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# ONLINE THERMODYNAMICS EDUCATION UNDER PANDEMIC TIMES, IN CONSTANTA MARITIME UNIVERSITY

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***Abstract:*** As well known, the day of 11 March 2020 will remain in the history as the day in which The World Health Organization (WHO) has declared COVID-19 a pandemic. Under these circumstances, the international higher education was forced to remove the campus activities in online. Constanta Maritime University is one of the universities across the world which moved the educational process from face- to- face to online learning. This was a challenging task for the academic, managing and technical administration and for the students, as well. This paper focuses on the disciplined entitled Thermodynamics 1, encountered in the curricula of the Electromechanics Faculty, Constanta Maritime University. The paper describes the steps done during the online education along the semester, both by students and lecturers. At the end of the semester, students and lecturers had to face another challenge: the online examination. Since in the new conditions, the students had to gain the same knowledge as during the classic educational process, we are providing the results obtained by our students. Their exam was scheduled on June 26, 2020. The number of students attending the online examination was 108. The online report for the examination, available on the online platform of the university, indicates that online 17 students were not able to pass the examination (grade 5). The same chart data shows that 19 students have obtained grades in the range (8,00- 8,50), while 2 students obtained grades in the range (9, 50- 10,00). These results are considered to be encouraging for lecturers and students. This type of examination it is seen as a potential long term examination manner, given its benefits: online generation of the test, online verification and not last, transparency.
***Key words:*** online, pandemic, students, thermodynamics.

## 1. INTRODUCTION

The dynamic of international economy is reflected also in the shipping activity, marine engineers having to face the challenge related to the competitivity, as well as engineers from all other sectors. In these conditions, future marine engineer's education has to reply to the need of providing skilled professionals, with high values and creative attitudes [1]. As a result of the economic growth, maritime activities are of great importance in EU, which under pandemic auspices is offering consistent financial resources to its member for reforms and investments [2]. In this context, quality education for students enrolled in maritime higher academic institutions is a pylon of a flourishing maritime sector [3]. Thermodynamics is seen as a discipline with a high level of difficulty that has to prepare students to deal with topics of energy, thermodynamics principles and their application on board the ships [4], [5].

Covid-19 lockdown forced education establishments to suspend their face-to-face educational process and to rapidly adapt to the online learning, with no negative impact on the opportunities, learning experience and employment, by taking into consideration the perspective of long time e-learning activities [6], [7], [8].

In Constanta Maritime University, Thermodynamics 1 is an imposed discipline, found in the curricula of students enrolled in the Electromechanics Faculty, year 2, second semester. The activities specific to this discipline are carried out during 42 course hours and 28 seminar hours. This course aims to ensure knowledge regarding the study and understanding of processes encountered in machines and plants on board the ships, in which energy exchanges occur in the form of heat and work.

In March 2020, Romanian educational system moved online. Under these conditions, thermodynamics lecturers from Constanta Maritime University had to deal with online teaching and learning, providing student skills reflected in a good performance after their final examination. We were motivated by studies indicating that there is no significant difference in the performance between online and face-to-face classroom activities [9].

In this study are described the efforts done by the lecturers in order to ensure the achievement of same knowledge - as during classic educational process. The following challenge faced was the online examination. The assessment of the results obtained by our students is

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of a great significance, since they were facing for the first time this type of performance examination. This aspect is very important, since examination represents a strong tool useful to identify individual accomplishment [10].

## 2. METHODS AND MATERIALS

The online Thermodynamics 1 education activities are delivered through out e-campus platform, developed by Constanta Maritime University. Immediately after lockdown announcement, students and lecturers were intensively trained in the platform use. A guide to a friendly use of the e-learning platform was released. Lecturers have built the online course and seminar materials so that students can take advantage of both synchronous and asynchronous classes, by an easy navigation process. The platform allows students to fulfil their different tasks, by the use of any personal device.

The online Thermodynamics 1 course is structured into an introduction and several units.

The introduction contains information on the following aspects:

- objectives
- course content
- supplementary resources
- methods and instruments of students' performance assessment.

The content of course is divided into units aiming the gradual learning. Each unit is developed in order to be delivered in 100 minutes and it is structured as follows:

- unit objectives
- learning instructions
- theoretical knowledge and examples
- summary and conclusions
- self-assessment tests
- solving and answers for each test
- unit references

According to the schedule, students and lecturers had access to the platform by login with their usernames and passwords. By clicking "curs video", as seen in Figure 1, students and moderator are together in the virtual classroom (Figure 2).

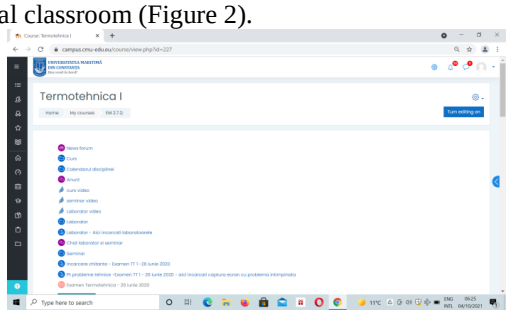


Figure 1 The page of Thermodynamic 1 on e-Campus

Students and lecturers access the page of the discipline. As seen in Figure 1, specific activities are permitted, such as life attending to course or seminar classes (curs video and seminar video) or examination (Examen Termotehnică – 26 June 2020). In special folders, students will find the course and seminars materials, specific to Thermodynamics 1 (Curs and Seminar).

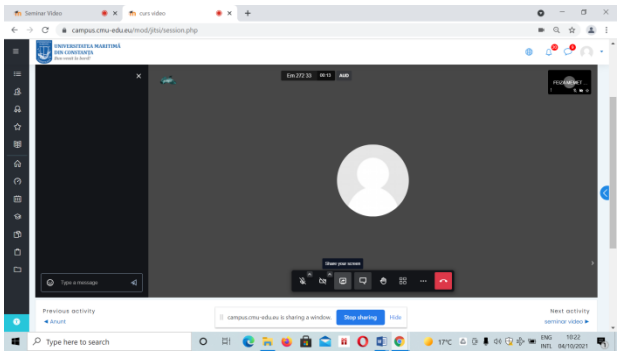

Figure 2 Access to the video course activity

The lecturer is able to present the educational materials by clicking the "share your screen" button.

Students are able to interact with their teacher and mates by starting their cameras and microphones and also by typing a message.

For the final examination of the students, lecturers had to prepare a bank of questions with 300 questions, in order to develop a multiple choice examination. Thus, each question has 3 options, only 1 being the correct one.

The online examination of the discussed discipline took place on 26 June. The lecturers option was that the platform will generate a quizz containing 25 questions, for the solving being allocated 30 minutes. The number of allowed attempts was 1. As seen in Figure 3, 108 students had attempted the examination.

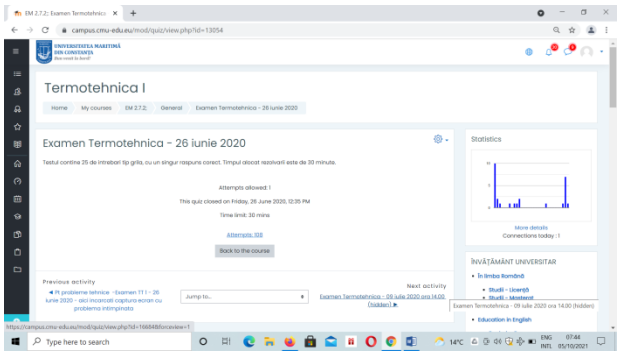


Figure 3 Information regarding the first online examination

The e-Campus platform is able to generate also a chart, indicating the grade ranges achieved by different numbers of students (see Figure 4).

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In order to continuously improve its educational and training programmes, Constanta Maritime University monitors the performance of its academic staff through-out a final evaluation questionnaire of each discipline, submitted to the students, after their final examination. The questionnaire contains 10 questions, for each question students have to allocate a grade in the range 1÷5, 5 meaning the maximum level of satisfaction.

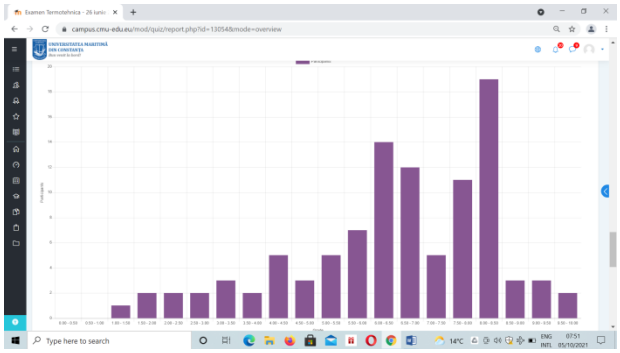

Figure 4. Overall number of students achieving grade ranges

Table 1 Discipline Thermodynamic 1: Evaluation Report

| | | |
|---|---|---|
| Q1 | Are you the beneficiary of clear and useful information by attending to this discipline? | 5 |
| Q2 | Have you been rigorously inform by your lecturer regarding the objectives, contain and evaluation, at the beginning of the semester? | 5 |
| Q3 | Do you consider that your lecturer had a proper interaction with you during the online teaching process? | 5 |
| Q4 | Do you consider that the e-Campus platform was a strong tool for going knowledge? | 5 |
| Q5 | Do you consider that the seminar activity had a proper contribution to the understanding of the theoretical knowledge provided during course activities? | 5 |
| Q6 | Do you consider that the course units, available on the page of the discipline had a significant contribution for a better understanding of the delivered information? | 5 |
| Q7 | Do you consider that the tasks of this discipline present an amount and difficulty level adequate to the student capacity? | 4.71 |
| Q8 | Do you consider that the online examination properly reflects your gained knowledge? | 4.86 |
| Q9 | Do you consider that your online evaluation was correctly carried out? | 4.86 |
| Q10 | Do you consider that during the online teaching and training process were respected the ethics and academic conduct rules? | 5 |

In Table 1 are provided the results of the evaluation questionnaire, specific for Thermodynamics 1, taken from the overall Report of Constanta Maritime University.

## 3. RESULTS AND DISCUSSIONS

The success of the online education and evaluation of both students and lecturers is reflected into the results obtained by our students after their first experience regarding the online evaluation and also in the student satisfaction-measured through out the above mentioned questionnaire.

The analysis done after the first online examination indicates that 75% of the examined students were able to be successful in their final examination (grades between 5÷10). Good scores are seen for 51% of the students (grades between 7÷10). Very good results were obtained by a number of 27 students, as follows:

- grades between 8.00 – 8.50: 19 students
- grades between 8.50 – 9.00: 3 students
- grades between 9.00 – 9.50: 3 students
- grades between 9.50 – 10.00: 2 students

These results are the reflection of the efforts done by students and lecturers as well, during the pandemic times.

The fact that lectures focused seriously on the transition from the traditional face-to-face class to online activities is reflected in the level of student satisfaction. The overall grade obtained to the questionnaire specific to the evaluation of Thermodynamic 1 discipline is 4.93, 5 being the maximum.

## 4. CONCLUSIONS

This paper exemplifies how lecturers and students managed to adapt rapidly to the online education and training and examination, during pandemic times. The focus was on the discipline called Thermodynamics 1, hosted in Constanta Maritime University.

After the first semester spent in the virtual environment, the results obtained by our students after their first online examination experience is more than encouraging: 75% of the students have been successful, 16% of the students being able to get grades in the range 8.00-10.00.

The efforts done by the lecturers in the service of this discipline was recognized by the students, which

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assessed their activity with a score of 4.93, the maximum awarded score being 5.

In comparison with the results obtained by the students after the classic evaluation, the presented results appear to be better.

Since for each question, students had only 1.2 minutes to provide the correct answer, the results are not a subject of doubt.

The explanation might be that the quiz solving was done on their personal devices, in a friendly environment.

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