

Department of Spatial Information Science and Engineering Faculty Report

Proposal to Eliminate the Undergraduate Academic Degree in Information Science and Engineering

To Whom It May Concern,

This is a report initiated by the faculty of the Department of Spatial Information Science and Engineering to aid our Departmental External Advisory Committee, the Faculty Senate, the Dean of the College of Engineering, the University of Maine President and the Chancellor's Office to assess a proposal to eliminate the BS in Information Systems Engineering. Alteration of an existing MS in Information Systems does not require approval but the proposed alterations are included in this report to help explain how a high-level information systems curriculum will continue to be maintained on the University of Maine campus.

From the outset it should be clearly understood that this is a proposal to eliminate a single undergraduate academic degree program and NOT to eliminate or rearrange a faculty, department or any other unit.

It is our understanding that the process for proposing the elimination of an academic degree at the University of Maine involves both a campus level process as defined by the document titled *Criteria and Process for Academic Program Elimination* (See Appendix A - last revised 3/25/92) and a University of Maine System process as defined by *Section 305.5 Academic Program Elimination* of the University of Maine System Academic Procedures Manual (See Appendix B - last revised 1/14/08).

This report responds to the questions and documentation requests set forth by the above two documents from the perspective of the unit faculty members. We hope this report is helpful to others with roles in the academic program elimination process as well as to any interested members of the general public. This report is organized as follows:

- I. Background and Introduction
- II. Responses to the Requirements of the University of Maine Process for Academic Program Elimination
- III. Responses to the Requirements of the University of Maine System Process for Academic Program Elimination
- IV. Description of the MS Information Systems Academic Degree Program and the Four Plus One Year Option
- V. Conclusions and Recommendations by the SIE Faculty

Respectfully submitted,
The Faculty of the Department of Spatial Information Science and Engineering

I. Background and Introduction

The department began as the Department of Surveying Engineering in 1988 and was renamed to reflect a broader academic mission in 1995 to the Department of Spatial Information Science and Engineering. After several years of debate among the faculty concerning societal and technological trends it was decided in 2003 that the surveying segment of the undergraduate program should move to the School of Engineering Technology while the core faculty would focus on creating a revised innovative undergraduate curriculum in *information systems engineering*. With the approval and support of the Dean of Engineering the faculty spent hundreds of hours during 2004 and 2005 redesigning and implementing a solid undergraduate curriculum to respond to the critical information technology human resource needs of the State of Maine and that would be the first academic program in the nation to meet both the ABET accreditation requirements for *engineering programs* (Engineering Accreditation Commission – EAC) and the ABET requirements for *information system programs* (Computing Accreditation Commission – CAC). While some students heard about this newly revised program by word of mouth and transferred into the program, the faculty made a conscious decision to hold off a major recruitment campaign until the first-in-the-nation dual accreditation had been received. After the campus visit by ABET but prior to receiving the results of the accreditation evaluation, the Dean of Engineering informed us that substantial pressure was being brought to close down undergraduate programs with current small enrollments and he had imposed a moratorium on any further transfers or admissions to the program in the Spring of 2006. Later in the Spring of 2006 the first Information Systems Engineering undergraduate degrees were granted and in the fall of 2006 we learned that that we had indeed achieved the first dual ABET accredited degree program in the nation so that at least those students already through or in the pipeline would graduate with this distinction.

In imposing the moratorium on admissions to the degree program the Dean also expressed concern over the small size of our current department (seven faculty members) and the significant pressure that a growing undergraduate program would bring to bear on increasing faculty numbers in our department at a time when faculty positions were being cut throughout the campus. He urged that we instead focus on growing our graduate student body and research since that has been the long-term strength of the department and, further, the university and state are in urgent need of high-level information technology graduates at the masters and PhD levels.

In consultation with the Dean and the former Provost the department faculty agreed to not fight the closing of the undergraduate degree program and indeed to support it under the following understanding by the faculty:

1. the department be allowed to remove the moratorium on graduate admissions to the MS Information Systems (MSIS) program and move its administration and the offering of all its required courses to the department.
(Note: The Master of Science in Information Systems is an interdisciplinary degree administered out of the graduate school with initial support and

participation by the Department of Spatial Information Science and Engineering, the Computer Science Department and the Business School. Due to severe resource challenges the Computer Science Department and the Business School retrenched to support only their core traditional graduate degrees in their own units resulting in the inability of future interdisciplinary MSIS students to gain admittance to some courses required for the degree. Although student demand exists and students are still progressing actively through the program, there was no choice but to refuse further admissions to this graduate degree program.)

2. the department be allowed to add an early provisional admission option to the MSIS degree program so that high performing undergraduate degree students would still have access to an in depth information systems curriculum on this campus and would be able to complete the MSIS degree in a single year after graduation if they planned early,
3. the department be allowed to hire replacement faculty when appropriate with profiles ensuring that the department could meet the needs of both the MSIS degree as well as our more established MS and PhD degrees in Spatial Information Science and Engineering.

The Dean and Provost agreed to and applauded the plan. New faculty members have now been hired to replace former faculty members that moved on to head a research program at another university. The profiles of the new faculty along with those of the existing faculty will now allow the department to achieve the above objectives. Sections of the report that follow provide the documentation needed to close the undergraduate program in Information Systems Engineering, shift the management of the MSIS graduate degree to the department, and add an early admission option to the MSIS degree.

It must be noted that Maine ranks forty-ninth in the nation in per capita graduation of undergraduate students in engineering (Trends in Engineering Bachelor's, Master's and Doctoral Degrees Awarded in Individual States, Engineering Trends, Inc., Houghton, MI, February, 2007). The State of Maine would need to double the number of BS degrees in engineering to meet the national average. We are not graduating enough BS degree engineers to maintain even Maine's currently inadequate engineering workforce. Two-thirds of in-state engineering graduates obtain their first job in Maine and one-third of out-of-state engineering students obtain their first job in Maine. With this document we are proposing the closure of an undergraduate degree due to limited resources when in fact the future economic vitality of the state suggests that the State of Maine should be increasing resources to expand such engineering degree programs.

In terms of graduate students, Maine drops to dead last in the nation per capita in the education of science and engineering graduate students. This has been true each and every year since at least 1992 (See p.4-15, US Dept of Commerce, State Science and Technology Indicators, Fourth Edition 2004.) In the 2008 federal report, while still in last place, Maine is in fact losing ground with the spread increasing from the next lowest

ranked states. (See Table 8-19 as well as Table 8-18 at <http://www.nsf.gov/statistics/seind08/>). These last place rankings for Maine are a reflection of a long-term systemic problem in providing sustained support for graduate education in Science and Engineering. Why is this ranking significant? The number of science and engineering students in graduate programs as well as the percentage of the workforce with science and engineering graduate degrees are used as **key indicators** in national comparative assessments and particularly by businesses in determining whether a State such as Maine has the knowledge base necessary for starting and maintaining innovative wealth generation in an information economy. Maine's very low performance in educating and retaining graduate level scientists and engineers as expressed by these indicators is an obvious impediment to investment by businesses and industry in the State of Maine.

Further, computer specialists as a percent of the work force for Maine is about half the national average and engineers as a percentage of the workforce is about a third below the national average (see <http://www.nsf.gov/statistics/seind08/>). That is, we could double the number of computer specialists in Maine and still be at just the national average. For a state that identified information technologies in 2002 as a high economic growth cluster with "star potential" (Assessing Maine's Technology Clusters) and has kept it on every research and economic development priority list since then, the State of Maine has made little progress in expanding those university information technology programs that could help it achieve its economic goals.

Other states have chosen to invest heavily in Schools of Information Science at their universities with both strong undergraduate and graduate programs and have greatly expanded their faculty numbers and research resources in this critical needs area for the nation. We believe this would be a very wise investment also for the economic future of the State of Maine. In the meantime, our department faculty is committed to serving our students, the university, the State of Maine and the nation at the highest level possible with the limited resources available.

II. Responses to the Requirements of the University of Maine Process for Academic Program Elimination

a. Program Quality

The quality of the nascent undergraduate degree program in *information systems engineering* was excellent. This was the first dual accredited undergraduate program in the nation accredited under both the ABET accreditation requirements for *engineering programs* (Engineering Accreditation Commission – EAC) and the ABET requirements for *information system programs* (Computing Accreditation Commission – CAC). As explained in the background section, a moratorium was placed on admissions to the program before the faculty had the opportunity to advertise it. The breadth and depth of the courses previously offered is available at <http://ise.umaine.edu/>

The quality of faculty is an indicator of the quality of any academic program. While one may access full biographies of the faculty at <http://spatial.umaine.edu/faculty/>, we offer here the following very brief bios.

Dr. Michael **Worboys** has worked for many years at the boundary between computer science, mathematics, and geographic information science. He is Professor and Chair of the Department of Spatial Information Science and Engineering. Until 2001, he was Professor of Computer Science and Director of the Geographic Information System Research Group at Keele University, England. Mike is a Distinguished Scientist of the Association for Computing Machinery and member of the London Mathematical Society. He has held posts at several UK universities, the Rutherford-Appleton Laboratory at Oxford and held a visiting professorship at the Technical University of Vienna. He is also an honorary professor at the University of Melbourne and recently received the 2008 University Consortium for Geographic Information Science Research Award.

Dr. Kate **Beard**, a specialist in the advancement and application of geographic information systems, has teaching and research interests in modeling, analysis and visualization of spatio-temporal phenomena. She is Director of the National Center for Geographic Information and Analysis at the University of Maine and Director of the NSF IGERT PhD training program in Sensor Science, Engineering and Informatics. Digital libraries and the exploration and visualization of events and patterns are additional areas of significant interest. She serves as well on the Executive Committee of the NSF IGERT program in Functional Genomics with interests in the application of spatial concepts to genome mapping. Among honors received include recipient of the Ashley Campbell award, the College of Engineering's highest annual recognition.

Dr. Harlan **Onsrud** addresses cyberlaw and ethical issues within information technology environments. He teaches information systems law, information ethics, and responsible conduct of research while his research focuses on integrated legal and technological approaches in resolving conflicts in the areas of individual privacy, security, intellectual property, freedom to access government information, freedom of expression and related topics. Recently accepted to the Fulbright Specialists roster for senior scientists, among his past honors include election as president of the *Global Spatial Data Infrastructure Association*, president of the *University Consortium for Geographic Information Science (UCGIS)*, and named as a lifetime National Associate of the U.S. National Academies of Sciences.

Dr. Max **Egenhofer** has teaching and research interests in spatial knowledge representation and spatial reasoning; user interfaces; the design of spatial database systems, and mobile spatial information appliances. His research results have been explicitly incorporated into several major commercial software products as well as used by numerous standards organizations. He has organized over 20 international conferences and workshops, served on the program committees of over 110 conferences and workshops and delivered 43 keynote addresses and invited talks at national and international meetings. He has held the Libra Professorship of the College of Engineering and is a recipient of the university's Presidential Research and Creative Achievement Award and the national UCGIS Research Award.

Dr. Silvia **Nittel** has teaching interests in database management systems, distributed computing, and data management in sensor networks. Her current research focuses on extending database technology to support stationary and mobile sensor networks, especially geosensor networks. She is the cofounder of the conference series of "Geosensor Networks", author of 2 books on Geosensor Networks, and is director of the

Geosensor Lab at the University of Maine. She is a 2005 recipient of a NSF Early CAREER award and her current research is funded with grants from NSF, NGA and NASA. Previously she was Co-Director of the UCLA Data Mining Lab where her research focused on high performance, location-independent tools for scientific data mining and scientific collaboration.

Dr. Reinhard **Moratz** is developing a research program focusing on spatial knowledge representation in cognitive systems. His main interests are methods to deal with imprecise, incomplete, qualitative, fuzzy, and conflicting spatial knowledge. He started as Associate Professor at the Department of Spatial Information Science and Engineering in the fall semester 2008. Prior to his new position at the University of Maine he was Assistant Professor at the University of Bremen, Germany, heading the Human-Robot Interaction Laboratory. He was co-principal investigator of three German Research Foundation projects at the Spatial Cognition Collaborative Research Centre.

Dr. Nicholas **Giudice** is a new assistant professor in the department and director of the Laboratory for Multimodal Spatial Research. Nicholas's teaching and research combine expertise in cognitive neuroscience and interface design using an integrative approach he calls neurocognitive engineering. His research investigates multimodal spatial learning with vision, touch, 3-D audio, and spatial language using behavioral studies in both real environments and virtual reality. He is interested in determining the optimal information requirements for multimodal interfaces and developing spatial displays to support real-time navigation and is currently the principal investigator at the University of Maine on two NSF sponsored collaborative research grants studying these issues.

The quality of the undergraduate ISE students is difficult to assess since we now have only a few finishing up and have had only a few graduates of the program. Suffice it to say that most have been employed part time as information system specialists by the University or local businesses while attending the undergraduate program and employers have often provided unsolicited high compliments regarding their skills and professionalism. All recent graduates that we have been able to track after receiving their degrees are gainfully employed using their acquired information system skills.

b. Centrality to the Mission of the University

We live in an information society. There is no going back. Virtually all businesses in the state and nation use information systems in their generation of wealth. The *information systems engineering* undergraduate program was designed to produce graduates with high level skills in information systems design, development, support, administration, and maintenance. From large industrial and medical operations to educational institutions, banking and small businesses, the need for the skills of such graduates is very high. Particularly during troubled economic times, we believe that government should invest in educational disciplines that promise high return in intellectual capital for the State.

The world list of schools and departments of information science, information management and related disciplines provides several thousand entries at <http://informationr.net/wl/>. The distinction between *computer scientists* and *information system scientists* is well established and well understood as attested to by the completely separate accreditation programs for these disciplines supported by the Accreditation Board for Engineering and Technology (ABET). Graduate programs in information systems following similar approaches and ideals to ours include the University of

Pennsylvania, University of California Berkeley, Syracuse University, University of Michigan and University of Washington. However it will be difficult to achieve high levels of graduate student academic achievement without solid information system and information technology undergraduate programs to provide the appropriate knowledge foundations for students. Having a fully supported *information systems engineering* undergraduate program for Maine students leading to the graduate program would be optimal but this would require increased resource commitments by the State of Maine.

c. The Cost of Instruction

There are no direct cost savings or cost increases as a result of the elimination of the undergraduate program in information systems engineering. Rather, any teaching and advising resources freed will be marshaled to more fully support the MS and PhD degrees in Spatial Information Science and Engineering, reinvigorate the MS in Information Systems and enable a four plus one year option for students to obtain the MSIS. Seven full time faculty are involved in the Department with a single staff member administrative assistant and a soft money research administrative assistant. The Department has offered one of the more successful PhD programs in the College of Engineering and the University has emphasized the need to expand the production of PhD graduates since this directly relates to the Carnegie Classification for the university (<http://www.carnegiefoundation.org/classifications/>) and the university's national and international reputation. Thus a shift to focus limited resources entirely on the graduate programs makes some sense.

d. The Cost of Research

Both funded and unfunded research accomplished by the faculty is extensive. Over the past ten years the department has averaged approximately \$1.9 million per year in funded research and has averaged over five refereed publications per faculty member per year. The annual reports of the faculty as a whole are available at <http://www.spatial.maine.edu/AnnualReports/> and the annual productivity reports of each faculty member may be accessed by administrators at <https://library.umaine.edu/fsprofile/login.aspx>. The documented high levels of activity are likely to increase with the elimination of the undergraduate program since the existing faculty will be able to spend more time with graduate students on projects, teaching and advising graduate students, and will have more time for soliciting funded research.

e. The Cost of Public Service

The faculty does virtually no paid public service. Public service to the profession through editorships, serving on journal, conference, and research proposal review panels, teaching short courses and workshops, and similar activities is very high. The annual reports of the faculty as a whole are available at <http://www.spatial.maine.edu/AnnualReports/> and the annual productivity reports of each faculty member may be accessed by administrators at <https://library.umaine.edu/fsprofile/login.aspx>. These documented high levels of activity are unlikely to change with the elimination of the undergraduate program.

f. Program Demand

The demand by businesses and industry for graduates is very high. Sorted by annual number of predicted openings, the job category of *network and computer systems*

administrators is ranked within the top six of high-wage, in-demand jobs in Maine in a recent study (An Analysis of High Demand, High Wage Jobs in Maine, Center for Workforce Research and Information, Maine Department of Labor, June 2008). Many other states predict similar high demand, high growth employment over the next decade for information systems applications developers, analysts and managers (example: <http://worknet.wisconsin.gov>) and we see the same predictions nationally (see <http://www.careervoyages.gov/infotech-main.cfm>).

Interest by Maine students in pursuing an *information systems engineering* degree is unknown because the undergraduate program was never advertised. Certainly similar programs at other universities have attracted substantial numbers of students. Due to the small number of faculty members in the department our goal had been to recruit a relatively small exclusive undergraduate class of approximately twenty new and highly motivated students each year. We have now shifted our efforts to meet at least some of the demand through our graduate degree programs rather than through the undergraduate program which we are proposing to close due to a shortage of resources to support both the undergraduate and graduate degree programs.

g. Other Costs and Benefits

No additional costs or benefits are noted.

h. Total Net Cost Savings of Program Elimination

There are no significant cost savings from elimination of the undergraduate program. Rather the savings will be in release of faculty resources to be applied to other high priorities of the university and State of Maine such as graduate education and research.

III. Responses to the Requirements of the University of Maine System Process for Academic Program Elimination

Note: Please note that this form lists several duplicate questions and therefore this form repeats the same or similar information from above.

a. A five-year summary of program enrollments (number of majors and number of graduates), course section enrollments, number of full-time faculty equivalents associated with the program, and budgets.

After several years of debate among the faculty concerning societal technological trends it was decided in 2003 that the surveying segment of the undergraduate program should move to the School of Engineering Technology while the core faculty would focus on creating a revised innovative undergraduate curriculum in *information systems engineering*. With the approval and support of the Dean of Engineering the faculty spent hundreds of hours during 2004 and 2005 redesigning and implementing a solid undergraduate curriculum to respond to the critical information technology human resource needs of the State of Maine and that would be the first program in the nation to meet both the ABET accreditation requirements for *engineering programs* (Engineering Accreditation Commission – EAC) and the ABET requirements for *information system programs* (Computing Accreditation Commission – CAC). While some students heard about this newly revised program by word of mouth and transferred into the program, the faculty made a conscious decision to hold off a major recruitment campaign until the first-in-the-nation dual accreditation had been received. After the campus visit by ABET but prior to receiving the results of the accreditation evaluation, the Dean of Engineering informed us that substantial pressure was being brought to close down undergraduate programs with current small enrollments and he had imposed a moratorium on any further transfers or admissions to the program in the Spring of 2006. Later in the Spring of 2006 the first Information Systems Engineering undergraduate degree was granted and in the fall of 2006 we learned that that we had indeed achieved the first dual ABET accredited degree program in the nation so that at least those students already through or in the pipeline would graduate with this distinction.

The five-year summary of undergraduate enrollments and graduates is as follows:

Academic Year	ISE Majors	Graduates
FY 2004	8	-
FY 2005	13	-
FY 2006	19	4
FY 2007	20	6
FY 2008	16	4

It should be noted that SIE majors are not included in the above numbers nor are any students that transferred to the School of Engineering Technology. Further, some students that learned that the ISE program would be closed transferred out and thus will not receive a degree in this major.

There are 2 full-time faculty equivalents associated with this program in the E&G budget and 5 full-time equivalents associated with the program funded from MEIF.

b. The specific rationale for the elimination of the program including an indication of the campus process used to reach the recommendation.

Maine is last in the nation in the education of science and engineering graduate students. This has been true each and every year since at least 1992 (See p.4-15, US Dept of Commerce, State Science and Technology Indicators, Fourth Edition 2004.) In the 2008 federal report, while still in last place, Maine is in fact losing ground with the spread increasing from the next lowest ranked states. (See Table 8-19 as well as Table 8-18 at <http://www.nsf.gov/statistics/seind08/>). Maine's very low performance in educating and retaining graduate level scientists and engineers as expressed by these indicators is an obvious impediment to investment by businesses and industry in the State of Maine.

This undergraduate program is being eliminated in order to free faculty resources to more fully support the MS and PhD degrees in Spatial Information Science and Engineering, reinvigorate the MS in Information Systems and enable a four plus one year option for students from any undergraduate academic discipline to obtain the MSIS. The shifting of priorities also will allow faculty to spend more time with graduate students on projects, teach and advise graduate students, and faculty will have more time for soliciting funded research.

The campus process followed in eliminating the program is documented in Appendix A and the responses to the steps in that process are documented in Section II of this report.

c. The relationship of the program elimination to the campus mission and to other programs on the campus.

We live in an information society. Virtually all businesses in the state and nation use information systems in their generation of wealth. We need graduates with high level skills in information systems design, development, support, administration, and maintenance. From large industrial and medical operations to educational institutions, banking and small businesses, the need for the skills of such graduates is great.

This specific undergraduate program elimination should not have much negative affect on other programs on campus because the program was still at a nascent stage when a moratorium on admissions was imposed. The closing will have a positive affect by providing expanded opportunities for campus students from many disciplinary backgrounds to now seek a master's degree in information systems that was previously unavailable to them.

The department does currently teach two undergraduate service courses populated by students from other degree programs. These courses are ISE 213 Information Ethics and ISE 112 Using Geographic Information Systems. The current intent is to continue to teach these courses at least once per year as a service by the department to the rest of the campus.

d. A plan for the retrenchment or reassignment of faculty.

There will be no retrenchment or reassignment of faculty away from the department. The involved small group of faculty is unable to continue to support a high caliber undergraduate program in addition to their internationally recognized graduate and research programs. Rather, resources are being marshaled to expand the graduate program offerings.

e. The impact of the program elimination on students.

University of Maine students will no longer have an opportunity to take an undergraduate program in information systems engineering. However, the academic department has reactivated the MS Information Systems (MSIS) by moving its administration and the offering of all its required courses to the department and has developed an early admission option for the MSIS degree program so that high performing undergraduate degree students still have access to an in depth information systems curriculum on campus. High performing students from virtually any disciplinary domain that plan early and take extra courses during their junior and senior years should be able to complete the MSIS degree in a single additional year after their undergraduate degree.

f. A timetable for the program elimination.

A moratorium was imposed on admitting new students into this program by the administration as of the Spring semester 2006. The final students currently enrolled in the curriculum are scheduled to graduate from the program in May 2010 and most undergraduate courses in the department as shown at <http://ise.umaine.edu/curriculum.php> will no longer be taught from that point forward.

g. The input obtained from meeting and discussion with the Associated Faculties of the University of Maine System prior to completion of the proposal.

<To be supplied by the administration.>

IV. Description of the MS Information Systems Degree Program and the Four Plus One Year Option

Explanation of Revisions to the MS Information Systems Degree Program

Curriculum

The curriculum for the MS Information Systems program is little changed from the coursework in the existing program except that any required course is now offered within the Department of Spatial Information Science and Engineering. In this way, no other department may prevent students from acquiring the core courses required for the degree. Great flexibility remains in choosing relevant elective courses from across campus to complete the program of study for each student. By example, students may continue to enroll in elective graduate courses in Business or Computer Science assuming the student has met the prerequisites for taking a desired course and the relevant administrative unit allows them to enroll in the course.

One notable change to the curriculum is addition of a required new course by a new faculty member who was hired with an eye to teaching this new course in *Information Systems Software Engineering*. This is a programming course explicitly designed for those envisioning careers focused on developing and managing information systems and databases as opposed to software design. This course is tailored for graduate students in information systems and spatial information engineering with little to no previous programming experience that have a need for practical in depth Java programming skills.

Addition of a Four Plus One Year Program

In order to lessen the negative effects on the State and its businesses by the elimination of the undergraduate academic degree program in *information systems engineering*, students enrolled in any UMaine undergraduate program may now apply for early conditional admission to the MSIS graduate degree program allowing them typically to take three graduate courses as overloads (with a maximum of four) during their undergraduate degree in their junior and senior years that would apply towards the graduate degree. These graduate courses do not count towards the undergraduate degree requirements but by taking them as undergraduates, students can realistically finish this coursework master's degree in a single year beyond their undergraduate program.

To enable completion of the 30 credit course work in a single 12 month period after the undergraduate degree and to meet the desires of industry and students, a new Information Systems Internship course has been added that will allow students to acquire as many as six credits through relevant internship programs.

MS Information Systems Program Requirements

1. The MS - Information Systems Science (MSIS) consists of 30 credits, all earned in course work. Thus, it is a professional “all course work” degree program.
2. Admission:

All students apply through the Graduate School for admission. Students must be admitted to the graduate degree program by the Steering Committee for the MSIS graduate program. To be considered for Fall admission, completed applications must be received 8 weeks prior to the beginning of the term. For additional information contact the MSIS Graduate Coordinator at onsrud@spatial.maine.edu
3. Programs of Study:
 - a. Programs of Study are approved for each student by the Steering Committee for the MSIS graduate program. This committee consists of the MSIS Graduate Program Coordinator and two additional graduate faculty members in the department or affiliated with the program.
 - b. Each student's program of study must include the five required core courses with the remainder of courses to be selected from an approved course list maintained by the department or proposed by the student and assessed for possible approval. The list is regularly updated and includes appropriate courses drawn from across campus. Each student's program of study must be approved in advance by the MSIS Steering Committee.
 - c. At least 15 credits of the 30 required on a student's program of study must be at the 500 level or above.
 - d. Up to two courses may be taken at other universities by distance methods or otherwise if contained on the student's graduate program of study and approved in advance by the MSIS Steering Committee.
 - e. Up to two graduate courses may be transferred into the student's graduate program of study if taken prior to admission to the Graduate School, the courses did not count towards the student's undergraduate degree requirements, and the courses are approved by the MSIS Steering Committee. (See the discussion of early admission students below for a potential increase in such courses).
 - f. The MSIS Graduate Coordinator serves as the advisor for each student admitted to the program and the MSIS Steering Committee serves as the graduate committee for each student in the program.
4. All students must complete the entire M.S. graduate program of study within a six-year period (as established by the Graduate School).

Prerequisites for Admission

Students must take the GRE exam prior to being admitted to the graduate program. Those with a GRE score of less than 900, a writing score less than 3.5 or an undergraduate grade point average less than 3.0 at the time of application are typically discouraged from submitting an application to the program.

Early Admission of UMaine Undergraduate Students to Four Plus One Program

Undergraduate students from any degree program at the University of Maine may apply as early as the summer before their junior year for admission to the *MS Information Systems* graduate degree program. Applications for “early admission” should be received by the middle of the first semester of the junior year and are not accepted after the senior year has commenced.

By taking a course overload of three credits in the second semester of the Junior year and a course overload of three credits in each of the semesters of the Senior year, a motivated student typically may acquire 9 credits (but no more than 12) for graduate school (at undergraduate tuition rates) prior to acquiring their undergraduate degree assuming that they receive a B or better in the courses. By taking a 6-credit Information Systems Internship graduate course with a corporation, agency or non-profit organization during the summer, a student may readily complete the coursework master’s degree in a single year after their undergraduate degree. This master’s degree will be highly complementary to an undergraduate degree in almost any field and attractive to employers.

To apply for early admission before or during the junior year, an applicant should expect to have an overall minimum undergraduate grade point average of 3.25, must have completed the University of Maine General Education Requirement in Math and must have three letters of recommendation from current or previous university instructors. The participating student must take the GRE exam prior to completing their senior year but continuation in the graduate program will be based primarily on performance in the graduate courses and overall grade point average upon graduation from the undergraduate program. Below a 3.0 accumulated undergraduate grade point average should be assumed cause for discontinuation in the graduate program.

Students with two or fewer semesters remaining to complete their undergraduate degree program (i.e. 30 credits or less) do not qualify for the “four-plus-one program” but their applications will be considered as applications within the regular MSIS admissions process. In this case, see item 3.e. above about transferring up to two graduate courses prior to formal admission.

Course Work Requirements for the M.S. Degree

The MSIS program consists of five three-credit core courses and a minimum of 15 additional credits from the list of courses approved for the program for a total of 30 credits. If some required courses are duplicative of courses that may have been taken in the student's undergraduate degree program, those courses need not be repeated, and the student will select in consultation with the MSIS Graduate Coordinator and the Steering Committee additional approved courses to arrive at the total of 30 credit hours.

Core Courses Required

All of the following courses must be taken and all count toward the graduate degree unless they were counted in a student's undergraduate program.

SIE 505 - Formal Foundations of Information Systems (3 credits), Instructor: Worboys

SIE 507 - Information Systems Software Engineering (3 credits), Instructor: Moratz*

SIE 525 - Information Systems Law (3 credits), Instructor: Onsrud

SIE 550 - Engineering Databases and Information Systems (3 credits), Instr: Egenhofer

SIE 565 - Information Systems Architecture (3 credits), Instructor: Nittel

Note: * indicates a new course. See the grad courses from the Berkeley School of Information at <http://www.ischool.berkeley.edu/programs/courses> for a comparison if desired.

Approved Elective Courses for the MS Information Systems Program

Students must take at least fifteen credits that are approved in advance by the MSIS Steering Committee from the following approved elective course listings in order to arrive at the total of 30 credits required. Students should NOT assume that any combination of the following courses will be approved by the Steering Committee. Students should obtain approval of their full program of study prior to taking the following elective courses to ensure that they will count towards their degree requirements. Students may propose additional graduate courses than those listed below be included on their program of study on a case-by-case basis or added to the list. The MSIS Steering Committee will assess the reasonableness of such requests and make the final decision on whether specific additional courses serving the objectives of the MSIS program and the needs of the student may be included.

Some of the elective graduate courses listed below may require prerequisites in addition to the minimum required for general admission to the MSIS graduate program. Some schools and departments grant enrollment preference to graduate students in their own programs so check with the relevant department or college as appropriate.

Pre-approved Elective Courses

Business

BUA 638 - Model-Based Decision Making (3 credits) Steiger

BUA 661 - Knowledge Management and Decision Support Systems (3 credits) Jones

BUA 664 - Databases and Data Mining in Industry (Oracle I, 3 credits) Steiger

BUA 465 - Business Systems Development (Oracle II, prereq is BUA664, 3 credits)
Steiger

BUA 668 - Electronic Commerce (3 credits) Jones

Communication

CMJ 480 - Media Theories and Research Methods (3 credits) Grosswiler

Computer Science

Any formally approved 400 level COS courses and above

Education

- EDT 616 Seminar in Educational Media (3 credits) Garthwait
- EDT 545 Information Security in the Educational Environment (3 credits) Baack
- EDG 657 Educational Practicum (3 credits) Garthwait

Electrical and Computer Engineering

- Any 400 level ECE courses and above

Interdisciplinary

- INT 400 - Pop! Tech: The Impact of Technology on Society (3 credits) Nichols
- INT 601 - Responsible Conduct of Research (1 credit) Onsrud

New Media

- Any formally approved 500 level and above NMD courses

Public Administration

- PAA 516 - Information Technology and Public Policy (3 credits) Nichols

Spatial Information Science and Engineering

- SIE 503 Experiment Design (1-3 credits) Giudice*
- SIE 506 Formal Foundations for Geographic Information Systems (1 credit) Worboys*
- SIE 509 Principles of Geographic Information Systems (3 credits) Beard
- SIE 510 Geographic Information Systems Applications (3 credits) Beard
- SIE 512 Spatial Analysis (3 credits) Beard
- SIE 515 Human Computer Interaction (3 credits) Giudice*
- SIE 526 Cadastral and Land Information Systems (3 credits) Onsrud
- SIE 555 Spatial Database Systems (3 credits) Nittel
- SIE 565 Reasoning With Uncertainty in Spatial Information Systems (3 credits) Worboys
- SIE 590 Information Systems Internship (3-6 credits) Onsrud*
- SIE 570 Spatial Cognition (3 credits) Moratz *

Graduate Faculty

M. Kate Beard-Tisdale, Ph.D. (Wisconsin, 1988), Professor.

Max Egenhofer, Ph.D. (Maine, 1989), Professor

Nicholas Giudice, Ph.D. (Minnesota, 2004), Assistant Professor

Reinhard Moratz, Ph.D. (Universitat Bielefeld, 1992), Associate Professor

Silvia Nittel, Ph.D. (Zurich, 1994), Associate Professor

Harlan J. Onsrud, J.D. (Wisconsin, 1982), Professor

Michael F. Worboys, Ph.D. (Birmingham England, 1980), Professor

V. Conclusions and Recommendations by the SIE Faculty

Our interpretation of numerous study reports suggests that the State of Maine would be wise to invest at a minimum in both an undergraduate program in information systems engineering and a master's program in information systems for the long-term well being of the State's businesses and its citizens. Support of both is not possible under current constrained resource conditions. As such the faculty in the Department of Spatial Information Science and Engineering fully support the closing of the *BS Information Systems Engineering* degree and revitalization of the *MS Information Systems* degree under the conditions set forth in this document.

APPENDIX A

University of Maine
CRITERIA AND PROCESS FOR ACADEMIC PROGRAM ELIMINATION
Revised 3/25/92

(Appendix eliminated. Material may be found in the in the Policies and Procedures Manual, accessible at <http://www.umaine.edu/facultysenate/PCRRRC/>)

APPENDIX B

University of Maine System
Academic Procedures Manual

Section 305.5 Academic Program Elimination

(Appendix eliminated. Material may be found in the in the Policies and Procedures Manual, accessible at <http://www.umaine.edu/facultysenate/PCRRRC/>)