

An Update on the Master of Engineering Program at UIC

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Abstract — The Master of Engineering (MEng) program is an online degree that has been offered at UIC since Fall semester 1999. Back in 1999, only one class was offered and only one MEng student was enrolled. Now there are 68 MEng students and 23 courses offered. This program was developed to provide an opportunity to pursue a master's degree in engineering to people who, for various reasons, cannot attend regular on-campus classes. Similar to other online programs, its strength is based on flexibility that allows each student to determine the pace at which lecturing material is accessed.

In this presentation, we provide a review of this program and discuss some feedback that we have received from the point of view of students and instructors.

1 INTRODUCTION

Online classes were offered since the end of the 1990's. They became available as soon as technology made it possible to deliver multimedia information over the internet. This kind of instruction requires more discipline from the students because students decide the pace at which to study the various lectures. The goal of this work is to present an update about the Master of Engineering (MEng) online degree program offered by the University of Illinois at Chicago since the Fall semester 1999.

In this presentation we will give an overview of the Master of Engineering degree at the University of Illinois at Chicago. We will discuss some feedback from students who attend MEng classes. Finally, we will summarize the main points about online teaching from the point of view of instructors and address the importance of motivating students using the multimedia facilities that are naturally part of an online environment.

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2 THE MENG PROGRAM

The University of Illinois at Chicago started offering the Master of Engineering (MEng) degree in the Fall semester 1999. The MEng is a totally online master degree that has no research thesis component. The MEng was introduced to offer the possibility to pursue a Master degree to those who cannot attend an ordinary on-campus graduate college because of various reasons, mostly related to their work schedule, but also their family commitments or the distance to a campus.

When the MEng started in 1999, only one class was offered. The enrollment of students into this program has grown, as shown in Table 1, and now 23 classes are offered, as shown in Table 2.

MEng students are required to take nine courses for their degree. The two required courses are Engineering Law and Engineering Management. The students choose the remaining seven classes from several areas of specialization. The Engineering Law class is required so that the students are prepared to understand the legal aspects of the engineering profession. For example, they learn that if you invent something and publish your results before filing for a patent application you may lose your rights in certain countries.

The MEng program is totally online with the exception of exams that must be taken in person at the University of Illinois at Chicago or at another institution where a proctor is available.

Offering online classes requires not only the availability of technical content but also the support of software to deliver the educational material. At the University of Illinois at Chicago, Blackboard Courseinfo (<http://www.blackboard.com/>) is the software that supports the management of online classes. Courseinfo provides an environment where students can login, see all the classes for which they are enrolled, access lecturing material and homework assignments, communicate with instructors and fellow students, and check their grades. Once an instructor's class material is ready for electronic delivery, the instructor simply needs to upload it to courseinfo and the student then has access to it. Details about the preparation of online classes have already been presented by some of these authors [1][2].

3 STUDENT'S PERSPECTIVE AND FEEDBACK

Based upon the experience of almost three years that the MEng program has existed, students expectations and some of their feedback is summarized below.

Students like the convenience of attending online classes. In fact, students who enroll in the MEng program are usually people who work and cannot attend classes because of distance and commuting time. For example, one of our students who works in the Middle Est says: "If there wasn't an online program, I wouldn't be taking any classes. The nearest university is 200 miles away and attending classes there would be a cultural adventure of questionable academic value. This program is perfect for me".

Students have the expectation of interacting with the instructor. Online students have the same kind of expectations in terms of interacting with the instructor as on-campus students have. However, unlike on-campus students, online students cannot raise their hands during a lecture and ask questions. Fortunately, the main advantage of online education over other forms of distance education, such as video-taped lectures, is the possibility of interaction with the instructor and other fellow students. This interaction occurs asynchronously through email and discussion boards or synchronously with virtual classrooms.

Students have the expectation that they are not taking the online version of a textbook. Even though an instructor may use the same core material from one semester to the next, the key factor for a successful online class is the time an instructor dedicates to making his participation in the class a remarkable experience. For example, one student wrote:

"Object-oriented programming is an amazing course. I feel as if I was attending classes in Chicago. I am well informed and updated to everything that is happening. I am challenged intellectually.

Similar comments came from students who took the class on Intellectual Property Law.

"I learned a lot as I expected regarding Intellectual Property Law. I have worked on patent filing before but without really knowing the significance of the various parts of the application and certainly without a good understanding of the process. I felt the course was as advertised in this regard. It has really hit me how the law is not something that lives in the courtroom or classroom, but really lives with all the interactions we have daily, especially in

business."

"The materials and topics you presented were interesting and useful. I also thought your personal insights added a lot of value to the course. The lectures were very easy to follow and I appreciated your use of voice inflection when you recorded the lectures. You really did a great job and I appreciate your efforts"

"The course was thoroughly enjoyable as a refreshing[] break from the theoretical grind of calculations usual to engineering education. Of great interest were your asides and parenthetical comments about the legal profession and the education of lawyers"

Students like downloadable lecture material. Lecture material for a class is available at all times during the semester when the class is offered and students are allowed to hear the same class as many times as they wish. When students access the same class material for a subsequent time, they usually prefer only the visual portion of it. Therefore, all lectures are also available in downloadable format, which is also convenient for those who like to add their own notes while listening to the voice of the instructor and following the text. In fact, one student commented "I really found attractive that you can attend your lectures whenever you want and have time, without a regular schedule, and a big plus is to have downloadable lectures, so that you can read them while listening to the explanations and take notes".

Students are aware that taking an online class requires more discipline than attending an on-campus class. For example, another student stated: "this long distance over the internet class is pretty new to all of us too. I think this is good especially for me or someone who needs to work but wants to be able to pursue a degree in his own time. This requires a little more discipline and overall this is a good experience for me".

Table 1: On-line course registration

Semester	Enrollment
Fall 2000	27
Spring 2001	48
Fall 2001	66
Spring 2002	86
Fall 2002	72
Spring 2003	75

4 INSTRUCTOR'S PERSPECTIVE

At the beginning, preparing an online class is more difficult than teaching an on-campus class because of the time commitment to prepare the material and the multimedia presentation of that material. In fact, online classes must be prepared to account for different learning styles: visual, audio, reading and writing, and interactive. For example, most MEng lectures are prepared using at least power point slides that contain a narration. In this way, students receive information in a visual format and hear the voice of the instructor.

Once the class has been prepared, there are a few advantages for the instructors.

Freedom of travel. Similar to students who enjoy the convenience of avoiding commuting to campus, teachers benefit from this convenience and can administer their classes from anywhere in the world where a good internet connection is available. This means that instructors can attend conferences and meetings off campus while still being able to accomplish their instructional duties.

Automatically graded quizzes Quality control is important in many aspects of our life and teaching is not exempt from it. Online instructors may easily take advantage from features that are available in many software management systems that support online classes. These typically provide the capability of automatically graded multiple choice quizzes.

Use of simulation tools As with all kinds of classes, successful performance is guaranteed if students find the class interesting and motivating. One way to make the class motivating is to challenge the students by asking them to develop a project that requires the use of some computer based simulation tools. In fact, one learning style is based on interaction, i.e. learning by doing something. For students who take engineering classes, simulation tools can increase their exposure to the fields of studies. While for on-campus students this exposure may feel different than sitting in a class, for those who attend online classes the use of software tools is simply part of the ordinary classroom environment. For example, the scope and effectiveness of the MEng class Fundamentals and Designs of Microelectronics Processing was substantially enhanced with the introduction and implementation of two web-based semiconductor simulation tools, ThermoEMP and Tsuprem. With ThermoEMP students calculate the chemical equilibrium compositions of microelectronic materials processing and the thermodynamic and transport properties of the equilibrium mixture. Tsuprem-4 simulates the pro-

cessing steps involved in the manufacture of Si integrated circuits, discrete devices and MEMS [3], [4]. Schuneman et al. [5] described the combined use of a method of moments solver with WebMath that allows students to simulate arbitrarily shaped wire antennas and arrays through a web-based interface. Use of Matlab and Mathematica is certainly a way to involve students in applying what they have learned. These mathematical software packages have plenty of routines to display functions and also let the user develop quite sophisticated simulations in the realm of automatic control, signal processing, and wireless communications. In addition there are more specifically targeted software packages that may be introduced for the benefit of the class.

It is important that the students do not feel that they are taking the online version of the old videotaped class. The students should not feel that the instructor only interacts with them when it comes to grading. Hence, instructors should **make effective use of communication tools that are available**. For example, instructors can keep students up to date using the main web page of the class. In addition, they can send emails directly to the students when something that deserves their attention happens. In order to help their understanding of particularly difficult material, a discussion board can be employed.

5 Conclusions

The MEng is the first engineering master online degree offered by the University of Illinois at Chicago. In this paper, we have given an update about this program using feedback we received from students and faculty members. The feature that students and instructors like the most is the time flexibility that an online program offers. Although it offers advantages, online classes require more discipline on the part of the students who have a certain degree of freedom to determine the pace at which they learn the instructional material, but must be ready when the exam time comes.

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Table 2: MEng topical areas

1	ChE 494	Fundamentals and Design of Microelectronics Processing
2	ChE/ME 494	Computational Molecular Modeling
3	CS 475	Object-Oriented Programming
4	ECE 401	Quasi Static Electric and Magnetic Fields
5	ECE 422	Wave Propagation and Communication Links
6	ECE 423	Electromagnetic Compatibility
7	ECE 432	Digital Communications
8	ECE 434	Multimedia Communication Networks
9	ECE 435	Wireless Communication Networks
10	ECE 449	Microdevices and Micromachining Technology
11	ECE 465	Digital Systems Design
12	ECE 466	Advanced Computer Architecture
13	ECE 491	Wireless Data
14	ECE 520	Electromagnetic Field Theory
15	ECE 526	Electromagnetic Scattering
16	ECE 527	Optical Electronics
17	ECE 535	Advanced Wireless Communication Networks
18	Engr 400	Engineering Law
19	Engr 401	Engineering Management
20	Engr 402	Intellectual Property Law
21	Engr 403	Reliability Engineering
22	ME/ChE 450	Air Pollution Engineering
23	ME 501	Advanced Thermodynamics

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