

## THE USE OF THE E-LEARNIG PLATFORM IN THE ASSESSMENT OF STUDENT KNOWLEDGE IN CMU

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**Abstract:** *Marine Refrigeration Plant is a discipline included in the curricula of students enrolled in Constanta Maritime University, willing to be trained as future marine engineers. In this paper we focus on the mid semester assessment of the knowledge gained by our part time students till a deadline, which is announced at the beginning of the semester, by the lecturer, through the so named Schedule of the Discipline, available on the e-learning platform. For the mentioned discipline, the compulsory mid semester assessment consists in an assignment dealing with ejection and absorption refrigeration plants. The assignment is evaluated by the lecturer through the e-learning platform which is a tool of realizing of communication and knowledge assessment, in the most effective way.*

**Keywords:** *Marine Refrigeration Plants, e-learning, assessment, part time*

### 1. INTRODUCTION

Refrigeration is an important technology in our modern society, being met in many of our daily activities. Refrigeration principle relies on the heat rejection to the environment at high temperature and the heat extraction from a body with a lower temperature.

Marine Refrigeration Plants are working on the most majority of ships, worldwide. The characteristics of the systems are affected by the scope of the refrigeration and might be of any industrial scale, if it is about fishing vessels.

Regarding refrigerants used on board, the main refrigerants in use are HFC's and HCFC's, given the fact that the main application of marine refrigeration is related to the storage of different kinds of perishables (cargo or food and drinks for crew and passengers). Not lastly, air conditioning is requested for reaching thermal control on board, in different enclosed spaces.

As other applications of marine refrigeration are also mentioned: foam insulation based on HFC and HCFC blowing chemicals and systems for fire protection using HFC fire suppression fluids.

This paper is focused on the manner in which it is assessed the level of knowledge of part time students enrolled in Constanta Maritime University (CMU), Marine Engineering Faculty, specific to the course entitled Marine Refrigeration Plants, through an assignment which have to be loaded on a e-learning platform.

### 2. COURSE COMPLIANCE WITH THE REQUEST OF INDUSTRY

In CMU, Marine Refrigerating Plants is an undergraduate course aiming the gain of specific skills for the future of professionals on board. For the focused students, this course is scheduled in the 4th year of study and lays on one semester, having allocated 42 hours.

The structure of this discipline is responding to competence A – III/1-4.1 and also to time budget mentioned in IMO Model 7.02 Marine Engineering at Managerial Level Competence [1].

The chapters provided through this discipline, with status of individual study, are as follows:

Chapter 1: Introduction on marine refrigerating plants (2 h).

Chapter 2: Selection of refrigerants. Brines (2 h).

Chapter 3: Single stage vapour compression plants (4h).

Chapter 4: Two stages vapour compression plants (4h).

Chapter 5: Moist air. Air conditioning (4h).

Chapter 6: Containers for perishables (2h).

Chapter 7: Refrigeration heat compressors (4h).

Chapter 8: Refrigeration heat exchangers (4h).

Chapter 9: Exergy analysis of marine refrigerating plants (2h).

The practical skills of future professionals are ensured through the following:

1. Control and measurement devices (2h).
2. Functioning and maintenance of the plant (4h).
3. COP assessment (2h).
4. Identification of malfunction and repairs (2h).
5. Exploitation of AC (4h).

Within the above mentioned chapters to the students are introduced information regarding international Current Legislation and refrigerant selection. The main resulting aspects are as below [2], [3], [4], [5], [6], [7], [8] and [9].

The ozone layer is of major importance for the Earth's surface and people's health.

The Montreal Protocol (September 1987) has marked the restrictions of production for CFC's, chemicals widely used on board.

Beijing Protocol (1999) stated the ban for export of HCFC to non-parties from 1.1.2004.

Global Warming Potential (GWP) is seen as important as Ozone Depletion Potential (ODP), considered to be appropriate for marine refrigeration, even if this chemical still shows a high value for GWP. For the mention reason, hydrocarbons (HC) and as well natural refrigerants and mixtures are seen to be attractive for different situations. There is not a perfect refrigerant, thus the nomination of a refrigerant as working agent is done according to several criteria (thermo-physical, environmental, safety and economic).

The refrigeration cycle starts when the refrigerant, in vapour state enters the compressor, where occurs the rising of pressure and temperature. In the condenser the vapours are turned into liquid by heat rejection to the environment.

By heat absorption the liquid refrigerant is turned back into vapours.

The two stage vapour compression system is widely used in cooling in fishing industry, and as a result, on board of fishing vessels.

Energetic and exergetic analysis are largely introduced in the assessment of the performance of cooling plants.

Being given the fact that vapour compression refrigeration systems consume important quantities of electrical energy, it is needed the improvement of the overall performance of the system.

For refrigeration machines the focus is on COP and exergetic efficiency. For the increase of the plant performance it is required the assessment of irreversibility, having in view that the exergy losses are the reasons for the performance diminishing.

Starting from the high request of agricultural products shipped using the controlled atmosphere (CA), this technology, used for storage, is under development and it is more and more attractive for ship builders.

The knowledge regarding the transportation of fruits, vegetables and plants in CA should be at the hand of future professionals.

The curricula allocated to this technology deals with the fact that reaching optimum CA parameters depends on the type of the product, as well as growing conditions and maturity of product.

By CA are monitored the following:

Temperature – it is established for each type of product which is shipped; it is aimed the diminishing of the respiration rate of the product

Oxygen – this contain should be decreased under 20.8% from the regular air.

Nitrogen – the percentage of oxygen is decreased by the help of introduction of Nitrogen – enriched CA gas, supplied by membrane – type Nitrogen generators.

Carbon dioxide – this element is produced naturally by the respiration of product, on increased percentage of CO<sub>2</sub>, being needed to be avoided. Extra amount of CO<sub>2</sub> might be evacuated by entries of air or nitrogen enriched CA gas.

thus HFC is

Water vapours – by cooling it results the dehydration of the holds transported; the existence of nitrogen-enriched low oxygen CA gas in the cooled space contributes to the achievement of a longer voyage duration.

Ethylene – it is produced through normal biological processes. The effect is seen in damaged products. This is why ethylene should be evacuated from the space by flushing with low oxygen CA gas or CO<sub>2</sub>.

Carbon monoxide - it is aimed a high percentage of CO, due to the delay of development of pathogens which have a negative impact on the quality of the product.

Turning back to the student assessment issue, the final grade of the student is composed by 80% - written paper and 20 %- mid semester assessment.

The condition of attempting to the written paper is providing, for evaluation, of an assignment related to ejection plants and absorption plants. The student is informed about this task by the lecturer- at the beginning of the semester. The student has to submit his assignment respecting the deadline and a given structure. All this info is at disposal of the student on the e-learning platform. The minimum grade for an approved assignment is six. The results are available also on the e-learning platform.

### 3. USING THE E-LEARNING PLATFORM FOR THE ASSIGNMENT EVALUATION

Part time students, are guided to use the e learning platform, provided by our university for a better interaction and student-teacher communication.

The platform provides and manages effectively the following:

- Accessing e Campus portal.
- Electronic management of course content according to the educational plan.
- Creation and updating of educational resources: course seminar/lab evaluation tests, other topics
- Adding topics of seminar/lab or homework.
- Adding verification test of knowledge.
- Interaction with students: chat, advice messages within e Campus.
- Accessing resources on scientific and academic information available within J Thomson ISI-Plus: Web of Science, SpringerLink, IEEE/IET Electronic Library.

The access on the platform is very simplistic, being possible with an username and a password, from the site of the University- in the Virtual Campus section. Using any internet browsers (Internet Explore, Firefox, Chrome, Safari, etc) students will access the following address : <http://campus.cmu-edu.eu>. Once they log in, they get in their dedicated section where they can access courses and related materials for years of studies as seen in Figure 1.

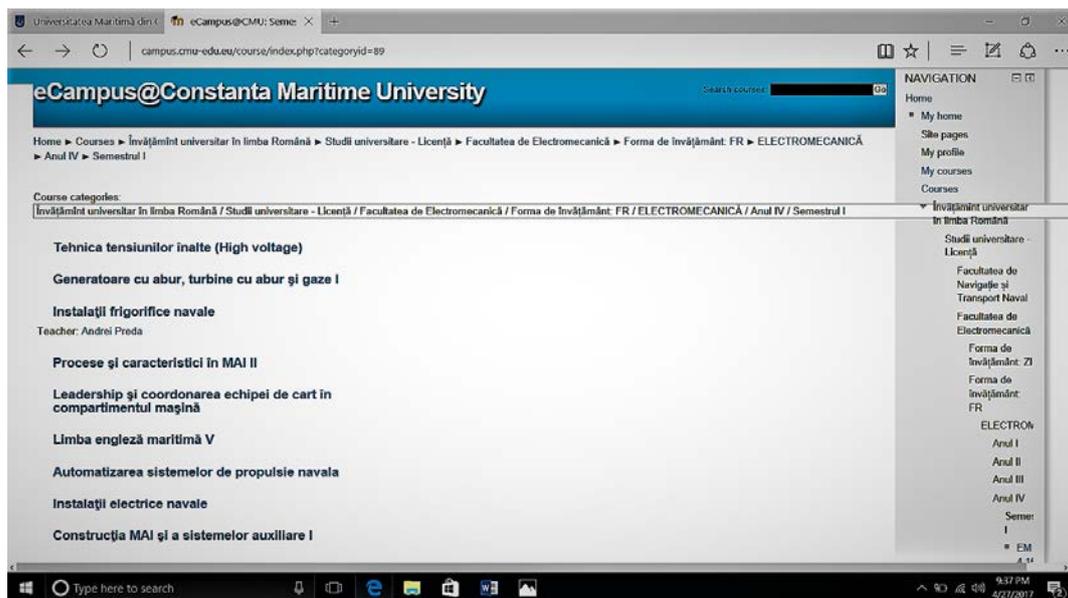


Fig. 1 Material structure for a semester

Each subject has a separate submenu that includes the appropriate course, seminars, laboratory lessons, and a section for uploading files. In this section, students can submit their homeworks and projects. As

mentioned above, when talking about Marine Refrigeration Plants, part-time students have to upload their essays regarding ejection and absorption plants on the platform, in order to be evaluated by the lecturer, as seen in Figure 2.

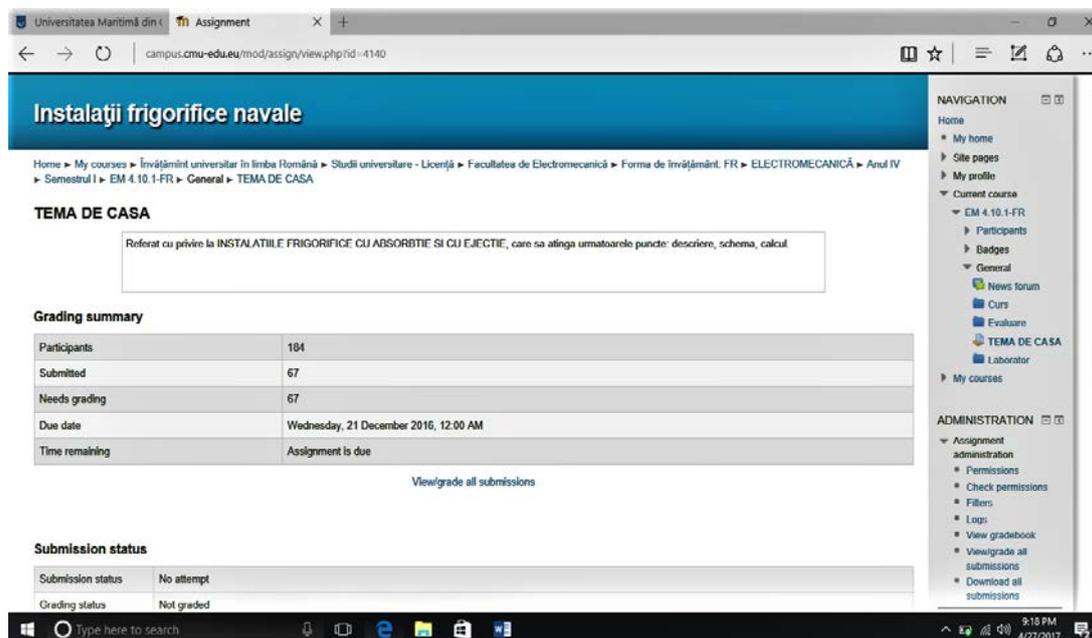


Fig. 2 The uploading section

The assignment contains requirements leading the student in the elaboration of his essay, which might contain experimental results, load charts, presentations etc. The student can upload files as pdf, doc, xls, jpg, etc. After analyzing the assignments, the lecturer has the opportunity to give students grades; each

student may see only his own grade. On the platform are also available the following information: student's name, e-mail address, homework title and recommendations for them according to the fairness of them.



Fig. 3 Homework section

In Figure 3 one can see how it is available on the platform the Homework Section.

In Figure 4 it is visible the access of the student to his grade.

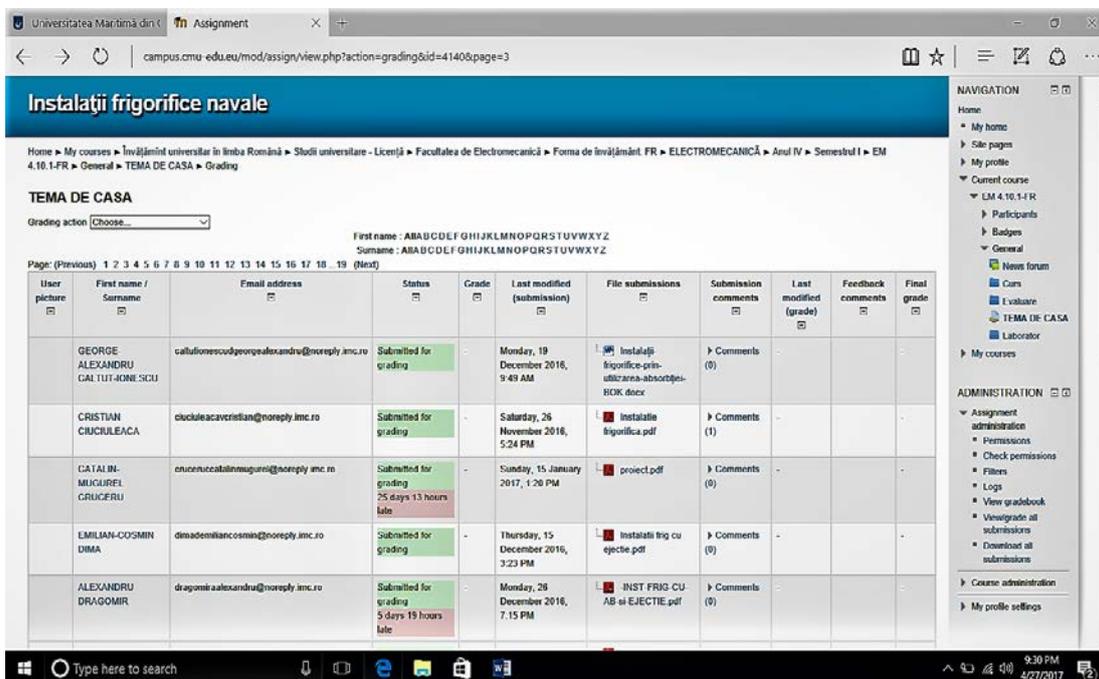


Fig. 4 Grade section

Students can carry out the themes of the assignment at home or on board. The topic is labeled by the teacher with a predetermined score. Default scoring scale has 100 points, but can be changed by the teacher. Being an extremely versatile platform, it offers to the lecturer the opportunity to communicate highly effective with

students through the creation of recommendation messages and chat rooms. By the creation of news forums, students have the opportunity to ask questions of both the teacher and the other person, enrolled in that course. The lecturer can thus control and guide the discussion towards the desired.

News Forum represents the section of the platform where the lecturer can establish a dialog with

students and post different messages to them, as presented in Figure 5.

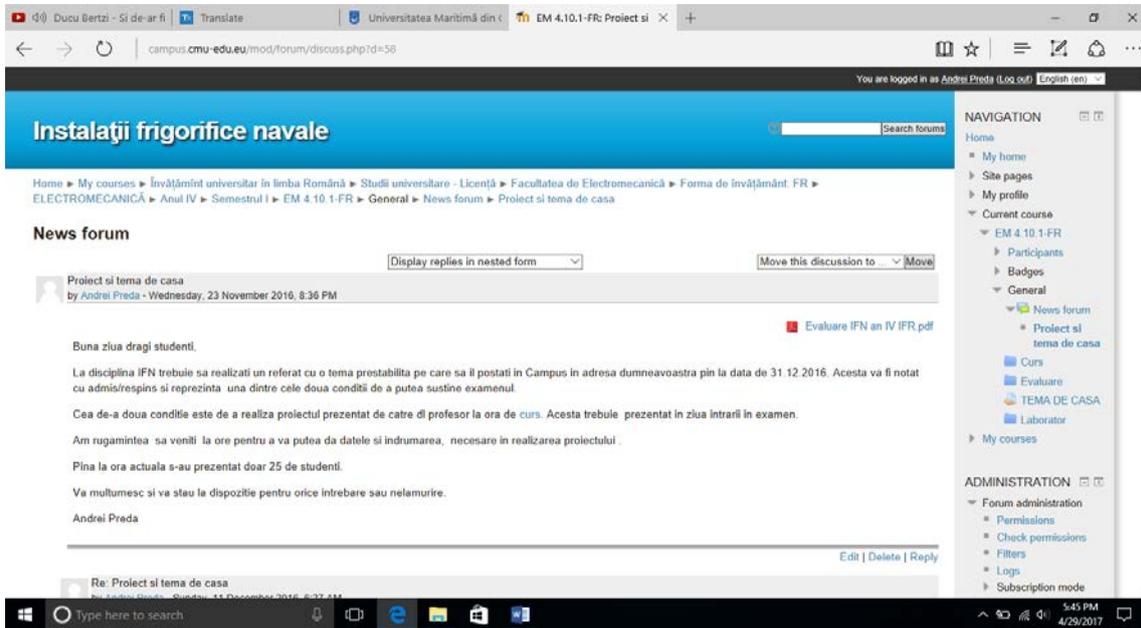


Fig. 5 News forum section

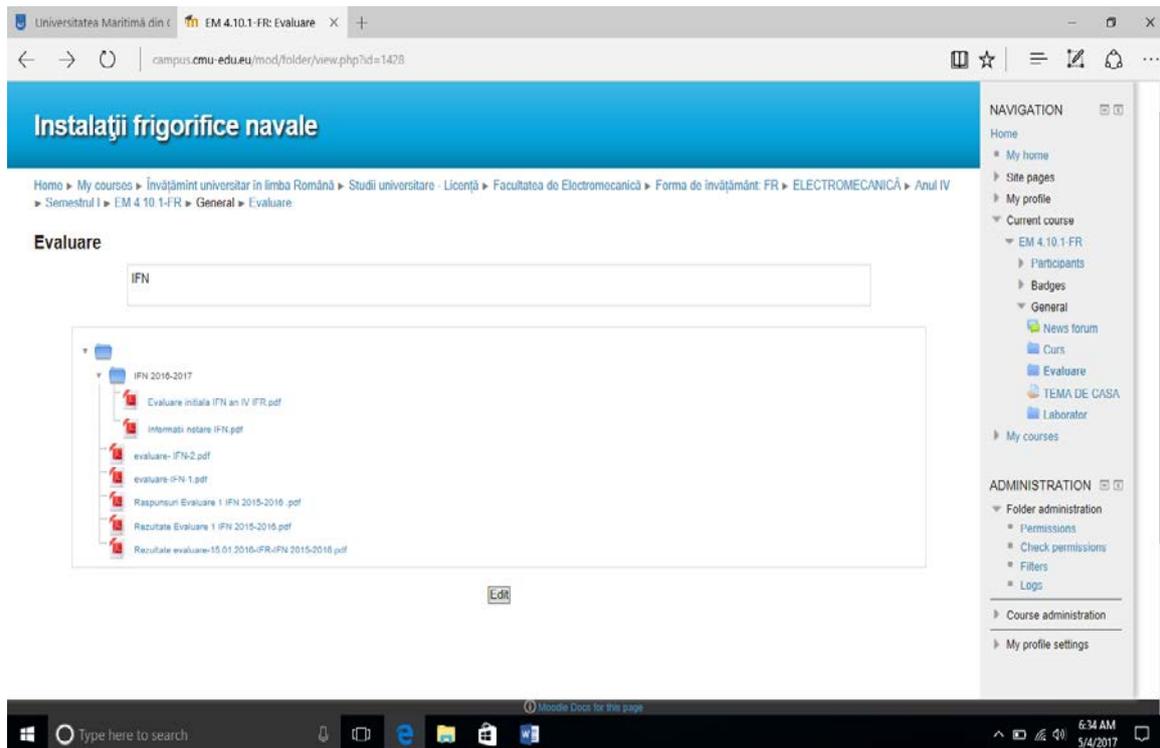


Fig. 6 Evaluation section

The last section of the campus, specifically designed for students and presented in Figure 6, is that of evaluation, where the lecturer posts the results of intermediate evaluations of students,

during the semester. In this menu, students can check their results and post comments and messages for further clarification.

## Conclusions

The mid semester evaluation of the students enrolled for the discipline Marine Refrigeration Plants is not only compulsory, it is also useful for the final gain of competencies specific for this discipline. This evaluation process is realized by the help of a very effective tool, presented in this article: the e-learning platform of CMU.

The use of the platform is simple and its structure is created so that the student can access the desired information fast enough.

The communication which is established via the platform, leads to total transparency and objective appreciation of the activity and knowledge of students.

The platform offers the opportunity of keeping contact with the lecturer and other students enrolled and exchange/ gain knowledge, no matter the distance between persons. Also, it provides the opportunity of submitting the assignment, even if the student is on board.

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