Report on feedback and final analysis

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Project acronym:	ADA
Project full title:	Advanced Data Analytics in Business
Project No:	598829-EPP-1-2018-1-RS-EPPKA2-CBHE-JP
Funding scheme:	ERASMUS+
Project start date:	November 15, 2018
Project duration:	36 months

Abstract	This report is the Report on feedback and final analysis, i.e. the report of the students' assessment of the new master study programs and LLL courses, developed within ADA project. It presents the answers and the opinions of the first generation of the students, enrolled at new master study programs and well as the answers of the attendees of the two cycles of LLL courses, organized within ADA project. The report also includes the recommendations for the further improvement of the courses.

Title of document:	Report on feedback and final analysis
Work package:	WP3: Implementation of the program
Activity:	3.4 Feedback and final analysis
Last version date:	14/11/2022
File name:	3.4 Report on feedback and final analysis.pdf
Number of pages:	27
Dissemination level:	Consortium

VERSIONING AND CONTRIBUTION HISTORY

Version	Date	Revision description	Partner responsible
1.0	14/11/2022	Creation of document	UNIKG

Contents

Report on feedback and final analysis - Summary

The Report on feedback and final analysis is the output of the activity 3.4 (Report on feedback and final analysis), within WP3: Implementation of the program. The purpose of the Report is to present the results of the assessment of the new master study programs and LLL courses by the attendees – students and participants in LLL program. Based on the feedback from the attendees, a series of recommendations how to improve the courses for the next generation is prepared and presented in the final section.

As promised by the Project Application, three Serbian HEI project partners – University of Novi Sad (UNS), University of Belgrade (UB) and University of Nis (UNI) successfully accredited new master study programs in advanced data analytics in English. Unfortunately, due to a long accreditation process and COVID-19 pandemics, all accreditations were finished in late 2021 or during 2022, and therefore it was not possible to enroll the first generation of students before year 2022. UNS and UB enrolled the students to the new master study programs in September/October 2022 and started with the lectures, and UNI had first enrollment call in October 2022 and plans second enrollment call for November/December 2022. Therefore, neither of the universities was not able to finish the first year of studies and then to organize assessment of the master programs by students. Since UNS first started with the lectures, and since it had organized a series of lectures in seven courses, presented by foreign lecturers In October/November 2022, it was an opportunity to get a feedback from the students how do they perceive offered lectures and the master program. Therefore, in November 2022, an online survey was organized by UNS, using Google Forms and a questionnaire template defined in the Quality and Assessment Plan and the detailed results are presented in this Report.

Forth Serbian HEI project partner - University of Kragujevac (UNIKG) was not obligated to accredit a new master study program in English, but to introduce some new master courses and to innovate some of the existing courses, by adding lectures related to advanced methods of data analysis. Supported by ADA project, UNIKG introduced three completely new courses: Machine Learning; Artificial Intelligence; and Big Data Analytics. Two new courses (Machine Learning and Artificial Intelligence) were the basis of a new study module: Artificial Intelligence in Business, which is a specialization within a new master study program Business Informatics. The new one-year master study program and the new module were successfully accredited at the Faculty of Economics, University of Kragujevac in spring 2020, and the first generation of students was enrolled in October 2020.

As planned by the Quality and Assessment plan, the assessment i.e. the evaluation of the quality of new courses by the students (their attitudes and perceptions) should be organized at the end of the school year. Therefore, as a part of this Report, a chapter two presents the results of the students' assessment of the two new courses (since the third new course, Big Data Analytics was elective, due to a low number of students at this course it was not valid to perform survey for this course), by the students of the first and second generation of the students at UNIKG, enrolled in school years 2020/2021 and 2021/2022. Both assessments were organized in October/November 2021 and 2022, and they were organized online, using Google Forms and the questionnaire template, from the Quality and Assessment plan (Annex G). The detailed analysis of the students' opinions and attitudes is presented in the second chapter.

Third chapter of this Report is dedicated to the evaluation of the LLL program, which was one of the significant outputs of the ADA project. In total, two cycles of LLL courses were organized within ADA project, in June 2021 and February-April 2022. Both cycles were, due to COVID-19 pandemics, organized online. After the end of all courses,

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their assessment by the participants was organized online, by UNIKG, and the results of this evaluation are presented in details in this Report.

Finally, last chapter of the Report, based on the opinions, remarks and suggestions of the participants, presents a series of recommendations how to improve the courses for the next generation of the attendees.

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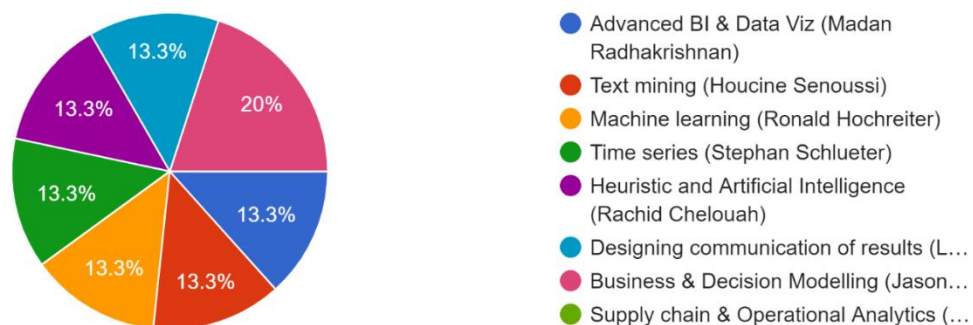Erasmus+ Programme
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Master study program Advanced Data Analytics in Business (University of Novi Sad)

Master study program Advanced Data Analytics in Business was successfully accredited at the Faculty of Economics in Novi Sad, University of Novi Sad in 2021, and the first generation of students was enrolled in September 2022.

In October/November 2022, a series of lectures in seven courses was organized by foreign lecturers, many of the within ADA project. At the end of these guest lectures, an online survey was organized by UNS, using Google Forms and a questionnaire template defined in the Quality and Assessment Plan. In total, 15 responses were recorded and here are the statistics of the answers of the group.

Please choose the course that you are assessing:
15 responses

- Advanced BI & Data Viz (Madan Radhakrishnan)
- Text mining (Houcine Senoussi)
- Machine learning (Ronald Hochreiter)
- Time series (Stephan Schlueter)
- Heuristic and Artificial Intelligence (Rachid Chelouah)
- Designing communication of results (L…
- Business & Decision Modelling (Jason…
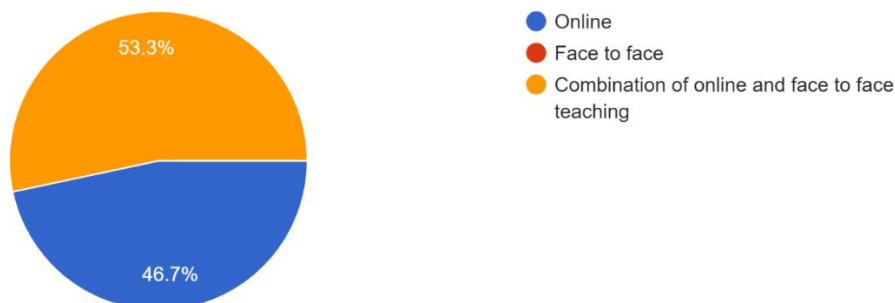- Supply chain & Operational Analytics (…

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The course was delivered

15 responses

- Online
- Face to face
- Combination of online and face to face teaching

53.3%

46.7%

Mark the approximate. percentage of the lectures of this subject that you have attended:

15 responses

- 0%-25%
- 26%-50%
- 51%-75%
- 76%-100%

53.3%

13.3%

20%

13.3%

The premises for lecturing were well equipped (video-projector, computers, etc.)

15 responses

0 (0%)   1 (6.7%)   2 (13.3%)   1 (6.7%)   11 (73.3%)

1   2   3   4   5

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Course objectives are clearly defined.

15 responses
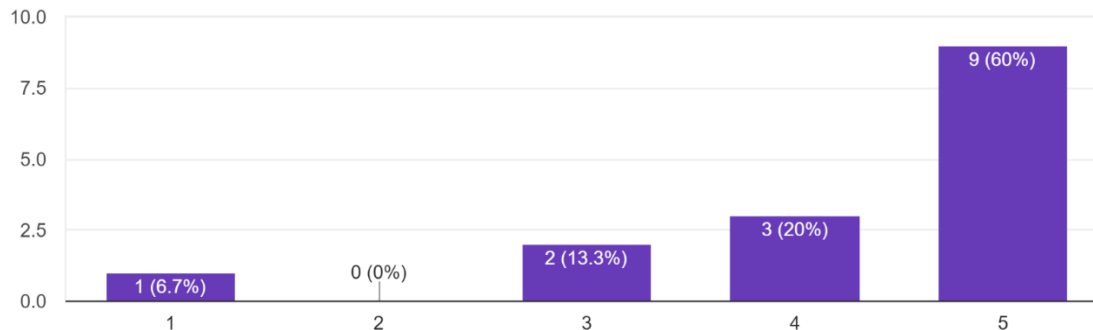
The course is well structured.

15 responses

Teaching materials (recommended readings, manuals, etc.) were clear and easy to read and they facilitate learning.

15 responses

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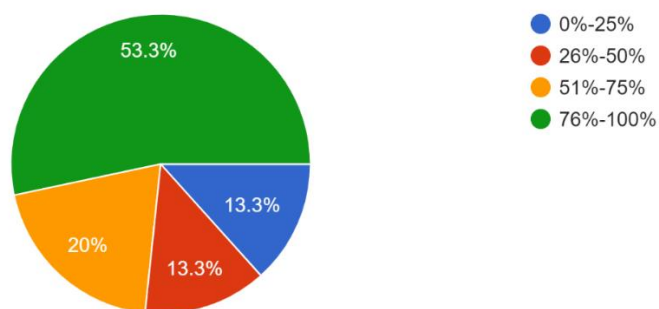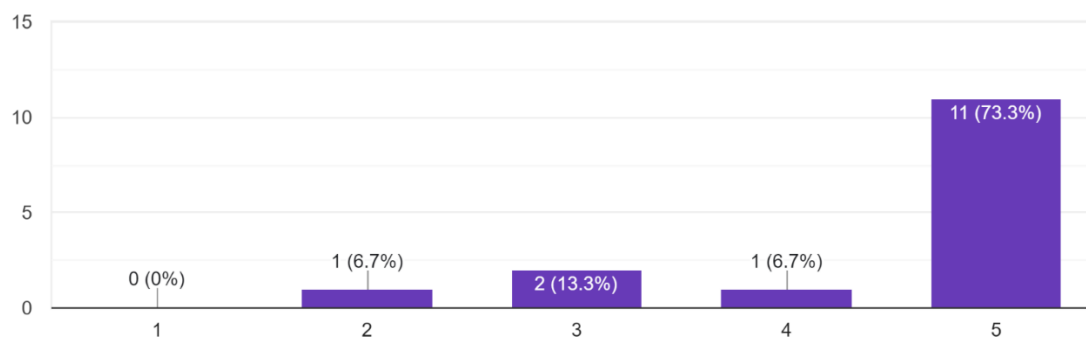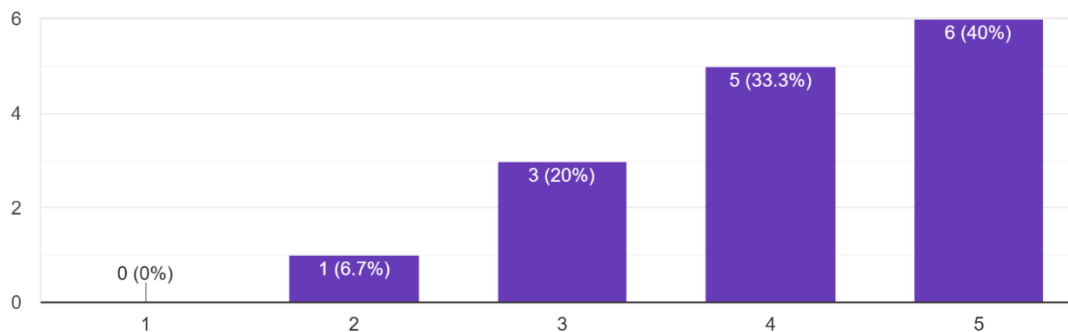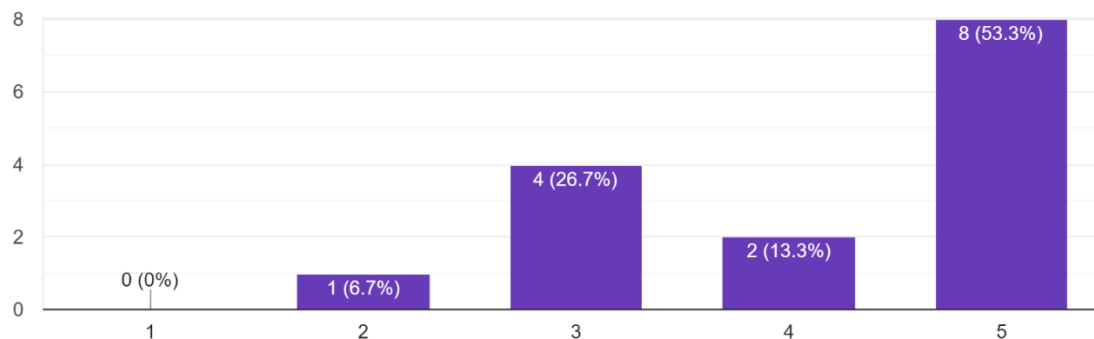
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The course was supported with enough illustrations (examples, case studies, exercises, etc.).

15 responses
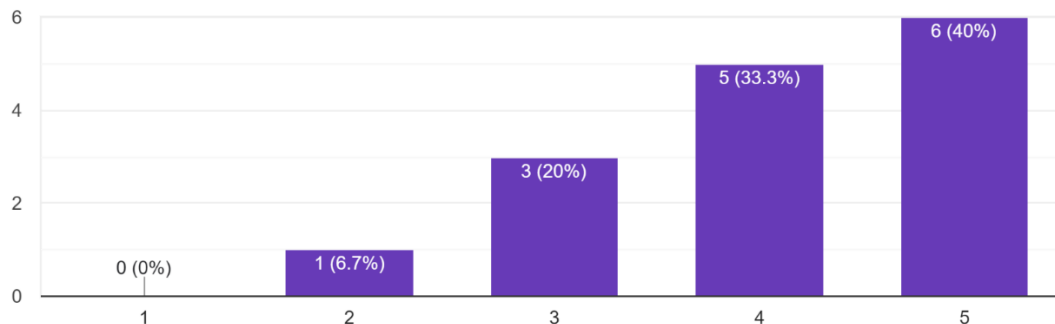
I was informed of the grading and evaluation system before the exam (type of exam, duration, preparation, etc.).

15 responses
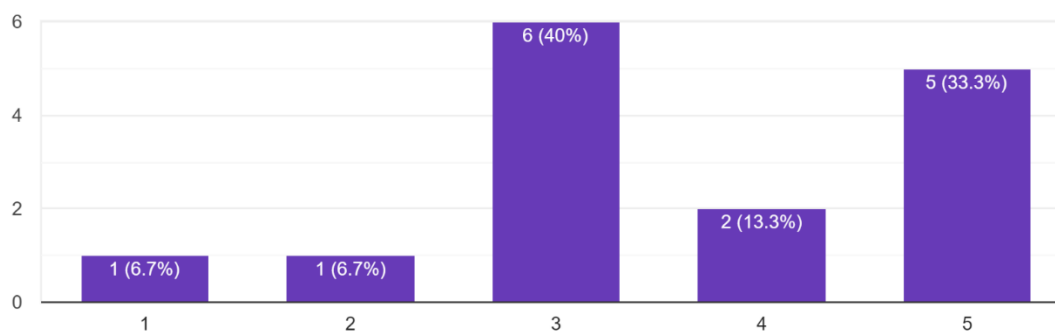
My thinking and discussions were stimulated.

15 responses
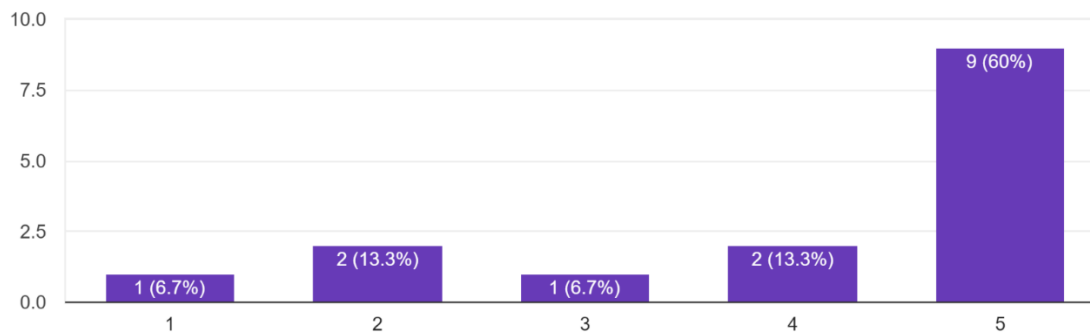
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The course is presented in an interesting and dynamic way.

15 responses
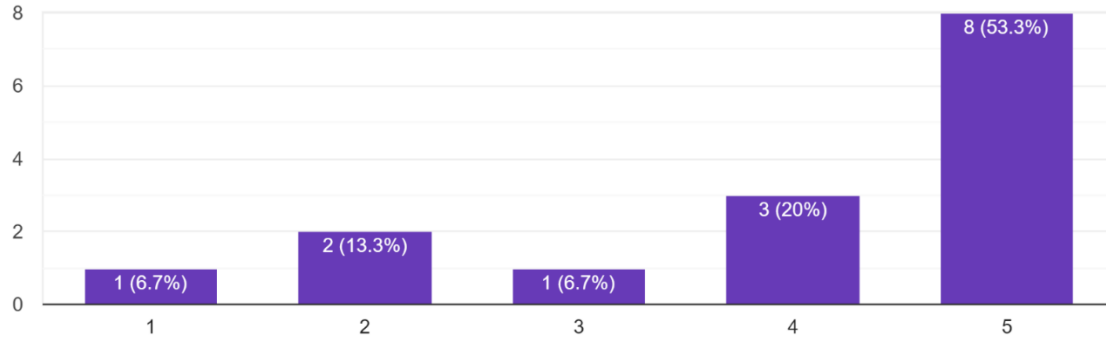
The lecturer's oral expression is good (clarity, volume, tone, flow).

15 responses

The lecturer shows interest in teaching.

15 responses

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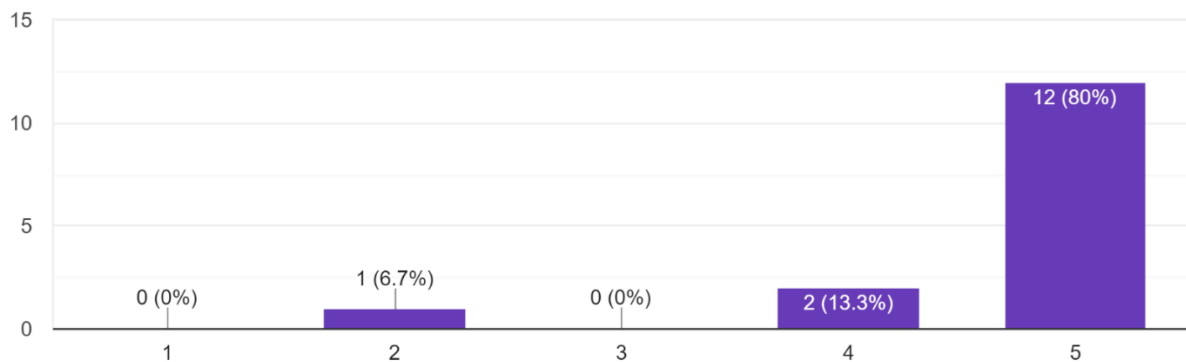
The lecturer is readily available to answer your questions.

15 responses
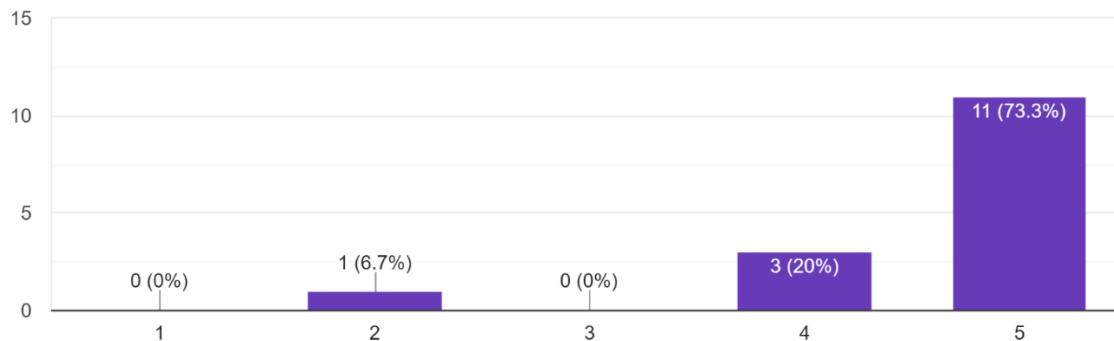
Guidelines for completing the assignments / additional activities are clearly stated.

15 responses
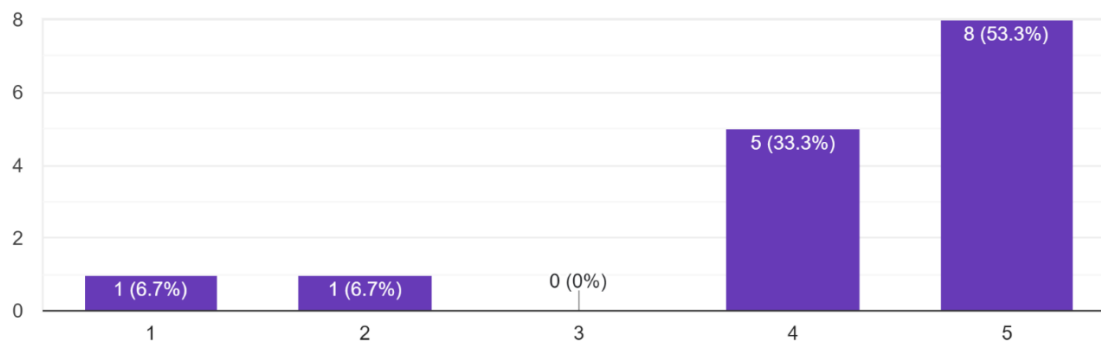
Assignments / additional activities facilitate understanding of the concepts taught during the course.

15 responses

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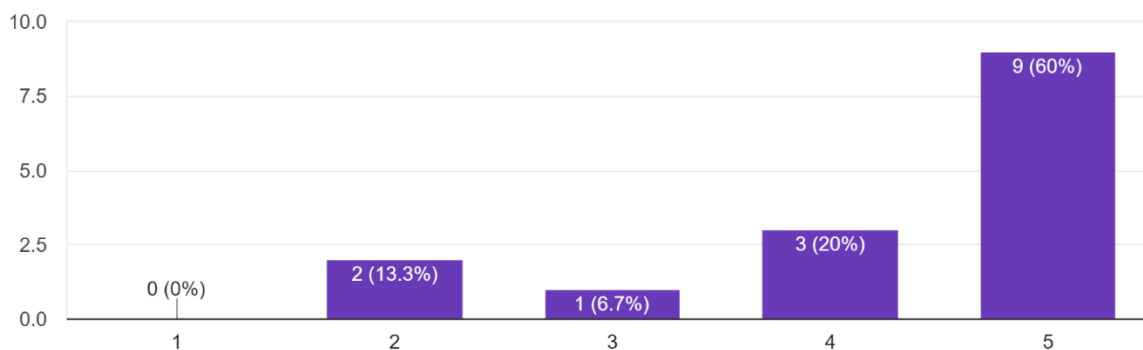
The lectures of visiting lecturer were very useful.
15 responses
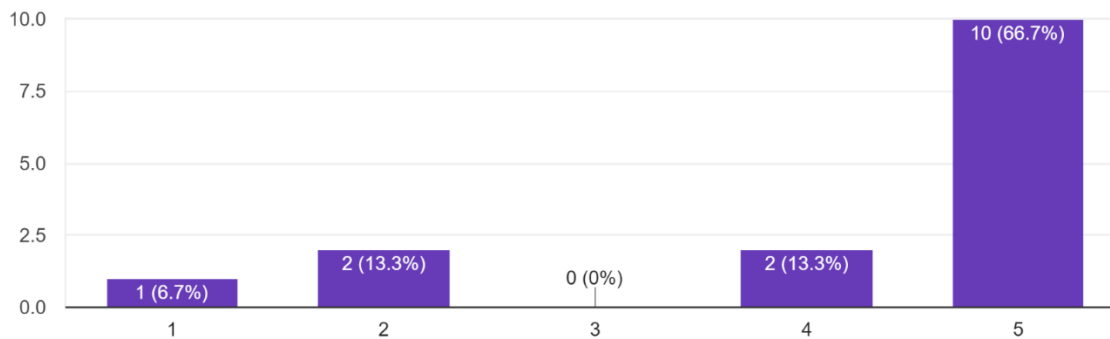
I got the knowledge I had expected from this course.
15 responses
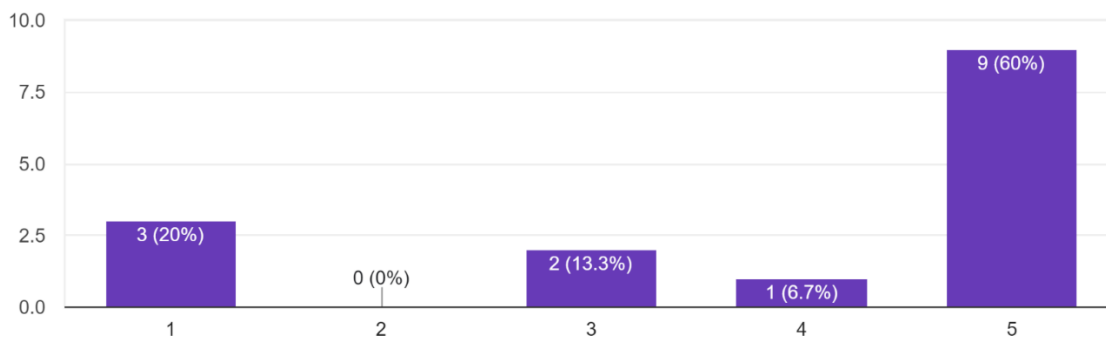
I have made significant advances in learning in this course.
15 responses

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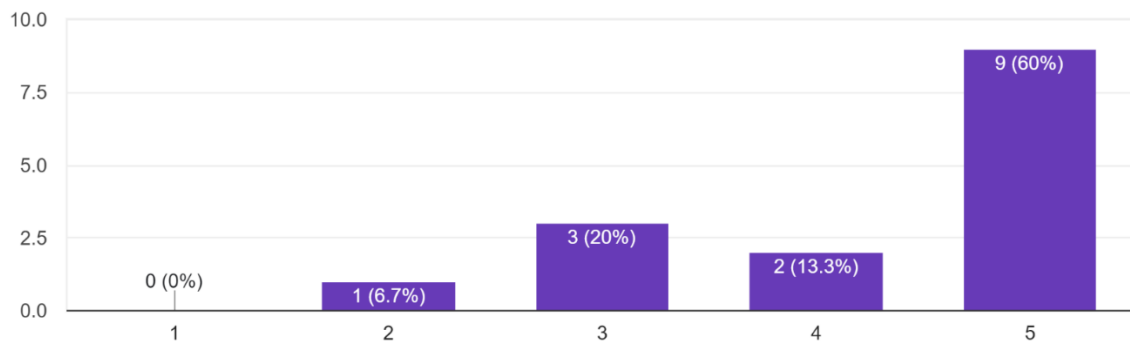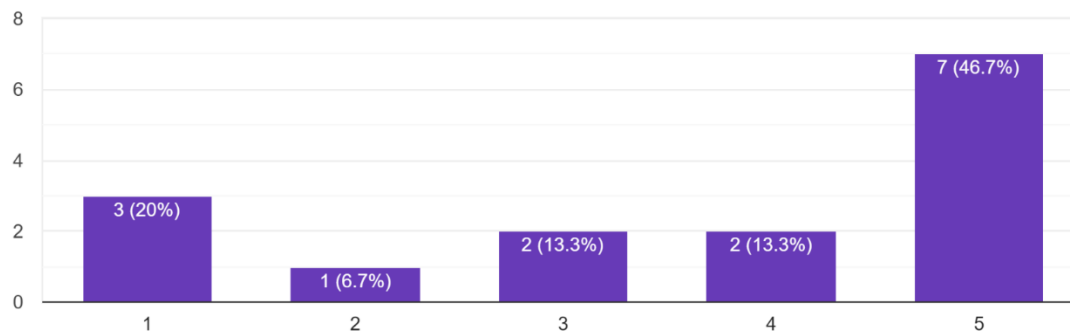In general, I appreciate this course.
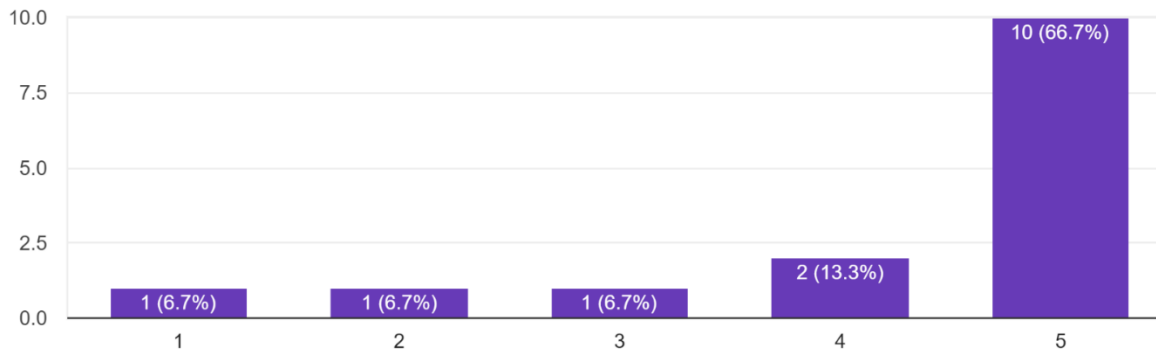
15 responses

I would recommend this course to the others.

15 responses
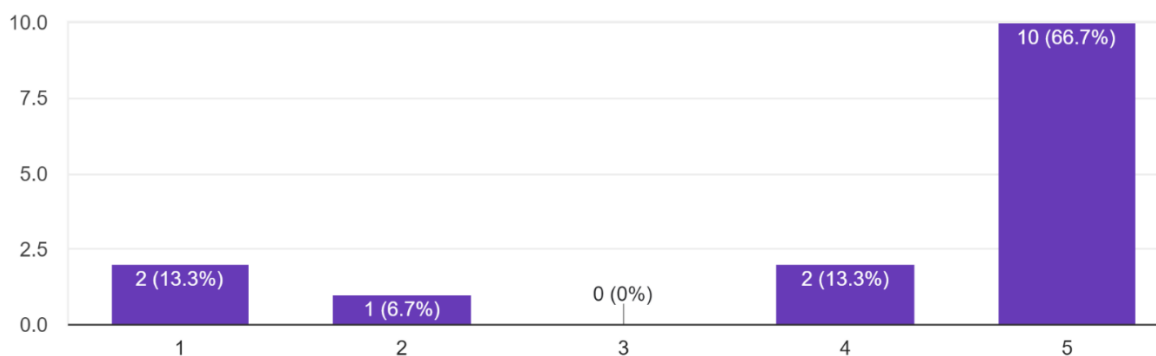
Generally, the students were satisfied with the courses, lectures and lecturers. In some cases, they reported that it was hard for them to follow the lectures, due to either problems with English language or the high level of pre-knowledge required to follow certain lectures.

In the following Table, the average grades for each course/statement are presented. As it can be seen, all courses were highly graded by the students.

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Statement	Advanced BI & Data Viz	Text mining	Machine learning	Time series	Heuristic and Artificial Intelligence	Business & Decision Modelling	Designing communication of results
The premises for lecturing were well equipped (video-projector, computers, etc.)	5.00	5.00	5.00	4.00	3.50	5.00	3.50
Course objectives are clearly defined.	5.00	5.00	4.50	3.50	2.50	5.00	4.00
The course is well structured.	4.50	4.50	4.50	3.00	3.00	5.00	3.50
Teaching materials (recommended readings, manuals, etc.) were clear and easy to read and they facilitate learning.	5.00	5.00	4.00	3.00	3.00	5.00	3.50
The course was supported with enough illustrations (examples, case studies, exercises, etc.).	4.50	4.50	4.50	3.00	3.00	5.00	3.50
I was informed of the grading and evaluation system before the exam (type of exam, duration, preparation, etc.).	4.50	4.00	4.00	3.50	2.50	4.33	2.00
My thinking and discussions were stimulated.	5.00	5.00	4.00	3.00	2.50	5.00	3.50
The lectures were organized on time (according to the schedule).	4.50	5.00	5.00	5.00	4.50	5.00	5.00
The course is presented in an interesting and dynamic way.	4.50	5.00	4.50	2.50	2.50	5.00	3.50
The lecturer's oral expression is good (clarity, volume, tone, flow).	4.50	5.00	5.00	3.00	3.00	5.00	4.00
The lecturer shows interest in teaching.	5.00	5.00	5.00	5.00	3.00	5.00	4.50
The lecturer is readily available to answer your questions.	5.00	5.00	5.00	4.50	3.00	5.00	4.50

Guidelines for completing the assignments / additional activities are clearly stated.	5.00	4.50	4.50	4.00	2.50	5.00	3.50
Assignments / additional activities facilitate understanding of the concepts taught during the course.	5.00	5.00	4.50	3.50	3.00	5.00	3.50
The lectures of visiting lecturer were very useful.	5.00	5.00	4.50	3.00	3.00	5.00	3.50
I got the knowledge I had expected from this course.	5.00	5.00	4.00	2.00	2.50	5.00	3.00
I have made significant advances in learning in this course.	4.00	5.00	4.00	1.50	2.00	5.00	3.00
In general, I appreciate this course.	5.00	5.00	5.00	3.00	2.50	5.00	4.00
I would recommend this course to the others.	5.00	5.00	5.00	2.50	2.50	5.00	3.50
AVERAGE	**4.79**	**4.87**	**4.55**	**3.29**	**2.84**	**4.96**	**3.63**

New courses at master module AI in Business (University of Kragujevac)

One of the acitivities and outcomes of the ADA project at UNIKG, by the project application, was to introduce new courses related to advanced data analytics to the existing master study programs at the Faculty of Economics, University of Kragujevac.

The project team at UNIKG introduced three completely new courses: Machine Learning; Artificial Intelligence; and Big Data Analytics, and innovated some exiting ones, by adding lectures related to advanced methods of data analysis. Two new courses (Machine Learning and Artificial Intelligence) were the basis of a new study module: Artificial Intelligence in Business, which is a specialization within a new master study program Business Informatics. The new one-year master study program and the new module were successfully accredited at the Faculty of Economics, University of Kragujevac in spring 2020, and the first generation of students was enrolled in October 2020.

As planned by the Quality and Assessment plan, the assessment i.e. the evaluation of the quality of new courses by the students (their attitudes and perceptions) should be organized at the end of the school year. Therefore, this Report presents the results of the students' assessment of the two new courses (since the third new course, Big Data Analytics was elective, due to a low number of students at this course it was not valid to perform survey), by the students of the **first** generation, in school year 2020/2021. The assessment was organized in October/November 2021, and it was organized online, using Google Forms and the questionnaire template, from the Quality and Assessment plan (Annex G).

The following Table presents the average grades to every statement of the questionnaire, for the both courses.

Statement	Machine Learning	Artificial Intelligence
The premises for lecturing were well equipped (video-projector, computers, etc.)	4.75	4.20
Course objectives are clearly defined.	4.75	4.60
The course is well structured.	4.75	4.60
Teaching materials (recommended readings, manuals, etc.) were clear and easy to read and they facilitate learning.	4.50	4.80
The course was supported with enough illustrations (examples, case studies, exercises, etc.).	4.00	4.60
I was informed of the grading and evaluation system before the exam (type of exam, duration, preparation, etc.).	5.00	5.00
Workload is appropriate in relation to the number of ECTS credits given to the course.	5.00	5.00
My thinking and discussions were stimulated.	5.00	4.80
The lectures were organized on time (according to the schedule).	5.00	5.00
The course is presented in an interesting and dynamic way.	4.75	4.00
The use of didactic material (slides, blackboard, films, etc.) helped me to understand the concepts that were taught.	4.75	4.20
The lecturer's oral expression is good (clarity, volume, tone, flow).	5.00	4.80
The lecturer shows interest in teaching.	5.00	4.80
The lecturer is readily available to answer your questions.	5.00	4.80
Guidelines for completing the assignments / additional activities are clearly stated.	5.00	4.80
Assignments / additional activities facilitate understanding of the concepts taught during the course.	5.00	4.80
The lectures of visiting lecturer were very useful.	4.75	4.00
I got the knowledge I had expected from this course.	4.50	4.40
I have made significant advances in learning in this course.	5.00	4.40
In general, I appreciate this course.	5.00	4.80
I would recommend this course to the others.	5.00	4.80
AVERAGE	**4.83**	**4.63**

As it can be seen from the Table, the students highly evaluated all statements (average grades were between 4.0 and 5.0, on a scale 1-5). The average grades for both courses were Exceptional (Machine Learning – 4.83, Artificial Intelligence – 4.63).

Generally, students liked both courses, and they stressed that the teachers were devoted to the students and lectures, that they have learn a lot, including a new programming language (Python), which was considered as one of the main benefits of these courses. There were no significant deficiencies and complains, and students generally suggested that there should be less theory and more practical examples, which would improve the perception of the course.

The same Survey was organized for the students of the **second** generation, in school year 2021/2022. The assessment was organized in October/November 2022, and it was organized online, using Google Forms and the questionnaire template, from the Quality and Assessment plan (Annex G).

The following Table presents the average grades to every statement of the questionnaire, for the two courses.

Statement	Machine Learning	Artificial Intelligence
The premises for lecturing were well equipped (video-projector, computers, etc.)	5.00	5.00
Course objectives are clearly defined.	5.00	4.80
The course is well structured.	4.75	4.60
Teaching materials (recommended readings, manuals, etc.) were clear and easy to read and they facilitate learning.	4.75	4.60
The course was supported with enough illustrations (examples, case studies, exercises, etc.).	4.50	4.60
I was informed of the grading and evaluation system before the exam (type of exam, duration, preparation, etc.).	5.00	5.00
Workload is appropriate in relation to the number of ECTS credits given to the course.	4.50	4.80
My thinking and discussions were stimulated.	4.50	4.80
The lectures were organized on time (according to the schedule).	5.00	5.00
The course is presented in an interesting and dynamic way.	4.67	4.60
The use of didactic material (slides, blackboard, films, etc.) helped me to understand the concepts that were taught.	4.33	4.80
The lecturer's oral expression is good (clarity, volume, tone, flow).	4.67	4.80
The lecturer shows interest in teaching.	5.00	4.80
The lecturer is readily available to answer your questions.	5.00	4.80
Guidelines for completing the assignments / additional activities are clearly stated.	4.33	4.60
Assignments / additional activities facilitate understanding of the concepts taught during the course.	4.67	4.60
The lectures of visiting lecturer were very useful.	5.00	5.00
I got the knowledge I had expected from this course.	4.75	4.60
I have made significant advances in learning in this course.	4.75	4.40
In general, I appreciate this course.	4.75	4.60
I would recommend this course to the others.	4.75	4.60
AVERAGE	**4.75**	**4.73**

As it can be seen from the Table, the students highly evaluated all statements (average grades were between 4.33 and 5.00, on a scale 1-5). The average grades for both courses were Exceptional (Machine Learning – 4.75, Artificial Intelligence – 4.73).

Generally, students of the second generation also liked both courses, and they stressed that the teachers were devoted to the students and lectures, that both courses were very interesting, that the organization of both courses was very good, and that they have learn a lot. There were no significant deficiencies and complains. Although both teachers made some adjustments based on suggestions from the previous Report, students again suggested that there should be even more practical examples and less theory.

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LLL program

As planned by the Project application and the Quality and Assessment plan of the project, at the end of courses, the survey of the quality of the LLL courses was performed by UNIKG, responsible for WP5 Quality control and monitoring and also for the implementation of LLL program. First survey was performed after the first cycle of LLL courses, organized in June 2021. The survey was organized online, using Google Forms and survey template for LLL courses, from the Quality and Assessment plan, adapted to online courses. An e-mail invitation was send to each applicant to the course, followed by two reminders, to those who didn't reply to the first invitation. It should be noted that the number of respondents was quite low (less than a half of those who stayed until the end of the course responded to the survey), partially due to high churn of the applicants (high non-show rate) and beginning of summer holidays (in many cases, invitations to the survey were replied automatically by out-of-the-office messages).

Quantitative results of the survey (statements and average scores) are presented in the following table.

STATEMENT	UNS1	UB1	UB2	UNI1	UNIKG1	WU1	UNITOV1	CERTH1	TOTAL
Online platform used for the course functioned without any problems.	3.8	4.6	4.4	4.4	5.0	5.0	4.5	4.3	**4.50**
Course objectives are clearly defined.	4.2	4.8	4.4	4.2	4.0	4.0	4.0	4.3	**4.24**
The course is well structured.	4.2	4.6	4.4	4.2	5.0	4.0	4.5	5.0	**4.49**
Teaching materials (recommended readings, manuals, etc.) were clear and easy to read and they facilitate learning.	4.3	4.4	4.4	4.4	-	-	5.0	4.3	**4.47**
The course was supported with enough illustrations (examples, case studies, exercises, etc.).	4.4	4.6	4.8	4.4	-	5.0	4.5	4.3	**4.57**
My thinking and discussions were stimulated.	4.2	4.6	4.3	4.1	-	5.0	4.5	4.3	**4.43**
The lectures were organized on time (according to the schedule).	3.6	4.8	4.9	3.6	-	5.0	5.0	4.3	**4.46**
The course is presented in an interesting and dynamic way.	4.4	4.6	4.2	4.0	5.0	5.0	4.0	4.3	**4.44**
The use of didactic material (slides, blackboard, films, etc.) helped me to understand the concepts that were taught.	4.2	4.4	4.7	4.2	-	-	4.5	4.3	**4.38**
The lecturer's oral expression is good (clarity, volume, tone, flow).	4.5	4.8	5.0	4.1	-	5.0	4.5	4.3	**4.60**
The lecturer shows show interest in teaching.	4.5	4.8	5.0	4.2	-	5.0	4.0	4.3	**4.54**
The lecturer is readily available to answer your questions.	4.5	5.0	5.0	4.4	-	5.0	4.5	4.3	**4.67**
The lectures of visiting lecturer were very useful.	4.2	4.6	4.5	4.3	5.0	5.0	5.0	4.3	**4.61**
I got the knowledge I had expected from this course.	4.0	4.0	4.0	4.1	5.0	5.0	5.0	4.3	**4.43**

The gained knowledge improves my competences and performance at my workplace.	3.6	4.0	3.9	3.8	5.0	5.0	5.0	4.3	**4.33**
I have made significant advances in learning in this course.	3.8	4.0	3.9	3.8	5.0	3.0	5.0	4.3	**4.10**
In general, I appreciate this course.	4.2	4.6	4.6	4.3	-	5.0	5.0	4.3	**4.57**
I would recommend this subject to the others.	4.0	4.6	4.6	4.2	-	5.0	5.0	4.3	**4.53**
TOTAL	**4.14**	**4.54**	**4.50**	**4.13**	**4.88**	**4.75**	**4.64**	**4.37**	**4.49**
Number of respondents	**5**	**5**	**9**	**18**	**1**	**1**	**2**	**3**	

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The highest average score (4.67) was recorded for the statement *The lecturer is readily available to answer your questions*, which confirms dedication of the lecturers to the attendees. Generally, all scores related to the quality of the course and the lecturer were high. All average scores were above 4.0. The average lowest score (4.10) was recorded for the statement *I have made significant advances in learning in this course*. This is probably due to the fact that majority of the courses were at the introductory level, and probably participants already had some pre-knowledge in this area, and therefore, they didn't experience significant advances in knowledge.

The analysis of open-ended questions gave the organizers some interesting ideas and guidelines for the next round of the LLL courses. The answers to the first open-ended question (What did you particularly like about this course/teacher and what are its strengths?) show that most of the participants were impressed by the knowledge, experience and dedication of the lecturers. The answers to the second open-ended question (What did you particularly dislike about this course/teacher and what are its weaknesses?) show that there were no significant deficiencies, only a few of respondents at some courses would prefer more practical examples or complained on lack of interactivity during the course.

Finally, third open-ended question (Do you have any suggestions for the improvement?) brought the organizers several ideas how to make next round better. Several respondents asked for the sequel of the courses. Also, in some cases, they asked longer courses ("Three days are just now enough") and more hours, and more practical examples and more interactivity during the course. In addition, respondents asked for more practical examples from particular areas of business, such as banking or marketing and more courses with coding.

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The same survey was also organized after second cycle of LLL courses, performed in February-April, 2022. The survey was again organized online, using Google Forms and survey template for LLL courses, from the Quality and Assessment plan, adapted to online courses. An e-mail invitation was send to each applicant to the course, followed by two reminders, to those who didn't reply to the first invitation. It should be noted that the number of respondents was not high (approx. 60% of those who stayed until the end of the course), partially due to relatively high churn of the applicants (high non-show rate) but also due to some problems to approach the survey (in some companies, due to IT security policy and rules, it was not possible to access the Google Forms survey at all, so participants were forced to use private computers/accounts).

Quantitative results of the survey (statements and average scores) are presented in the following table.

STATEMENT	WU	UNITOV	CERTH	UNI	UNIKG	TOTAL
Online platform used for the course functioned without any problems.	4.93	4.50	4.62	4.71	5.00	**4.75**
Course objectives are clearly defined.	4.47	4.33	4.77	4.29	5.00	**4.57**
The course is well structured.	4.33	4.40	4.62	4.35	5.00	**4.54**
Teaching materials (recommended readings, manuals, etc.) were clear and easy to read and they facilitate learning.	4.47	4.33	4.77	4.24	5.00	**4.56**
The course was supported with enough illustrations (examples, case studies, exercises, etc.).	4.40	4.83	4.77	4.41	4.78	**4.64**
My thinking and discussions were stimulated.	4.07	4.83	4.69	4.24	4.67	**4.50**
The lectures were organized on time (according to the schedule).	4.80	4.83	4.69	4.88	4.89	**4.82**
The course is presented in an interesting and dynamic way.	4.20	4.83	4.62	4.53	4.78	**4.59**
The use of didactic material (slides, blackboard, films, etc.) helped me to understand the concepts that were taught.	4.20	4.67	4.77	4.18	5.00	**4.56**
The lecturer's oral expression is good (clarity, volume, tone, flow).	4.71	3.83	4.54	4.75	5.00	**4.57**
The lecturer shows show interest in teaching.	4.57	4.83	4.77	4.71	5.00	**4.78**
The lecturer is readily available to answer your questions.	4.71	4.83	4.77	4.71	5.00	**4.80**
The lectures of visiting lecturer were very useful.	4.27	4.83	4.54	4.24	4.89	**4.55**
I got the knowledge I had expected from this course.	4.20	4.50	4.62	4.00	4.67	**4.40**

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The gained knowledge improves my competences and performance at my workplace.	3.93	4.67	4.15	3.69	4.50	**4.19**
I have made significant advances in learning in this course.	3.80	4.50	4.23	3.69	4.25	**4.09**
In general, I appreciate this course.	4.53	4.83	4.69	4.53	5.00	**4.72**
I would recommend this subject to the others.	4.33	4.83	4.69	4.47	5.00	**4.67**
TOTAL	**4.39**	**4.62**	**4.63**	**4.37**	**4.86**	**4.57**
Number of respondents	**15**	**6**	**12**	**17**	**9**	

All courses and all questions were highly graded (grades of all courses are higher that 4.35). The highest average scores were recorded for the statements *The lectures were organized on time* (4.82) and *The lecturer is readily available to answer your questions* (4.80), which confirms dedication of the lecturers to the attendees. Generally, all scores related to the quality of the course and the lecturer were high. All average scores were above 4.0. The average lowest score (4.09) was recorded for the statement *I have made significant advances in learning in this course*. This is probably due to the fact that majority of the courses were at the introductory level, and probably participants already had some pre-knowledge in this area, and therefore, they didn't experience significant advances in knowledge.

The analysis of open-ended questions gave the organizers some interesting ideas and guidelines for the next round of the LLL courses. The answers to the first open-ended question (*What did you particularly like about this course/teacher and what are its strengths?*) show that most of the participants stressed that the lecturers were very competent, motivated, open to questions and discussion and that the lectures were interesting, well structured, with plenty of good examples. The answers to the second open-ended question (*What did you particularly dislike about this course/teacher and what are its weaknesses?*) show that there were no significant complains, only a few of respondents at some courses suggested that the lectures should not be organized in consecutive days, immediately after working hours, as this was quite tiresome for them.

Finally, the responses to the third open-ended question (*Do you have any suggestions for the improvement?*) were mainly focused on suggestions that courses should be longer (more days, less hours per day), and that it would be better next time to be organized in-person.

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Recommendations for the improvement of the programs

Based on the feedback from the participants in master studies and LLL program and the feedback from the lecturers participated in both programs, the following set of recommendations is suggested to the lecturers for the next generation of attendees:

- Many of the participants in both programs stressed that the courses should have less theory and more practical examples and more computer-based work;
- Although online lecturing is well-established during COVID-19 pandemics, many participants responded that they would prefer in-person than online classes, particularly for the courses which require computer work;
- The courses should have more real-life, practical, business-oriented tasks and examples, from different areas of business, i.e. finance, marketing, management, accounting, etc.
- The courses organized for professionals (LLL courses) should be organized to last no longer than a few days i.e. complex courses should be divided into several shorter courses (3-5 days), with gradual improvement levels (Introductory, Intermediate and Expert);
- for LLL courses, the Certificate of Attendance is a good incentive for the participants and should be delivered to all participants attending more than 70% of the lectures;