees gain from the available study programs at universities. In addition, the majority of employees sometimes take training courses outside their companies. Therefore, the employees lack the required skill and experience in EV/HEV technologies; they are somewhat satisfied with the HV/EV technical skills services and courses offered by your organization. Thus ECO-CAR will develop programs that equip its graduates with both theoretical and practical skills in EV/HEV technologies.

Table 11. availability of training courses

Response	Has your organization dedicated EV/HEV courses (Hardware, Software) available to help its employee to accomplish their work?	Have staff from your organization participated in particular activities aiming at improving their knowledge of maintain and operate HV/EHV?
Very high	1.08	0.62
High	1.05	0.98
Some	1.01	1.16
Very little	0.18	0.22
None	0.09	0.14
Average (overall score)	3.41	3.11

Figure 27 displays the main attributes, skills, and specialized knowledge that is considered essential to the employers in the organization. Approximately, 50% of employers mentioned that there is a need for knowledge and skills related to vehicle fault diagnostics, 46% of respondents mentioned that there is a need for technical skills related to EV/HEV, and 36% of them believe that there is a need for experience in maintenance. In addition, respondents mentioned the need for personal skills such as critical thinking, ethics, teamwork, and gentle behavior, especially with the customer.

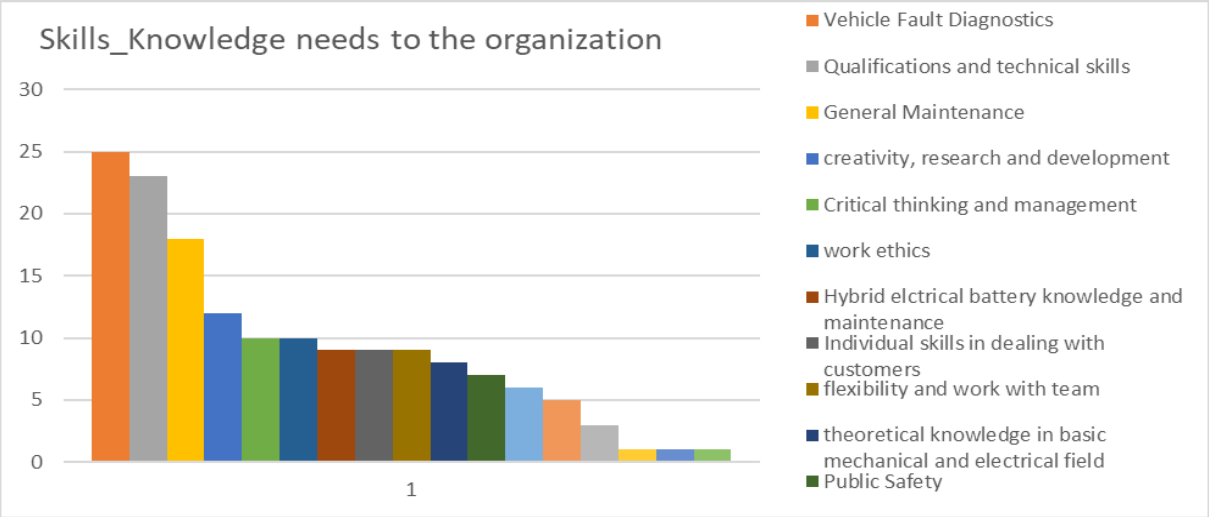


Figure 27: Employers' Skills And Knowledge Required by The Stakeholder

2.6.5 Role of Graduates of the Program in the Market

Figure 28 shows the role of program graduates in the market as seen by employers. Nearly 64% of the stakeholders mentioned that they need personnel with the knowledge, training, and skills that the program graduates will have; i.e. the skills acquired by those who complete a degree in the proposed program. 88% of the stakeholders mentioned that they will hire the program graduates when there is a vacancy, where 80% of the surveyed stakeholders mentioned that the graduates will add value to the company. The majority of the respondents 76.9% of the stakeholders assured that this program will be able to produce the right kind of graduates who are needed by the market.

On the other hand, 79% of stockholder's mentioned that this need is expected to increase over the next 5-10 years. 71.9% of the stockholder's would recommend the program for their employees.

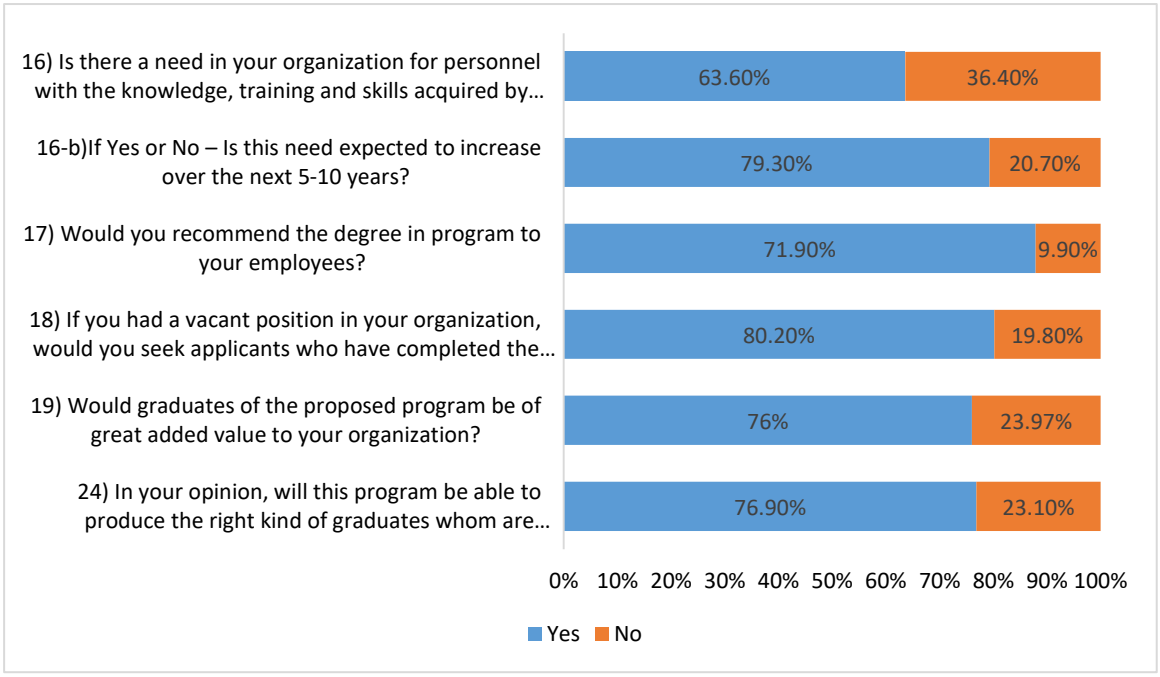


Figure 28: Role of the Program Graduates in the Market-Employers Point of View

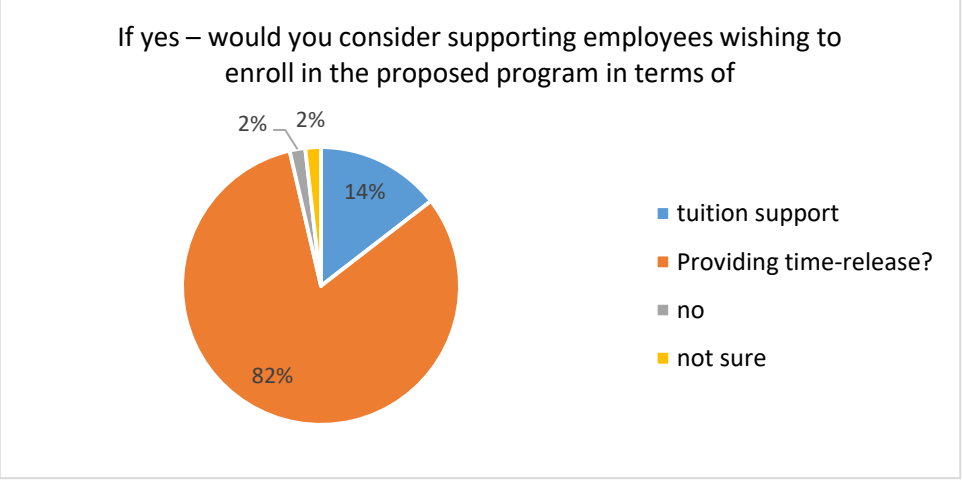
Table 12 summarizes some of the statements that are repeatedly mentioned in the comments part of the employees-survey. They assure that there is a trend towards renewable energy locally and globally, which opens a wide range of employment opportunities. Thus ECO_CAR project is essential to help support the market with professionals in EV/HEV

Table 12: statements repeated by EV/HEV employees

HEV sector needs more trainers with high and professional qualifications in the theoretical and technical side in this field.
the HEV Market is developing continuously. So, there is a need for new science and research
The new generation needs to get the experience to handle the market shift towards renewable energy
There is a need for professionals as an outcome of these programs.
The urgent and accelerated growth of EV/HEV market.
The vehicle's market in Jordan is requiring these types of programs. Job opportunities regarding this field are increasing
There is a trend in the whole world towards renewable energy

Figure 29 shows that the majority (82%) of the stakeholders would allow those employees to leave early, while 14% of stakeholders agreed to pay the studying fees, and nearly 84% (46%+38%) of the stakeholders are willing to pay them a salary between 300-550 JD.

In addition, the majority of the stockholders 81% stated that they may have 1-3 positions available for the program graduates. as shown in Figure 30.



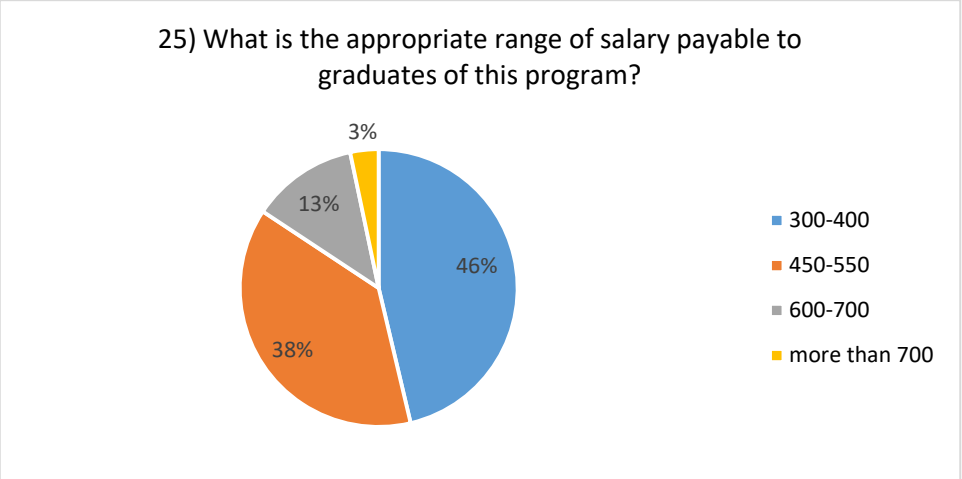


Figure 29: The Role of Stakeholder to Support Employees

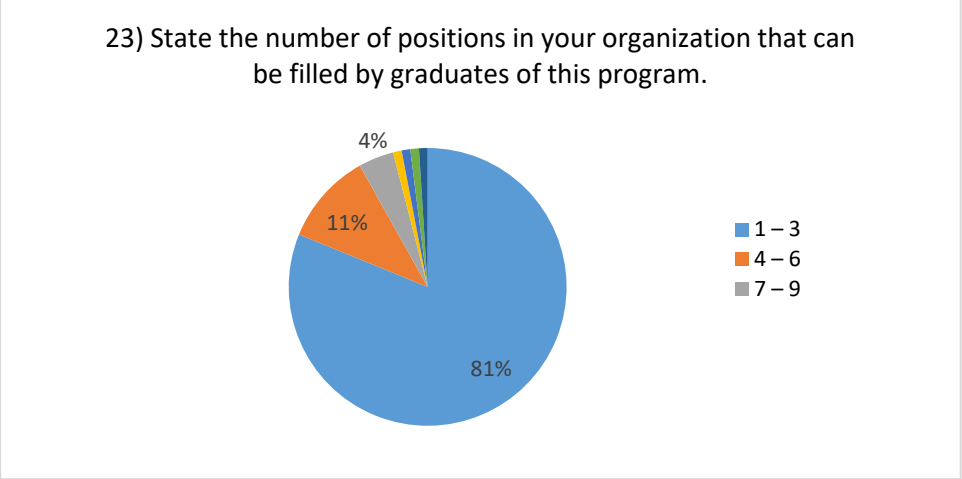


Figure 30: Expected No. of Positions for the Graduates of the Proposed Program

2.7 Summarized Results of Employers and Employees Surveys

ECO-CAR Project will establish programs that are important for most HEV/HV Companies,

- The majority of companies seek in order to utilize EV/HEV technologies in daily processes successfully, they sometimes offer appropriate in-house training for employees, and then they mainly depend on the knowledge and skills the employees gain from the available study programs at universities. [which means we have to improve and update the study curriculums].
- majority of employees sometimes take training courses outside their companies, which means we have to build and develop our Labs in universities to improve the practical skills.
- Nearly 64% of the employees mentioned that they need personnel with the knowledge, training, and skills that the program graduates will have. that's a good impact of the ECO-CAR Project.
- nearly 77% of the surveyed employees mentioned that the graduates will add value to the company. Majority of the respondents (78.9% of employees) assured that this program will be able to produce the right kind of graduates who are needed by the market.

ECO-CAR project will establish programs that are important for the employees for two main reasons:

- Help the stakeholders to plan for the EV/HEV training courses that may include Hardware and Software
- Help stakeholders to plan activities that allow them to improve their knowledge of maintaining and operate EV/EHV.

Based on the stakeholder survey, the following will be a good impact on the ECO-CAR project

- The majority of the stakeholders assured that this program will be able to produce the right kind of graduates who are needed by the market.
- The majority of the stakeholders mentioned that they will hire the program graduates and they may have 1-3 positions available for the program graduates.
- the majority of stakeholders mentioned that the market need is expected to increase over the next 5-10 years
- the majority of the stakeholders would recommend the program for their employees and would allow those employees to leave early, while 14% of stakeholders agreed to pay the studying fees.

3 CURRENT CAPABILITIES ANALYSIS.

The aim of this questionnaire was to screen the already existing study structure as well as to evaluate the existing teaching and lab infrastructure. By direct comparison between partner universities, existing and/or required courses and laboratories can be highlighted.

3.1 Structure of the University

The first part of the survey scans the location of the partner universities, where ECO-CAR will take place as shown in Table 13. The partner universities cover the north, middle, and south of Jordan which will guarantee that ECO-CAR will benefit will spread across the country. In addition, Table 11shows the number of students and faculty members. It is clear that the faculty of engineering constitute nearly 10% of the university. Thus, there will be enough capabilities to achieve the required results of ECO-CAR.

Table 13: location and capacity of partner universities

	ASU	BAU	HTU	JUST	MU	TTU	UJ	ZUJ
Location	Amman	AL-Salt	Amman	Irbid	Karak	Tafila	Amman	Amman
Number of students registered at the university	5,001-10,000	>30,000	<3,000	20,001-30,000	20,001-30,000	5,001-10,000	>30,000	5,001-10,000
Number of Faculty members appointed at the university	211-420	>630	<60	>630	420-630	211-420	>630	211-420
Number of students registered at the faculty of Engineering	500-1000	>2500	<500	>2500	>2500	2000-2500	>2500	500-1000
Number of Faculty members appointed at the faculty of engineering	>15	>15	11-15	>15	>15	>15	>15	>15

3.2 Existing courses

Table 14 lists the existing/non-existing courses in the different partner universities. Cells marked with the green show already existing lectures at the University. Cells marked with bluer show that those courses are planned to be offered using ECO-CAR. Therefore, lectures in **the Fundamental knowledge in Mechanical, electrical, and mechatronics science** are already well established in the different universities.

ECO-CAR_Vocational Training Diploma On Electrical and Hybrid Vehicles

The main shortage of lectures is highlighted in the field of **Fundamental technical knowledge in EV/HEV** and **Applied technical knowledge in EV/HEV**. Nevertheless, such courses are offered in some of the participating universities. Therefore, within the ECO-CAR project exchange of information and exchange of knowledge will be possible between the participating universities.

Table 14: list of existing/non-existing courses in the different partner universities

	Legend	**ASU**	**BAU**	**HTU**	**JUST**	**MU**	**TTU**	**UJ**	**ZUJ**
	Currently offered								
	Currently not offered, but planned								
	Not offered and not planned								
B1	**COURSES**								
B1.1	Fundamental knowledge in Mechanical, electrical and mechatronics science								
	Basic electrical and electronics								
	Principles of thermal engineering								
	fluid and hydraulic machines								
	measurements and instrumentations								
	Thermo dynamic								
	Hydraulic and pneumatic controls								
	Power electronics								
	Energy storage								
	Automotive engineering								
	Internal combustion Engines								
	Automobile electrical and electronic systems								

	Other:							
B1.2	Fundamental technical knowledge in EV/HEV							
	Hybrid and Electric Vehicle Basics							
	EV&HEV technology and hazardous material							
	Automobile systems and subsystems							
	Well to wheel LCA calculations							
	Construction of vehicle manufacturing systems							
	Electrical power transmission system							
	Other:							
B1.3	Applied technical knowledge in EV/HEV							
	Battery technology, Charging safety, and Recharging infrastructure							
	Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair							
	Automotive Climate Control Systems and Vehicle Lighting system							
	Low Voltage System and Modern Electronic Ignition Systems.							
	Automotive diagnostics and repair faults electric hybrid vehicles							
	Other:							

Table 15 shows the existing software lab infrastructure and the required software labs for each partner that may be needed for ECO-CAR. The technical experience required for those labs can be exchanged between universities participating in ECO_CAR.

Table 15: list of software labs

B2	**Software LAB**							
	Automotive database software Lab.							
	Programming and Simulation							

	Modelling (Mat lab, Simulink,…)								
	Control (SPS, LabVIEW,…)								
	Thermal Simulation (TRNSYS,								
	E Plus, Solar systems, PV,…)								
	Building physics and moisture Simulations (Comsol, Delphin…)								
	Computational fluid dynamics								
	Structural analysis (FEM,…)								
	CAD (Katia, ProEngineer, Solid Works …)								
	Project management and Controlling								
	Technical English								
	Scientific work								
	Quality management (ISO 9001)								
	Environmental management (ISO 14001)								
	Waste management								
	Other:								

Most universities have many laboratories specified for engineering students. But they lack laboratories for EV/HEV as shown in Table 16. Nevertheless, they need to have student's laboratories and research laboratories where they have the space to establish new laboratories using ECO-CAR as shown in Figure 27.

Table 16: laboratories infrastructure

B3	**Laboratories used for EV/HEV.**								
	Hybrid vehicles workshop								
	Electrical vehicles workshop								
	Automobile systems and subsystems lab								
	Other:								

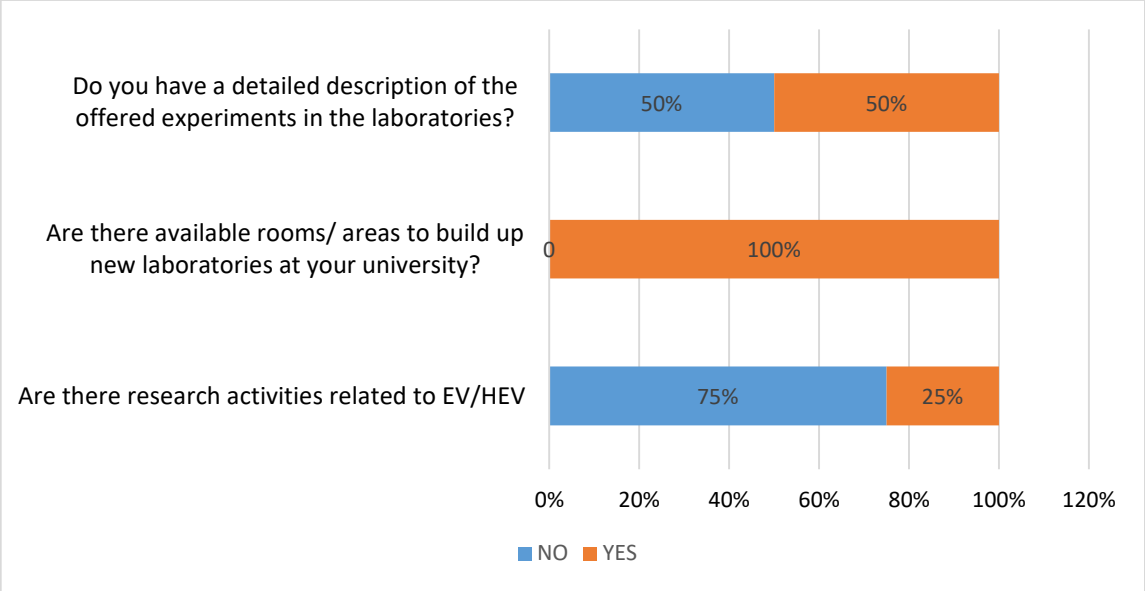


Figure 31: The Requirement for Both Students and Research Laboratories.

4 APPENDIX

4.1 Appendix A: Course Content for The Different Programs

Table A.1: Vocational Diploma (9-Months,300 Credit Hours)

Automotive Electricity, Electronics, Sensors, and Actuators
Internal Combustion Engine
Low Voltage System and Modern Electronic Ignition Systems.
Battery technology, Charging safety, and Recharging infrastructure
electrical power transmission system
automotive database programs Lab.
automotive diagnostics and repair faults electric hybrid vehicles
automobile systems and subsystems

Table A.2: First: Diploma (2-Years After High School); Main Subjects 45 Credit Hours

Course Name	Credit Hours
Basic electrical and electronics	2
Basic electrical and electronics lab.	1
Mechanical drawing	2
Applied mechanics	2
Principles of thermal engineering	3
Principles of thermal engineering lab	1
Fluid and hydraulic machines	3
Fluid and hydraulic machines lab.	1
Automotive engineering	3
Automotive engineering workshop	2
Internal combustion Engines	3
Internal combustion Engines lab.	1
Automobile electrical and electronic systems	3
Automobile electrical and electronic systems workshop	1
Electrical and hybrid Vehicles Technology	3
Electrical and hybrid Vehicles lab.	1

Automotive measure and control systems	2
Automotive measure and control systems lab.	1
Automotive diagnostics and repair faults vehicles	3
Automotive diagnostics and repair faults vehicles workshop	2
Engineering Workshop	1

Table A.3: Higher diploma (For Mechanical, Electrical and Mechatronics engineers), 30 credit hours

Course Title	Credit Hours
Hybrid and Electric Vehicle Basics	3
Battery technology, Charging safety, and Recharging infrastructure	3
EV&HEV technology and hazardous material	3
Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair	3
Automotive Climate Control Systems and Vehicle Lighting system	3
Internal Combustion Engines in Hybrid vehicles	3
Well to wheel LCA calculations	3
Automotive Electricity, Electronics, Sensors, and Actuators	3
Construction of vehicle manufacturing systems	3

Table A.4: Bachelor's Technical Degree (4-years); Main Courses: 90 hours

Course Title	Credit Hours
Electrical circuits	3
Electrical circuits lab.	1
Dynamics	3
Strength of materials	3
material science	3
measurements and instrumentations	3
measurements and instrumentations lab.	1
modern control	3
Control lab.	1
Thermos dynamic 1	3
Thermos dynamic 2	3
Thermos dynamic lab.	1

Fluid Mechanics	3
Fluid Mechanics lab.	1
Heat Transfer	3
Heat Transfer lab.	1
Mechanical Design	3
electronic devices and circuits	3
electronic devices and circuits lab.	1
automotive electricity and electronics	3
automotive electricity and electronics lab.	1
automotive technology	3
electrical machines	3
electrical machines lab.	1
Electrical and Hybrid Vehicles	3
Internal Combustion Engine	3
Internal Combustion Engine lab	1
automotive sensors and actuators	3
automotive design	3
automotive diagnostics and repair vehicles engines	3
Hydraulic and pneumatic controls	3
Hydraulic and pneumatic controls lab.	1
Power electronics	3
energy storage	3
vehicles battery cells and systems	3
vehicles battery cells and systems lab.	1
practical training	3
Graduation Project	3

ECO-CAR Project Number: 618509-EPP-1-2020-1-JO-EPPKA2-CBHE-JP

4.2 Appendix B: Questionnaires Content

4.2.1 Partner Questionnaire

Dear Partner,

In order for the ECO-CAR (Vocational Training Diploma on Electrical and Hybrid Vehicles) Project to effectively determine the current status of the use of Hybrid and electric vehicles Technology (HV/EV) in the market place; we are conducting this survey to Measure the satisfaction of each partner on suggesting programs, In according with,

- Any of these programs are effective and suitable for your Organization and Area
- In Your Opinion, Which Program Has More Impact On the Market Needs
- How Can We Edit to Improving Our Capability and Impact?

The Suggestion Programs will be as the following, please answer the question according to the suitable program your organization need.

1. Vocational training (9-month study and training, include around 300 hours). Including Comprehensive theoretical and practical lectures that include diagnosing, checking, and maintaining all Electric and Hybrid vehicle systems and parts.
2. Diploma (2-year study and training, includes around 90 credit hours). A student with a secondary school certificate can join this program.
3. Higher diploma (1-year theoretical study with 30 credit hours) including lectures, assignments, group work, exams, and final research project. This program is designated for students with engineering backgrounds such as Mechanical, Electrical, Mechatronics Engineers. (Bachelor degrees' holders)
4. Bachelor's technical degree (4-years Engineering plan with a focus on Hybrid and EV, total 130 credit hours required by the ministry of higher education in Jordan).

Participation in this study is entirely voluntary, your responses will be completely anonymous; your name will not appear anywhere on the survey. All of the information you provide will be kept confidential.

Please feel free to include any additional comments you deem necessary or relevant to improving the research project. Your response and time is greatly appreciated.

Thank you in advance for your participation, assistance, and valuable input.
Sincerely, ASU Team
ECO_CAR Erasmus+ Programme

Fulfilment Contents of Program and Its Relevance to the Needs of Partners

According to the following suggested programs, please answer the following questions

1. University Name is
    - The University of Jordan (UJ)

- Jordan University of Science and Technology (JUST)
- Mutah University (MU)
- Tafila Technical University (TTU)
- AlBalqa'a Applied University (BAU)
- AlHussein Technical University (HTU)
- Al-Zaytoonah University (ZUJ)

2. Does your university have any of the following programs (you can select more than one),
   - Higher Diploma
   - Professional Diploma
   - Bachelor's Technical Degree
   - Diploma Degree
   - Vocational Diploma
   - Training courses

According to the main topics for each program, we need your opinion about the selected program and other proposed programs

3. Do you prefer the new program to be?
   - Higher Diploma
   - Bachelor's Technical Degree
   - Diploma Degree
   - Vocational Diploma

According to which new program you have selected, please answer the following questions,

4. Does the program fulfil the practical skills needed?

   Fully Partially None

5. Are the concepts and principles relevant to future needs?

   Yes fairly No

6. Do the suggested course contents help to build a strong program?

   Yes Fairly No

7. Does the suggested course contents cover all relevant subjects/topics?

   Yes Fairly No

   If your answer is 'Fairly' or 'No', please indicate other additional areas that need to be covered by the new program

   ……..

8. Is there any subject that is not relevant?

   Yes No

Co-funded by the Erasmus+ Programme of the European Union

If your answer is 'Yes', what are the subjects that need to be deleted?

9. State whether the program fulfils this criteria:

	Fully	Partially	None
a. build the practical skills of engineers in this field to meet the needs of expanding EV and HEV market in Jordan			
b. Increase the employability of graduates in Local and International Market			
c. Through this program, students will get the needed skills to maintain operate and repair Electric and Hybrid vehicles with appropriate knowledge in the fields of transportation and logistics			
d. Improve the level of provided services for maintaining, operating and repairing electric and Hybrid vehicles in Jordanian enterprises.			
e. Helping to move Jordan forward to become a host for Electrical and Hybrid vehicles industry in future			

10. Is this program sufficient in terms of Length of study?
    Yes No

    If your answer is 'No', please suggest the appropriate length of study duration. Please explain your suggestion.
    ……..

11. Is this program sufficient in terms of duration of practical training?
    Yes No

    If your answer is 'No', please suggest the appropriate duration of practical training. Please explain your suggestion.

12. Is this program sufficient in terms of the courses contents?
    Yes No

    If your answer is 'No', please suggest the related topics of course/ practical training. Please explain your suggestion.
    ……

13. Please make any additional comments you would like to add or anything else you would like to mention about the HV/EV. (Answering this question is optional)
    ……..

ECO-CAR Vocational Training Diploma on Electrical and Hybrid Vehicles

WP 2 (PREPARATION)

4.2.2 Faculty Members' Questionnaire

Dear Faculty Member,

We have a useful project titled "ECO-CAR (Vocational Training Diploma on Electrical and Hybrid Vehicles" funded by Erasmus+ Program, it suggests four programs to cover the Jordan needs in different area such as:

1) Vocational training (9-month study and training, include around 300 hours). Including Comprehensive theoretical and practical lectures that include diagnosing, checking, and maintaining all Electric and Hybrid vehicle systems and parts.

2) Diploma (2-year study and training, includes around 90 credit hours). A student with a secondary school certificate can join this program.

3) Higher diploma (1-year theoretical study with 30 credit hours) including lectures, assignments, group work, exams, and final research project. This program is designated for students with engineering backgrounds such as Mechanical, Electrical, Mechatronics Engineers. (Bachelor degrees' holders)

4) Bachelor's technical degree (4-years Engineering plan with a focus on Hybrid and EV, total 130 credit hours required by the ministry of higher education in Jordan).

As your academic member, we need your help to review the content of the suggested programs, add or remove courses, training, etc. We have four suggested programs and you can select the first importance according to your experience and opinion, then answer the following questions

Participation in this study is entirely voluntary, your responses will be completely anonymous; your name will not appear anywhere on the survey. All of the information you provide will be kept confidential.

The survey will take approximately 10 minutes to complete, please start to answer the questionnaire. This is an opportunity to help us to get essential information to ensure a successful implementation of the project, also we hope that you will answer the survey questions thoughtfully and thoroughly.

Thank you in advance for your participation, assistance, and valuable input.

Sincerely,
ECO-CAR Team

Erasmus+ Program

1. What is the name of your University?
    - Al-Zaytoonah University of Jordan
    - al-Balqa applied University
    - Mutah university
    - Al-Hussein bin Abdullah II Technical university
    - Tafila technical university
    - Jordan University of Science and Technology
    - University of Jordan
    - Other (please specify)
2. What is your age?
    - Less than 30 years' old

- 30-45
- 45-60
- More than 60 years' old

3. What is your current faculty rank?
   - Lecturer
   - Assistant Professor
   - Associate Professor
   - Professor
   - Engineer
   - Other (specify)

4. Including the current year, how many years of teaching experience do you have?
   1 2 3 4 5 or more

5. If you use HV/EV Technology in teaching, how many years have you used HEV/HV?
   1 2 3 4 5 or more

6. In what Engineering Department do you teach?
   Mechanical Electrical Mechatronics Energy Other

7. As a current faculty member, which statement of the following applies to you (you can select more than one)?
   - I have no plans to teach courses utilizing best practices in HEV/HV.
   - I plan to teach courses utilizing best practices in HV/HEV in the coming year.
   - I have taught courses utilizing best practices in HV/HEV.
   - Currently, I am teaching a course utilizing best practices in HV/HEV.

8. Have you attended HV/HEV training sessions?
   • Yes • No • if yes, specify where

Does your department curriculum include Courses that deal with Vehicles Technology?

• if yes, please specify what is courses name • If No, please specify what is courses name

Does your department curriculum include Courses that deal with Electric and Hybrid Vehicles Technology?

• if yes, please specify what is courses name • If No, please specify what is courses name

9. Does your department have special Electric and hybrid Vehicles Laboratories?
   • Yes • No

10. Does your department have professors who are specialize in electric and hybrid cars?
    • Yes • No • if yes, specify how many?

11. How much helpful are the electric and hybrid vehicles technologies labs in teaching/research/learning and curriculum design engagement?
    • Very helpful • helpful • Not at all Helpful

12. Is there any cooperation between your university and HV/HEV enterprises?
    - Yes
    - No
    - if yes, specify the enterprises name

13. As a faculty member, rate the extent to which you agree with the following statements about major incentives for utilizing HV/HEV technology in education in the future?

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
f. build the practical skills of engineers in this field to meet the needs of expanding EV and HEV market in Jordan					
g. Increase the employability of graduates in Local and International Market					
h. Improve the level of provided services for maintaining, operating and repairing electric and Hybrid vehicles in Jordanian enterprises.					
i. Helping to move Jordan forward to become a host for Electrical and Hybrid vehicles industry in future					
j. The graduated students from this new program will be able to fulfill roles of vehicle engineering tasks, like improvement and operation, taking into account safety, environment and energy management aspects.					

According to the main topics for each program, we need your opinion about the selected program and other proposed programs

14. In your opinion, which of the following programs your university area needs
    - Higher Diploma
    - Bachelor's Technical Degree
    - Diploma Degree
    - Vocational Diploma

According to which <u>new program</u> you have selected, please answer the following questions, (In google form, there are topics of the selected program)

15. Does the program fulfil the practical skills needed?
    Fully Partially None

16. Are the concepts and principles relevant to future needs?

Yes fairly No

17. Do the suggested course contents help to build a strong program?
    Yes Fairly No
18. Does the suggested course contents cover all relevant subjects/topics?
    Yes Fairly No

    If your answer is 'Fairly' or 'No', please indicate other additional areas that need to be covered by the new program

    ……..
19. Is there any subject that is not relevant?
    Yes No

    If your answer is 'Yes', what are the subjects that need to be deleted?

20. Please make any additional comments you would like to add about the HV/EV. (Answering this question is optional)

4.2.3 Students Questionnaire

Dear Students,

We have a useful project titled “ECO-CAR (Vocational Training Diploma on Electrical and Hybrid Vehicles” funded by Erasmus+ Program, it suggests four programs to cover the Jordan needs in different area such as:

1) Vocational training (9-month) Including Comprehensive theoretical and practical lectures that include diagnosing, checking, and maintaining all Electric and Hybrid vehicle systems and parts.
2) Diploma (2-year study and training).
3) Higher diploma (1-year theoretical study) including lectures, assignments, group work, exams, and final research project. This program is designated for students with engineering backgrounds such as Mechanical, Electrical, Mechatronics Engineers. (Bachelor degrees' holders)
4) Bachelor's technical degree (4-years Engineering plan with a focus on Hybrid and EV).

We are conducting this survey to understand the level of Hybrid and electric vehicles technologies skills our fresh graduates possess that enables them to meet the current job market needs.

Your response to this survey as a student is crucial in providing the necessary information to formulate a useful teaching methodology at higher education institutes in upcoming years. We need to learn your opinion about the suggestions programs, what you prefer, and what the expected gained skills…

Participation in this study is entirely voluntary, your responses will be completely anonymous; your name will not appear anywhere on the survey. All of the information you provide will be kept confidential.

The survey will take approximately 10 minutes to complete, please start to answer the questionnaire. This is an opportunity to help us to get essential information to ensure a successful implementation of the project, also we hope that you will answer the survey questions thoughtfully and thoroughly.

Thank you in advance for your participation, assistance, and valuable input.

Sincerely, ECO-CAR Team

Erasmus+ Program

Market survey

1) What is the name of your University?
    - Al-Zaytoonah University of Jordan
    - al-Balqa applied University
    - Mutah university
    - Al-Hussein bin Abdullah II Technical university
    - Tafila technical university
    - Jordan University of Science and Technology
    - University of Jordan
    - Applied Science Private University
    - Other (please specify)
2) What is your age?
    - 18-21
    - 22-24

- 24-26
- More than 26 years' old

3) In what level do you study?
   - Secondary level graduate
   - Technical Diploma
   - Bachelor's degree
   - Master degree
   - Other (please specify)

If you have Secondary or Technical level, please answer the following questions [will be Separate in Google form according which his/ her level select]

4) Do you prefer the program to be?
   - Vocational Diploma
   - Diploma
   - Higher Diploma
   - Bachelor Degree

According to which <u>new program</u> you select, please answer the following questions,

5) Please rate your level of interest in the selected program?
   very high somewhat high Neutral somewhat low very low

6) Rate the likelihood of submitting an application for admission to the proposed program if it were launched within the next 2-3 years?
   very likely somewhat likely Neutral somewhat unlikely very unlikely

7) Do you believe that the proposed program will increase your employment opportunities? (Y/N)

   If Yes or No – Explain…….

8) Have you actively searched for programs similar to the one proposed? (Y/N)

   If Yes or No, Explain When did you make search…….

9) Is your interest in the program influenced by the following (check all that apply), (you can select more than one)?

   - Mode of delivery: on-site face-to-face; on-line; blended (<number> short period(s) of on-site face-to-face followed by on-line)
   - The courses offered and program structure
   - Experiential learning opportunities
   - Flexibility in enrolment status (i.e. full-time or part-time)
   - Availability of funding support
   - Estimated program cost
   - Other (please specify)

10) What is your preferred mode of delivery?
- on-site face-to-face;
- on-line;
- blended (short period(s) of on-site face-to-face followed by on-line)

11) Please rate the extent to which you agree with the following statements about major incentives for utilizing HV/HEV technology in education in the future?

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
k. build the practical skills of Technician or Engineer in this field to meet the needs of expanding EV and HEV market in Jordan					
l. Increase the employability of graduates in Local and International Market					
m. Through this program, students will get the needed skills to maintain operate and repair Electric and Hybrid vehicles with appropriate knowledge in the fields of transportation and logistics					
n. Helping to move Jordan forward to become a host for Electrical and Hybrid vehicles industry in future					
o. The graduated students from this new program will be able to fulfill roles of vehicle engineering tasks, like improvement and operation, taking into account safety, environment and energy management aspects.					

Would you recommend to others that they consider enrolling in the proposed program?

(Y/N)

Provide the main reasons why or why not……..

Would you like us to contact you when we begin accepting applications to the program?

(Y/N)

If yes - please provide your contact information…….

If you have bachelor's or Master Degree, please answer the following questions [will be Separate in Google form according which his/ her level select]

4) Does your curriculum include Courses that deal with Vehicles Technology?

•Yes • No

if yes, please specify what is courses name…….

5) Does your curriculum include Courses that deal with Electric and Hybrid Vehicles Technology?
• Yes • No

if yes, please specify what is courses name…….

6) Does your curriculum include special Electric and hybrid Vehicles Laboratories?
• Yes • No

if yes, please specify what is courses name…….

7) Do you prefer the program to be?
- Vocational Diploma
- Diploma
- Higher Diploma
- Bachelor Degree

According to which <u>new program</u> you select, please answer the following questions,

8) Please rate your level of interest in the selected program?
very high somewhat high Neutral somewhat low very low

9) Rate the likelihood of submitting an application for admission to the proposed program if it were launched within the next 2-3 years?
very likely somewhat likely Neutral somewhat unlikely very unlikely

10) Do you believe that the proposed program will increase your employment opportunities? (Y/N)

If yes or No, please explain how?…….

11) Have you actively searched for programs similar to the one proposed? (Y/N)

If Yes or No, Explain When did you make search…….

12) Is your interest in the program influenced by the following (check all that apply), (you can select more than one)?

- Mode of delivery: on-site face-to-face; on-line; blended (<number> short period(s) of on-site
face-to-face followed by on-line)
- The courses offered and program structure
- Experiential learning opportunities
- Flexibility in enrolment status (i.e. full-time or part-time)
- Availability of funding support
- Estimated program cost
- Other (please specify)

13) What is your preferred mode of delivery?

- on-site face-to-face;
- on-line;
- blended (short period(s) of on-site face-to-face followed by on-line)

14) Please rate the extent to which you agree with the following statements about major incentives for utilizing HV/HEV technology in education in the future?

Statements	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
p. build the practical skills of engineers in this field to meet the needs of expanding EV and HEV market in Jordan					
q. Increase the employability of graduates in Local and International Market					
r. Through this program, students will get the needed skills to maintain operate and repair Electric and Hybrid vehicles with appropriate knowledge in the fields of transportation and logistics					
s. Helping to move Jordan forward to become a host for Electrical and Hybrid vehicles industry in future					
t. The graduated students from this new program will be able to fulfill roles of vehicle engineering tasks, like improvement and operation, taking into account safety, environment and energy management aspects.					

Would you recommend to others that they consider enrolling in the proposed program?

(Y/N)

Provide the main reasons why or why not……..

Would you like us to contact you when we begin accepting applications to the program?

(Y/N)

If yes - please provide your contact information…….

4.2.4 Stakeholder Questionnaire

Dear Participant,

We have a useful project titled “ECO-CAR (Vocational Training Diploma on Electrical and Hybrid Vehicles” funded by Erasmus+ Program, it suggests four programs to cover the Jordan needs in different area such as:

1) Vocational training (9-month) Including Comprehensive theoretical and practical lectures that include diagnosing, checking, and maintaining all Electric and Hybrid vehicle systems and parts.
2) Diploma (2-year study and training).
3) Higher diploma (1-year theoretical study) including lectures, assignments, group work, exams, and final research project. This program is designated for students with engineering backgrounds such as Mechanical, Electrical, Mechatronics Engineers. (Bachelor degrees' holders)
4) Bachelor's technical degree (4-years Engineering plan with a focus on Hybrid and EV).

We are conducting this survey to understand the level of Hybrid and electric vehicles technologies skills our fresh graduates possess that enables them to meet the current job market needs. More specifically, we would like to investigate the impact of employing a graduate with HV/EV Technical skills on the overall performance of his/her job and the operation and success of your organization.

Your response to this survey as a stakeholder is crucial in providing the necessary information to formulate a useful teaching methodology at higher education institutes in upcoming years.

Participation in this study is entirely voluntary, your responses will be completely anonymous; your name will not appear anywhere on the survey. All of the information you provide will be kept confidential.

The survey will take approximately 10 minutes to complete, please start to answer the questionnaire. This is an opportunity to help us to get essential information to ensure a successful implementation of the project, also we hope that you will answer the survey questions thoughtfully and thoroughly.

Please feel free to include any additional comments you deem necessary or relevant to improving the research project. Your response and time is greatly appreciated.

Thank you in advance for your participation, assistance, and valuable input!

Sincerely,

ECO-CAR Team

Erasmus+ Program Project

Number: 618509-EPP-1-2020-1-JO-EPPKA2-CBHE-JP

Market survey

According to which new program you select, please answer the following questions

ECO-CAR_Vocational Training Diploma On Electrical and Hybrid Vehicles

1) What would make you hire a new program fresh graduate student and why?
    - In hiring new graduates, employers can foster their unique culture and develop employees in such a way that works for them
    - hire fresh grads is that they can be paid lower salaries
    - Fresh graduates are often eager to learn and extremely determined to prove themselves
    - prefer to hire fresh grads While they have gone through internships
    - other
2) What competencies should be acquired by the students to convince you as an employer to appoint them?
    - Critical thinking and problem solving
    - Teamwork/collaboration
    - Information technology application
    - Professionalism and work ethic
    - other
3) You have been invited to this survey by:
    - Applied Science Private University (ASU)
    - The University of Jordan (UJ)
    - Jordan University of Science and Technology (JUST)
    - Mutah University (MU)
    - Tafila Technical University (TTU)
    - AlBalqa'a Applied University (BAU)
    - AlHussein Technical University (HTU)
    - Al-Zaytoonah University (ZUJ)
4) What is your role in the company/organization?
    - Founder
    - Executive manager
    - Electrical/mechanical/mechatronics Engineer
    - Other (please specify)
5) What is your Previous experience related to HV/HEV technologies?
    - Researcher
    - Academic
    - Administrative
    - Project Manager
    - Other:
6) For how many years have you worked in the current position?
   1 2 3 4 5 or more
7) Is your current position and work related to university – enterprise cooperation?
   Yes NO
8) What type of business does your company represent?
    - trade company
    - maintain, operate and repair workshop
    - training academy

- consultation company
- Others (please specify)

9) Please indicate the size of your company.
0-50 50-100 >100

10) What kinds of technologies are most relevant for your organization?
- Hybrid vehicles technology
- Electrical vehicles technology
- Electrical Hybrid Vehicles Technology
- Renewable energy technology
- Other (please specify)

11) Has your organization dedicated HV/HEV courses (Hardware, Software) available to help its employee to accomplish their work?
o Very high o High o Some o Very little o None

12) Have staff from your organization participated in particular activities aiming at improving their knowledge of maintain and operate HV/EHV?
o Very high o High o Some o Very little o None

13) What type of improvements does your organization seek in order to utilize EV/EHV technologies in daily processes successfully?
- Battery technology, Charging safety, and Recharging infrastructure
- Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair
- Automotive Climate Control Systems
- Construction of vehicle manufacturing systems
- Other (specify please)

14) As an organization and employer in the vehicles sector, what are three main attributes, skills or specialized knowledge that you consider essential within your organization?
…….

15) As an employer in the vehicles sector, , identify the main gaps in knowledge and/or skills that you have compared to newly hired employees with same educational background (you can select more than one)
- Battery technology, Charging safety, and Recharging infrastructure
- Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair
- Automotive Climate Control Systems
- Construction of vehicle manufacturing systems
- Other (specify please)

16) Is there a need in your organization for personnel with the knowledge, training and skills acquired by those who complete a degree in the proposed program?
(Yes/No)

If yes or No – Is this need expected to increase over the next 5-10 years? (Yes/No)

17) Would you recommend the degree in program to your employees?
Yes No uncertain

If yes – would you consider supporting employees wishing to enroll in the proposed program in terms of

- tuition support
- Providing time-release?
- Other? (please specify)

If No or uncertain please explain your opinion……

18) If you had a vacant position in your organization, would you seek applicants who have completed the proposed program?

If yes or No, please explain ……

19) Would graduates of the proposed program be of great added value to your organization? (Y/N)

If yes or No, please explain ……

20) How do you evaluate the EV/HEV skills of the fresh graduates whom hired at your organization?
…….

21) To what extent do you agree or disagree with the following statements about your organization's EV/HV?

• Employees of the organization demonstrate knowledge and expertise in Electric or Hybrid Vehicles Diagnosis for Maintenance and Repair

Strongly agree Agree Neutral disagree Strongly Disagree

• Employees of the organization demonstrate knowledge and expertise in EV/HV Battery technology, Charging safety, and Recharging infrastructure

Strongly agree Agree Neutral disagree Strongly Disagree

• Employees of the organization demonstrate knowledge and expertise in Automotive Climate Control Systems and Vehicle Lighting system

Strongly agree Agree Neutral disagree Strongly Disagree

• Employees of the organization demonstrate knowledge and expertise in Internal Combustion Engines in Hybrid vehicles

Strongly agree Agree Neutral disagree Strongly Disagree

• Employees of the organization demonstrate knowledge and expertise in Automotive Electricity, Electronics, Sensors, and Actuators

Strongly agree Agree Neutral disagree Strongly Disagree

22) In your own opinion (as an owner or a manager), what will motivate you to hire a university graduate at your organization most of all?
    - if the student has a courses or diploma certificate in hybrid and electric vehicles
    - if the student has one of the proposed programs certificate in HEV
    - if the student has a certificate in electrical or mechatronics engineering
    - if the student has a certificate in mechanical engineering
    - other (please specify)

23) State the number of Positions in your organization that can be filled by graduates of this program.
    1 – 3
    4 – 6
    7 – 9
    Others. Please specify: _____

24) In your opinion, will this program be able to produce the right kind of graduates whom are needed by the market?
    Yes NO
    If Yes or No, please Explain……..

25) What is the appropriate range of salary payable to graduates of this program?
    - 300-400
    - 450-550
    - 600-700
    - More than 700

Improvements and Suggestions

26) Are there additional comments you would like to make about HV/EV services at your organization?

Optional Contact Information

…….

4.2.5 Private Public Organization Questionnaire

Dear participant,

ECO-CAR_Vocational Training Diploma On Electrical and Hybrid Vehicles

We have a useful project titled "ECO-CAR (Vocational Training Diploma on Electrical and Hybrid Vehicles" funded by Erasmus+ Program, it suggests four programs to cover the Jordan needs in different area such as:

1) Vocational training (9-month) Including Comprehensive theoretical and practical lectures that include diagnosing, checking, and maintaining all Electric and Hybrid vehicle systems and parts.
2) Diploma (2-year study and training).
3) Higher diploma (1-year theoretical study) including lectures, assignments, group work, exams, and final research project. This program is designated for students with engineering backgrounds such as Mechanical, Electrical, Mechatronics Engineers. (Bachelor degrees' holders)
4) Bachelor's technical degree (4-years Engineering plan with a focus on Hybrid and EV).

We are conducting this survey to understand the level of Hybrid and electric vehicles technologies skills our fresh graduates possess that enables them to meet the current job market needs. More specifically, we would like to investigate the impact of employing a graduate with HV/EV Technical skills on the overall performance of his/her job and the operation and success of your organization.

Your response to this survey as an employee is crucial in providing the necessary information to formulate a useful teaching methodology at higher education institutes in upcoming years.

Participation in this study is entirely voluntary, your responses will be completely anonymous; your name will not appear anywhere on the survey. All of the information you provide will be kept confidential.

The survey will take approximately 10 minutes to complete, please start to answer the questionnaire. This is an opportunity to help us to get essential information to ensure a successful implementation of the project, also we hope that you will answer the survey questions thoughtfully and thoroughly.

Thank you in advance for your participation, assistance, and valuable input!

Sincerely,

ECO-CAR Team

Erasmus+ Program Project

Number: 618509-EPP-1-2020-1-JO-EPPKA2-CBHE-JP

Market survey

1) You have been invited to this survey by:
    - Applied Science Private University (ASU)
    - The University of Jordan (UJ)
    - Jordan University of Science and Technology (JUST)
    - Mutah University (MU)
    - Tafila Technical University (TTU)
    - AlBalqa'a Applied University (BAU)
    - AlHussein Technical University (HTU)

- Al-Zaytoonah University (ZU)

2) What is your role in the company/organization?
   - Founder
   - Executive manager
   - Electrical/mechanical/mechatronics Engineer
   - Technician
   - Other (please specify)
3) What is your Previous experience related to HV/EV technologies?
   .....
4) For how many years have you worked in the current position?
   1 2 3 4 5 or more
5) Is your current position and work related to university – enterprise cooperation?
   Yes NO
6) What type of business does your company represent?
   - trade company
   - maintain, operate and repair workshop
   - training academy
   - consultation company
   - Others (please specify)
7) Please indicate the size of your company.
   0-50 50-100 >100
8) What kinds of technologies are most relevant for your organization?
   - Hybrid vehicles technology
   - Electrical vehicles technology
   - Renewable energy technology
   - Other (please specify)
9) Does your organization have dedicated HV/EHV training courses (Hardware, Software) available to help its employees to accomplish their work?
   o Very high o High o Some o Very little o None
10) Have staff from your organization participated in particular activities aiming at improving their knowledge of maintain, operate and maintain of HV/EHV?
    o Very high o High o Some o Very little o None
11) Have staff from your organization participated in particular activities aiming at improving their knowledge on how to maintain the charging stations and their safety issues
    o Many times o In some cases o One or two cases o Never
12) Overall, as an employee, how satisfied are you with the HV/EV technical skills services and courses offered by your organization?
    Extremely satisfied Satisfied not at all satisfied

ECO-CAR_Vocational Training Diploma On Electrical and Hybrid Vehicles

13) What type of improvements does your organization seek in order to successfully utilize EV/HV technologies in daily processes
    - Battery technology, Charging safety, and Recharging infrastructure
    - Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair
    - Automotive Climate Control Systems
    - Construction of vehicle manufacturing systems
    - Other (specify please)

14) As an organization and employee in the vehicles sector, what are three main attributes, skills or specialized knowledge that you consider essential to your organization?
    ……..

15) As an employee in the vehicles sector, identify the main gaps in knowledge and/or skills that you have compared to newly hired employees with same educational background (you can select more than one).
    - Battery technology, Charging safety, and Recharging infrastructure
    - Electric and Hybrid Vehicles Diagnosis for Maintenance and Repair
    - Automotive Climate Control Systems
    - Construction of vehicle manufacturing systems
    - Other (specify please)

16) Is there a need in your organization for personnel with the knowledge, training and skills acquired by those who complete a degree in the proposed program?
    Yes No

    If Yes or No – Is this need expected to increase over the next 3-7 years?
    Yes No

17) To what extent do you agree or disagree with the following statements about your organization's EV/HV?

• Employees of the organization demonstrate knowledge and expertise in Electric or Hybrid Vehicles Diagnosis for Maintenance and Repair

Strongly agree Agree neutral disagree Strongly Disagree

• Employees of the organization demonstrate knowledge and expertise in EV/HV Battery technology, Charging safety, and Recharging infrastructure

Strongly agree Agree neutral disagree Strongly Disagree

• Employees of the organization demonstrate knowledge and expertise in Automotive Climate Control Systems and Vehicle Lighting system

Strongly agree Agree neutral disagree Strongly Disagree

• Employees of the organization demonstrate knowledge and expertise in Internal Combustion Engines in Hybrid vehicles

Strongly agree Agree neutral disagree Strongly Disagree

ECO-CAR Project Number: 618509-EPP-1-2020-1-JO-EPPKA2-CBHE-JP

ECO-CAR_Vocational Training Diploma On Electrical and Hybrid Vehicles

• Employees of the organization demonstrate knowledge and expertise in Automotive Electricity, Electronics, Sensors, and Actuators

Strongly agree Agree neutral disagree Strongly Disagree

18) Would graduates of the proposed program be of great added value to your organization?
Yes No

If Yes or No, please Explain…….

19) State the number of positions in your organization that can be filled by graduates of this program.
- 1 – 3
- 4 – 6
- 7 – 9
- Others. Please specify: _____

20) Are there additional comments you would like to make about HV/EV services at your organization?

……

21) Do you prefer the new program to be?
- Higher Diploma
- Bachelor's Technical Degree
- Diploma Degree
- Vocational Diploma

In your opinion, will this program be able to produce the right kind of graduates whom are needed by the market?
Yes NO

If Yes or No, please explain…….

Improvements and Suggestions

22) Are there additional comments you would like to make about HV/EV services at your organization?
…….

23) **Optional Contact Information**
…….

ECO-CAR Project Number: 618509-EPP-1-2020-1-JO-EPPKA2-CBHE-JP

ECO-CAR Vocational Training Diploma on Electrical and Hybrid Vehicles

WP 2 (PREPARATION)

4.3 Appendix C: Questionnaire 2 (Analyze of Institution Infrastructure)

4.3.1 Part A - Structure of the University and Education

Notes:

- Please activate by clicking x in the cell of the circle, UNDO for re-clicking Use supplementary statements for any comments

A. University Structure

Name of University	
Location/	

	Number/capacity					
Nation Students (overall)	<3.000	3.001-5.000	5.001-10.000	10.001-20.000	20.001-30.000	>30.000
Professors (Faculty members)	<60	61-105	106-210	211-420	420-630	>630
Faculties at the University/ school	<2	3-5	6-10	11-15	15-20	>15

Laboratories at your University

- Yes, we have different laboratories for our practical education work (continue later at Part C)
- No, currently we have no laboratories installed (in this case you don't have to continue on Part C)

B. Educational structure

- **Number of vocational training programs in HEV field**

  0 1 2-3 <3

  Average Duration of training study …… month

- **Number of diploma study programs in HEV field**

  0 1 2-3 <3

- **Number of Bachelor study programs in HEV field**

  0 1 2-3 <3

  Average Duration of Bachelor study …… YEAR

- **Number of Master study programs in HEV field**

0 1 2-3 <3

Average Duration of master study …… YEAR

C. Educational Programs

- Are currently new HEV vocational programs at your University planned? (Y, N)
- Are currently new HEV diploma programs at your University planned? (Y, N)
- Are currently new HEV Bachelor programs at your University planned? (Y, N)
- Are currently new HEV Master programs at your University planned? (Y, N)

4.3.2 Part B - Offered Course programs (Vocational/Diploma/Bachelor- / Master degree)

What courses are mainly offered in your vocational, diploma, bachelor and Masters programs? - especially in the field of HV/HEV

B1	Lecture content	offered in vocational training	offered in diploma study	offered in Bachelor study	offered in Master study	currently not offered, but planned	not offered and not planned
B1.1	COURSES						
	Automotive Electricity, Electronics, Sensors, and Actuators						
	Internal Combustion Engine						
	Hybrid and Electric Vehicle Basics						
	EV&HEV technology and hazardous material						
	Electric and Hybrid Vehicles						

	Diagnosis for Maintenance and Repair						
	automotive diagnostics and repair faults electric hybrid vehicles						
	Automotive Climate Control Systems and Vehicle Lighting system						
	Low Voltage System and Modern Electronic Ignition Systems.						
	electrical power transmission system						
	Battery technology, Charging safety, and Recharging infrastructure						
	automobile systems and subsystems						
	Well to wheel LCA calculations						
	Construction of vehicle manufacturing systems						
	Other:						

B1.2	PROGRAMMING LAB						
	automotive database programs Lab.						
	Other:						
B1.3	Technical lab.						
	Hybrid vehicles workshop						
	Electrical vehicles workshop						
	automobile systems and subsystems lab						
	Other:						

For a overall information about your studying programs please enclose a curricula document!

4.3.3 Part C: Laboratories

A. What kind of laboratories in the technical field do you actually have at your university?

° Student labs

If yes, in what field:

° Research and Testing labs (equipment testing e.g. Materials, components, product development, research …)

If yes, in what field:

° Actually we have no labs

B. Resources for new laboratories

° Are there available rooms/ areas to build up new laboratories at your university?

° There are no more rooms available for new laboratories

C. Description of laboratories

° Yes, we have a detailed description of our laboratories

° No, we have no descriptions

If you have any description or folder of the laboratories, please attach them (as file or in paper) !