BOARD OF HIGHER EDUCATION

REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Academic Affairs	**NO**.: AAC 12-32
	COMMITTEE DATE: May 8, 2012
	BOARD DATE: May 15, 2012

APPLICATION OF UNIVERSITY OF MASSACHUSETTS LOWELL TO AWARD THE MASTER OF SCIENCE IN INFORMATION TECHNOLOGY

MOVED: The Board of Higher Education hereby approves the application of **University of Massachusetts Lowell** to award the **Master of Science in Information Technology**.

Upon graduating the first class for this program, the University shall submit to the Board a status report addressing its success in reaching program goals as stated in the application and in the areas of enrollment, curriculum, faculty resources, and program effectiveness.

Authority: Massachusetts General Laws Chapter 15A, Section 9(b)

Contact: Dr. Francesca Purcell, Associate Commissioner for Academic and P-16 Policy

BOARD OF HIGHER EDUCATION

University of Massachusetts Lowell

INTENT AND MISSION

The University of Massachusetts Lowell (UML) filed an expedited application to offer the Master of Science in Information Technology (MSIT). The MSIT will have an applied focus with graduates able to design, manage and deploy networked systems of computers. The program will emphasize practical skills based on Linux/Unix, Windows and Apple platforms, but will also incorporate general principles along with technical and ethical foundations. Courses will include general system administration, virtualization technologies, core networking, cloud computing, routing, large scale application deployment, mobile computing, security analysis and regulatory compliance. Students completing the degree program will be qualified for senior level IT management and consulting positions as well as information security and IT strategic planning functions. The proposed MSIT intends to provide a pathway for students who have already completed a baccalaureate degree in information technology and for working professionals who want to pursue advanced graduate studies in information technology. The proposed program will be offered online with all students attending part-time.

One of the goals found in UML's recently adopted strategic plan is to develop and expand graduate education programs. The new MSIT program will align itself with UMass Lowell's strategic priorities as well as the University's mission to promote economic and workforce development in Massachusetts.

UMass Lowell's Continuing Studies Division has a long track record in developing online programs and scaling them for regional, national, and international audiences. The University was an early pioneer in online education, launching its program in 1996. UMass Lowell now has over 18,000 online enrollments annually and offers 42 online degree and certificate programs at the baccalaureate and graduate levels.

The proposed program was approved by the University's internal governance procedures and was approved by the University of Massachusetts Board of Trustees on February 7, 2012. The letter of intent was circulated on February 24, 2012. No responses were received.

NEED AND DEMAND

According to a recent IT study conducted by the UMass Donahue Institute: "As one of the state's largest sectors, Massachusetts' IT industry is home to 10,300 firms and over 178,000 workers. The IT industry expended $65 billion in Massachusetts in 2008, a figure that is comparable in scale to nearly 18% of GDP." (Executive Report, "The IT Industry: Hub of the Massachusetts Technology Economy," University of Massachusetts, Donahue Institute, Economic & Public Policy Research, November 2009, Page 3).

The economic development of the region is dependent upon a highly educated workforce, especially in the area of information technology. A recent article in the *Boston Globe* referred to the technology sector as "vital to the Massachusetts economy, providing one in ten jobs, generating high wages, and encompassing industries that are

projected to grow quickly in the coming years, according to a study being published by the US Bureau of Labor statistics." (*Boston Globe*, September 7, 2010, Page B5) The article goes on to say that "…Massachusetts has a concentration of computer system design jobs that is 1.5 times greater than the nation as a whole. Nationally, employment in that industry is projected by the bureau to grow by 45% by 2018."

In a recent press release issued by Governor Deval Patrick's Office, Michael D. Goodman, an Associate Professor at UMass Dartmouth reported: "The IT industry is critical to Massachusetts' entire innovation ecosystem. The Commonwealth's global leadership in sectors like financial services, health care and defense is significantly enhanced by the presence and expertise of IT firms and the thousands of IT professionals working inside and outside of the industry." ("Governor Patrick Announces Results of Massachusetts IT Industry," Press Release, Official Website of the Governor of Massachusetts, December 07, 2009.)

In a recent *Boston Globe* article, Gary DiCamillo, chairman of the Education Task Force of the Massachusetts Business Roundtable, noted that: "IT, middle management, middle-level financial services,-- those are the kind of people we're short of in Massachusetts." The problem according to DiCamillo is that "public colleges are not producing enough skilled professionals in these areas." (Jon Marcus, "Second Class", *The Boston Globe Magazine*, October 31, 2010, page 25.)

The U.S. Bureau of Labor Statistics, Occupational Handbook (2010-11 edition),reports that the demand for Information Technology workers is expected to continue its growth trajectory through 2018. (Bureau of Labor Statistics, "Occupational Outlook Handbook, 2010-11 Edition," http://www.bls.gov/oco/ocos305.htm, page 4.). According to UML, the proposed program will be one of the very few in the country available entirely online for individuals interested in expanding their knowledge base in subject areas addressed in the program. For many professionals who are busy juggling career and family responsibilities, offering the degree entirely online in an asynchronous format will help maximizes access nationally.

Some examples of job titles that students completing the degree program may qualify for are: "Director of IT," "VP of Informatics," "Vice President of IT," "Project Manager in IT," "Chief Technology Officer," "Manager of IT development teams," "Manager of Information Services," "Network Manager," "Network Administrator," "Systems Analyst," "Information Security Professional," "Corporate Security Officer," "Lead Systems Engineer Security Analyst," "Strategic IT Planner," "Director of Hosting and Managed Systems," "IT Specialist," "IT Consultant," "Lead Technologist," "Business Analyst," "Manager, Global Security Services," "Director of Help Desk Support" and "Chief Information Officer." With the growth of the healthcare industry in Massachusetts, graduates of the program should also find opportunities in the IT Healthcare and Informatics industry where the shortage of IT professionals is particularly serious (Health Data Management Magazine, 02/01/2011). Executive employment opportunities should also be available in technology and software companies as well as for the Federal government.

According to UML, its Bachelor of Science in Information Technology is one of the largest and most comprehensive online IT programs in New England and currently has in excess of 1081 declared majors, many of whom have expressed interest in advancing their education beyond the Bachelor's degree. A survey was mailed to over 600

graduates of the BSIT program to determine student interest in pursuing a master's degree. Over 150 individuals completed the survey. Over 84% of those who responded to the survey said they were interested in pursuing a Master's in IT if it were available at UMass Lowell. 95.7% said it was important to have a Master's in IT offered as an affordable public program at a state university. 97% of students saw a new Master's in IT program as complementing the current array of IT offerings at UMass Lowell. Over 60% of the respondents were from Massachusetts with 34% responding outside of Massachusetts and New Hampshire. The survey results confirmed much of the feedback faculty advisors received as they conducted exit interviews of students graduating from the BS in IT. According to UML, during those exit interviews many of the students indicated a strong interest in seeing an MSIT offered at UMass Lowell as a pathway program for graduating UML BSIT students.

UML notes that private institutions of higher education in the greater Boston area offer some courses and programs in Computer Science and Information Technology, however very few focus entirely on Information Technology. Within the UMass system, only UMass Boston offers a Master's in Information Technology on campus which focuses heavily on management topics. UML's curriculum will focus on primarily technical courses.

ACADEMIC AND RELATED MATTERS

Curriculum (Attachment A)

The proposed curriculum will be a 30 credit-hour master's degree program that builds upon two Computer Science Department Certificate programs in Information Technology known as the "Systems Models and Management Certificate" and the "Network Security Certificate." The program will consist of ten three-credit graduate courses. The curriculum will include newly developed applied courses in key areas such as "cloud computing," "virtualization technologies," "mobile communications," and "advanced network security."

The courses that comprise the curriculum will be distributed into four categories:
1. Systems Infrastructures
2. Network Infrastructures
3. Software Management
4. Electives

Degree requirements will include a minimum of two courses from each of the first three categories for 18 credit hours. The remaining 12 credit hours can be distributed freely among the four categories.

Student Learning Outcomes

Upon completion of the program, students will know:

definitions and characteristics of contemporary operating systems
principles, processes, and concepts of networks and network management
legal and ethical aspects of information management
how to extract and manage system critical information

And upon completion of this program students will be able to:

> manage the software environments of commercial systems
> manage the networking environments for local and metropolitan area networks
> identify the appropriate compliance criteria for selective information management
> train and supervise IT professionals

Admission

Program admission requirements will include: Completion of an undergraduate BS or BA degree from an accredited institution. Further, students should have completed a minimum of one semester of precalculus mathematics, one semester of discrete mathematics and one semester of statistics as part of their undergraduate studies, or possess the equivalent experience in C programming proficiency, to include a minimum of one semester of C programming and one semester of data structures, or the equivalent experience. Students who do not meet the requirements above may have to take additional undergraduate courses in order to meet the requirements.

Enrollment

All students will enroll part-time taking up to three courses per semester. UML provided the following enrollment projections for the first five years of the program:

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*	# of Students Year 5
New Full Time	---	---	---	---	---
Continuing Full Time	---	---	---	---	---
New Part Time	45	50	80	100	120
Continuing Part Time	---	43	91	169 minus 45 degree completers=124	222 minus 50 degree completers=172
Totals	**45**	**93**	**171***	**224**	**292**

*Note: Enrollment projections in Year 4 are based on the assumption that the original cohort of 45 students in Year 1 will have completed the degree program (10 courses) and therefore are not carried over into Year 4. Enrollment projections also allow for attrition of 2 students per year. Enrollment projections in Year 5 are based on the assumption that the cohort of 50 students in Year 2 will have completed the degree program.

RESOURCES AND BUDGET

Faculty and Administration

The proposed degree program will be administered by UML's Continuing Studies Division with complete academic oversight provided by the Computer Science Department. Admission requirements, curriculum and degree requirements will be established and maintained by the Computer Science Department. The Department will designate a full-time faculty member to coordinate the MSIT program in conjunction with CSCDE. The coordinator will be responsible for admissions, course scheduling and degree clearance processes.

In the first year of the program there will be 6 full time UMass Lowell Computer Science faculty members and two adjunct faculty members teaching part-time in the program. By the 4th and 5th year of the program, UML expects that 30 or more faculty members will be teaching in the program.

Since 1996, UMass Lowell's Continuing Education Division has created and expanded an administrative support structure to conduct its online operations. Te Continuing Education team will continue to serve the new program and additional personnel will be added as needed as the program grows.

Library and Information Technology

The proposed program's library and information technology will be fully supported by UML's Continuing Studies Division.

Facilities and Equipment

Since the proposed program will be offered entirely online there is no need for a facility, lab or customized equipment for the program.

Fiscal (Appendix B)

UML's revenue estimates are based on three courses per year per student at $1,590 tuition per course with an average of 15 enrollments per course. UML's expenditure estimates account for personnel and operating expenses. The faculty costs grow over the five-year period to accommodate the increased number of course sections that will need to be offered as enrollments grow. The $10,000 administrative line is for a full-time faculty member who will serve as the graduate coordinator. UML anticipates growing revenues over the first five years of the proposed program. Since this new degree will be offered totally online through the Division of Continuing Studies and the Computer Science Department, no additional resources will be required by the University of Massachusetts system.

PROGRAM GOALS and EFFECTIVENESS
UML submitted the following program goals, objectives, strategies, and timelines:

Goal	Measurable Objective	Strategy for Achievement	Timetable
Program Enrollees	1. Attract high-quality applicants. 2. Applicants with strong technical skills are especially encouraged to apply.	Market program through: 1. CSCDE will conduct an extensive email marketing campaign to all students who completed the BSIT degree at UMass Lowell. 2. Ads will be placed in selective media including computer journals and newspapers as well as electronic websites that IT professionals frequently access. 3. Web presence and online search services. 4. The program will be announced in the local and national press including an extensive campaign over *Business Wire.* 5. Newspaper ads will be placed regionally, such as the Boston Globe, Lowell Sun, and Mass High Tech.	3-6 mos. before implementation, then ongoing
Relevance of Curriculum	1. Internal Computer Science faculty approval. 2. Approval of the Computer Science External Advisory Board. 3. Compliance with professional organizations such as the National Centers of Academic Excellence.	1. Present the program proposal to CS Dept. Faculty 2. Present the proposal to the CS External Advisory Board	Prior to implementation and then ongoing
Retention and Graduation	1. High retention of matriculated students [80%] 2. High graduation rate [80%]	1. Recruit high-quality applicants matched to program strengths 2. Monitor student feedback closely 3. Provide readily accessible and thorough student advising	Ongoing
Professional advancement of students	1. Graduates improve employment opportunities. 2. Matriculated students increase their professional compensation.	1. Produce high-quality graduates with superior skill sets 2. Provide leading edge instruction in the most contemporary technologies	Ongoing
Professional program endorsements	1. Qualify for endorsements from: National Centers for Excellence in IA education. Systems Security Certification Consortium.	1. Relevant coursework 2. High-quality instruction 3. Successful graduates	Ongoing, to meet qualifying timeframes

EXTERNAL REVIEW AND INSTITUTIONAL RESPONSE

External Review

The external review was conducted by Dr. George Markowsky, Associate Director and Professor, School of Computing and Information Science, University of Maine; and Dr. Steven Homer, Associate Chair and Professor, Computer Science Department, Boston University. Dr. Homer offered that the proposed program is a strong and worthwhile degree program with experienced faculty who have significant and high-level research accomplishments while Dr. Markowsky also found the proposed program to be worthwhile with the computer science faculty "perfectly capable of delivering a quality program to students." The reviewers made a number of recommendations including that UML provides support to older students taking courses online, monitors graduates' success in the workforce, clarifies the goals of the program, includes a capstone course, and ensures adequate laboratories and hands-on experiences in the curriculum.

Institutional response

UML clarified that the proposed program will be technically-focused as opposed to management-focused and that the primary audience will be working professionals who have some work experience. UML noted that other master's programs do not require a thesis and that the proposed program will not require a thesis or capstone course because the program is focused towards career professionals who are engaged in project work. As the program evolves, the faculty may consider a thesis option for students who express an interest in moving beyond the MS degree and following a research-oriented career, but with a primary audience of entrenched professionals, UML believes that its current approach best fulfills its mission statement. UML stated that all students will be provided with their own online dedicated machines and peripherals allowing students to provision, configure, deploy, and administer their own systems.

UMass Lowell noted that it launched its online program in 1996. Since then, the Division has developed an infrastructure to support both the faculty and students engaged with the program. UML's award-winning program has won numerous awards from The Sloan Foundation for the quality of its online program. With over 18,000 online enrollments, the University offers 24/7 technical support for all online students. In addition, during work hours, the online division has support staff that are available to assist students with all aspects of the program. UMass Lowell consistently receives very high student satisfaction ratings in the 90% range for its online program, as validated by student evaluations and testimonials. All faculty who teach online are required to respond to student emails and questions within 24 hours. In addition, faculty are required to conduct weekly real-time chat sessions. Since the faculty are the subject matter experts for these courses, their primary responsibility is to answer content questions from the students.

UMass Lowell plans to continue to monitor graduates of the program in the workforce through exit interviews and ongoing surveys. The Computer Science External Advisory Board will continue to play an active role in the program, as it has during the development process. The Board's input in discussions with Computer Science faculty has been and continues to be a critical component in the emerging curriculum. The University will continue to do exit monitoring and communicate with alumni on an ongoing basis.

STAFF ANALYSIS AND RECOMMENDATION

Board staff thoroughly reviewed all documentation submitted by UML and external reviewers. Staff recommendation is for approval of the Master of Science in Information Technology.

Upon graduating the first class for this program, the University shall submit to the Board a status report addressing its success in reaching program goals as stated in the application and in the areas of enrollment, curriculum, faculty resources and program effectiveness.

ATTACHMENT A: CURRICULUM OUTLINE

Course	Category 1 – System Infrastructures (choose 2)	Credit Hours
94.511	1. Network and Systems Administration	3
94.517	2. Operating Systems Organization	3
94.519	3. Managing Virtual Systems	3
94.5xx (new)	4. Systems Security and Auditing	3
	Category 2 – Network Infrastructures (choose 2)	
94.560	1. Network Infrastructures	3
94.561	2. Computer Network Security	3
94.562	3. Digital Forensics	3
94.563	4. Secure Mobile Networks	3
94.565	5. Cloud Computing	3
	Category 3 – Software Management (choose 2)	
94.518	1. Large Scale Application Deployment	3
94.5xx (new)	2. Project Management	3
94.5xx (future)	3. Managing and Mining Large Data Sets	3
	Category 4 – Electives* (4 courses)	
94.520	1. Digital Storage Architectures	3
94.5xx (new)	2. Information Security, Privacy and Regulatory Compliance	3
94.5xx (future)	3. Intrusion Detection Systems	3
	*Electives may be chosen from the Electives Category or from Categories 1-3 above, not already used as required courses.	
	Curriculum Summary	
	Total number of courses required for degree	10
	Total credit hours required for degree	30

ATTACHMENT B: BUDGET

REVENUE ESTIMATES										
	Year 1 2012		Year 2 2013		Year 3 2014		Year 4 2015		Year 5 2016	
Full-Time Tuition Rate: In-State	N/A		N/A		N/A		N/A		N/A	
Full-Time Tuition Rate: Out-State	N/A		N/A		N/A		N/A		N/A	
Mandatory Fees per Student (In-state)	N/A		N/A		N/A		N/A		N/A	
Mandatory Fees per Student (out-state)	N/A		N/A		N/A		N/A		N/A	
FTE # of New Students: In-State	N/A		N/A		N/A		N/A		N/A	
FTE # of New Students: Out-State	N/A		N/A		N/A		N/A		N/A	
# of In-State FTE Students transferring in from the institution's existing programs	N/A		N/A		N/A		N/A		N/A	
# of Out-State FTE Students transferring in from the institution's existing programs	N/A		N/A		N/A		N/A		N/A	
Tuition and Fees	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs
First Year Students (Part-Time, Cont.Ed.)										
Tuition ($1590 per course)	$214,650	--	$238,500	--	$381,600	--	$477,000		$572,400	
In-State (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Out-of-State (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Mandatory Fees (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Second Year Students (Part-Time, Cont.Ed.)										
Tuition ($1590 per course)	(N/A)		205,110		434,070		591,480		820,440	
In-State (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Out-of-State (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Mandatory Fees (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Third Year Students (Part-Time, Cont.Ed.)										
Tuition ($1590 per course)										
In-State (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Out-of-State (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Mandatory Fees (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Fourth Year Students (Part-Time, Cont.Ed.)										
Tuition ($1590 per course)										
In-State (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Out-of-State (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Mandatory Fees (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Gross Tuition and Fees	$214,650	$0	$443,610	$0	$815,670	$0	$1,068,480	$0	$1,392,840	$0
Grants (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Contracts (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other Revenues (specify) (N/A)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

EXPENDITURE ESTIMATES

	Year 1 2012 New Expenditures required for Program	Year 1 2012 Expenditures from current resources	Year 2 2013 New Expenditures required for Program	Year 2 2013 Expenditures from current resources	Year 3 2014 New Expenditures required for Program	Year 3 2014 Expenditures from current resources	Year 4 2015 New Expenditures required for Program	Year 4 2015 Expenditures from current resources	Year 5 2016 New Expenditures required for Program	Year 5 2016 Expenditures from current resources
Personnel Services										
Faculty	$58,500	$0	$117,000	$0	$214,500	$0	$292,500	$0	$377,000	$0
Administrators	$10,000	$0	$10,000	$0	$10,000	$0	$10,000	$0	$10,000	$0
Support Staff	$10,000	$0	$10,000	$0	$10,000	$0	$10,000	$0	$10,000	$0
Others	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Fringe Benefits ____%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Personnel	**$78,500**	**$0**	**$137,000**	**$0**	**$234,500**	**$0**	**$312,500**	**$0**	**$397,000**	**$0**
Operating Expenses										
Supplies	$500	$0	$500	$0	$500	$0	$500	$0	$500	$0
Library Resources	$500	$0	$500	$0	$500	$0	$500	$0	$500	$0
Marketing/Promotional Expenses	$15,000	$0	$15,000	$0	$15,000	$0	$15,000	$0	$15,000	$0
Laboratory Expenses	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
General Administrative Overhead	$64,395	$0	$133,083	$0	$244,701	$0	$320,544	$0	$417,852	$0
Other (specify)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Operating Expenses	**$80,395**	**$0**	**$149,083**	**$0**	**$260,701**	**$0**	**$336,544**	**$0**	**$433,852**	**$0**
Net Student Assistance										
Assistantships	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Fellowships	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Stipends/Scholarships	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Student Assistance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Capital										
Facilities	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Equipment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Capital	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Total Expenditures	**$158,895**	**$0**	**$286,083**	**$0**	**$495,201**	**$0**	**$649,044**	**$0**	**$830,852**	**$0**

BUDGET SUMMARY OF NEW PROGRAM ONLY

	Year 1 2012	Year 2 2013	Year 3 2014	Year 4 2015	Year 5 2016
Total of newly generated revenue	$214,650	$443,610	$815,670	$1,068,480	$1,392,840
Total of additional resources required for program	$158,895	$286,083	$495,201	$649,044	$830,852
Excess/ (Deficiency)	$55,755	$157,527	$320,469	$419,436	$561,988

Justification of Financial Projections: Program is self supporting in Year 1 and earns an excess of revenue in all Years (1-5). This Continuing Education program requires no state funds.