

# Higher Education in Ethics and Deontology Student's Perspective Survey

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*Abstract:* - In many countries, particularly European ones, there are professions such as Engineering, Medicine, Law, and other professional areas that work as regulated professions; that is, they are professions that have an organization behind them, either public or private, but in this case of public interest and framed by national laws, which regulate these professions through the establishment of Codes of Ethics and Deontology. These organizations require their associated professionals to comply with, in the exercise of their respective professions, under penalty of being professionally sanctioned if they do not do it. Therefore, professionals in these areas must be trained in Ethics and Deontology. However, in some countries, in terms of higher education, great importance is not given to raising students' awareness of issues related to Ethics and Deontology, particularly in some courses, even at the undergraduate level. Although it seems that training in Ethics and Deontology is of great interest to any higher education student, regardless of the training area, considering this training in courses related to the so-called "regulated professions" is essential. However, specific considerations make it difficult to generalize training in these matters. In this article, we will, therefore, address these issues and carry out a study in a specific situation regarding their consideration in Informatics Engineering courses, a professional area whose professional exercise of specific engineering acts related to this profession is regulated but which is very difficult to regulate. Therefore, it is necessary to make these professionals aware of the need to comply with Ethics and Deontology in the exercise of their profession. Higher Education is essential in transmitting these concepts to its students, who will exercise these regulated professions. However, we also consider it essential that the basic concepts of ethics and deontology are taught in all higher education courses. To understand the students' perspective on this topic, we will analyze the responses that Ethics and Deontology students from Informatics Engineering Degree courses gave to a survey about the training they had in this curricular unit and try to understand what their perception was of the area and their interest and which was passed on to them in classes and lectures on that subject.

*Key-Words:* - Ethics, Deontology, Higher Education, Soft Skills, Regulated Professions, Engineering ethics.

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## 1 Introduction

In this paper, we analyze the results of a survey applied to students of a curricular unity about Ethics and Deontology in a Bachelor's-level course.

This survey was conducted with 106 students of a three-year Informatics Engineering Bachelor's Course. This sample includes female and male students, and the course has three modes of functioning: Daytime, After Work, and a third course, a transnational and multi-degree course in partnership with several European Universities and Polytechnics. This unit has five classes and ten lectures, totaling 45 hours.

The difference with this curricular unit is, that in addition to classes, students receive lectures given by

renowned external entities. Therefore, one of the objectives of this research is also to understand how students perceive this mixed model of classes and lectures.

At this level of education, a bachelor's degree is not usually for students to have lectures, so it was essential to know the receptivity and interest students saw in this mixed model.

### 1.1 The need for Codes of Ethics and Deontology

The need to know the basic concepts of Ethics is fundamental for everyone, even allowing interpersonal relationships and society to exist.

It is also essential to know the deontological principles, based on ethics, that should govern the exercise of a profession.

In the particular case of so-called regulated professions, such as Engineering, Medicine, and Law, it is even fundamental and mandatory for the good functioning of these professions and the excellent understanding and relationships between their members and clients.

These professions value being considered a "Profession of Public Trust", a perspective they want society to have towards this profession and its members. For this to be possible, it is therefore essential that all its members have irreproachable ethical and deontological behavior that makes society accept them and fully trust its members as professionals. Being regulated professions have behind them an organization, public or private, but with public utility status, which, through its own and specific legislation, fights for the proper functioning of the profession as a whole and the professionals associated with it, regulating based on a code of Ethics and Deontology in the exercise of this profession. Therefore, all professionals linked to a regulated profession must be fully aware of this code that allows the regulation of their profession. Knowledge of and strict compliance with this code is for the good of society but also very much for the professionals themselves as it allows for the establishment of trust not only among their peers but also among society from the perspective of considering them a "Profession of Public Trust", as already mentioned.

In addition to members of regulated professions, all members of any civil society, whether or not they are members of a regulated profession, must know and behave ethically.

## 1.2 The Role of Higher Education

From the outset and when training professionals, train them in this area and not just in the hard skills of any profession; it is mandatory and fundamental that educational institutions, notably Higher Education, are also concerned with the training of these professionals in soft skills, namely in Ethics and Deontology. Otherwise, they are training "incomplete" professionals.

Therefore, Higher Education institutions must integrate soft skills into the curriculum of their courses, whatever they may be, to allow them to train competent citizens and professionals who are also severe and ethical. In the particular case of Engineering, as this is generally regulated, this is fundamental. This Ethics and Deontology training should not replace training in the area that the

profession's regulatory organizations also generally promote among their members but rather be a complement to this specific training that the profession's regulatory organizations will give in the future. Therefore, the perspective of training in Higher Education institutions must be more comprehensive, more holistic, not only focusing on the Ethical and, in particular, Deontological aspects of a given profession, [1], [2].

In this article, we will present and analyze, in particular, the training given by a higher education institution to Informatics Engineering students and potential future Informatics Engineers. The approach followed sought to be based on the holistic perspective outlined above.

## 2 The Engineering Profession

In Portugal and many other countries, particularly European ones, the exercise of the profession of "Engineer" is subject to mandatory registration with a professional organization called the "Order of Engineers", [3]. Therefore, the Engineering Profession is regulated, as this order regulates the profession's exercise in compliance with ethical and deontological duties and obligations. This order even has a Code of Ethics and Deontology, [4], to which any engineer must adhere, know, respect, and act professionally.

Any non-compliance with this code by an Engineer as a professional when communicated to the order is analyzed by disciplinary councils that evaluate the situation and in case of non-compliance with any of the duties inherent to the exercise of the profession of Engineer, they are punished in accordance with the provisions of a Disciplinary Regulation.

Another important aspect is, as mentioned, to exercise the profession of Engineer in Portugal, it is legally mandatory to register with the order. If this does not happen, the offender is subject to legal penalties provided for in the Portuguese Penal Code, [3]. The same happens with other regulated professions such as Medicine, Law, Architecture, and others.

Penalties can essentially result from two types of non-compliance [4]:

1. Those individuals who, although not having or even have any academic qualification in the field of engineering, for example, a degree in engineering, bear the Professional Title of Engineer on their own and are not regularly registered with the Order of Engineers or who do not comply with equivalent legal obligations

incur the so-called “Crime of Usurpation of Functions”.

In other words, they cannot even bear the title of Engineer or allow themselves to be treated as such if they are not members of the Order of Engineers!

2. Those individuals who, although registered with the Order of Engineers, practice “Engineering Acts” in other Engineering specialties than their own.

In other words, they are only qualified to deal with technical situations related to their engineering specialty despite being Engineers, that is, despite being members of the order.

Many young engineering graduates and holders of a Degree in Engineering of any specialty are unaware that there is a considerable difference from the legal point of view between the Academic Titles of Bachelor, Licensed, Master, or Doctor, which are granted by a Higher Education Institution such as Universities and Polytechnics, and the Professional Titles of Engineer, which can only be granted by the Order of Engineers.

So, Academic titles and Professional Titles are very different and are awarded by entirely different entities, academic and professional!

For example, if they designate themselves as Engineers in any situation or circumstance, including on social networks, whether they do so with names in Portuguese or any other language, such as English, without being members of the Order of Engineers, they are legally penalized. As the Professional Title of Engineer can only be granted by the Order of Engineers, by doing this, these people are committing a crime of usurpation of functions.

This difference between Academic Titles and Professional Titles is substantial, meaning someone can have a degree in Engineering from a higher education institution qualified for this and yet not be an "Engineer" if they are not a member of that order. This difference, which, as mentioned, is substantial, is also unknown to many people, namely young engineering graduates, who may, without intent, fail to comply with these legal obligations resulting from this non-compliance and, therefore, be legally penalized.

Therefore, training in ethics and deontology is mandatory to register with the order and exercise the profession. Consequently, higher education institutions must provide this training to engineering students when they attend their courses. The Order of Engineers and some other orders require, following legislation, the attendance of an Ethics and Deontology Course taught by that order.

Other institutions, such as ACM and IEEE, also have their codes of ethics, [5] and [6], related to the performance, in these cases, of the profession of software developers.

However, we understand that this course should complement the Ethics and Deontology training taken in higher education and not be the only training in the area that future members of the order, that is, Engineers, have.

Similar legal provisions apply to technical engineers, and the Order of Technical Engineers regulates the exercise of this profession.

These legal aspects and the legal obligation to comply with them place more pressure on higher education institutions regarding training their Engineering graduates in Ethics and Deontology, [7], [8] and [9].

In addition to the citations already made about the development of curricula for teaching ethics and professional deontology in higher education, particularly in engineering courses, none of the studies that we found and analyzed measure, considering students' points of view, the "quality" and "interest" that students see in these curricula.

This perception and the fact that we wanted to avoid the training we provided being inconsequential with the study and the current reality in other universities also led us to consider carrying out the analysis presented here and its extension to other universities, higher education courses, and institutions. In addition to this consideration from the student's point of view, we also sought more recent perspectives on analyzing training curricula in this area and higher education, so we then looked for current studies, [10], [11] and [12], that, together with the survey we carried out, would allow us to improve and adapt the future training.

## 3 Training in Ethics and Deontology

### 3.1 Target Audience

This training in Ethics and Deontology is included in the curriculum of three Bachelor's Degrees in Informatics Engineering taught at a public Portuguese higher education institution that offers several engineering courses at the bachelor's and master's levels, with technical-professional courses also available in some areas.

Two of the three Degree Courses in Informatics Engineering are similar; the only difference is that one operates during the Daytime, LEI-D, and the other After Work, LEI-PL. The third, designated by LEI-European Computer Science Course, LEI-ECS, is based on the curriculum of the other two already

mentioned but presents some differences as it is a transnational and multi-degree course taught by a group of European universities and polytechnics that joined together for its creation and operation and the institution where this training was developed is one of the partners in this European consortium. In addition to the regular students of these courses, there are also some ERASMUS students attending them, as well as in the case of the LEI-ECS, students from partner institutions who attend this institution under the partnership agreement for the third and final year of their curriculum in the LEI-ECS.

Most students are young adults, with some older students, particularly in the after-work course. Many of these students, also mainly in the after-work course, are working students, which allows them to have a deeper awareness of the need for Ethics and Deontology in interpersonal and professional relationships, particularly in the work context in which they operate.

As this curricular unit in Ethics and Deontology is a curricular unit of the last academic semester, it works alongside the Internship curricular unit, meaning that practically all students attending this curricular unit are inserted in companies or institutions or, as already mentioned, they are student workers or because they are undertaking the curricular Internship.

The existence of these working and internship students enables them to understand better whether or not this training is necessary and better enables them to assess how it works.

### 3.2 How Training Works

This training and the model adopted, division of the planned classes between "traditional" classes and lectures, has been going on for five years, and the teacher's perception of this organization and methodology used was very satisfactory. However, he understood that after these five years, it should be to evaluate the training and its operating model, which occurred at the end of the current academic year with the results shown below.

The "traditional" classes were taught by a teacher from a higher education institution, and the lectures were given by entities external to the educational institution of recognized academic and professional merit.

In classes, the subjects taught were the concepts of Ethics and Deontology, the Codes of Ethics and Deontology of the Order of Engineers and the Order of Technical Engineers, and other subjects related to Ethics in ICT, its particularities, and consequences for users of such technologies.

Throughout the five Cycles of Lectures that have taken place over the last five years, speakers were invited to talk about various subjects complementary to ethics, such as cybersecurity, the Portuguese legal framework, data protection and copyright, social solidarity, organization and functioning of the Order of Engineers and professional legal issues, career development of an engineer and other matters adjacent to ethics and related to it and that could contribute to better preparation of the students as a good person and ethical professional.

### 3.3 Model and Process of the Training

According to those mentioned above, five classes and ten lectures occurred in the current academic year. Students could choose between two assessment models: Continuous Assessment with Exam or Assessment by Practical Work with Exam. In either of the two assessment models, students were free to attend classes or not.

In the Continuous Assessment with Examination model, students were required to attend a minimum number of lectures and make a minimum number of reports on lectures they attended. These reports were evaluated and, together with lecture attendance, constituted the attendance grade. This grade was then added to the grade obtained in a written exam on the subject of the classes, thus obtaining the final grade for the curricular unit.

In the model of Assessment by Practical Work with Exam, students had to prepare a Practical Work in which they wrote a report analyzing a scientific article related to Ethics and Deontology provided to them and other similar articles they had to research. After a public defense, they were given a grade for this work, which would then be added to the grade of an exam different from the first type of assessment, obtaining the final grade.

Most students chose the first assessment model and some the second.

As this curricular unit was given alongside the Internship curricular unit, carried out in companies or institutions, many students were away from school. For this reason, classes could not take place in person, so a platform for teleclasses was adopted.

This teleclass option was also essential for attracting speakers for lectures as it did not require them to travel, which made accepting invitations and diversifying speakers much more accessible. A hybrid operation, in person and online, was also possible, and some speakers opted for this hybrid operation.

The class material and some of the presentations made in the lectures were made available to students on a computer platform.

## 4 Measurement of Results

### 4.1 Evaluation by Students of Functioning and Model

This training worked well overall in the various aspects in which it was developed: lectures, lecture reports, classes, and academic assessment tests.

In lectures, although students only have to attend a predetermined minimum number of lectures, a large majority of students attended all or almost all lectures. Student attendance at the lectures was relatively high, reflected in the high average number of attendees. Student participation in the final part, a period reserved for interaction with the speaker through questions and answers, was reasonably good.

Class participation was similar to lectures, with an average participation rate that was also relatively high.

The reports prepared were of an acceptable average quality, reflected in the grades obtained in this sub-component.

There was a small number of students who, despite being enrolled, did not attend this curricular unit.

All other students who attended the curricular unit, whether they chose the first or the second assessment method, had a positive assessment in the frequency assessment component. The average grade for this component was high.

Table 1 (Appendix) shows the distribution by gender and enrollment number of the 106 students who responded to the survey. As the classes and lectures were common to the three courses, this table does not show the division of students between the different courses.

The study considered this division of students by gender to try to understand whether the gender of the respondent influenced the answers obtained.

Likewise, the division of students by the number of enrollments was considered to assess whether a more significant number of years studying in higher education would have influenced the responses.

In the assessment of the written exam component, the grades obtained by the students were lower than in the assessment by frequency component. However, all students completed the curricular unit successfully.

Given these results of the knowledge assessment, we consider that the primary objectives of the curricular unit were the transmission of knowledge about the concepts of Ethics, the notions of Professional Deontology of Engineers, reflected in the Code of Ethics and Deontology and in the Statutes of the Order of Engineers, the transmission of experiences and knowledge by the speakers was fully

achieved, meaning that these students will have obtained knowledge that will be very useful to them when they practice their profession.

However, these academic assessment results are in line with those of the same type carried out in the previous four years, although in these previous years, there could have been some influence from teaching and assessment conditions due to functional changes resulting from COVID-19.

Therefore, the students were expected to assess the model and functioning of the curricular unit, which they also did. The results of the first analysis are shown in the following section.

### 4.2 Academic Measurement of Knowledge with Assessment Tests

#### 4.2.1 Student Assessment Model

Given the objectives of obtaining an evaluation by students of the functioning and model of this curricular unit, we developed a survey to be completed by students, which asked a set of questions with several answer options that students selected.

These surveys were distributed to students when taking the written exam and students were invited to fill them out and submit them when the written exam was delivered.

Students were informed that the surveys were anonymous and optional.

One hundred-six responses to the surveys were obtained from 110 students present for the exam. These numbers indicate that the students themselves were interested in participating in this process, thus contributing to the success of the action and extending the teaching of subjects related to Ethics and Deontology to the remaining courses.

These surveys were treated by obtaining response graphs, which were created for simple and compound questions. In these compound questions, students were asked a basic question, and then, if they answered affirmatively to that question, they filled out a Likert scale grading their feelings regarding the basic question from "1" to "5".

Also, the questions asked allow us to obtain correlations between data that will later be treated and presented in a new and subsequent article.

#### 4.2.2 Survey Structure

The survey design consisted of ten questions divided into three large groups.

The first group consisted of questions to characterize the sample, such as gender, the course to which they belonged, and the number of course enrollments already made. The second group, consisting of three simple, specific questions, aimed

to characterize the action. The third group, consisting of four compound questions, also characterized the action.

The questions were prepared to obtain correlations between the data, such as considering the respondent's gender and trying to conclude whether the answers followed a specific trend of that gender and/or the number of enrollments already carried out and whether these factors would also be correlated with the other responses obtained.

The compound questions were considered to the students had to grade their perception of that particular aspect in addition to answering a basic question to understand and classify more correctly how the student felt about the issue presented in the basic question. This grading was done by presenting students with a Likert Scale with values from 1 to 5, in which students indicated a value on this scale if they answered Yes to the first part of the question.

The analysis of these possible correlations has yet to be carried out in its entirety, which is why it will not be presented in this first article about this study but in a subsequent one.

Therefore, the questions asked were the following:

**1. First group of questions – Sample Characterization**

- a. gender:
  - Male
  - Female
  - Other
- b. Course:
  - LEI Daytime
  - LEI After-work
  - LEI European Course / Erasmus Student
- c. Number of Course Enrollments:
  - First Enrollment
  - Second Enrollment
  - Third or more Enrollment

**2. Second group of questions – Characterization of the Experience**

- a. Do you understand the concepts of Ethics and Deontology?
  - No
  - Yes
- b. Have you had any training in this area?
  - No
  - Yes
- c. Do you believe that this subject should be part of the curricula of Higher Education courses?
  - No
  - Yes

d. Do you consider that giving lectures on Ethics and Deontology was useful for your training in the area?

- No
  - Yes - If yes, how much? 

1	2	3	4	5
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- 1= a little, 5 = a lot

e. Do you understand that the training in Ethics and Deontology you received will allow you to be a better professional?

- No
  - Yes - If yes, how much? 

1	2	3	4	5
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- 1= a little, 5 = a lot

f. Do you consider it useful to have Codes of Ethics and Deontology in the various professions?

- No
  - Yes - If yes, how much? 

1	2	3	4	5
---	---	---	---	---
- 1= a little, 5 = a lot

g. In your perception, do you consider yourself an Ethical citizen towards society?

- No
  - Yes - If yes, how much? 

1	2	3	4	5
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- 1 = a little, 5 = a lot

**4.2.3 Data Correlation**

Through this set of questions, we will correlate the data provided to obtain information and extract knowledge, considering different combinations of answers given depending on the type of respondents to the survey, such as gender, course, number of enrollments, whether or not you have already had training in the area, and other considerations.

From this study presented here, some lessons were drawn regarding the correlations that could and should be considered.

Therefore, this aspect of correlations will be improved in the subsequent phases of the study. The objective will be to obtain, based on other data combinations, the possibility of considering more correlations to obtain more information and extract other knowledge.

We will only analyze some of the correlations in this analysis of results, although some can already be done and will be presented in future articles.

**4.2.4 Analysis of Survey Results**

In Figure 1, we show the results of the question, “Do you understand the concepts of Ethics and Deontology?”. This predominance of “Yes” responses was expected, given that these student respondents had training in the area!

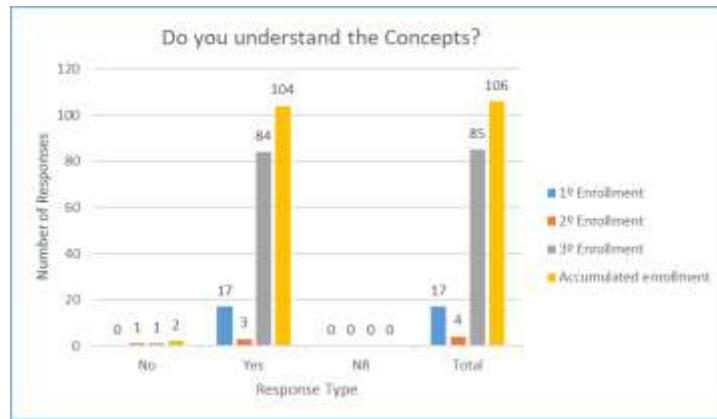


Fig. 1: Do you understand the concepts of Ethics and Deontology?



Fig. 2: Have you had any previous training in this area?

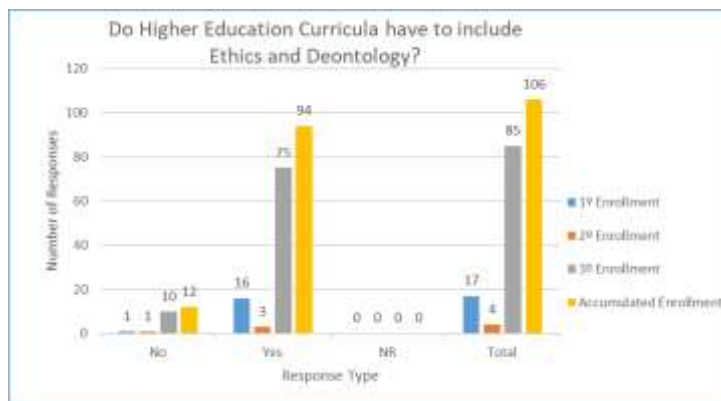


Fig. 3: Have you had any previous training in this area?

Figure 2 shows the data obtained from the question, “Have you had any previous training in this area?” It would be expected that the predominance of “Yes” answers would be total or almost total or in line with the answers obtained in the previous question and for the same reasons presented there. However, a relatively large number of “No” responses were still obtained, given the context.

These results need to be better analyzed. However, one cause may be that the responding students needed to understand the question correctly and confused the action referred to in the question

with other training than the training they had in this curricular unit.

The graph in Figure .3 shows the data for the question, “Do you believe that this subject should be part of the curricula of higher education courses?”

These results were also not precisely expected because, considering several aspects of the development of this curricular unit, a percentage of responses very close to 100% was expected. Despite being a high value, the percentage of “Yes” responses was 88.7%. A more careful study of this question and the answers obtained will also be carried out, possibly considering the correlations that can be made here.

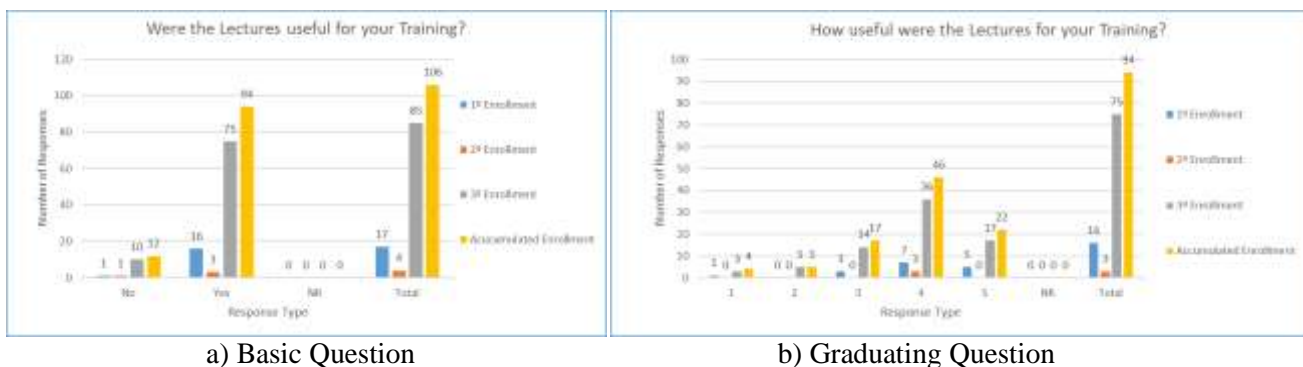


Fig. 4: Do you consider that giving lectures on Ethics and Deontology was useful for your training in the area?

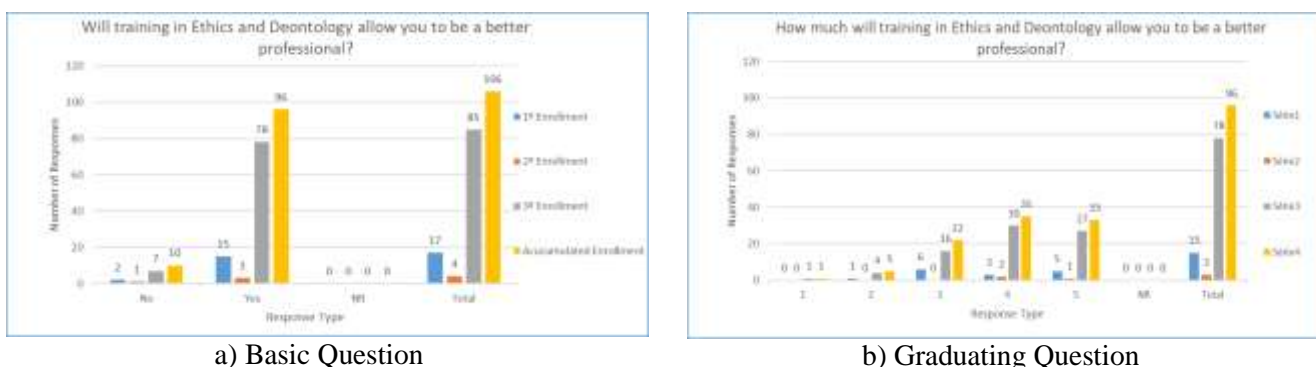


Fig. 5: Do you understand that the training in Ethics and Deontology you received will allow you to be a better professional?

These results are shown in Figure 4, although there were some "No" responses, which were as expected, considering the number of students in the lectures. 88.7% of students answered "Yes"!

However, we expected some "No Response—NR" responses here because although there were not many, some students chose the second type of assessment.

This aspect needs to be considered in future surveys.

Overall, and once again considering the high number of "Yes" responses, 88.7%, we consider that holding classes and lectures meets what students prefer and desire in this type of curricular unit where soft skills are considered, in this case, Ethics and Deontology.

The graph in Figure 5 refers to the possible influence of the Ethics and Deontology concepts that students learn in this training on their future professional lives.

We had some expectations about the answers that would be given to this question because it, in a way, condenses all the perceptions that the students had about the concepts of Ethics and Deontology and the need and interest or not of them for their professional life and that were transmitted to them both in classes and in lectures.

The high number of positive responses, 90.6%, reflects that the expectations were correct and that the students understood that these concepts were fundamental for a correct, healthy, and positive professional life for their relationships with peers and society.

The results of the graduation of "Yes" answers corroborate our interpretation that the students considered the concepts that were transmitted to them to be fundamental to their professional lives. In addition to the high number of "Yes" answers, 70.8% of these answers were valued at "4" or "5," the two highest values on this grading scale.

The answers to the question "Do you consider it useful to have Codes of Ethics and Deontology in the various professions?", whose results are shown in Figure 6, were also very interesting and reinforce our conviction that the students found this training very interesting both for their personal and professional development, to the point of considering it essential for other colleagues in other professions. The number of "Yes" responses was very high, 98.2% of the total responses.

The grades given by those who answered "Yes" to the fundamental question were also very high. There was no assignment of the lowest grading values, "1" and "2", with the majority of grading values given, 91.3%, being responses with the values "4" and "5".



Even the intermediate value "3", often given in this type of graduation for convenience or uncertainty, had a relatively low percentage of assignments, 8.7%.

In Figure 7, we show a graphic of the results of the answers to the question, "In your perception, do you consider yourself an Ethical citizen towards society?" With this question, we wanted to deflect false answers in the sense of positivity regarding Ethics and Deontology on the part of the students.

Our perception of all the answers to the previous questions was very positive, indicating the students' genuine interest in this training.

These answers and the very high number of "Yes" answers translated into the high percentage of positive answers, 99.1%, only confirm what we had noticed with the answers to the previous questions as we understand that if such a high percentage of students want to be an "Ethical Citizen", is because they consider being "Ethical" to be very positive and interesting to the point that they want to be so too.

Also, when grading these "Yes" answers given in this question, a large majority, 96.2%, of students, in addition to grading their answer with at least the average value "3", do so in a peremptory way as 86.7% assign one of the maximum graduation values,

"4" or "5", which is revealing of the fact that they want to be "Ethical Citizens" or at least consider that they want to or should be.

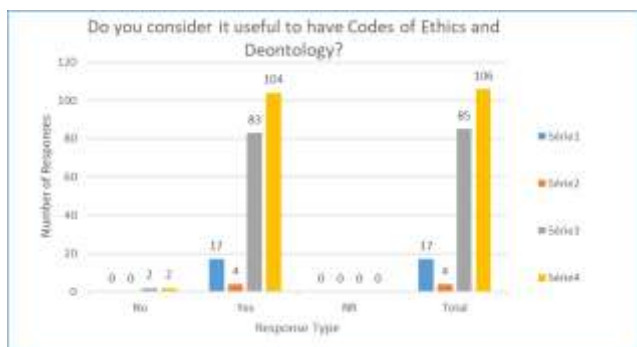
### 5 Conclusion

We conclude that the class-and-lecture approach to teaching Ethics and Deontology soft skills is correct and adjusted to the student's desires.

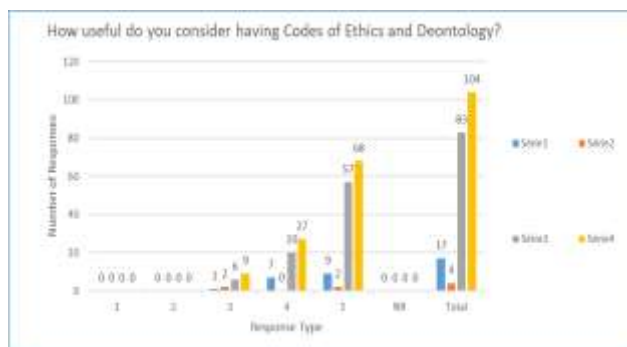
However, we will conduct more refined data analyses, particularly considering some correlations, to obtain more precise information and more concise knowledge.

With this new stage, it will be possible to assess better whether any changes to the model used until now are necessary to improve it by incorporating the knowledge now extracted.

It is also planned to extend this study to several other courses and higher education institutions to avoid bias by focusing the survey on students who had specific training in the area. Based on this target audience expansion, we will have more robust results than expected from students.

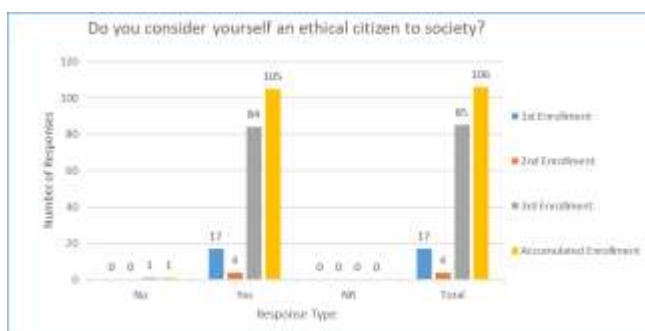


a) Basic Question

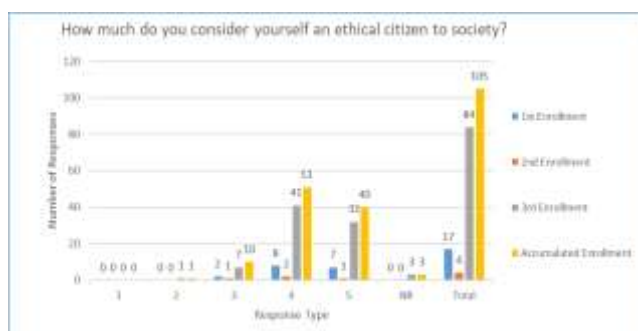


b) Graduating Question

Fig. 6: Do you consider it useful to have Codes of Ethics and Deontology in the various professions?



a) Basic Question



b) Graduating Question

Fig. 7: In your perception, do you consider yourself an Ethical citizen towards society?

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## APPENDIX

Table 1. Distribution of Ethics and Deontology Students

<b>Students of Ethics and Deontology Course</b>												
	<b>Females</b>				<b>Males</b>				<b>Total</b>			
<b>Enrollments</b>	1st Enroll	2nd Enroll	3rd Enroll	Subtotal	1st Enroll	2nd Enroll	3rd Enroll	Subtotal	1st Enroll	2nd Enroll	3rd Enroll	Grand Total
<b>Number of Responses</b>	4	0	8	<b>12</b>	13	4	77	<b>94</b>	21	4	92	<b>106</b>