

## The use of online teaching in an aircraft technology course

Vassilios M. Spathopoulos

Technological Education Institute of Chalkida  
Chalkida, Greece

**ABSTRACT:** The enormous progress in the development of IT tools has provided great impetus to online instruction. Engineering courses that have been traditionally described as *hands on* are now offered as distance learning modules. The World Wide Web (WWW) can provide a range of learning experiences and, not requiring continuous on-campus presence, is fast becoming a popular means for non-traditional teaching. In the Department of Aircraft Technology at the Technological Education Institute (TEI) of Chalkida in Chalkida, Greece, a Web-based software application is being used to enhance the teaching of two core subjects. Although face-to-face tuition still forms the basis of students' learning, an online element has been added with the aim of complementing the more traditional methods of teaching. The obtained benefits both for the teacher and students are analysed in this article and it is concluded that this practice could be successfully applied to other subjects in the course.

### INTRODUCTION

In recent years, the advancement of computer technology, coupled with certain social and economic factors, have increased the demand for non-traditional methods of education. On the one hand, modern students are more experienced in the use of IT tools than their predecessors, but on the other hand, they are often forced to work in parallel to their studies, thus requiring much more flexible study schedules. Therefore, it is natural that asynchronous distance learning methods, particularly where participants conduct their communication in their own time, have become important elements of education that are often used to enhance – not merely to substitute – the on-campus components [1].

The World Wide Web (WWW), being easily accessible to most, is a particularly convenient means of achieving the above-mentioned. Various Web-based software applications have been developed (for example the commercial software, *WebCT*, used in ref. [2]), so as to provide the necessary technology required to expand the boundaries of traditional teaching, enabling students to structure their personal study schedules. In order to achieve this, the platforms developed usually support the electronic managing, filing and presentation of traditional lecture materials, the use of e-mail and chat rooms, which serve to establish a direct communication between the teacher and student, and the generation of self-assessment exercises. Furthermore, the ever-increasing number of information resources available in the Web environment can be inexpensively utilised to extend the boundaries of the knowledge of students.

In this article, the author presents such an example where a Web-based platform has been designed in order to enhance traditional education activities. This platform has been applied to the teaching of two subjects delivered within a course in the field of aircraft technology.

### COURSE BACKGROUND

The Technological Education Institute (TEI) of Chalkida in Chalkida is one of 12 independent, self-governed TEIs that constitute the Greek national system of higher technological education in Greece. The Institute provides high school graduates with the necessary scientific and academic training for immediate professional integration into the contemporary workforce.

The Department of Aircraft Technology was founded in 2004 in response to a demand for specialised aircraft engineers from airlines and maintenance companies. It is a four-year degree course leading to two specialisation directions, specifically:

- Aircraft Power Plant Structures and Systems;
- Aircraft Avionics.

Graduates are expected to engage in careers that are related to the quality control, maintenance and repair of aircraft structures and aircraft systems (power plant, electric, electronic, computer, etc). Upon completion of their studies, students should also be able to contribute to the design and development of products in the aircraft technology sector, both in industry and at research institutions.

The author of this article teaches two of the core subjects attended by students of both specialisation directions: *Introduction to Automatic Control* and *Mechanics of Flight*. The former is a prerequisite to optional specialisation subjects, such as *Automatic Flight Control* and *Flight Control Systems*. It is taught during the second year of studies and its purpose is to introduce the basic concepts of control theory to students. The subject called *Mechanics of Flight*, considered as a backbone subject for aeronautical engineers, is delivered in the penultimate year of studies and introduces students to many of the basic ideas that govern conventional aircraft flight. Approximately 35

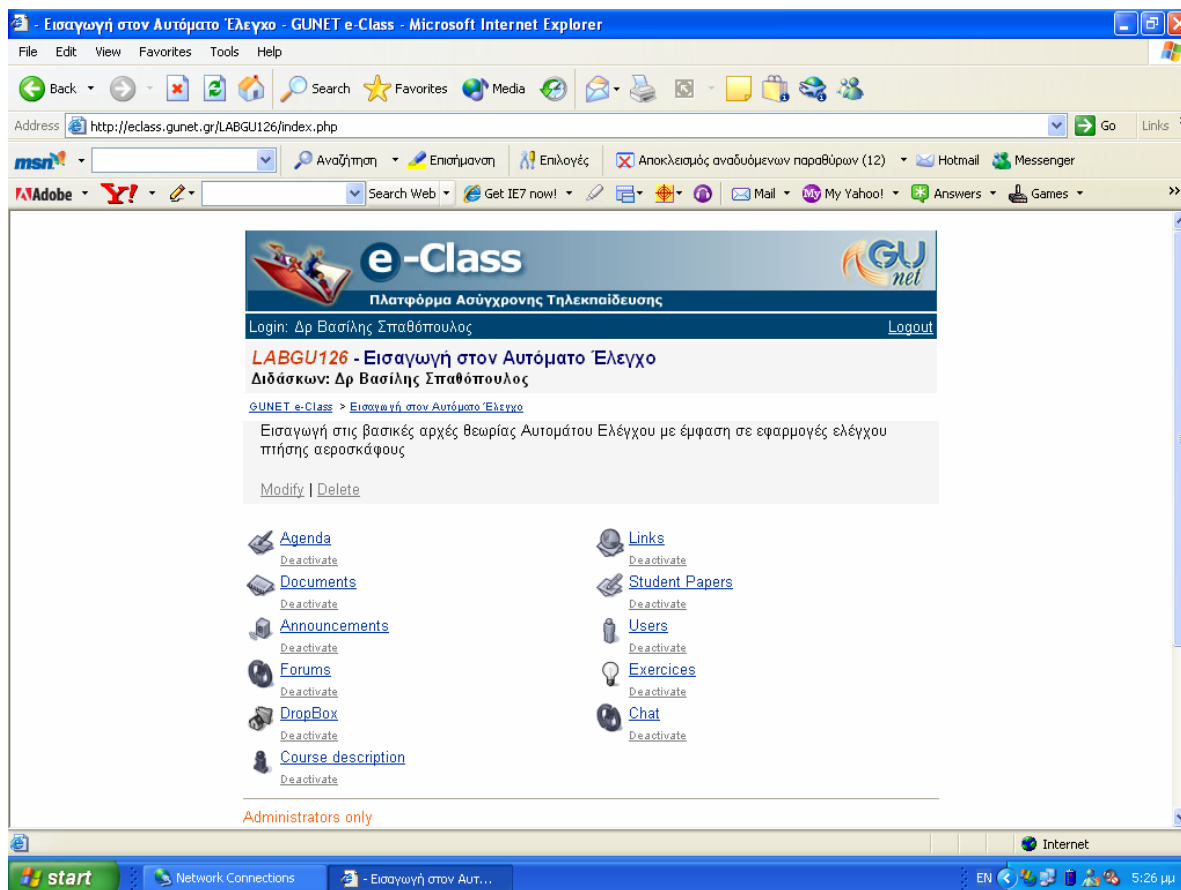


Figure 1: The introductory page of the *e-class* environment.

students are enrolled in both subjects and the on-campus teaching comprises four hours of lectures and tutorials per week.

#### THE ONLINE TEACHING SOFTWARE PACKAGE

The on-campus teaching is ameliorated by use of the *GUnet e-class* electronic platform (GU standing for Greek Universities), which is Internet-based and freely distributed to all members of the Greek academic community [3]. The software design has been based on existing open source software applications and contains a variety of elements that are necessary for applying asynchronous online teaching. The environment is user friendly, both to the teacher in designing the subject and to the student who can access all available information within a matter of a few clicks. Figure 1 shows the introductory page of the *e-class* environment.

The basic features include the following:

- Detailed description of the subject;
- Course announcements and schedule;
- Lecture notes and handouts;
- Web site links;
- Exercises;
- Online project.

These elements are described in more detail below.

#### Detailed Description of the Subject

Students are introduced to the subject through a detailed description of its aims, syllabus, bibliography and assessment methods. This element is designed to offer a succinct picture of what lies ahead to those wishing to follow the subject.

#### Course Announcements and Schedule

Frequent use of this feature promotes the feeling of an online classroom environment necessary to encourage students to utilise the resources actively and not passively just for the downloading of information.

#### Lecture Notes and Handouts

All lecture materials used for the on-campus lectures are placed on the Internet site dedicated to each subject. This is carried out in the following order:

- The lecture and tutorial (including theory and relevant examples) are presented on-campus together with a problem to be discussed in the following lecture;
- Shortly afterwards, the lecture notes, worked examples together with the solution to the set problem are made available online.

In this manner, a high degree of interaction is achieved between the on-campus and online teaching. This is important so that students appreciate that the aim of the Web-based course is to improve the on-campus teaching and not to substitute it. For those who have attended the week's lecture, it is a means of cementing the already obtained knowledge, whereas for those who have missed it, it is a chance to make up for lost time.

#### Web Site Links

For each topic discussed in the classroom, and after extensive Internet searching, the author has placed a number of relevant Web site links together with a short description on the purpose

of each one. Particular emphasis has been placed on the use of online applets, which students are encouraged to use in order to demonstrate to themselves various aspects of the taught theory. As discussed by various authors, (for example [4]), applet software applications have been successfully utilised as an inexpensive, user-friendly means of simulating actual experiments.

In the field of aircraft technology, where relevant experimental apparatus can be difficult to find and also too expensive for the budget of a small university, the use of specialised applets provides a particularly appealing alternative. Furthermore, they are especially suited to an online teaching environment. It should be noted that the author has used his experience in the field of aircraft flight mechanics (for example, see ref. [5]) in order to design his own applet applications for this particular subject.

### Exercises

Self-assessment exercises constitute a significant element of online teaching. A number of multiple choice questions can be set and automatically graded within the *e-class* platform. Once again, the structure of the exercises follows that of the on-campus lectures, with each set of questions uploaded after the topic has been covered in class.

Careful thought has been put into the content of the questions, which is designed to cover the subtle points in the theory that students may have missed. Figure 2 shows an exercise page of the *e-class* environment.

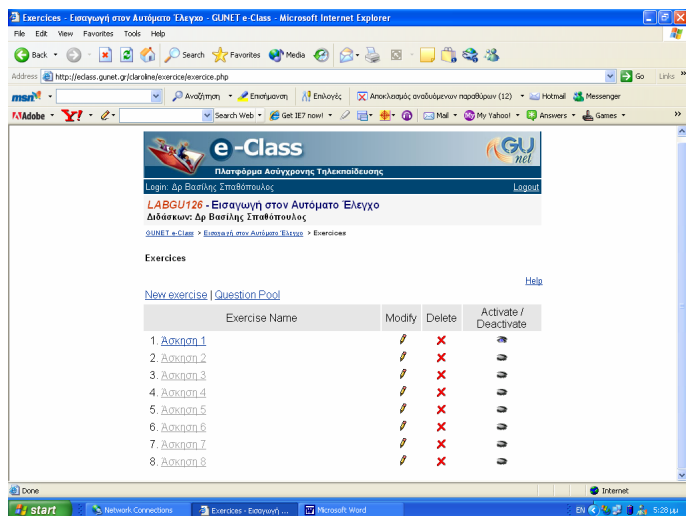


Figure 2: The exercise page of the *e-class* environment.

### Online Project

The online project is an important feature as it provides students with the strongest motivation for using the online tools described previously. It forms an important part of the overall assessment contributing to the final grade. The title, detailed description and deadlines of the project are all made available online and are only discussed briefly in class.

Students are given a task that has been designed so as to require the theoretical knowledge derived from both the on-campus teaching and online materials, as well as the use of the previously described Web links (normally one or more applets available on the Internet).

The project report must be written on a word processor and uploaded to the subject site within a set deadline. The software automatically rejects any reports that students attempt to upload after this set date.

### BENEFITS OBTAINED

The combined use of on-campus and online teaching yields the following benefits:

- Campus boundaries and learning times are extended, thereby facilitating working students and students from remote areas to fully participate in the course;
- The use of online tools, such as virtual experiments, self assessment exercises and reports, open up new avenues for active learning that otherwise could not be pursued within the narrow limits of lecture room teaching;
- Learning and administration of the teaching has been greatly simplified by the use of computing power and IT applications in that course materials are easily modified electronically and two-way communication with students is handled in a more efficient manner;
- Furthermore, the application of both conventional assessment methods (written examination) and the online project offers a more reliable means of student grading.

### STUDENT ASSESSMENT

In order to obtain an insight into the effect of the online element of the course on the students themselves, a short questionnaire was distributed at the end of the term for them to complete anonymously. The main questions are presented in Table 1.

When trying to predict the success of applying the practice to other subjects, two of the results are most significant. With regard to Question 7, approximately 55% answered that they would use *e-class* extensively and 45% that they would use it limitedly; none of the students responded that they would not use the online facility. Furthermore, with regard to Question 8, 73% answered that a combination of on-campus and distance learning was the most successful method of teaching, with 27% declaring that traditional, on-campus methods are the most preferred.

Overall, it can be deduced that students are motivated by what they view as a novelty in their learning process.

Table 1: Student assessment questionnaire.

1. Did you possess the technical knowledge to make easy use of the e-class site?
2. How often did you use the e-class site?
3. In what way did you most often connect to the site?
4. Which of the following list did you find most useful? (lecture notes and handouts, exercises, online project)
5. Did the material and structure of the site enhance your understanding of the subject?
6. Did the online project contribute to a more objective grading of your performance?
7. In case a similar site was created for another subject, would you use it?
8. Which of the following would you assess as the best method of teaching? (on-campus, distance learning, a combination of both)

## CONCLUSIONS

The conclusions derived from the experience of incorporating an online teaching element into an aircraft technology course can be summarised as follows:

- A basic, user-friendly software application for online teaching has easily and inexpensively been used to supplement a traditional classroom with a *virtual* one;
- The use of IT has reduced the amount of administration and management time required for the subjects taught;
- The general student response has been positive, thus encouraging the application of this practice to other subjects of the course;
- Overall, it is felt that the teaching quality has been improved, so benefiting the image of the teacher.

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