



COLLEGE OF ENGINEERING AND INFORMATION TECHNOLOGY

What Do Graduates of Engineering, Computer Science, and Information Systems Programs Need to Know Beyond Their Technical Courses?

There is a lot more to an Engineering, Computer Science, or Information Systems education than you will learn in your technical courses. The Accreditation Board of Engineering and Technology, which accredits Engineering, Computer Science, and Information Systems programs, specifies six essential non-technical skills that will make your career much more successful and rewarding. In fact, these non-technical skills are often much more important to career success than the ability to solve technical problems. These skills are:

- 1-Communicate effectively
- 2-Understand professional,ethical responsibility
- 3-Function on multi-disciplinary teams
- 4-Broad education necessary to understand the impact of engineering solutions in a global and societal context
- 5-Recognition of the need for, and an ability to engage in, life-long learning
- 6-Knowledge of contemporary issues

In addition to these, we believe you will need to know the essentials of **business, management, law, and entrepreneurship** because your work will probably involve aspects of these disciplines. There are many ways to acquire these skills at UMBC. Here are some suggestions.

1. Communicate effectively

Your ability to communicate your ideas to others will determine whether you are successful in having your ideas understood and accepted. **This is probably the most important non-technical skill you will need.** UMBC's General Foundation Requirements include English 100 - Composition, or its equivalent. Our engineering programs require ENGL 393 - Technical Writing. In addition to this requirement, you should consider: SPCH 100 - Public Communication; ENGL 106 - The Grammars of Speaking and Writing; ENGL 200 - Language and Scientific Value, and similar courses in the English Department. Many of the faculty members in the College of Engineering and IT incorporate writing assignments designed to teach precise communication. Please take these assignments

seriously and use the critique from the faculty to improve your communication ability.

2.Understand professional,ethical responsibility

We frequently hear from employers that it is not only important, but also essential, for their employees to be thoroughly grounded in professional and ethical behavior. In fact, unethical behavior of an employee can be very serious for a company and can be cause for dismissal. In order to understand professional and ethical behavior, it is necessary to go beyond an understanding of personal morality. You need to understand the kinds of situations that can and frequently do occur in the conduct of business that can have a serious negative impact on people if these situations are not handled correctly.

Many College of Engineering and IT faculty members include discussions and case studies of professionalism and ethics in courses where these issues fit with the course material. While these class discussions and case studies are essential, there is much more that you need to know.

At the request of the College of Engineering and IT, the Philosophy Department teaches two courses on ethics for students in engineering and information technology: **PHIL 251 - Ethical Issues in Science, Engineering and Information Technology** and **IS 304 - Ethical Issues in Information Systems**. These courses are specifically designed to address the ethical and professional responsibilities you are likely to encounter in your career. These courses are so important that the faculty in computer engineering and mechanical engineering have voted to make taking one of them required for graduation. Both courses are taught in the fall, spring, and summer semesters to make sure you can fit one of them into your schedule. Other relevant courses include PHIL 100 - Introduction to Philosophy, PHIL - Critical Thinking, PHIL 150 - Contemporary Moral Issues, PHIL 152 - Introduction to Moral Theory, PHIL 350 - Ethical Theory and PHIL 358 - Bioethics.

3. Function on multi-disciplinary teams

Most of you will work on teams throughout your career. Employers highly value ability to function on and lead multi-disciplinary teams in hiring and promoting.

Introduction to Engineering - ENES 101, which is required for all Engineering students, stresses teamwork. In addition, several courses in Engineering, Computer Science, and Information Systems are structured to teach teamwork. All of the engineering programs include capstone courses in the senior year consisting of projects executed by teams. These courses are opportunities to learn how to interact with fellow team members to divide responsibility and accomplish team goals. You should learn to assume the team leadership role because employers need leaders who are willing and able to assume responsibility for a team.

4. Broad education necessary to understand the impact of engineering solutions in a global and societal context

Throughout history, scientists and engineers have had a major impact on the world, generally very positive, but sometimes negative. The prospect of having a positive impact on society may have been one of the reasons you chose Engineering, Computer Science, or Information Systems as a profession. To help you understand the impact that your work might have, it is important to study the work and impact of other scientists and engineers.

UMBC has established a program of study in this field leading to an Undergraduate Certificate, entitled "**The Human Context of Science and Technology.**" The introductory course, **HCST 100**, explores interactions among the humanities, the sciences and technology and the effects of science and technology on art, philosophy, and society. For further information on this course and the certificate program, visit the HCST Web site:

www.umbc.edu/hcst

In addition, there are several history courses that provide perspectives on the history of science and technology, such as HIST 102 - American History from 1877 to the Present, HIST 445 and 446 - History of Science Before and After 1700, and HIST 404 - The History of Computers and Computing.

5. Recognition of the need for, and an ability to engage in, life-long learning

Throughout your career, the body of knowledge that you will need to understand will continue to expand, just as it has in the past. Professionals find that they must keep up, not only in their own field, but also in related fields. In fact, the breadth of your education will continue to expand with life experiences and specific courses in your field. Many of your courses will require that you learn beyond the textbook and learn to think critically.

UMBC does not specifically teach a course in life-long learning, but we encourage you to take advantage of the breadth of courses available to expand your horizons beyond your chosen field. A broad liberal arts education is an excellent complement to your technical education.

6. Knowledge of contemporary issues

It is essential to keep abreast of what is happening in the world as you go through life. Many of your technical courses will introduce contemporary issues as part of the classroom discussion. In addition, there are various courses that deal with current issues, such as those in the American Studies Department and the Political Science Department. You should explore opportunities to deal with current issues in some depth so that you will learn how to think critically.

7. Essentials of business, management, law, and entrepreneurship

Throughout your career, many of your actions will involve decisions that you or your management must make. Often, these decisions will involve the use of limited resources that should be invested wisely. Decision economics or engineering economics is the application of economic criteria to help select the best of a group of technically feasible alternatives, by bringing costs and benefits (which often occur at different times) to a common basis for comparison. UMBC offers several courses in the Economics Department and the Administrative Sciences/Accounting Department that are applicable. In particular, ECON 309 - Survey of Economics for Scientists and Engineers, is aimed at engineering and IT students.

Throughout your career, you will probably be involved in management and legal issues that you will need to understand. There are several courses in management and law that you should consider: ECAD 210 - The Practice of Management; ECAD 360 - Business Law; ECAD 385 - Law, Business Ethics, and Society; ECAD 410 - Production Management; POLI 233 - Law and the Legal System.

Entrepreneurship is a skill that you will likely need also, for various reasons: You may be part of a new venture within the company where you are employed; you may be involved in starting a new company; you will probably need to market yourself to others for promotion or a new position. UMBC offers a course in entrepreneurship ENES 200 - Introduction to Science and Technology Entrepreneurship. The course provides an overview of the basic concepts and focus on the nature, environment, and risks of new venture formation and technology commercialization. You can learn more about this new course and other entrepreneurship courses at the Web site: www.umbc.edu/entrepreneurship/courses.html

College of Engineering & Information Technology
University of Maryland, Baltimore County
1000 Hilltop Circle
Baltimore, Maryland 21250
Phone: 410-455-3270
Fax: 410-455-3559
Voice/TTY: 410-455-3233
Web: www.umbc.edu/engineering

