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Introduction

This report communicates the results of the evaluation of the Innovative Courses on Renewable Energies delivered in the five Jordanian Universities involved in MUREE project: Princess Sumaya University for Technology (PSUT), University of Jordan (UJ), Jordan University of Science and Technology (JUST), Mutah University (Mutah), Hashemite University (HU).

Information has been collected through an online questionnaire which was designed and planned to evaluate the learning outcomes of the delivered courses, laboratories and eLearning courses, at mid-term and at the end.

Questionnaires were posted online for two months for responses from professors and students who have participated in the courses.

On the basis of the outcomes of the evaluation, this Report proposes recommendations for improving the quality of the courses in the next editions.

Students' Participation in the Survey

The report elaborates on information relating to 217 questionnaires answered out from 353 students (61%) who attended the courses. Questionnaires take in consideration the courses delivered at the date of the survey submission. It means only PSUT delivered all courses and included Laboratories in the training. The other universities have provided only part of the foreseen courses. Mutah University had not provided any courses at the date of the survey

and this is the result of a delay in their MUREE activities, and the necessity to accelerate action to correct the situation.

Survey Name	Partner	No. of Responses	Total No. of Students	Participation
Electric Machines Drives	PSUT	16	16	100%
Energy Conversion	PSUT	34	39	87%
Renewable Energy System	PSUT	17	18	94%
Electric Machines Lab	PSUT	16	16	100%
Power Electronics Lab	PSUT	15	15	100%
Power Systems Lab	PSUT	9	15	60%
Power Systems Protection Lab	PSUT	7	7	100%
Principles Of Renewable Energy Systems	HU	20	20	100%
Solar Energy	UJ	32	55	58%
Special Topics	UJ	42	50	84%
Sustainable Energy Conversion	JUST	9	102	8.8%
Totals		217	353	61%

Results of the Evaluation of Courses

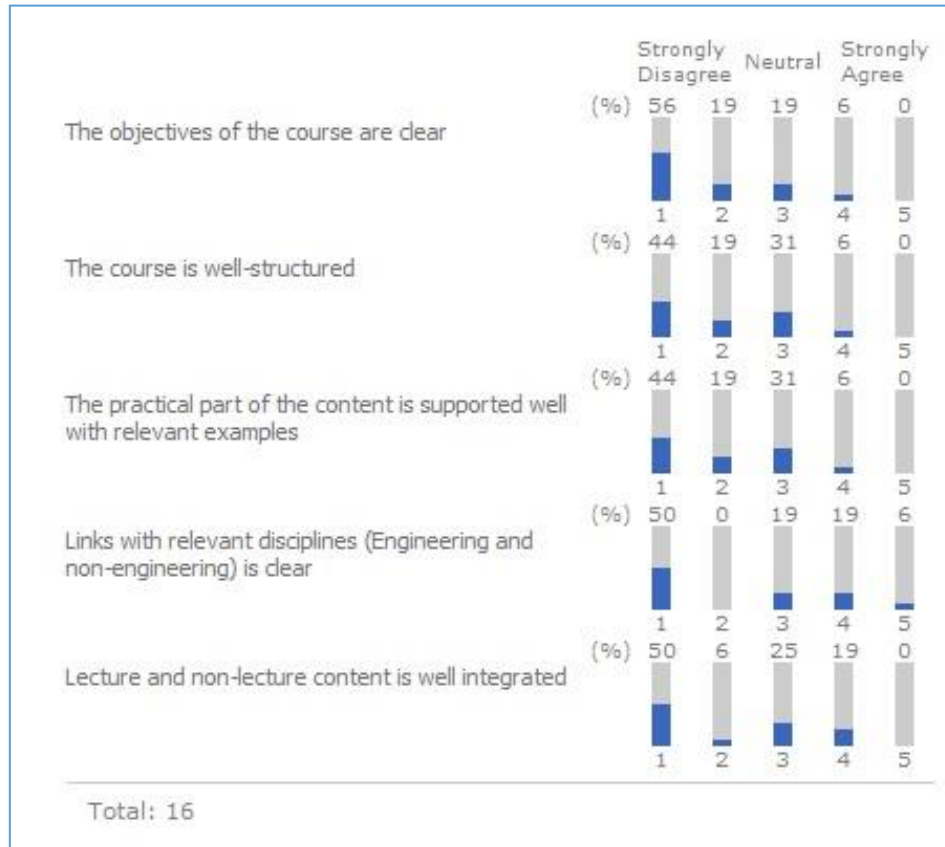
a) Electric Machines Drives

Princess Sumaya University for Technology (PSUT)

1. The Course Design and Structure

Students were invited to express their opinions about 5 components with 5 levels of satisfaction:

- a) Clarity of course objectives according to the International Quality Standard;
- b) The quality of the course design;
- c) Integration in the course of practical and theoretical components;
- d) Links with other disciplines;
- e) Integration of lecture and non-lecture content.

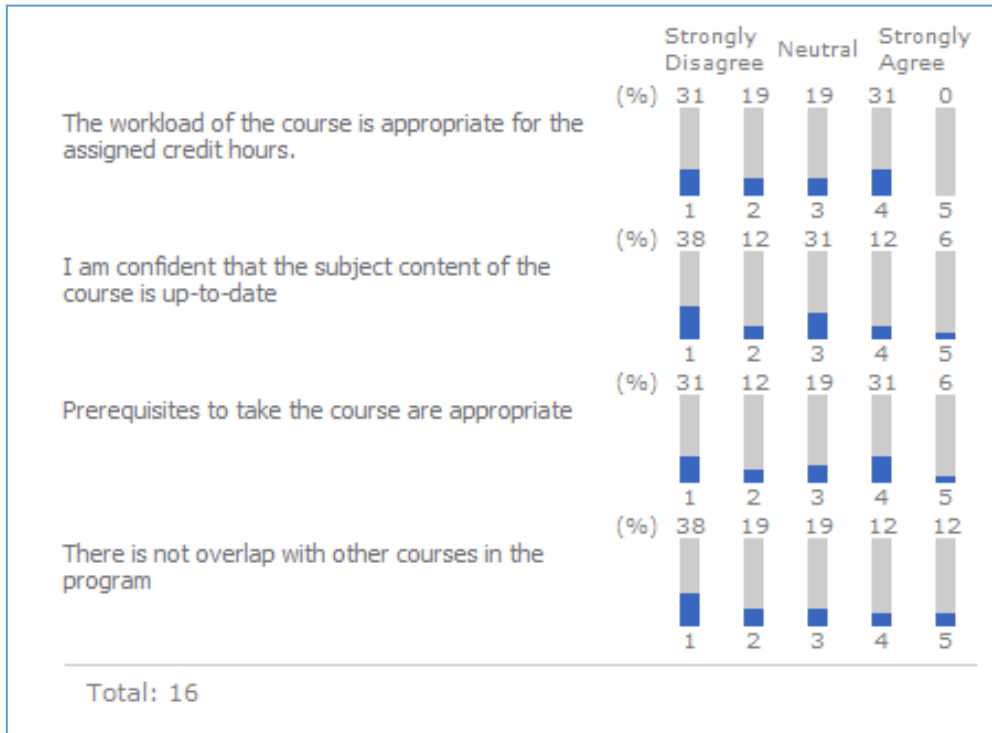


The results point to needs for improvements. The 75% of students considers the objectives were not clear (56% of the students strongly disagree) and the 63% of them are negative about the course structure. The practical part of the course was not fully supported by relevant examples for the 63% of interviewed, and 50% think the links with the other disciplines were not clear. Moreover, the 50% of students reported a poor integration of lecture and non-lecture contents in the course. In general the opinion on Electric Machines Drives design and structure is low also in consideration of the percentage of clearly positive answers: only 6% of students agree the course's objectives are clear, the course is well-structured and the practical part is supported by complete and clear examples. Only the 19% of them think lecture and non-lecture content is well integrated.

2. Workload and Content

Workload and content have been analysed through four components:

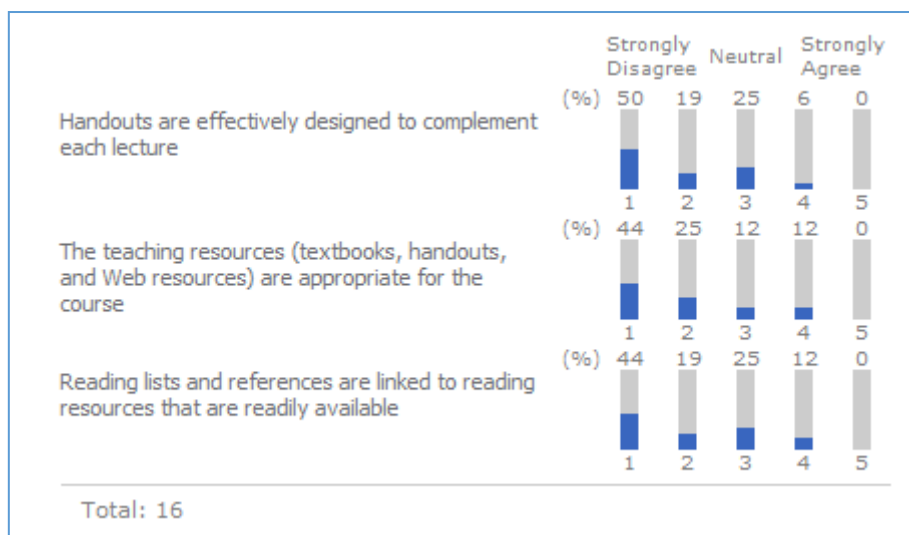
- Workload compared to the number of credits;
- Updating of the contents;
- Suitability of prerequisites;
- Overlapping of Electric Machines Drives course with others.



50% of the students note the workload was not appropriate for the number of credits (only the 31% agree with the sentence) and only 18% were positive that the course content were up-to date. A large proportion of students disagree also with the assumption on the prerequisites (considered not appropriate for the 43% of them) and the overlapping with other courses (57% of the students think the course overlaps with previous ones).

3. Resources

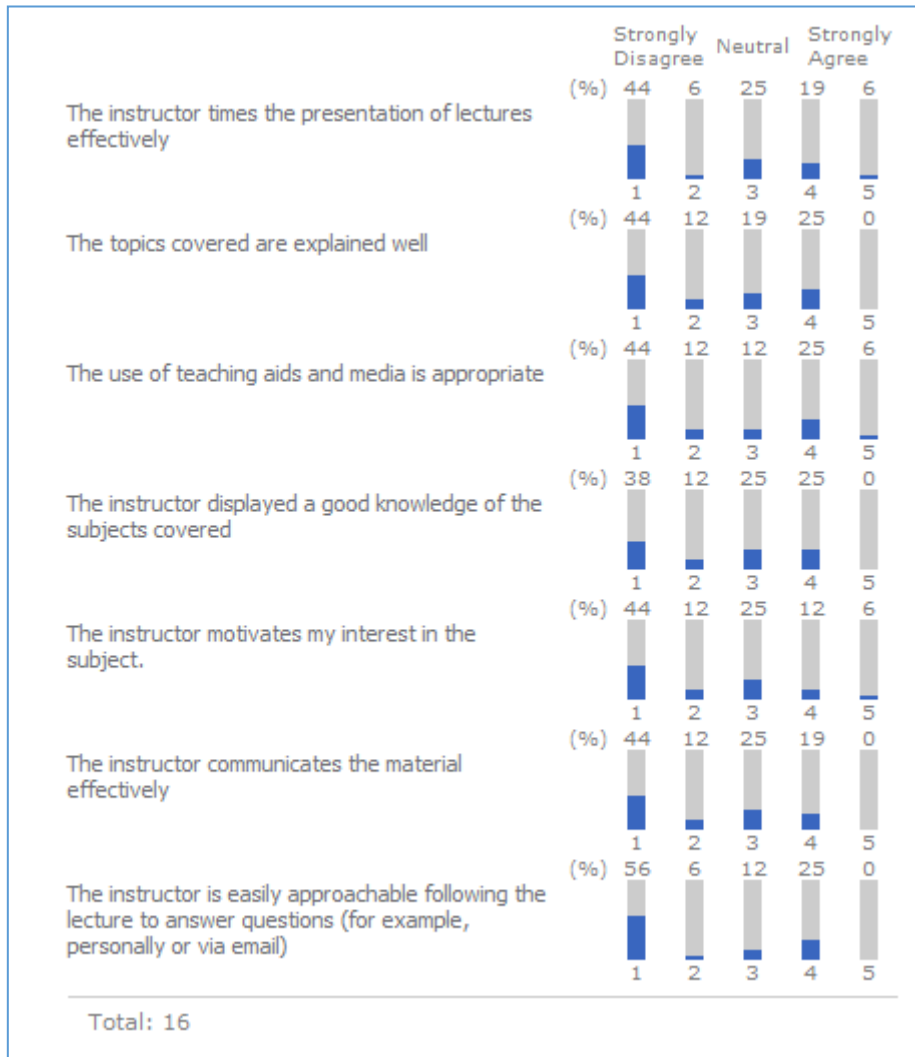
The questionnaire asked the students to evaluate the resources offered for the course in term of hand-outs, textbooks, web resources and references.



For the 69% of the students, hand-outs were not effectively designed to complement the lectures and the teaching resources were appropriate for the course.

4. Instructors

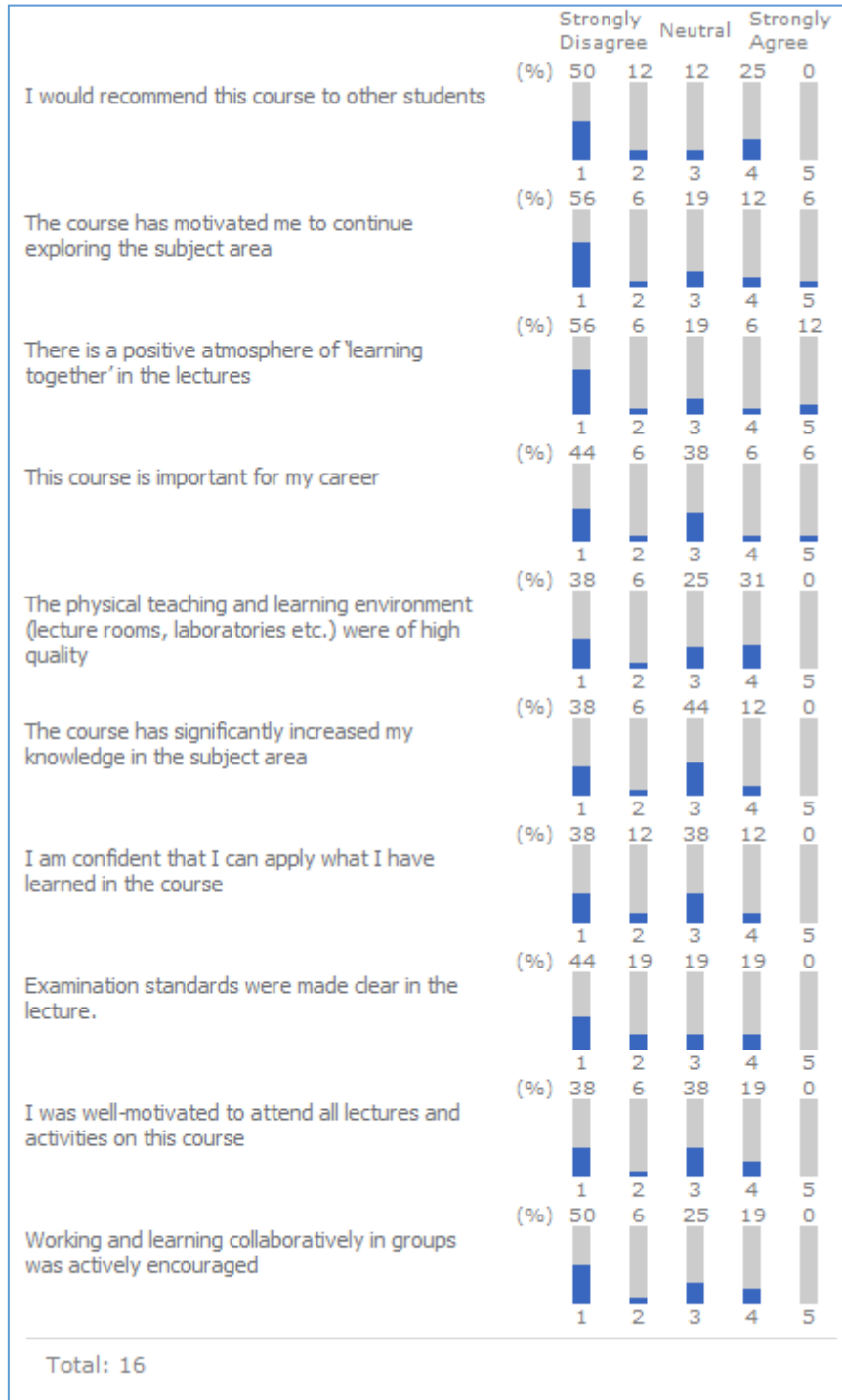
In general the evaluation of instructors is imbalanced toward a low satisfaction. The questionnaire has taken in consideration the suitability of the time devoted to training, the capacities of Professors to transfer knowledge and to motivate the students' interest, the availability of instructors to meet students also after the lessons.



50% of students thought that the instructor did not time the presentation of lectures effectively and the 56% consider the level of explanation was too low. Only the 25% of students think the instructor demonstrated a good knowledge of the subject covered and the reduced competences influence also the capacity to generate interest in the topic (only the 18% of students agree).

5. Overall Quality

Overall quality aims to evaluate the quality standards of Electric Machines Drives course analysing the level of satisfaction of students, the impact of the course in the university choices, the influence of the course in the students' careers, the interest in the future editions.

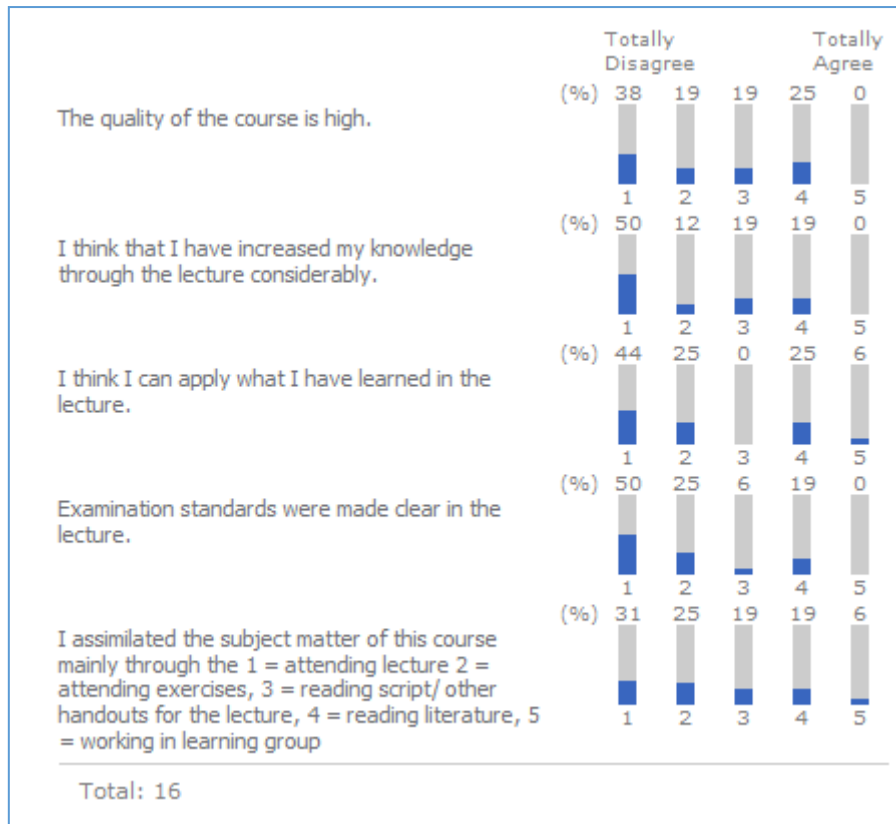


62% of students would not recommend the course and were not motivated to continue exploring the subject area. Students did not find a collaborative environment for learning and consider this course of low importance for their careers. 44% of students were “neutral” about the increasing of competences due at the course. Only 12% of participants noted that they will use concretely what they learnt during the course.

6. Summary

In general, student opinion was low. Students consider the topic interesting and useful for their careers, but only 25% of them agree the course is of high quality. The 62% haven't

received benefits in term of increasing of knowledge and 69% will not apply the acquired competences. The 75% of students declared not to have received clear information on examination standards.



The Electric Machines Drives course has been delivered only at PSUT. No other surveys have been provided to allow a comparison among the same courses in different universities. A final evaluation could be conducted, in order to analyse the different impact of the same course in the n. 5 Jordanian universities and to provide suggestions to improve the didactic offer.

The results at first look seem quite negative. However, this form of student opinion survey is innovative for Jordanian students. The student-professor relationship has been one where students had little say in the form of courses, in the teaching and learning environment. Furthermore, this survey has been brought in where leading-edge curriculum has been imported and adapted from leading EU universities. Courses in Jordanian Universities generally focus on a textbook and teaching which follows the structure of a textbook. The MUREE courses have taken students outside of that historical ‘comfort zone’, and have challenged the students accordingly.

However, it also must be noted that, as with the students, the new innovative teaching and learning environments have also challenged the Jordanian faculty. They have needed to upskill their teaching and learning techniques, to become more innovative and creative, and to build a teaching ‘partnership’ (learning together) with the students. So, the faculty are also taken well out of their comfort zone.

But, that is what MUREE is about, and the first generation of courses are the start of a journey toward sustainable and innovative learning. There are clearly opportunities for improvement. The teaching faculty need to be ‘trained’ in new teaching methodologies. The students need to be ‘trained’ in self-learning and participatory learning. Students and teachers need to build a dialogue based on mutual trust and the main objective of better learning

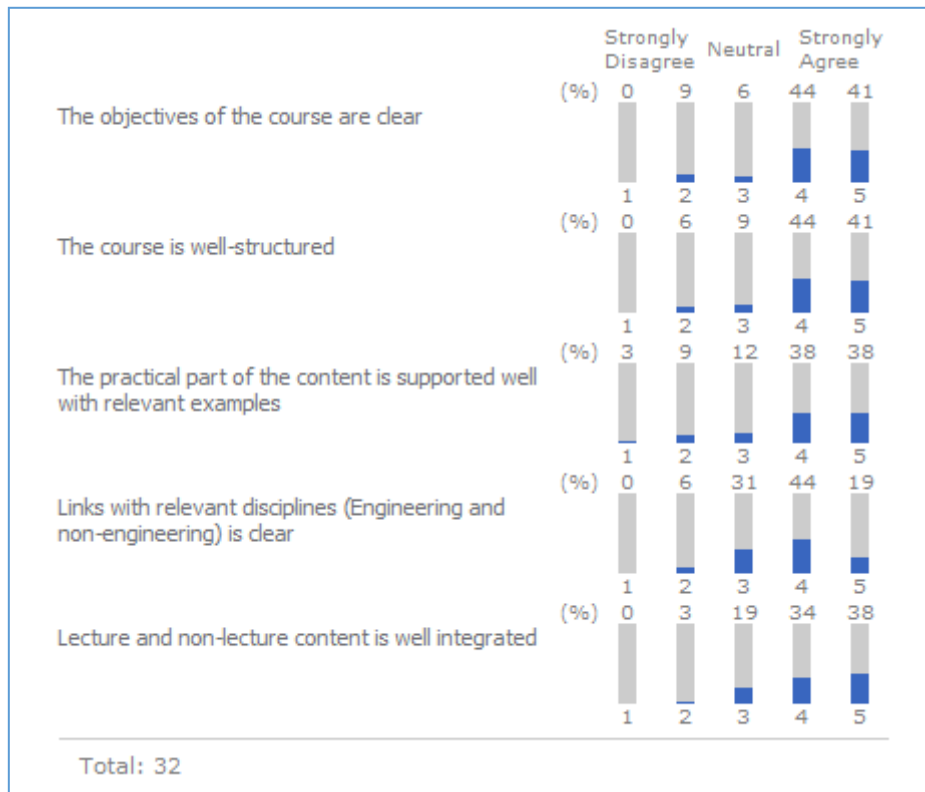
outcomes. Learning outcomes need to be clearly specified and understood. Workload needs better management. The student evaluation process needs now to be built into a process of quality enhancement, and students need to know how their feedback is being used, and what action is being taken.

b) Solar Energy

University of Jordan (UJ)

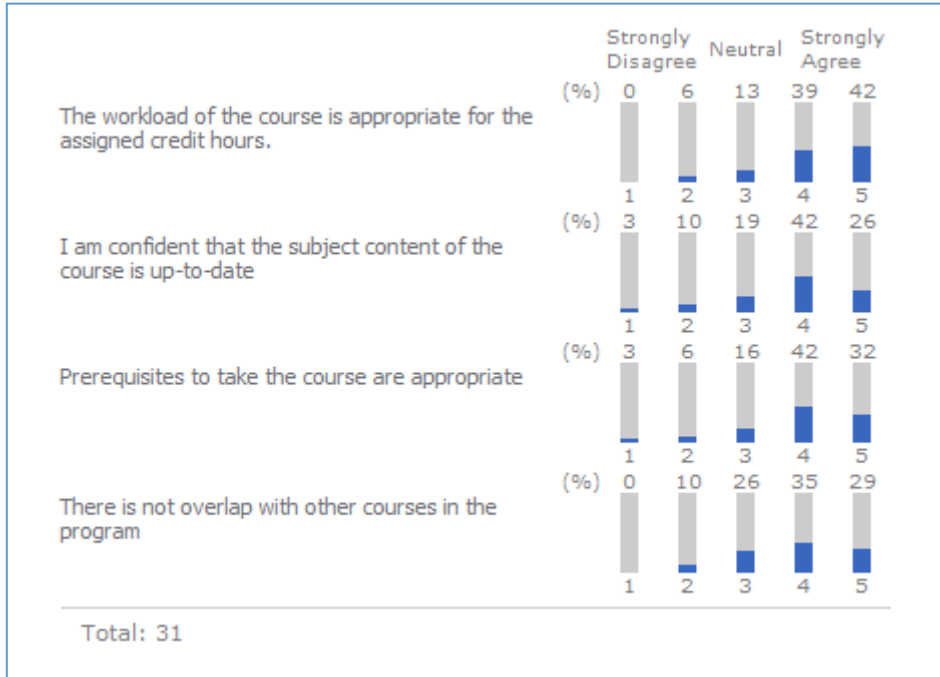
1. The Course Design and Structure

84% of students participated in the survey, expressing their opinion on the course on Solar Energy (32 students on 50). In general the evaluation is positive, and 86% agreed that the course objectives were clear (41% of students totally agreed). For 94% the course is well-structured (41% of them strongly agree) and 88% think the practical part is well-supported with relevant examples. The links with relevant disciplines do not appear totally clear but in general the course offers a good integration of lecture and non-lecture for 97% of respondents.



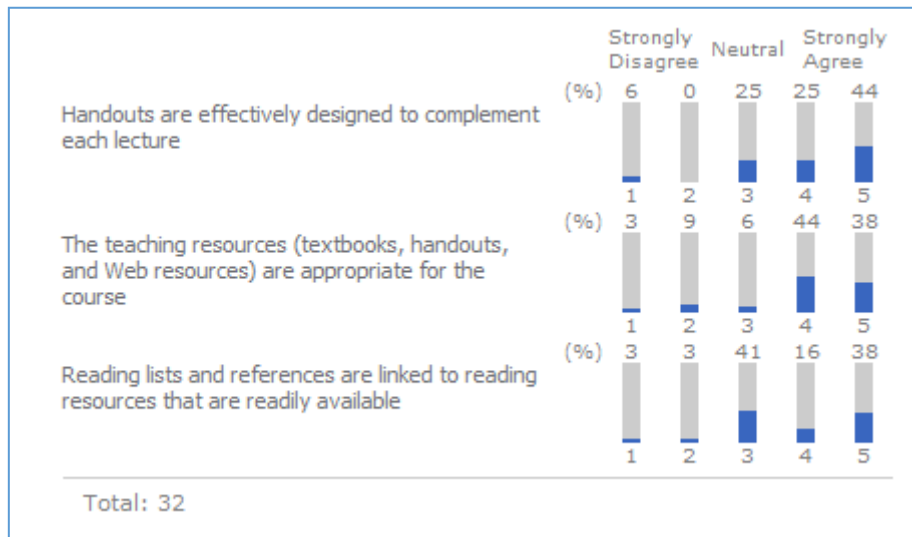
2. Workload and Content

The evaluation of workload and content was also positive. For the 81% of interviewed students the workload is appropriate for the assigned credit hours. The 68% of them noted the subject content of the course is up-to-date. For the next edition the subject can be improved working directly with the students for the integration of innovative contents. 74% noted that the prerequisites are appropriate, and 64% that the course did not overlap with others f.



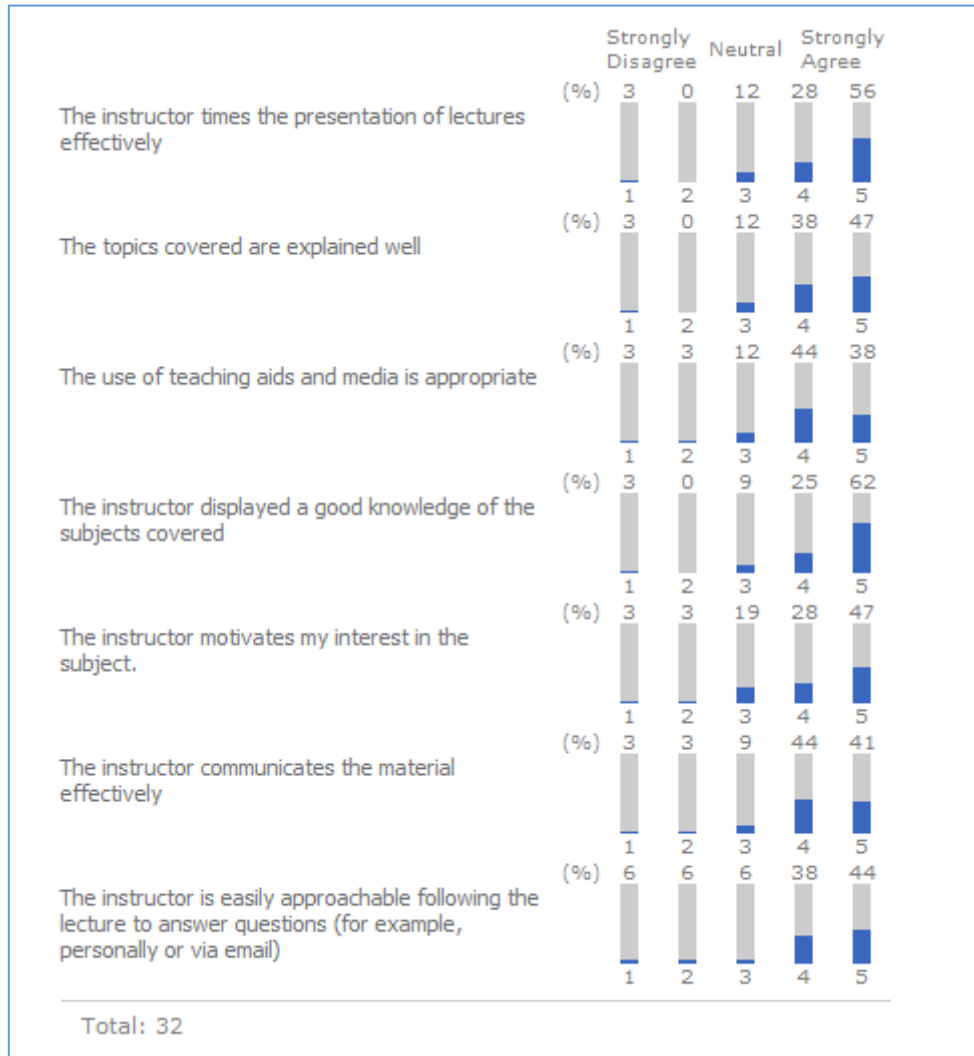
3. Resources

59% of students responded that the hand-outs are effectively designed to complement each lecture. In general students are satisfied by the teaching resources, which are considered appropriate for the course for the 82% of them.



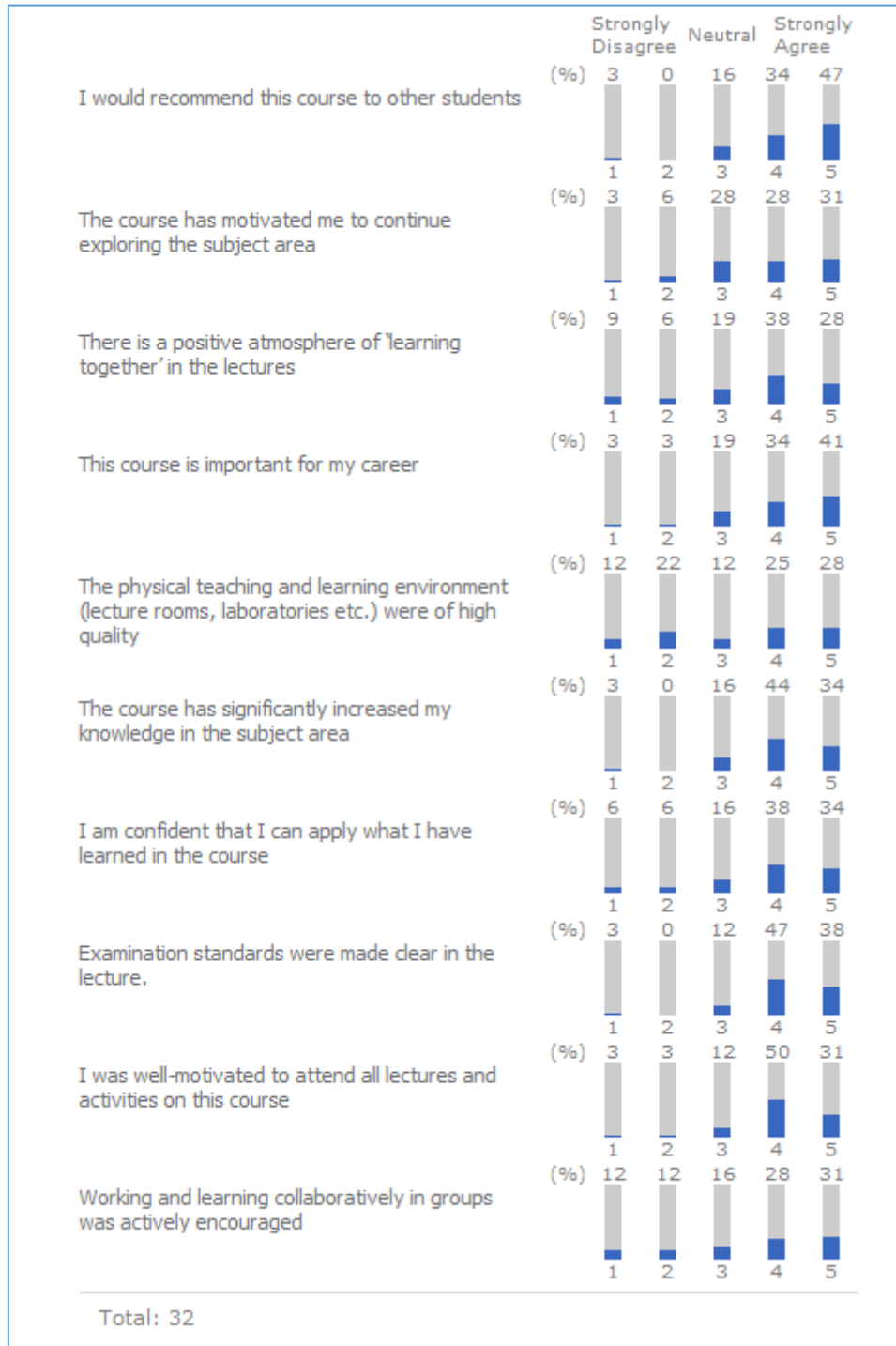
4. Instructors

The instructors have been evaluated competent and available toward the students. For 84% of students, instructors have timed the presentation of lectures effectively, explaining well the topic covered and have shown a good knowledge of the subjects delivered. For 82% of participants, instructors have included in the training appropriate teaching aids and media, motivating their interest in the subjects and communicating the materials effectively. 82% of students were satisfied with the availability of the instructors to answer questions at the end of lectures.



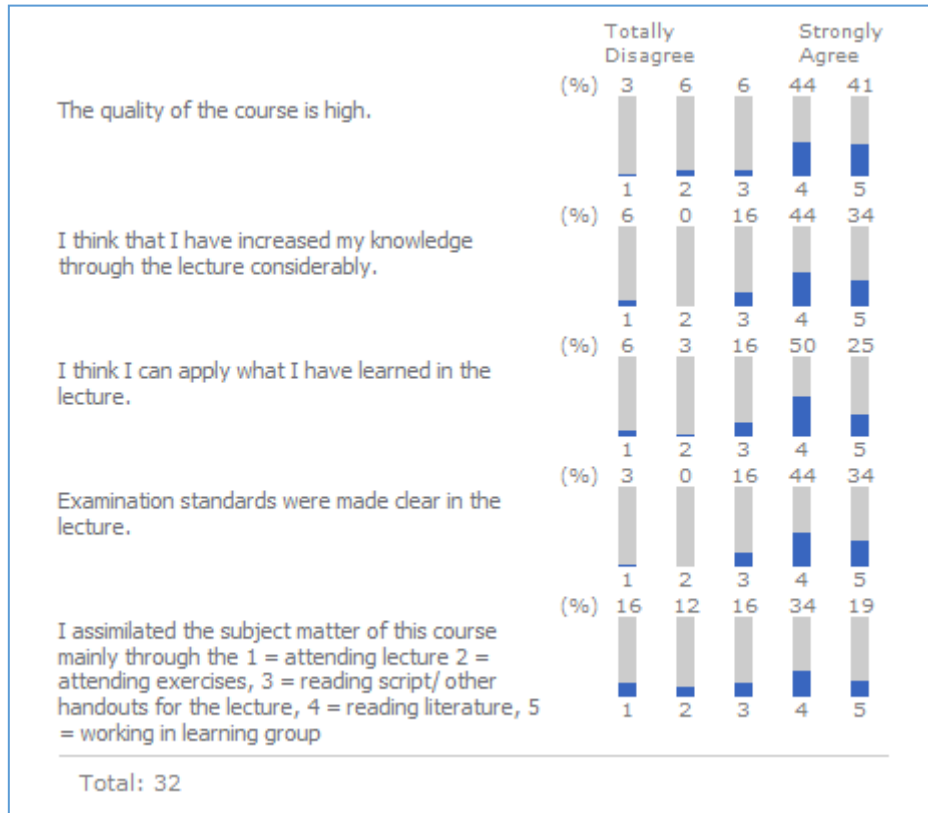
5. Overall Quality

The positive evaluation of the course is confirmed also in overall quality section. 81% of students recommend the course to other students and 59% of them confirm their interest in the topic. 66% have appreciated the “learning atmosphere” in the lectures and the 75% think this topic is important for their future careers. Only 53% were positive about the physical teaching and learning environment, which could be improved for the future editions. 78% were positive about having received new knowledge in the subject area. The suggestion of students is to improve the working and learning collaboratively in groups, in fact the 59% of them underlines this methodology is encouraging.



6. Summary

The general evaluation of the course is positive. The course has been considered of high quality by the 85% of students. The 78% of participants admit the course has increased their knowledge on solar technologies and the 75% think they will apply what they have learned. “Reading literature” and “working in groups” has been the main method for assimilating the subject matter for 53% of students, but the overall distribution of students among the other different methodologies of learning demonstrates all have been considered efficient for training.



c) (Sustainable) Energy Conversion

Jordan University for Science and Technology (JUST)

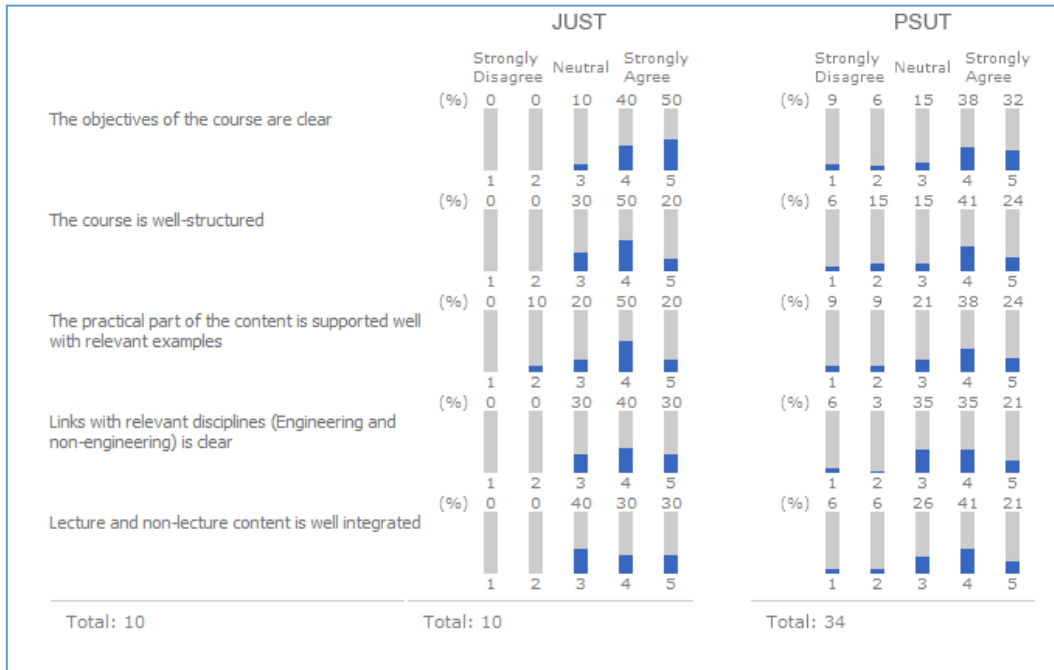
Princess Sumaya University for Technology (PSUT)

The course on Energy Conversion has been delivered at Jordan University for Science and Technology (n. 102 students, only n. 10 of them have taken part in the survey (8.8%)) and at Princess Sumaya University for Technology (n. 39 students, 87% of them have participated in the survey). The evaluation of the course in JUST is invalidated by the insufficient participation of the students. The report will take in consideration the results, comparing them with the evaluation of the same course in PSUT.

1. The Course Design and Structure

The students' feedback in PSUT is positive: 70% of students think the course objectives are clear and 65% think the course is well-structured. The links with relevant disciplines are clear for the 56% of students and lecture and non-lecture content is well-integrated for the 63% of them.

The worryingly low response rate for JUST means that we cannot draw any reliable conclusions from the responses.

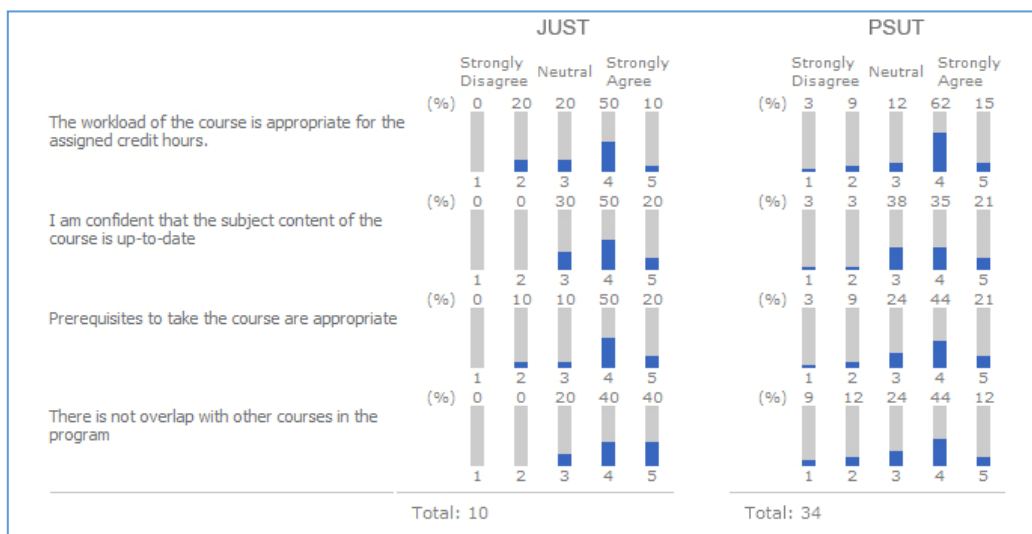


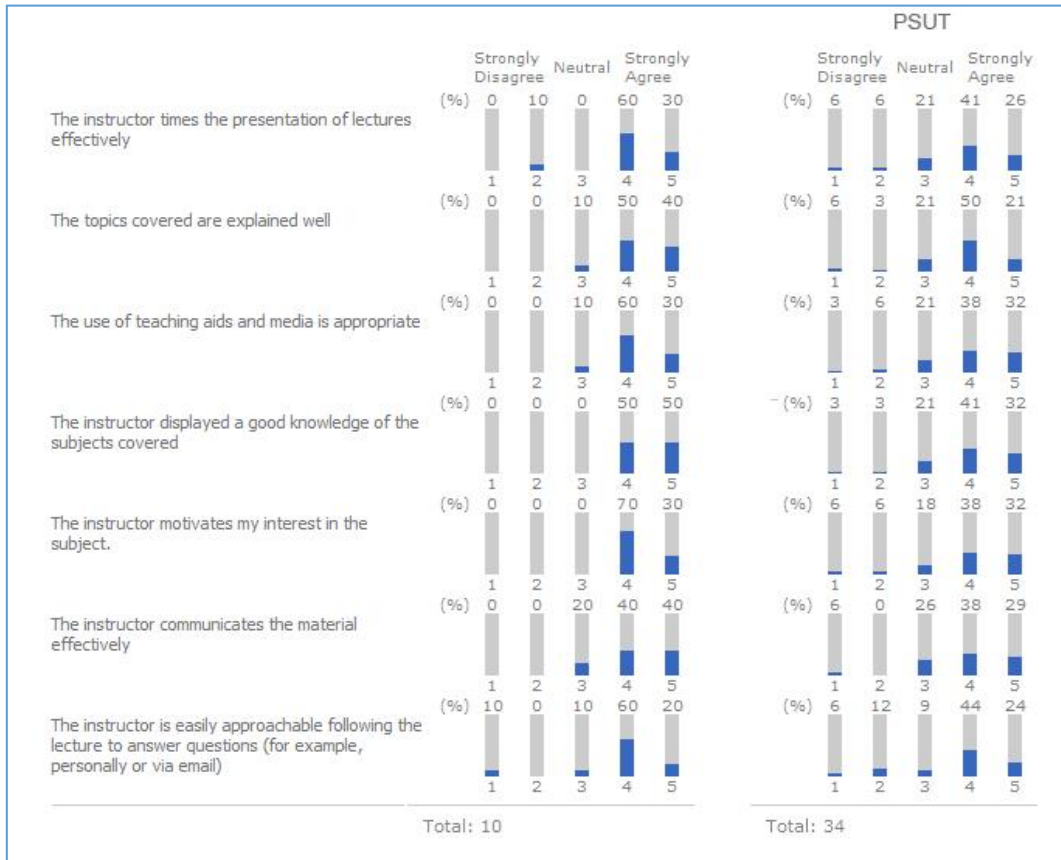
Energy Conversion course in PSUT could be improved, working on the objectives and on the structure. It is important, according with the quality standards, to show objectives and structure in a clear and comprehensible way. In general students look for a more practical and professionalizing course. The new edition could work in this direction.

2. Workload and Content

At PSUT, the workload has been considered appropriate for the credit hours by the 77% of students and only the 6% consider the content not up-to-date. In general the prerequisites are considered appropriate by 63% of interviewed, while the 21% declare there is overlap with other courses.

The worryingly low response rate for JUST means that we cannot draw any reliable conclusions from the responses.

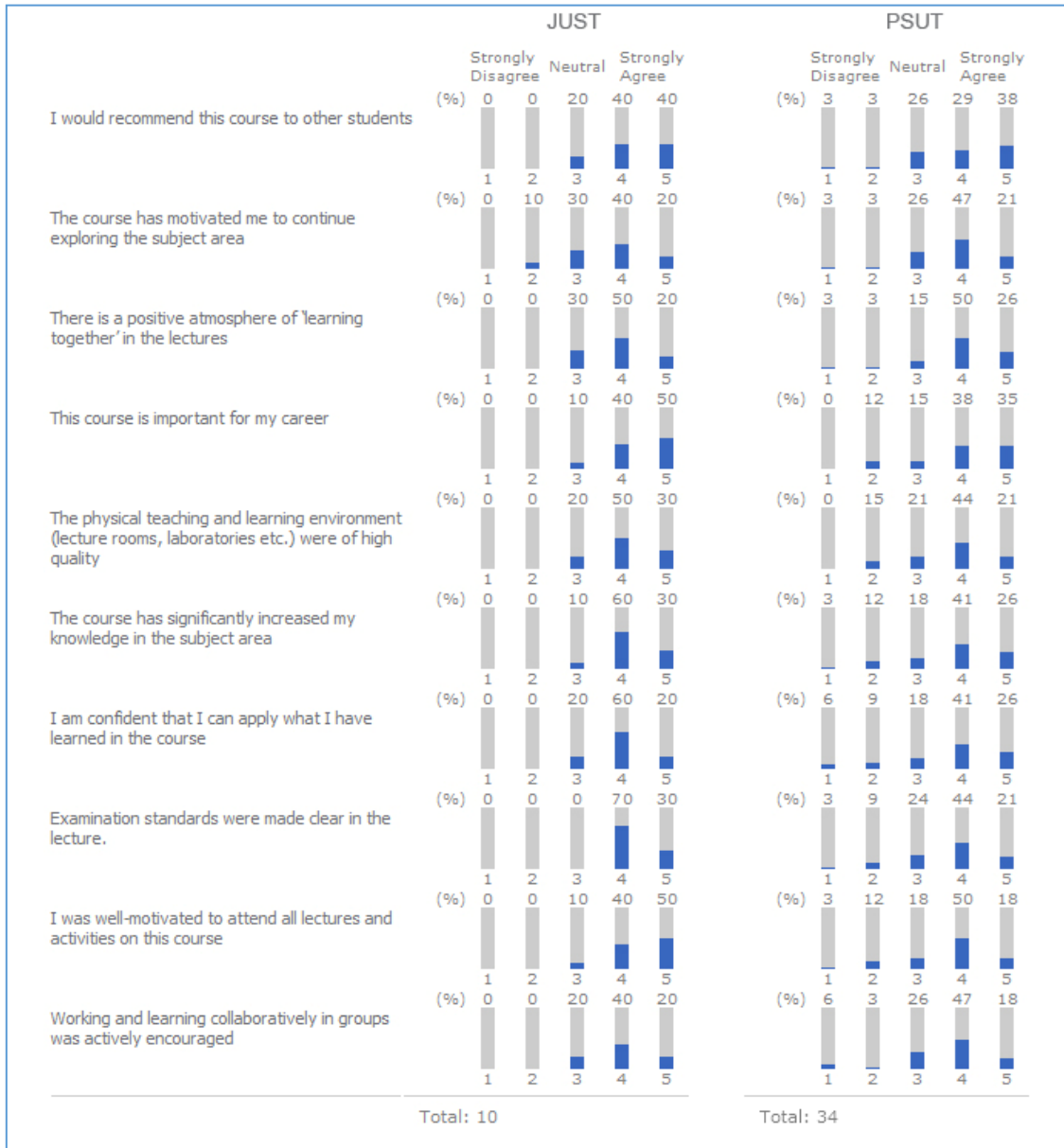




5. Overall Quality

At PSUT 67% of students will recommend the course to others, have been motivated to continue to exploring the subject area and declare to have found a positive atmosphere to “learning together”. Only the 12% of students think the course is not important for their career but this could be motivated by interest in other fields of engineering and not by the low level of the course. The results suggest improving continuously the level of the course elaborating contents which answer to the real needs of labour market in order to make the competences directly applicable.

The worryingly low response rate for JUST means that we cannot draw any reliable conclusions from the responses.

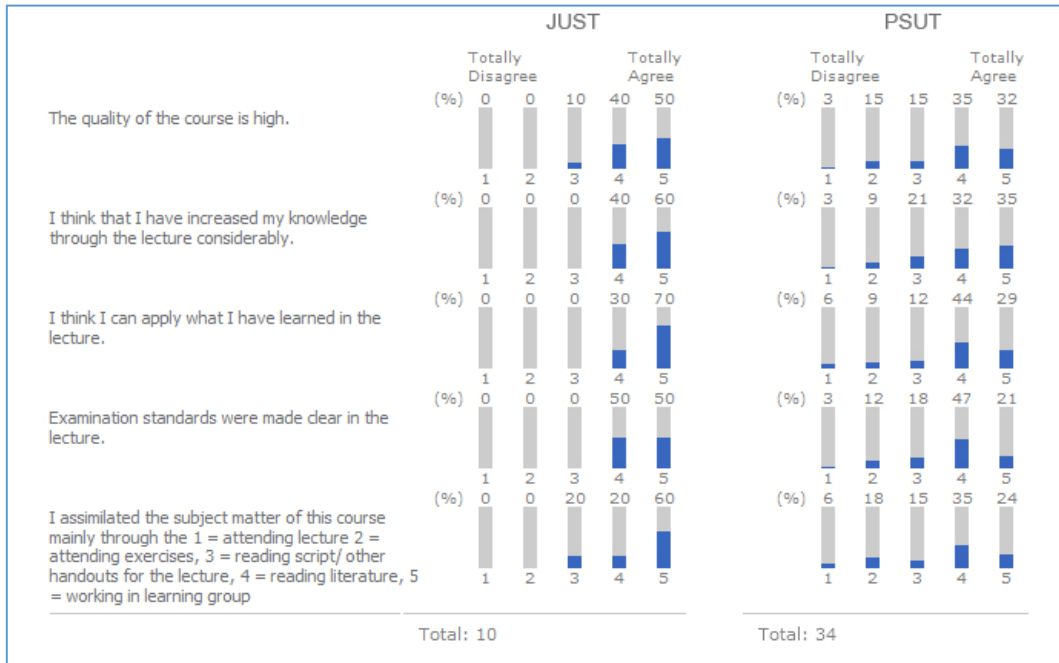


6. Summary

In general the opinion on Energy Conversion course is positive. In order to improve the course's level PSUT team could work in the following direction to:

- 1) Better clarify objectives and structure
- 2) Connect the course with the labour market needs
- 3) Provide more technical information in order to make the competences directly applicable in future jobs.

The low number of answers received by JUST's students does not allow to elaborate a useful evaluation. JUST should resubmit the survey in the next edition of the course, encouraging students to provide their feed-back in order to improve the quality of the didactic offer.



d) Renewable Energy Systems

Jordan University for Science and Technology (UJ)

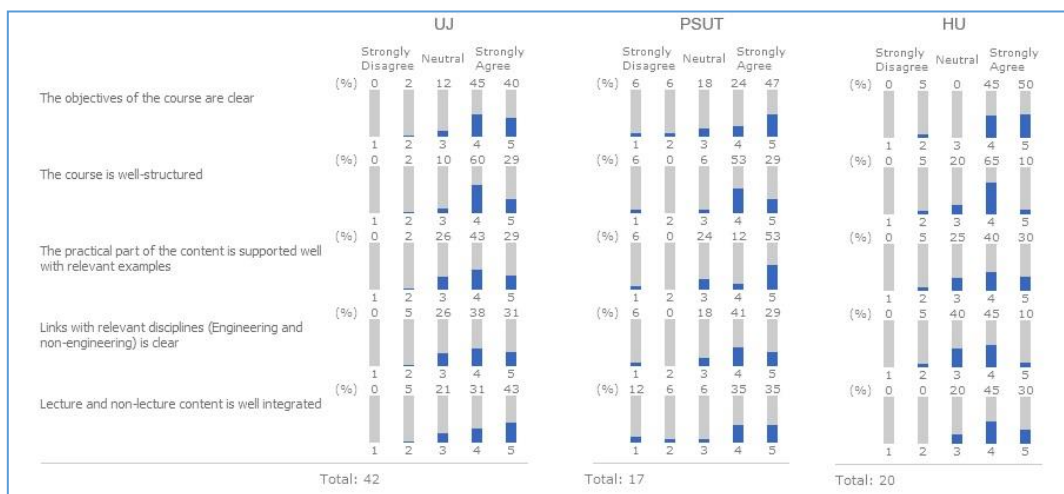
Princess Sumaya University for Technology (PSUT)

Hashemite University (HU)

The course on Renewable Energy Systems has been delivered at UJ, PSUT and HU in two different methodologies: in presence at the first two universities and in distance at Hashemite University. The participation to the survey has touched the 100% for HU, the 94% for PSUT (n. 17 students of 18) and the 84% for UJ (n. 42 students of 50).

1. The Course Design and Structure

The student opinion is positive in all universities. At UJ, only 1 student disagrees with the assertions and only 2 think the link with relevant disciplines is not clear. At PSUT the main critics regard the integration of lecture and non-lecture content in the course: 75% of students think it is well done. At HU only 1 student disagrees with the statement. The low number of students who strongly agree with the assertions could indicate there is a wide area of improving of the course. This could be due to the innovation of the didactic materials and the fact it is the first edition.

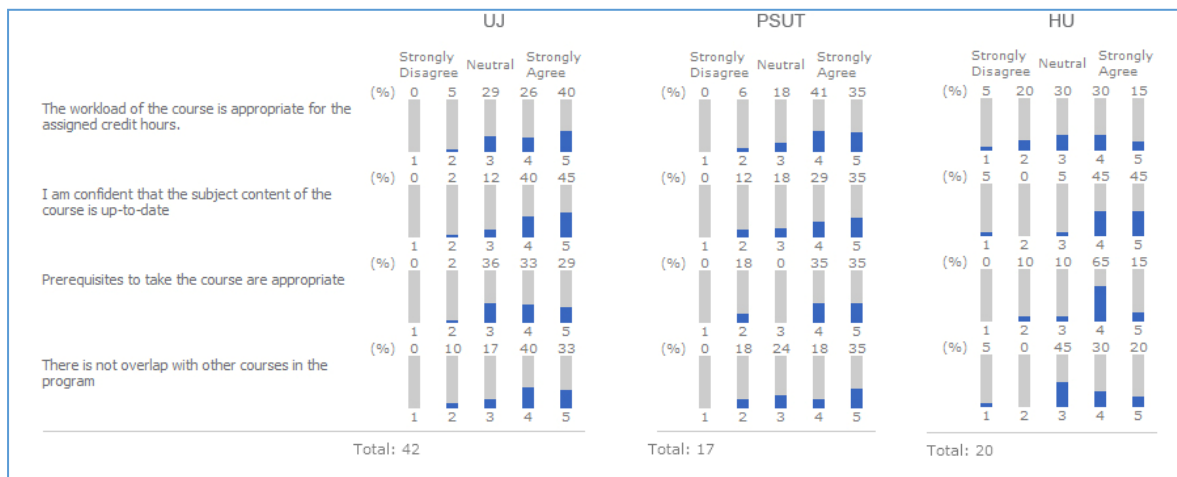


2. Workload and Content

66% of UJ's students think the workload is appropriate for the credit hours and the 85% declare the subject content is up-to-date and the prerequisites are appropriate. 4 students think the course overlap other courses in the program.

Only 1 student at PSUT thinks the workload is not appropriate for the credit hours and 2 students declare the subject content of the course is not up-to-date. 7% of students totally agree the prerequisites are appropriate, while 18% declare there is an overlap with other course content.

25% of HU students think the workload is not appropriate for the credit hours and only the 15% strongly agree with this assertion. This could suggest working in order to adapt the workload to course credits. In general, the subject content is considered up-to-date and the prerequisites appropriate for the course. Only 1 student declares that there is an overlap with other courses but this could depend to the specific university path.

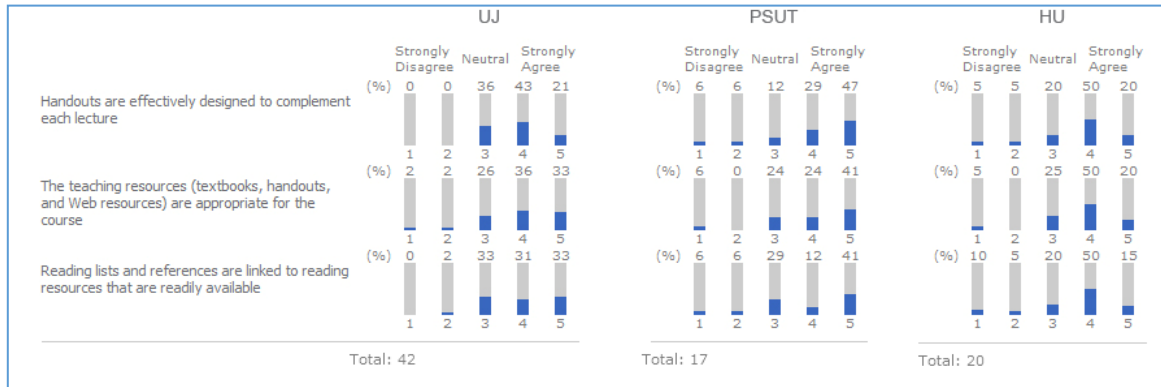


3. Resources

64% of UJ's students declare the hand-outs are designed to complement the course, and 36% of them assume a neutral position regarding this evaluation. Only 2 students think the teaching resources are not appropriate for the course and only 1 student declares the reading resources are not readily available.

More than the 40% of PSUT students strongly agree with the statements. 2 students of 17 think the hand-outs are not effectively designed to complement each course and 1 student declares teaching resources are not appropriate for the course.

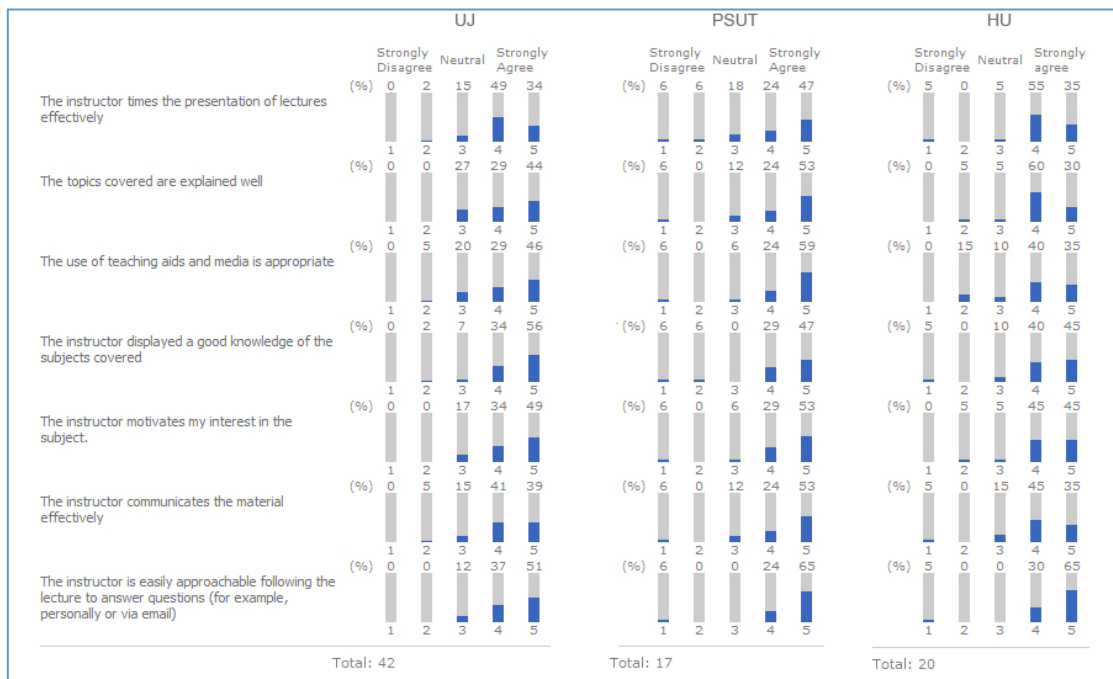
Student opinion is positive also at HU which could work to increase the number of students who strongly agree with the statements.



4. Instructors

The instructors have been evaluated competent and available toward the students in all universities. For 83% of UJ’s students, instructors have timed the presentation of lectures effectively, showing a good knowledge of the subject covered. The total number of students who think that the instructors have well explained the topic covered, have motivated their interest in the topic and have demonstrated availability to meet students.

PSUT’s students have expressed a more than positive opinion on instructors; only 1 student totally disagrees with all assertion. This could be due to a compromised collaboration between student and professor for other reasons. 90% of HU’s students agree with the statements. Also in this case only a student seems to totally disagree with all.

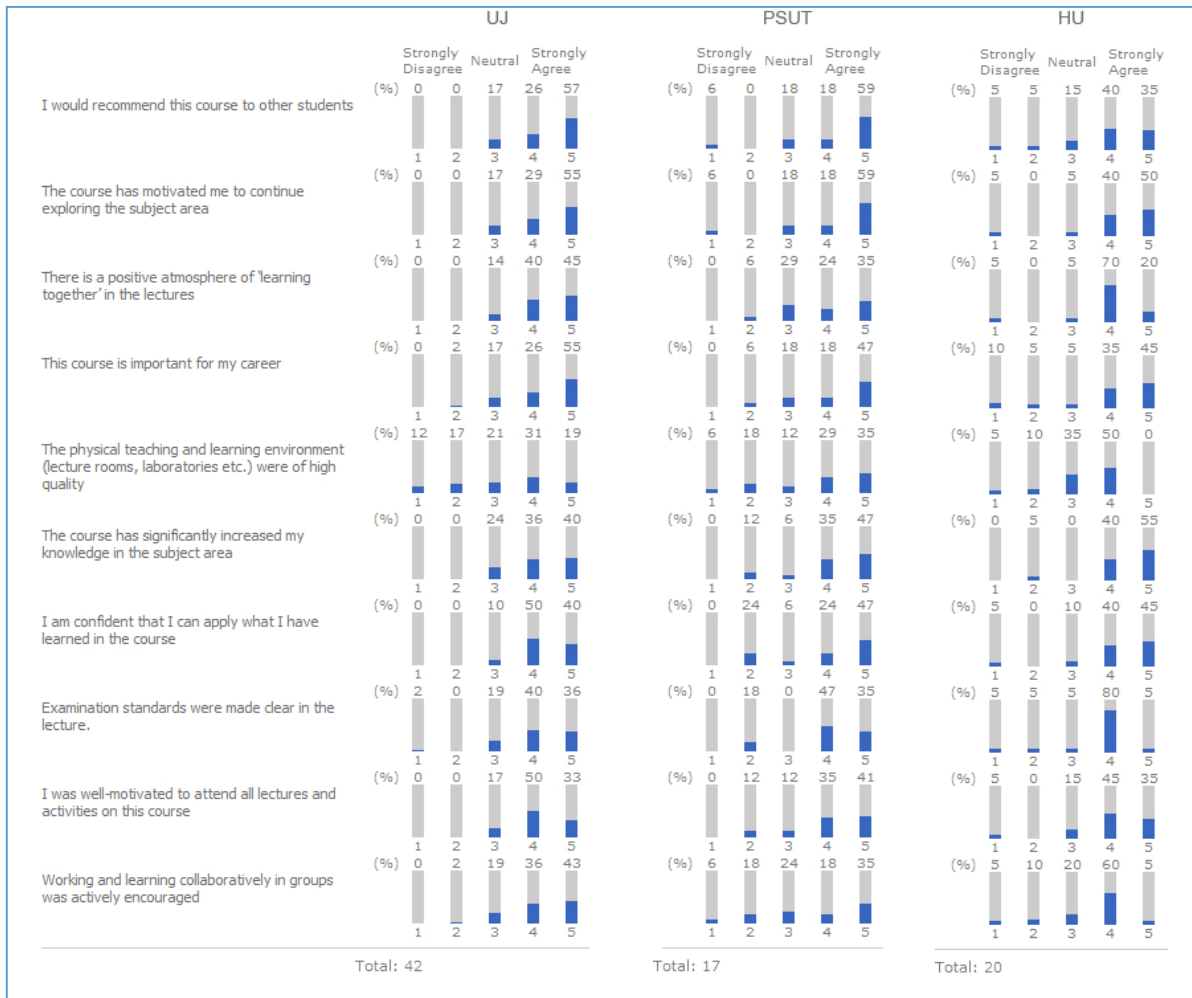


5. Overall Quality

83% of UJ’s students will recommend the course to others, declare the course has motivated them to continue exploring the topic area and were well-motivated to attend lessons and activities. 29% ask for a higher quality of learning environment: UJ could work on this issue. At PSUT 1 student seems to be totally disappointed by the course and will not recommend the course to other students. Also in this case the learning environment is a point of fragility for the course: 24% of students think it isn’t of high quality. 24% of students declare they will not apply what they have learned in the course: this could be motivated by a more theoretical

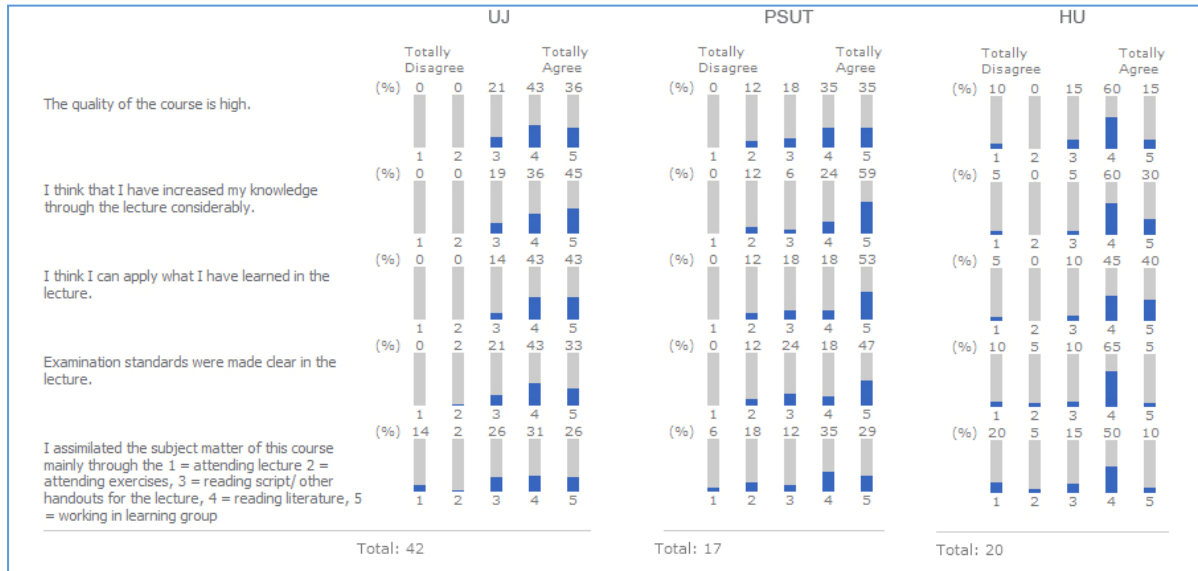
approach adopted in the delivery of the course or by external factors such as the lacking of National incentives or investments in the sector. PSUT team could improve the quality of the course clarifying the examination standard (not clear for 18% of students), including in the course a clear connection with the labour market and encourage the working in groups.

The 75% of HU's students will recommend the course to others; 95% are motivated to continue exploring this area and have declared to have found a positive learning atmosphere. The 80% of students are sure the course will be important for their careers and 15% ask for a higher quality learning environment.



6. Summary

The opinion of JUST's students is totally positive. Only 1 student asks for more clear examination standards in the lectures.



Conclusions and Recommendations

The report summarizes the results of the student evaluation of the 4 courses (Electric Machines Drives, Solar Energy, Energy Conversion and Renewable Energy Systems) delivered at four Jordanian Universities involved in MUREE project: Princess Sumaya University for Technology (PSUT), University of Jordan (UJ), Jordan University of Science and Technology (JUST) and Hashemite University (HU).

For the three universities where there were enough responses, the student views show a strong start to what is a radically new teaching and learning offer across Jordanian HE. A modernised curriculum with strong European influence through the Bologna process and through state-of-the-art pedagogy is being adapted collaboratively across Jordanian universities at a level of transparency not hitherto experiences by both teachers and learners.

The survey has registered a good participation of the students which has overpassed the 87% of the total students enrolled in the courses. The only exception is represented by JUST, where only the 8.8% of students participated in the survey. This result has invalidated any analysis for JUST, not providing interesting information for the improving of the course in term of quality, didactic contents and instructors' competences.

It is desirable, for the usefulness of the analysis, in the next editions of the courses, the partner universities should:

- Encourage the participation of students in the course survey
- Increase the number of answers in order to make effective the analysis
- Encourage the submission of the questionnaire to the students
- Communicate clearly to students how their responses are important, and how the analysis of their responses will contribute to the further improvement of the courses.

The analysis of the results of the received surveys recommends the universities to work in the following direction:

- To improve the learning environment and to create, if possible, a positive atmosphere of "learning together" in the lectures;
- To strengthen the collaboration between universities and national (and international) stakeholders working in the energy fields, elaborating courses which answer to the real needs of labour market;
- To clarify the objectives and structure of proposed courses;



- To encourage the continuous training of trainers through a close collaboration with the European partners, the mobility of staff and the self-learning.

Attachment

1.Survey