III. Information Technology Program Proposal

A. Abstract

The Information Technology Task Force of the University of Massachusetts, Amherst, supporting academic departments, and supporting faculty propose an interdisciplinary, university-wide Minor in Information Technology. The Minor would be composed of a minimum of 5, three-credit-hour courses. Two to three of the courses would be drawn from a technical core, at least one from a "broadened inquiry" group, and the balance from a list of electives. The Minor would be overseen by an IT Steering Committee, a Curriculum Subcommittee, and a program director. The unit would report to the Office of the Provost.

B. Outline

Need and rationale

Information technology (IT) has recast American life and work. It has changed the structure, access, and volume of information available, reshaping institutions of knowledge. It has spawned demands from employers seeking talented graduates to command these changes—and from our students, eager to master them. The issues have been under focused group study at UMass Amherst for at least the past three years.

Reflecting these realities, the faculty and departments of the University of Massachusetts Amherst (noted in section II) respectfully request that the Faculty Senate approve a new, intercollegiate, university-wide minor in Information Technology. The goal of the minor is to enable any interested student to confidently employ IT, and to secure an intellectual platform from which to develop capacity to innovate, using IT in his or her field.

At base, the point of the program is to combine the myriad strengths of this great university with the best technical means to extend them. By doing so, UMass Amherst

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2 Joan Stoia, Director, Campus Career Network; Memorandum to Prof. Bill Israel, Director, UMass IT Initiative, August 17, 2001.
3 Some 30 UMass students have devised BDIC programs in Information Technology-related endeavors. Gino Sorcinelli telephone communication to Bill Israel, August 27, 2001.
4 See "History" section, next item; and Appendix IV. A.
6 See http://www.umass.edu/itprogram/
seeks (in partnership with the Commonwealth Information Technology Initiative – CITI\(^7\) -- and our sister institutions) to mold a knowledge revolution that we believe will favorably affect the intellectual, social, and economic base of the Commonwealth of Massachusetts.

**History: A program apart**

Other institutions have introduced programs in Information Technology (see Appendix IV.B.), largely from technical roots in Computer Science, Engineering, and Management Information Systems. The resulting programs generally reflect those orientations. At UMass, a working group that developed into the University’s Information Technology Task Force has since 1998 investigated these issues from similar roots, but broadened from the beginning by including humanities and social scientific points of view.\(^8\)

After three years of development (and in contrast to the institutions we have studied), a distinguishing characteristic of the UMass IT program is its eclecticism, breadth, and generalist orientation. Where programs at the University of Maryland, Penn State, Indiana, and Rensselaer for the most part seek to increase the number of information technology specialists, the UMass IT program seeks instead, *across the curriculum*, to increase the number of IT generalists. The approach, while not identical, is similar to general education programs that emphasize writing across the curriculum. The result of the UMass program, we believe, will be to enhance disciplinary specialization by offering students a comprehensive IT curriculum.\(^9\) That curriculum is already largely in place, funded mostly through the CITI program. The breadth of the curriculum is evident, in part, in that the 20 CITI-developed IT courses offered here are taught by faculty from eight of nine of the University’s colleges and schools.

**Framework and course requirements**

The program seeks, through a 15-credit-hour minimum program, to introduce students to fundamental issues in computing, the Internet and networking; data analysis; research methods; media theory; critical thinking; and IT’s effects. Because these issues will change with time and technical developments, our objective is to flexibly acquaint students with the range of issues germane to their fields -- and equip them to learn more.

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\(^7\) See: http://www.citi.mass.edu/ and http://www.citi.mass.edu/programs/it.html


\(^9\) See following section, Item C., “Program Detail;” first heading: "Flexibility and coherence."
We anticipate that the IT Curriculum Subcommittee will recommend improvements in the program with time and experience.

New courses will be encouraged to supplement courses that currently exist. All courses will be screened and categorized by the Curriculum Subcommittee. Any changes in requirements for the minor would, of course, be vetted through usual faculty governance procedures.

Requirements:

1. One Introduction to Information Technology “foundations” course, selected from one of the following:

- CmpSci 102 - Computer and Society
- CmpSci 105 - Computer Literacy
- ResEc 197a - Computing Foundations to Frontiers
- SOM 210 - Introduction to Business Information Systems

Course objective is for students to learn the concepts of computer information systems (emphasizing the key concept of information), the rudiments of electronic technology, and the technical base to succeed in other IT courses.

Students who believe they have met the objective may petition for exemption from the requirement, but not from the 15-credit minimum.

2. At least two courses selected from two of the three following categories:

A. Principles of Object-Oriented Programming

Focuses on object-oriented design and programming, exposing students to design strategies, language features, and constructs that support the object environment. Enables students to apply system development principles with an object-oriented language, and to understand how object-oriented techniques increase productivity of complex systems.

- CmpSci 121: Introduction to Problem Solving with Computers (Java)
- ECE 122: Beginning Programming (C++)

Current Subcommittee members include Seshu Desu (chair), Glenn Caffery, Copper Giloth, Graham Gal, Bill Israel, David Mix Barrington, Charles Moran, Charlie Schweik, and Harlan Sturm.

Object-oriented programming is an approach which speeds the development of new programs, and, if properly used, improves the maintenance, reusability, and modifiability of software.
B. Representing, Storing and Retrieving Information

Introduces the representation, storage, retrieval, manipulation, analysis and display of information. Includes introduction to data structures, design principles of databases, database models and database management systems, architectures, database analysis and design, and database administration. Topics will include heterogeneous collection of data and effectiveness of various search engines.

CmpSci 145 - Representing, Storing, and Retrieving Information
(taught under experimental number, CmpSci 195).
ECE 242: - Data Structures in Java
CmpSci 187 - Programming with Data Structures

C. Introduction to Internet Technology; or Multimedia Systems

Develops a familiarity with the concepts, vocabulary and tools of Internet technology, and enhances students' written and oral presentation skills.

CmpSci 120 – Problem Solving with the Internet

OR

ECE 197H: Multimedia Systems

Introduces systems issues in multimedia: how multimedia applications are implemented; design of multimedia components; network performance, compression algorithms, and errors.

3. At least one course from the following “broadened inquiry” group:

Comm297T - Social Impact of Information Technology
Comm234 - History of Electronic Media and Information Technology
Eng391 - Writing and Emerging Technologies
ENGL 297B / ECE 297B - Contemporary Internet Communications: Writing, Information Design and Research on the Web
Journ397T - Information Technology in Social and Historical Perspective
HRTA 394E - Contemporary Legal and Ethical Issues in Cyber Space
ResEc - Economic Issues of Contemporary Information Technology
4. Electives:

CITI program-developed electives:

Art297H - Information Design
MIE 5970 - Intelligent and Integrated Design Systems
BIO 5XX - Information Technology in Biology Education
PubHealth – Information Systems in Public Health

Departmental electives (preliminary list):

Art271 - Introduction to computing in fine arts
Art372 - Introduction to computer aided design in arts
Art374 - Computer Animation I
Art397 - Computer Animation II
Art397 - Computer aided graphic design

Biol597: Special Topics: Genomics and bioinformatics
Biol597 Special Topics: Sex Steroids - Advanced Physiology:
  Communicating Current Research in Endocrine Physiology
Biol572 Neurobiology

CompLit236 - Digital culture I

CmpSci 391F - HTML for Poets
CmpSci 370 - Image Processing
CmpSci 551 - 3-D Animation and Digital Editing
CmpSci 552 - Interactive Multimedia Production

Journ 391R - Travel Writing and Photojournalism
Journ 392M - Wired Reporting
Journ 392R - Future of Online Journalism
Journ 393C - Computer-Assisted Reporting
Journ 397P - Photojournalism
Journ 397W - Introduction to Web Journalism

Music585 - Fundamentals of electronic music
Music586 - MIDI studio techniques

FOMGT – 304 Information Technology in Finance
NRC290S - Introduction to Spatial Information Technologies
Forestry/WFCON577 - Ecosystem Modeling and Simulation
Forestry/WFCON587 - Introduction to Digital Remote Sensing
Forestry/WFCON592G - Geographic Information Systems
BMATWT 290A - Building Materials Computing and Telecommunications

Students will be encouraged not to “double-dip” – i.e., to count a single course for both major and the IT Minor.

In addition, at least two of the courses in the Minor must be taken outside the student’s major department.
C. Program Detail

Flexibility and coherence

Although the UMass Amherst program seems broader than other IT programs, its content appears to be consistent with the breadth of views available as to appropriate curricula for such programs.

On the one hand, the program follows standards of the National Research Council (NRC),12 which says IT fluency requires:

- Contemporary skills -- the ability to use today's applications, which enable people to use information technology immediately, and to produce a store of practical experience on which to build new competence;

- Foundational concepts - the basic principles and ideas of computers, networks and information that underpin the technology. Concepts are the raw material for understanding new information technology as it evolves.

- Intellectual capabilities that apply IT in complex and sustained situations, and encapsulate higher-level thinking in the context of IT. Foster more abstract thinking about IT and its manipulation.

On the other hand, the program reflects the culture of the University and the enunciated needs in Information Technology for strength in critical thinking, research methods, media theory, cognitive science, and social reflection.13

Governance

The program's intention to accommodate maximum flexibility as to student needs while maintaining a coherence of curriculum requires a standing body to review, evaluate, and

12 Committee on Information Technology Literacy; Computer Science and Telecommunications Board; Committee on Physical Sciences, Mathematics and Applications; National Research Council. Being Fluent with Information Technology (Washington: National Academy Press, 1999),
13 Keynote address of UMass alumna Dr. Cheryl Harris, vice president, OMNIENT.com, before Provost's Conference on Information Technology, Oct. 11, 2000, Lincoln Campus Center, University of Massachusetts Amherst. Available at: http://www.umass.edu/itprogram/news_archives.html#Harris
make curricular judgments. Moreover, we can say with confidence that curricular issues will change as the program gathers students, experience, and even more breadth. Consequently, we believe that guidance for the program should be placed in an IT Steering Committee, and its Curriculum Subcommittee (a group first appointed by the Provost in Fall, 2000), assisted by a program director. The Curriculum Subcommittee would continue to report to the Steering Committee.

Because of the breadth implied in the program, we propose that the Steering Committee and program director be appointed by and report to the Provost’s Office. The suggestion seems consistent with the reporting arrangements of two other all-university units: the University Writing Program, and the Honors College. Changes in requirements for the minor would be vetted through usual Faculty Governance procedures.

Budget

Because developmental funds for the program have been made available by the CITI program, a minimum of regular state funds have been required for curriculum development. Indeed, an unpleasant irony is that at a moment of very tight budgets for the University, the IT program is a curricular leader in the region, and perhaps in the nation, because of substantial new state support.14

The program has been supported through the CITI program by the Massachusetts Board of Higher Education (to date, about $400,000), from administrative funding ($50,000) afforded by the UMass President’s office, and from limited private funding ($10,000). The IT Task Force intends, with the help of its private Advisory Committee, to seek additional means, private and public, to sustain the program.

While the University is facing a “hard times budget,” in normal times we believe this program and the resources to support it would be considered a priority for funding. Because the UMass Amherst IT program now has a track record and is leading state-wide in program development by the design of the CITI program, we believe it important to anticipate that more support will be forthcoming. If we fail to move ahead, we will face the prospect of losing a substantial lead.

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14 See: http://www.citi.mass.edu/grants/grid.html
D. Minor or certificate program

In preliminary conversations about the program, two Senate officials (without benefit of this documentation) suggested that the program be designated a certificate program, as opposed to a minor.

After substantial reflection and debate on that point on the part of the IT Task Force, we respectfully request that the Senate grant the status of a minor, as opposed to a certificate program, for the following reasons:

1. The program is generalist in orientation, as opposed to specialist. The program is more similar to a general education program, as noted in the program outline. Because the program is generalist in approach, we believe the term “minor” is most appropriate.

2. The program is one of unusual curricular breadth, as opposed to depth. It is not only intercollegiate and interdisciplinary, but university-wide, including coursework to date in CFNR, NSM, CHFA, SBS, ISOM, ED, Pub Health, and Engineering.

3. We are aware of two precedents for granting similar minor programs:
   a. Latin American Studies offers both a certificate and a minor, with different requirements for each. The minor was added in 1981, when a wave of academic programs were instituting minors. In a 1983 publication for students which described program offerings, the certificate is described as the option for those “wishing a more rigorous program with added recognition” and the minor as potentially only a first step in a process towards the Certificate. We would argue that the IT program is similar.

   b. Modern European Studies offered first a certificate and then, in 1992, replaced the certificate with a minor.

4. For the preceding reasons, the IT Task Force, on Aug. 23, 2001, after reviewing its understanding of the minor versus certificate issue, voted 20-0 to ask the Senate for a minor, as opposed to a certificate, designation. We, consequently, respectfully request minor designation.