

Columbus State University
TSYS Department of Computer Science
Master of Science in Applied Computer Science
Comprehensive Program Review
Detailed Self-Study
November 2005

I. Brief Program Overview

The program has two concentrations: Software Development and Information Assurance. To allow students with different backgrounds to benefit from and be successful in the program, students may also design a program of study without a concentration.

In conjunction with the Mission Statement of Columbus State University, the Department of Computer Science serves the educational needs of students of the university in the area of computing and the specific educational needs of the businesses and industries in our community. Computing continues to play a larger part in the educational experience of each student at Columbus State University. The Department of Computer Science is committed to playing a leadership role in this process.

II. Summary Findings of the Program's Overall Quality

The TSYS Department of Computer Science provides a high quality program to its students. The quality of teaching, quality of the curriculum, quality of faculty, quality of facilities, quality of research and scholarship, and quality of service are all above average. Efforts need to be made to improve the quality of students through recruitment and graduate assistant opportunities for exceptional students. The faculty need to continue to enhance the quality of instruction. Changes scheduled for Fall 2006 are expected to significantly improve the quality of the M.S. program.

II A. The Quality of Teaching Supporting the Program

State your assessment of the strength of the evidence of program quality on this indicator.
Above Average

- *Explain how good teaching is assessed and rewarded.*
Each faculty member is required to submit a teaching portfolio (see http://csc.colstate.edu/policy/FacultyPerformanceEvaluationFinal_050830.doc). Teaching is the major criterion in annual faculty evaluations.

- *Explain how good advising is assessed and rewarded*
Each faculty member is required to be available in their office for a minimum of five hours per week with the hours distributed over at least three days of the week. Online students are advised by email and telephone. Advising is an important consideration in annual faculty evaluations.

- *Describe opportunities for interaction that occur between faculty and students outside the classroom*

The Computer Science Department encourages interaction between faculty and students outside the classroom. With the faculty offices across the hall from the classrooms, there are plenty of opportunities for this interaction.

- Students are required to consult with their advisors prior to registration.
- Students are encouraged to consult with faculty members for help with assignments and to monitor their progress in courses.
- The student chapter of the Association of Computing Machinery holds regular meetings with faculty sponsors present.
- Colloquium events are held periodically and students are encouraged to present and/or attend.
- Student presentations are an integral part of open house events.
- Students prepare for programming competition under the supervision of faculty and then travel to compete in programming contests accompanied by faculty members.
- Students work on research projects under the supervision of faculty members.
- Students serve as tutors under faculty supervision.
- Students assist faculty members in developing and maintaining the departmental Web site.
- Students work closely with faculty members in completing independent studies courses.

- *Indicate the availability of tutoring*

A tutoring lab is available 48 hours per week staffed by tutors from a pool of 6 students. Faculty are available for consultation by graduate students via email and telephone as well in person for those students on campus.

- *Describe opportunities for internships, service-learning, practica, study abroad, and career planning and placement*

Internship and co-op opportunities are coordinated by a department faculty member in conjunction with the Career Center. At the time of this writing there are two students participating in internships and five additional department-related internships available.

A group of students traveled to India in May 2005 as part of a service-learning project and cultural exchange. A similar trip is planned for May 2006.

The department maintains active communication with area employers to find students and graduates to meet the employers' staffing needs. Career planning is discussed with students as part of advising. Students are encouraged to visit the Career Center for assistance in planning their careers.

Many faculty provide opportunities for the Career Center and the International Student Center to visit classes and speak to the students.

- *Describe methods to be pursued for program improvement.*

With current staffing, it is difficult to provide adequate support for student research. The department plans to increase the number of faculty members. It also plans to hire a computer specialist which will allow the faculty to focus more on instruction and less on computer systems management.

II B. The Quality of the Curriculum Supporting the Program

State your assessment of the strength of the evidence of program quality on this indicator.

Above Average

- *Describe the relationship between the program's curriculum and its outcomes*

The following expected outcomes are supported by the listed courses. In addition, students are required to take three elective courses in Computer Science that extend their knowledge in the different areas.

All graduates in the Master of Science in Applied Computer Science program will be able to apply techniques and technologies from at least four of the following areas:

- Algorithm Analysis and Design (course: CPSC 5115G - Algorithm Analysis and Design)
- Programming Languages (courses: CPSC 5129G - Programming Languages, CPSC 6129 - Advanced Programming Languages)
- Database (courses: CPSC 5138G - Advanced Database Systems, CPSC 6127 - Contemporary Issues in Database Systems)
- Computer Architecture (courses: CPSC 5155G - Introduction to Computer Architecture, CPSC 6155 - Advanced Computer Architecture)
- Operating Systems (course: CPSC 6125 - Advanced Operating Systems)
- Computer Networks (courses: CPSC 5157G - Computer Networks, CPSC 6157 - Network Management)

In addition graduates in the Information Assurance concentration will:

- understand the major issues of information assurance (courses: CPSC 6126 - Information Systems Assurance, CPSC 6136 - Advanced Systems Security)
- be able to identify threats and vulnerabilities to information systems (courses: CPSC 6128 - Network Security, CPSC 6167 - Network Risk Assessment)
- be able to identify data, computer and network exploits (courses: CPSC 6128 - Network Security, CPSC 6159 - Computer Forensics, CPSC 6167 - Network Risk Assessment)
- be able to identify ways to secure information, computers and networks (courses: CPSC 6126 - Information Systems Assurance, CPSC 6128 - Network Security, CPSC 6136 - Advanced Systems Security)

In addition graduates in the Software Development concentration will:

- be able to produce a software solution using an object-oriented programming architecture (courses: CPSC 6119 - Object-Oriented Development, CPSC 6118 - Human Computer Interface Development)
- be able to produce a web-based software solution using high-level development tools (courses: CPSC 6175 - Web Site Development and Technologies, CPSC 6176 - Enterprise Web Application Development)
- be able to produce solutions in a distributed and/or enterprise environment (courses: CPSC 6137 - Distributed Software Architecture and Design, CPSC 6166 - Distributed Enterprise Software Development)

- *Indicate how technological skills are incorporated into the program of study*
The program of study consists of subject matter primarily concerned with the acquisition and application of technological skills.

- *Indicate how the program is relevant to student needs*
The Master of Science in Applied Computer Science program prepares students to enter or enhance their careers by providing sets of complementary courses that concentrate on well-defined areas of currently relevant computing knowledge. The Software Development track prepares students to take positions as software architects who are able to develop software solutions for the web and for enterprise level environments. The Information Assurance track prepares students to take positions as information systems security professionals and information systems security officers.

- *Describe how students are challenged to think across disciplines*
Computers are used in many disciplines including business, engineering, science, and education. Many of the assignments given to students involve developing solutions to problems based in these areas.

- *Explain how diversity, multiculturalism, and international perspectives are included in the program*
Students are taught to isolate culture-specific features in software to facilitate adapting programs to diverse markets. For example, in Human Computer Interface Development, students learn how to take into account the international audience when creating interfaces.

- *Describe methods to be pursued for program improvement.*
Many students enter the program without a B.S. in Computer Science and lacking knowledge in a number of fundamental areas. In the past the students have been required to complete the equivalent of a three-course sequence in computer programming. This has been inadequate. To address this concern, two new courses will be offered beginning in fall 2006: Fundamentals of Computer Programming and Data Structures and Fundamental Principles of Computer Science. These courses will be required of all entering graduate students who lack an adequate background in the

computer science core areas. These courses will not count towards the required 36 hours of graduate courses.

II C. Selectivity, Academic Achievement, and Satisfaction of Students in the Program

State your assessment of the strength of the evidence of program quality on this indicator.
Satisfactory

Describe the characteristics of students in the program (i.e., test scores, overall GPA, retention rates)

MS Applied Computer Science	2001/2002	2002/2003	2003/2004	2004/2005
Average GRE Score	1036, n=59	1087, n=50	1043, n=72	1056, n=66
Average Graduate GPA	3.22, n=59	3.33, n=56	3.54, n=78	3.67, n=66

Retention rate data is not available for graduate programs.

- *Describe student learning, satisfaction and evidence of success in meeting student needs and learning outcomes as reflected by major field assessment*
At the present time there is no major field assessment instrument in use.
- *Describe methods to be pursued for program improvement.*
 - The department is developing a student recruitment plan to increase the quality and quantity of graduate students majoring in Computer Science programs. This should improve retention rates and performance in the program.
 - The department is exploring the use of the ETS Major Field Test as a measure for graduating M.S. students. This test is currently administering to undergraduate students.
 - The department also plans to increase student involvement in research projects as well as to increase its level of grant and external funding to support this research.

II D. The Quality of Faculty Supporting the Program

State your assessment of the strength of the evidence of program quality on this indicator.
Above Average

- *Describe the adequacy of faculty and staff to support the program (locations of graduate training, post-graduate training, specializations, secondary fields)*

	2001/2002	2002/2003	2003/2004	2004/2005
Full-Time Faculty	11	11	12	11
Part-Time Faculty	1	4	5	5

The department currently has 12 full-time faculty members. This number is inadequate to effectively support the department's programs.

- *Describe the support provided for faculty development*
 Over the last three years, the faculty have received nearly \$90,000 in support for faculty development. \$20,000 of this support was received from the College of Science and over \$13,000 from the University budget for Faculty Development. The balance was support from funds within the department. Over \$22,000 were stipends to faculty to prepare online courses. As a result of these funds,
 - the faculty generated over one hundred publications,
 - the faculty presented nearly forty invited talks around the world,
 - one faculty member has been conducting NSF Chautauqua workshops for the past ten years,
 - faculty members were reviewers for over thirty journals,
 - faculty members were conference organizers at more than thirty different computer professional conferences,
 - several faculty members were officers in professional organizations.

- *Show faculty diversity and credentials*

Faculty Diversity

	Fulltime Faculty				
	2001	2002	2003	2004	2005
Male (% male)	8(80%)	9(82%)	9(75%)	9(82%)	9(75%)
Female(% female)	2(20%)	2(18%)	3(25%)	2(18%)	3(25%)
Asian(% Asian)	1(10%)	1(9%)	2(17%)	1(9%)	3(17%)
Black(% Black)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Hispanic(% Hispanic)	0(0%)	0(0%)	0(0%)	0(0%)	1(8%)
American Indian(% American Indian)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Multi-Racial(% Multi-Racial)	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
White()	9(90%)	10(91%)	10(83%)	10(91%)	9(75%)

Graduate Faculty Credentials

Dr. Wayne Summers
Professor and Distinguished Chairperson
 Ph.D. in Mathematical Sciences; St. Louis University
 Dissertation in Computer Science

Dr. Bhagyavati
Assistant Professor
 Ph.D. Computer Science; University of Louisiana at Lafayette

Dr. Edward Bosworth

Assistant Professor

M.A., Ph.D. Physics; Vanderbilt University, Nashville, TN
M.S., Ph.D. Computer Science; University of Alabama in Huntsville,
Huntsville, AL

Ms. YongMi Kim

Assistant Professor

Ph.D, Computer Science and Software Engineering; Auburn University-In
progress
MS, Computer Science; Columbus State University

Dr. Angkul Kongmunvattana

Associate Professor

Ph.D., Computer Science, University of Louisiana at Lafayette

Dr. Rodrigo Obando

Assistant Professor

Ph.D. in Electrical Engineering, Old Dominion University, Norfolk, VA.

Mr. Neal Rogers

Educational Specialist

Ph.D, Computer Science and Software Engineering; Auburn University-In
progress
M.S.; Columbus State University

Prof. Chris Whitehead

Assistant Professor

M.S.; Operations Research, Naval Postgraduate School
Doctoral Student, Capella University (expected completion 9/05)

Dr. David Woolbright

Professor

Ph.D.; Auburn University

Dr. Vladimir Zanev

Professor

Ph.D. in Computer Science; Sofia University, Bulgaria

- *Describe how part-time faculty are integrated into the program*

Part-time faculty members have not taught graduate-level courses this program.

- *Describe methods to be pursued for program improvement.*

The department plans to increase the number of faculty members targeting candidates with expertise in areas that need stronger support. The department also plans to seek additional institutional support for instruction and research.

II E. The Quality of Facilities and Equipment Supporting the Program

State your assessment of the strength of the evidence of program quality on this indicator.
Above Average

- *Describe the condition and adequacy of available space*

Since summer 2003 the department has been housed in the new Center for Commerce and Technology on the fourth floor. All the space on the fourth floor except for one classroom is used by the department as well as a large lecture hall on the second floor. The space comprises three 30-seat classrooms, two 30-seat classrooms and one lecture hall with computers, a conference room, 21 offices, 2 rooms housing special-purpose laboratories, a library, a faculty workroom, department office, and storage areas. Classrooms are equipped with multimedia equipment including data projectors, computers, and playback equipment for video presentations. Offices are furnished with modular desks, bookcases, and computers. The lobby areas are furnished with chairs and tables containing power receptacles and network connections. A wireless network is deployed and can be accessed within the building.

The condition of the department's space is very good. The space is fully utilized by the department.

- *Describe the condition and adequacy of technology labs, equipment, and library resources*

The computers in the labs are in good condition and adequate for current needs. The department maintains a library of computer related books and publications made up primarily of donations from faculty members.

- *Provide other indicators of adequacy of campus infrastructure to support the program*

The Computer and Information Networking Services department provides support to the department by maintaining and upgrading hardware and software as needed. The Simon Schwob Memorial Library supports the department by setting up facilities for online courses and maintaining the underlying software. The Library also maintains subscriptions to IEEE/ACM digital libraries and the Safari electronic reference library for the department and institution.

- *Describe methods to be pursued for program improvement.*

The department plans to hire a computer specialist to augment the support provided by the Computer and Information Networking Services department. Having this support within the department will allow faculty members to focus more on instruction and less on computer systems management.

The department will continue to upgrade its labs, hardware, and software.

II F. The Quality of Research and Scholarship Supporting the Program

State your assessment of the strength of the evidence of program quality on this indicator.
Above Average

- *Explain how faculty involve students in research*

Over the last three years faculty members and students have co-authored more than twenty publications and presentations. Faculty members actively encourage student involvement in research as well as attendance and participation at conferences, workshops, and forums.

- For the past two summers, eight students each year were funded through a NSF Research for Emerging Undergraduates to do research with a CSU faculty mentor. Three CSU undergraduates were selected each year.
- Two graduate and four undergraduate students are funded through a grant from the Georgia Courts to evaluate software for the Traffic Courts.
- Two CSU undergraduate were funded through a CREU grant to conduct research.
- One graduate student funded through a OneGeorgia grant has conducted applied research in collaboration with Georgia Tech faculty and graduate students.
- In the past three years, five graduate students have completed theses.
- Two students, one graduate and one undergraduate were awarded the top prizes for their presentations at the ACM-Midsoutheast Conference.

- *Describe how faculty research relates to the program mission*

Faculty research often directly involves students and thereby enriches the learning experience. Research enhances the ability of faculty members to expose students to current relevant activities in the discipline.

- *Describe mentoring and professional development opportunities for faculty*

Over the last 3 years faculty members have mentored and/or supervised research for over 25 undergraduate students and more than 10 graduate students. Graduate assistants are supervised by faculty members. Internship and cooperative learning positions are overseen by faculty members.

- *List faculty publications, papers given, and public lectures*

A summary of relevant activity can be found in <http://csc.colstate.edu/CPR/faculty-productivity.xls> and detailed lists can be found in <http://csc.colstate.edu/CPR/Annual-Review-2002-3.doc> and <http://csc.colstate.edu/CPR/Annual-Review-2004-5.doc>.

- *Describe methods to be pursued for program improvement.*

Faculty who receive faculty development funding are expected to present their results. Graduate assistants are required to attend while other undergraduate and graduate students are encouraged to attend these presentations. Students are encouraged to participate in independent research and supported in presenting their results at conferences. The department plans to increase internship opportunities for

students and faculty as well as increase the department level of grant and external funding to expand research opportunities for undergraduate and graduate students.

II G. The Quality of Service Supporting the Program

State your assessment of the strength of the evidence of program quality on this indicator.

Above Average

- *Describe projects completed and outcomes which contribute to the program, department, college, institution, community, and/or the region*

The Computer Science faculty members are often called upon by university faculty and staff as well as others in the community to help with computer related problems. The faculty members are active on campus and in the community and region. Faculty members serve on a large number of department, college, university and community level committees.

In 2002, several faculty created a Center for Academic Excellence in Information Assurance Education, wrote a proposal to NSA to have the curriculum recognized as meeting the National Security Agency (NSA) federal guidelines for information assurance. The Center has received recognition by the NSA for its mapping of the curriculum to NSTISSI-4011 and NSTISSI-4014 standards for training Information Systems Security Professionals and Information Systems Security Officers. In 2003, the department's Center for Information Assurance Education hosted a 4-day CISCO workshop on network security for faculty from CSU and five regional two-year and four-year schools. In 2004, the department hosted the first CSU Computer Security Awareness Day. This has been expanded this year to a Security Awareness Week and involves departments across the campus.

A number of faculty members are actively involved with the regional public schools, including serving as chief scorer for the Muscogee School Academic Decathlon and judge for the Muscogee School Page One competition. Several faculty members have served as mentors to local high school students in completing senior projects. Faculty members have visited the local high schools and talked about computer science and presented awards to the students.

A number of faculty members are actively involved in other community activities including organizing and serving as officers of the Columbus Regional Technology Association, serving as a member of the Phenix City-Columbus Business Division Advisory Council, serving as a member of the Southwest Georgia Technology Council, and serving as a member of TechPrep Program.

Several faculty are active in professional organizations including secretary to ACM Mid-Southeast Chapter and former Vice-President of the Chattahoochee Valley chapter of Infragard.

In 2004, the department hosted the first SIG-Ada Seminar at CSU.

- *Describe methods to be pursued for program improvement.*
Continue to encourage faculty members to seize and create opportunities for campus and community involvement.

II H. Program Honors & Awards

- *Identify the formal honors, awards, high rankings, citations of excellence, accreditations, positive external reviews, etc. that this degree program has received over the last seven years.*
 - ❖ In 1997, the Computer Science Department received the University System of Georgia Award for Collaborative Excellence and the Georgia Economic Development Authority TERRIFIC Award
 - ❖ In 2002, the Computer Science Department received recognition from the Committee on National Security Systems and the National Security Agency (NSA) for mapping the curriculum to NSTISSI-4011 – Training for Information Systems Security Professionals.
 - ❖ In 2003, the TSYS Department of Computer Science received a \$500,000 endowment from Synovus in recognition of the long-standing relationship between the department and TSYS.
 - ❖ In 2005, the Computer Science Department received recognition from the Committee on National Security Systems and the National Security Agency (NSA) for mapping the curriculum to NSTISSI-4014e – Training for Information Systems Security Officers.
- *If program accreditation is available but has not been attained at CSU, explain why.*
Accreditation is not available for this program.

II I. Exceptional Achievements & Honors of the Program's Students, Graduates, & Faculty

- *Identify the exceptional achievements and honors received by the program's students, graduates, and faculty over the past five years which reflect on the quality of the program.*
2002-2003
 - Dr. Bhagyavati was College of Science nominee for the CSU Faculty Research and Scholarship Award, Spring 2003.
 - Prof. McQueen was College of Science nominee for the CSU Faculty Service Award, Spring 2003.
 - Dr. Linton was promoted to Full Professor.
 - Dr. Zanev was promoted to Full Professor.
 - Dr. Woolbright was a Spencer Scholar at Oxford.

2003-2004

- Dr. Kurkovsky was College of Science nominee for the CSU Faculty Research and Scholarship Award, Spring 2004.
- Dr. Kurkovsky was promoted to Associate Professor and received tenure.
- Dr. Woolbright and Prof. McQueen were Spencer Scholars at Oxford.
- Several faculty members served as officers in computer professional organizations.

2004-2005

- Karthik Harihar won first place for the graduate paper presentations at the ACM-Midsoutheast Conference.
- Fred Johnson won first place for the undergraduate graduate paper presentations at the ACM-Midsoutheast Conference.
- Dr. Bhagyavati and Dr. Kurkovsky were the College of Science nominee for the CSU Faculty Research and Scholarship Award, Spring 2005.
- Dr. Bhagyavati was selected as recipient of the CSU Faculty Research and Scholarship Award.
- Drs. Zanev, Kurkovsky, and Summers were Spencer Scholars at Oxford.

II J. General Success of the Program's Graduates

- *Report the results of the department's assessments of the general success of the program's graduates such as licensure or certification rates, job offers, job placement statistics, average salaries, subsequent career advancement, test scores, admissions to post-baccalaureate programs, etc.*

Between 2002 and 2005 there were 53 graduates of the program. Fifteen are employed in Columbus, thirteen by employers outside Columbus including five who are working at other colleges and universities, two are in PhD programs. The employment status of the remainder isn't known. Many of the graduates have received professional certifications as a result of their studies.

Area employers, most notably TSYs, frequently approach the department about providing employee training. Earning a degree from CSU or elsewhere is sometimes the basis for accelerated promotion.

II K. Stakeholder Satisfaction with the Program

- *Report the results of surveys of students, alumni, employers, community partners, etc. concerning their satisfaction with the quality of the program and its learning experiences and any program improvements initiated as a function of such feedback over time.*

See the documents "Summary of Assessment Results (2002-2003)" at [http://csc.colstate.edu/wright/CPR/Summary of Assessment Results - 2002-3.doc](http://csc.colstate.edu/wright/CPR/Summary%20of%20Assessment%20Results%20-%202002-3.doc) and "APPLIED COMPUTER SCIENCE GRADUATE EXIT SURVEY

Spring 2004” at [http://csc.colstate.edu/wright/CPR/surveys-sp2004 - MS\(reduced\).doc](http://csc.colstate.edu/wright/CPR/surveys-sp2004-MS(reduced).doc)

Feedback from students was largely responsible for the addition of two new courses to begin in fall 2006: Fundamentals of Computer Programming and Data Structures and Fundamental Principles of Computer Science. Student interest was also the prime motivator for the establishment of graduate internship opportunities as well as increasing the credit available for independent study. Student feedback also resulted in the acquisition of Silicon Graphics and Apple workstations to expose students to more computing platforms.

Several recent graduates who have continued in other graduate programs have provided comments that our graduate program is quite rigorous and provides a good education. Below are three recent emails from alumni.

○ *“I attended the online graduate program and graduated in December 2003. I need to thank you for the program that prepared me a solid foundation for advanced studies. I have been accepted as a Ph.D. candidate in Information Technology at George Mason University starting this month!”*

○ *“I believe that graduate degree has played a key role in providing a strong foundation of knowledge and comprehension needed at the workplace.*

I am very thankful to my professors and the TSYS Department Of Computer Science at Columbus State University for the encouragement and support throughout my coursework and beyond that. I am positive that the department is committed to growth and excellence and will continue to do so in future.”

○ *“I’m also in the CSSE program at *****. I believe that the program at CSU is more strenuous and more effective than the program at ***** but think that this is because most of the students at ***** are fifth year students, while the students at CSU typically have been out in the workforce and have more maturity and more experience. This may change as I take more courses, but so far, the work at ***** has not challenged me as much as the work at CSU. I’ll be taking my quals later in the academic year (and I hope I pass).”*

● *Also comment on the effectiveness of the program’s use of a community advisory board.*

The department’s Industry Advisory Board includes representatives from Microsoft, Wellpoint, Columbus Regional Healthcare Systems, AFLAC, and TSYS.

The Board has made numerous suggestions regarding the department’s programs and many of those suggestions have resulted in modifications to the curricula. The advisory board needs to be used more effectively.

II L. Program’s Responsiveness to Change & Improvement

- *Cite the most significant examples of improvements made in the program over the last seven years in response to changing conditions, new external requirements, and/or departmental assessment initiatives.*

The department relocated to the new Center for Commerce and Technology in 2003. This provided improved facilities for teaching and research and increased opportunities for interaction between faculty and students.

Drawing on community input including students, faculty and employers, a significant upgrade of the curriculum was implemented in 2003. This reflected developments in computer science and a significant change in direction for the program. Prior to 2003, there were two distinct M.S. in Applied in Computer Science. The on campus program consisted of primarily upper-level undergraduate courses (5***) and some electives. The online program was patterned after a number of Microsoft MCSE Certification programs. The new curriculum requires a core set of Computer Science courses and two tracks, Software Development and Information Assurance. The courses are offered so that students can complete the entire program either online or on campus.

- *Comment on how frequently the program's faculty is engaged in program assessment activities, comprehensive program evaluations, and fine tuning of the program and its requirements.*

Assessment is an ongoing process with particular emphasis on obtaining feedback from students as they graduate. Each year, the department completes a comprehensive program review consisting of student evaluations, along with other measures including alumni and employer evaluations. The result of this assessment is discussed at the department's first meeting of the academic year and concerns and recommendations are incorporated into the charges to the different department committees. Recently efforts to track alumni have been strengthened and will become a regular part of the overall assessment process. A comprehensive program review is completed every seven years.

III. Summary Findings of the Program's Overall Productivity

Productivity in the Master Science in Applied Computer Science is strong but can be improved. The productivity indicators enrollment of students in the program, annual degree production, efficiency & clarity of the program's course requirements, position of program's annual degree productivity among comparable USG Programs, program's responsiveness to state needs and employer demand for program graduates, and program's contribution to achieving CSU's Mission are all above average.

The department needs to work on program completion efficiency and graduation rate, frequency and sequencing of course offerings required for program completion, enrollment in the program's required courses, diversity of program's majors and graduates, and cost effectiveness of instructional delivery in the program's department. This can be facilitated by hiring additional graduate faculty members to improve the course offerings, and by implementing several curriculum changes scheduled for Fall

2006 to improve retention. Recruitment of students from underrepresented groups needs to be increased.

III A. Enrollment of Students in the Program

State your assessment of the strength of the evidence of program productivity on this indicator.

Above Average

- *Analyze and interpret the numbers of enrolled upper division majors in the program and the enrollment trends of these majors for the past five years.*

MS Applied Computer Science				
Number of Declared Majors - Fall Semester	2001/2002	2002/2003	2003/2004	2004/2005
Full-Time	15	15	17	10
Part-Time	52	45	70	64
<i>Total</i>	<i>67</i>	<i>60</i>	<i>87</i>	<i>74</i>

Enrollment is fluctuating but is still sufficient for program maintenance.

- *Compare the strength of the numbers of the upper division majors and enrollment trends for this program with the enrollments and trends of upper division declared majors in other undergraduate programs at CSU.*

The M.S. in Applied Computer Science is the second largest master's program on campus behind the Master's in Public Administration. The program has experienced a 42.3% growth since 2000. The drop from 17 full time graduate students in Fall 2003 to 10 full time graduate students in Fall 2004 does cause considerable concern. This decrease is consistent with nationwide trends in computer science.

- *Describe methods to be pursued for program improvement.*

The department has increased its efforts to make potential students more aware through Internet websites and through discussions with employers in the region. By improving the quality of the program, CSU is becoming a university of choice by more and more CSU alumni. The department is actively working on grant support so that the department can support additional graduate assistants. State funding through the university increased this past year for graduate assistant support. This has allowed the department to increase the graduate student stipend by 50% to make graduate assistantships more attractive.

III B. Annual Degree Productivity of the Program

State your assessment of the strength of the evidence of program productivity on this indicator.

Above Average

- *Analyze and interpret the numbers of degrees granted annually (fiscal year) by this program and the trends of the program's degree productivity over the past five years.*

Number of Degrees Conferred - Fiscal Year	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005
MS Applied Computer Science	11	18	9	21	23

The number of degrees conferred is increasing.

- *Compare the strength of the degree productivity of this program with the productivity of other undergraduate programs at CSU.*

The M.S. in Applied Computer Science is the third most productive Master's program at CSU. The number of degrees conferred has more than doubled since 2000/2001.

The significant increase the past two years can be attributed to increased enrollment, revised curriculum in 2003, and improved advising by the faculty.

- *Describe methods to be pursued for program improvement.*

The department is developing a student recruitment plan to increase the quality of students in the M.S. in Applied Computer Science program. Adding the two Foundations courses for underprepared graduate students should significantly improve retention rates and degree productivity. Because many of the students are non-traditional and already working fulltime, the department will need to continue offering a limited number of required graduate level courses during the Summer Semester. The scheduling of classes will need to continue to take into account the needs of students in the online program.

III C. Program Completion Efficiency & Graduation Rate

State your assessment of the strength of the evidence of program productivity on this indicator.

Satisfactory

- *Analyze and interpret the program's graduation rate.*

Graduation Rate* - Fiscal Year	2002/2003	2003/2004	2004/2005
MS Applied Computer Science	17%	31%	38%

**graduates divided by majors who started two years previous*

Rate is increasing.

- *Compare the program's graduation rate with those of the other undergraduate programs at CSU and offer possible explanations for this program's unusually high or low graduation rate if applicable.*

The graduate rate was extremely low in 2002/2003. By providing more flexibility in the scheduling of classes to include a limited number of required classes in the summer and ensuring that as much as possible all required courses are offered at least once a year, the rate has increased to 38% this past year. This rate is consistent with most departments on campus.

- *Describe methods to be pursued for program improvement.*

Adding the two Foundations courses for under prepared graduate students should significantly improve retention rates and degree productivity. Because many of the students are non-traditional and already working fulltime, the department will need to continue offering a limited number of required graduate level courses during the Summer Semester. The scheduling of classes will need to continue to take into account the needs of students in the online program. With the addition of one or two new graduate faculty next year, the department will be better able to offer the required graduate classes.

III D. Efficiency & Clarity of the Program's Course Requirements

State your assessment of the strength of the evidence of program productivity on this indicator.

Above Average

- *Analyze the published course requirements for program completion in terms of the simplicity and efficiency of the program's curricular design and the degree to which program requirements are communicated clearly and effectively.*

Course requirements and prerequisites allow for completion of program requirements to be accomplished in a minimum of four terms assuming courses are scheduled when needed. See the diagram of course prerequisites at http://cs.colstate.edu/html_hi/programs/grad_prereqs.aspx

- *Comment on the ease with which majors understand and successfully navigate through the required curriculum for program completion.*

Course requirements and prerequisites are available in the printed CSU catalog, the multimedia CSU catalog on CD-ROM, the CSU web site, and the department's web site. The department's web site contains projected schedules and programs of study for the MS degree program. Students can also seek advice from faculty as needed in person, by email or telephone.

- *Describe methods to be pursued for program improvement.*

The department plans to increase the number of faculty members. The department continually strives to improve student advisement and registration procedures. It is anticipated that the two foundation courses will improve the efficiency and clarity of the program.

III E. Frequency and Sequencing of Course Offerings Required for Program Completion

State your assessment of the strength of the evidence of program productivity on this indicator.

Satisfactory

- *Analyze and interpret the scheduling and enrollment history of courses required for program completion, giving particular focus to the regularity, frequency, and sequencing of course offerings required for program completion.*

Required courses are offered regularly and typically alternate between daytime and evening hours and, where applicable, between face-to-face and online formats to accommodate students' schedules. See the department's projected schedule at http://cs.colstate.edu/html_hi/academics/projected_schedule.aspx Based on student feedback, course offerings are adjusted. Fulltime graduate students should be able to complete either track within two years (four semesters), while part-time students should be able to complete either track within six or more semesters. One of the difficulties in offering all of the required courses has been a shortage of Computer Science faculty able to teach graduate classes. This has necessitated some substitution of courses for students to ensure that they graduate on time.

- *Describe methods to be pursued for program improvement.*

The Department continues to monitor enrollment patterns and refine scheduling of courses. With the addition of one or two new graduate faculty next year, the department will be better able to offer the required graduate classes.

III F. Enrollment in the Program's Required Courses

State your assessment of the strength of the evidence of program productivity on this indicator.

Satisfactory

- *Analyze and interpret the strength of the enrollments in the courses required for program completion.*

Average Course Enrollment - Fall Semester	2001/2002	2002/2003	2003/2004	2004/2005
5000 Level Courses	11.8	8.6	12.9	9.4
6000 Level Courses and Above	15.6	12.4	11.7	7.5

The enrollment pattern of students in the program has dropped over the past couple of years. This is consistent with nationwide trends, but needs to be monitored.

- *Comment on differences between core and elective course enrollments as well as differences among courses required for optional tracks or concentrations. Identify any required courses that are dropped from the schedule of classes frequently due to low enrollment and which majors must complete through approved substitutions or directed studies.*

The only courses cancelled due to low enrollment for fall and spring semesters have been electives, no core courses have been cancelled. Summer courses are required to generate sufficient enrollment to underwrite their delivery so occasionally core as well as elective courses have been cancelled.

- *Describe methods to be pursued for program improvement.*

The Department continues to monitor enrollment patterns to refine scheduling of courses as well as immediate requests from students.

III G. Diversity of the Program’s Majors and Graduates

State your assessment of the strength of the evidence of program productivity on this indicator.

Satisfactory

- *Analyze and interpret the gender, ethnicity, nationality, and age of the upper division majors and graduates in the program.*

MS Applied Computer Science				
Gender	2001/2002	2002/2003	2003/2004	2004/2005
Female	14(21%)	21(35%)	22(25%)	20(27%)
Male	53	39	65	54
Total	67	60	87	74
Ethnic Origin	2001/2002	2002/2003	2003/2004	2004/2005
International Students	5	3	4	6
Asian	5	2	2	3
Black	11	7	14	10
Hispanic	2	3	3	0
American Indian	0	0	0	0
Multi-Racial	0	1	2	1
White	44	44	62	54
Total	67	60	87	74
Age	2001/2002	2002/2003	2003/2004	2004/2005
Under 21	0	0	9	0
21 - 25	10	5	19	8

26 - 30	16	18	28	18
31 - 40	23	20	22	25
41 - 50	14	16	8	18
51 - 60	3	1	1	4
Over 60	1	0	0	1
Total	67	60	87	74
Average	34.8	35.3	37.3	36.4

- *Comment on the program's success and distinctiveness in enrolling and graduating a diverse mix of students.*

Computer science has historically had low numbers of female majors and our situation is no exception. This is consistent with national trends. With regard to other demographic criteria the program has been successful in attracting a diverse student population.

- *Describe methods to be pursued for program improvement.*

The department has as a strategic planning initiative to increase the diversity of students majoring in computer science as part of its recruitment strategy. Several faculty recently wrote a grant proposal to the National Science Foundation seeking funding to increase diversity in the program.

III H. Cost-Effectiveness of Instructional Delivery in the Program's Home Department

State your assessment of the strength of the evidence of program productivity on this indicator.

Satisfactory

- *Contrast the instructional cost-effectiveness of this program's home department with others at CSU.*

Cost per Credit Hour	2001/2002	2002/2003	2003/2004	2004/2005
TSYS Department of Computer Science (Credit Hours Taught Fall and Spring Semesters)	\$214	\$210	\$202	\$223
Columbus State University (Fiscal Year)	\$200	\$179	\$160	\$162

- *List the principal factors that cause this program's home department appear to be unusually cost-effective (i.e., have a low ratio of instructional expenses per weighted credit hour of instruction) or appear to be unusually costly (i.e., have a high cost per credit hour).*

Salaries for department faculty members are higher on average than many departments at CSU, but are below salaries for computer science faculty at peer institutions. Courses must sometimes be delivered to small classes so students can

maintain progress toward graduation. Computer Science has a higher demand for equipment than most departments.

- *Comment on the degree to which this program contributes to or detracts from the cost-effectiveness of the department.*

The program detracts from the department's cost-effectiveness but this is typical of graduate programs. Based on the USG Funding Formula, the M.S. Applied Computer Science graduate program is budgeted to have an instruction cost per credit hour of \$386.06, compared to \$175.57 for graduate programs in Business, Education, and Public Affairs and compared to \$170.22 for undergraduate programs in Computer Science.

- *Describe methods to be pursued for program improvement.*

The department has in place a strategic planning initiative to continue to develop and to upgrade the delivery of the online MS in Applied Computer Science Program. The department is currently exploring ways to improve the efficiency of delivering online courses which are more cost effective than offering multiple sections of courses on campus to accommodate day and evening students.

III I. Program's Responsiveness to State Needs and Employer Demand for Program Graduates

State your assessment of the strength of the evidence of program productivity on this indicator.

Above Average

- *Comment on the demand for graduates of this program, followed by an assessment of the program's success in responding productively to such need and demand.*

Both anecdotal feedback and the results of formal surveys indicate that demand for graduates from the program is strong. Meetings this year with local companies confirm this demand. The program is attempting to respond to this demand.

- *List the factors that limit the program's ability to be more productive and responsive to these needs and demands.*

Factors include an insufficient number of full-time faculty members as well as a shortage of exceptionally talented students. Technical support is needed to improve the delivery of online courses. This will increase the productivity of the faculty and improve the quality of the courses.

- *Describe methods to be pursued for program improvement.*

The department continually monitors employer demand through its own efforts as well as those of the University's Career Center with whom the department maintains a close relationship. The curriculum is frequently reevaluated to determine if adjustments are needed to respond to the needs of the employer community. A technical support position has been requested to support faculty in the delivery of

their classes. Additional support is needed from Instructional Technology Services that will improve the quality of online course delivery. In particular, several faculty are exploring the addition of video to their online courses.

III J. Position of the Program's Annual Degree Productivity among Comparable USG Programs

State your assessment of the strength of the evidence of program productivity on this indicator.

Above Average

- *Identify the ranking of this program relative to comparable programs in the University System of Georgia (or region or nation) in terms of the number of degrees granted annually.*

Within the University System of Georgia for Fiscal Year 2004 including CIP Codes: 11.0101 Computer and Information Sciences, General; 11.0701 Computer Science; and 11.0202 Computer Programming, Specific Applications:

With 21 degrees awarded, Columbus State University ranked fourth out of 9 institutions that awarded masters degrees in computer science.

- *Describe methods to be pursued for program improvement.*

The Columbus area is expected to experience considerable population growth due to recently announced relocations of military personnel to Fort Benning. This should provide the department's and institution's programs with an expanded market for students. Many of the methods for program improvement cited for previous indicators will also play a role in improving the standing of the department's programs. Some of these include the plan to increase the number of faculty members, developing a student recruitment plan, increasing institutional support for instruction and research, and pursuit of accreditation for the department's undergraduate programs.

III K. This Program's Contribution to Achieving CSU's Mission

State your assessment of the strength of the evidence of program productivity on this indicator.

Above Average

- *List the substantive contributions this program makes to the achievement of CSU's published statement of institutional mission.*

The program serves the educational, cultural, and economic needs of the region by producing graduates who are prepared to enter the computing profession in various capacities. The program serves students who are seeking certification and licensure.

- *Describe methods to be pursued for program improvement.*

All the methods for program improvement cited for previous indicators will also enhance the program's contributions to the University's mission.

IV. Conclusion about the Program's Viability at CSU

The faculty of the TSYS Department of Computer Science has concluded that the Master Science in Applied Computer Science is viable. Support of the program should be increased to better serve the needs of the community.

V. Program Improvement Plan

Highlight the department's plans, priorities, and timetable for improving the program's quality and productivity if the program is judged to be viable.

The department has concluded that the program is viable. Plans for future improvements include:

- Increasing the number of graduate faculty members. The first addition is planned for fall 2006.
- Hiring a computer specialist by spring 2006.
- Offering two new foundations courses in fall 2006.

The following improvements are currently underway:

- Developing a student recruitment plan.
- Exploring the use of the ETS Major Field Test as a measure for graduating M.S. students.
- Increasing student involvement in research projects.
- Seeking additional institutional support for instruction and research.
- Having faculty who receive faculty development funding present their results.
- Expanding internship opportunities for students and faculty.
- Increasing the department level of grant and external funding.
- Encouraging faculty members to seize and create opportunities for campus and community involvement.
- Increasing efforts to make potential students more aware of the program through internet websites and dialogue with employers in the region.
- Supporting additional graduate assistants.
- Improving the delivery of online courses.

VI. Summary Recommendation

Highlight the department's recommendations, rationale, plans, and timetable for expanding, maintaining, reducing, or consolidating/discontinuing the program.

The department recommends expanding the Master Science in Applied Computer Science program due to its significant contribution to the institution's mission. There has been an increased awareness and emphasis on information technology and computing in the Columbus region. The TSYS Department of Computer Science is increasingly being expected to take a leadership role in these activities and provide expertise in these areas. The department should intensify its efforts to improve the program's faculty, curriculum,

and students. Resources should be applied to increase the quality of the Master of Science in Applied Computer Science programs and to increase enrollments to meet the needs of industry. More efforts need to be made to recruit and retain better students in the program.