

University of Central Missouri, M.S., Computer Science

Form OS: Off-Site Delivery of an Existing Program

Sponsoring Institution(s): University of Central Missouri

Program Title: Computer Science

Degree/Certificate: Master of Science

Institution Granting Degree: University of Central Missouri

Delivery Site(s): University of Central Missouri Central Summit Campus in Lee's Summit, Missouri

Mode of Program Delivery: Courses will be taught at the Central Summit Campus by direct instruction and/or ITV by computer science faculty from the Department of Mathematics and Computer Science at the University of Central Missouri.

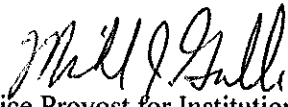
Geographic Location of Student Access: University of Central Missouri Central Summit Campus in Lee's Summit, Missouri, 850 NW Chipman Road, Door 54, Lee's Summit, MO 64063

CIP Classification: 11.0701

Implementation Date: Fall 2013

Cooperative Partners: None

AUTHORIZATION



Dr. Michael J. Grelle, Vice Provost for Institutional Effectiveness & Assessment

Name/Title of Institutional Officer Signature Date

Dr. Xiaodong Yue, yue@ucmo.edu, 660-543-4930

Person to Contact for More Information Telephone

Form SE: STUDENT ENROLLMENT PROJECTIONS

1. Need:

Student Demand:

Estimated enrollment each year for the first five years for full-time and part-time students (Please complete Form SE.)

Year	1	2	3	4	5
Full Time	5	10	15	20	20
Part Time	3	3	3	3	3
Total	8	13	18	23	23

According to the most recent Graduate Enrollment and Degrees report released in September 2012 by the Council of Graduate Schools [1], "At the master's level between fall 2010 and fall 2011, the largest increases in applications were in mathematics and computer sciences (19.3%), health sciences (14.6%), and engineering (14.0%)". "First-time, full-time graduate enrollment increased fastest in health sciences in fall 2011, with an 3.9% one-year increase, followed by mathematics and computer sciences (3.8%), and engineering (3.2%)". These figures show that Computer Science is a very popular and viable graduate program in the US and has a very strong, consistent and increasing student demand.

Specifically, the Kansas City area has many IT related companies. For example, Cerner alone will hire several hundred software engineers in the next several years. Since computer science is a fast changing discipline, with new technologies emerging almost every day, there is solid demand from many working professionals to advance their education and training without interrupting their full-time work. In fact, our master program frequently receives inquiries from prospective students who work full-time regarding whether they can take classes at the Central Summit Center to save their travelling times to Warrensburg. Furthermore, since Jackson County is one of UCM's 21 traditional service counties, as a comprehensive regional university with a statewide mission in applied sciences and technology programs, it is our mission to provide Missouri citizens in our service region more access to affordable graduate study in Computer Science within reasonable driving distance.

Will enrollment be capped in the future?

There is no expectation of a cap being needed on enrollment.

A. Market Demand:

National, state, regional, or local assessment of labor need for citizens with these skills

Computer Science is an applied science discipline. The Master of Science in Computer Science supports the goals of the University of Central Missouri's Mission statement to provide advanced graduate studies and research in areas of particular strength and need. Furthermore, the University of Central Missouri has a statewide mission in professional applied sciences and technology programs. Offering an M.S. in Computer Science advances our university's statewide mission.

The demand for quality employees in the field of computing remains strong. This trend is shown to be solid and still growing. The US Bureau of Labor Statistics provides the data illustrated in Table 1 regarding the top fastest growing career fields, requiring a bachelor's degree or higher, during the 2010-2020 time period. 4 out of the top 15 fastest growing occupations in the US through 2020 are computer related.

Table 1 - Fastest Growing Occupations in the United States that Require a Bachelor's Degree or Higher

#	Occupation	Employment		Percent * Change	Earnings
		2010	2020		
1	<u>Biomedical Engineers</u>	15,700	25,400	62%	\$ \$ \$ \$
2	<u>Meeting, Convention, and Event Planners</u>	71,600	102,900	44%	\$ \$ \$
3	<u>Interpreters and Translators</u>	58,400	83,100	42%	\$ \$ \$
4	<u>Market Research Analysts and Marketing Specialists</u>	282,700	399,300	41%	\$ \$ \$ \$
5	<u>Health Educators</u>	63,400	86,600	37%	\$ \$ \$
6	<u>Cost Estimators</u>	185,400	252,900	36%	\$ \$ \$ \$
7	<u>Geographers</u>	1,600	2,200	35%	\$ \$ \$ \$
8	<u>Software Developers, Systems Software</u>	392,300	519,400	32%	\$ \$ \$ \$
9	<u>Personal Financial Advisors</u>	206,800	273,200	32%	\$ \$ \$ \$
10	<u>Mental Health and Substance Abuse Social Workers</u>	126,100	165,600	31%	\$ \$ \$
11	<u>Database Administrators</u>	110,800	144,800	31%	\$ \$ \$ \$
12	<u>Athletic Trainers</u>	18,200	23,700	30%	\$ \$ \$
13	<u>Training and Development Specialists</u>	217,700	279,300	28%	\$ \$ \$
14	<u>Network and Computer Systems Administrators</u>	347,200	443,800	28%	\$ \$ \$ \$
15	<u>Software Developers, Applications</u>	520,800	664,500	28%	\$ \$ \$ \$

Source:

<http://www.careerinfonet.org/oview1.asp?next=oview1&Level=edu3&optstatus=&jobfam=&id=1&nodeid=3&socode=&stfips=&ShowAll=> (original source: Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections.)

According to the US Bureau of Labor Statistics 2006 Occupational Employment Statistics Survey, the St. Louis and Kansas City metropolitan areas are ranked 16th and 27th, respectively among 100 US metropolitan areas in terms of the number of employment in science and engineering occupations. The share of science and engineering employment in the workforce is 4.3% and 4.7% for St. Louis and Kansas City, respectively.

According to the Science and Engineering Indicators 2008 published by the National Science Board, the computer specialists share of the workforce in Missouri is 2.12% in 2006, which is the second largest among 16 neighboring states or states in the Midwest region.

The 2007 Missouri Job Vacancy Survey developed by the Missouri Department of Economic Development's Division of Workforce Development (DWD), and Missouri Economic Research and Information Center (MERIC) shows that 42% of METS (Mathematics, Engineering, Technology and Science) job vacancies in Missouri are in computer science. Let us consider the job vacancies in METS-related occupations with respect to different regions in Missouri. Occupations with the most vacancies in Kansas City and also in the Central region of Missouri are Computer Support Specialists. In St. Louis, Computer Systems Analysts have the third largest number of vacancies.

Finally, in a Missouri CBHE official document titled "Clarifying Comments on CBHE Policies and Procedures for the Review of Academic Program Proposals" [2], Computer Science belongs to one of the four categories identified as a field representing needs. In fact, Missouri employers cannot find enough computer science graduates to fill the vacancies. According to the Missouri Job Vacancy Survey mentioned above, employers indicated they had either "some" or "great difficulty" filling the opening for 47% of the vacancies in computer science or engineering disciplines. In other words, the current existing Computer Science programs cannot produce enough graduates to meet the workforce needs of our state.

B. Societal Need: General needs which are not directly related to employment

The computer industry is one of the fastest growing segments of our economy and that growth promises to continue. Today, computers are used in almost every aspect of our lives: from desktops at home and work to mainframe computers in government and industry to supercomputers expanding the frontiers of science and technology.

To maintain a competitive edge, industry and commerce must continue to make creative scientific and engineering advances as well as produce high quality products. More than ever, there is a demand for a prepared work force with the scientific and technical training necessary to perform effectively on the job.

Advances in computer technology are being made daily. These computing-related advancements continue to distribute themselves throughout the U.S. economy at great speed in the forms of computers, communications equipment, software, and other application products. These technological advancements continue to transform our economy, our society, and our day-to-day lives. Individuals are becoming reliant on these technologies as over 60 percent of the U.S. uses computers and over 50 percent use the Internet [3].

According to the Science and Engineering Indicators 2008 published by the National Science Board, Missouri only has 9.6 science and engineering graduate students per 1,000 individuals 25-34 years old in 2005. This places Missouri 12th among 16 neighboring states or states in the Midwest region.

According to the Educational Needs Index Project Sponsored by the Tennessee Higher Education Commission, 16 out of UCM's 21 service counties have educational needs index in the most critical or critical category.

According to the US Bureau of Census, the average poverty rate for the UCM service area is above the state figure, and the average median household income is significantly below the state figure. At the same time, a clear majority of UCM students are from our 21 service counties according to the most recent report released by the UCM Office of Institutional Research. As a comprehensive regional university with a statewide mission in applied sciences and technology programs, it is our mission to provide Missouri citizens in our own service region and/or beyond the access to affordable graduate study in Computer Science with reasonable cost and driving distance.

Table 2 – Average Percent of Poverty and Average Median Household Income

Area	Average Percent of Poverty (2007)	Average Median Household Income (2007)
UCM service area (21 counties)	14.9%	\$40,099
State of Missouri	13.3%	\$45,012

C. Methodology used to determine "B" and "C" above.

Data in this proposal is mainly derived from reliable Internet sources such as: National Science Foundation, Council of Graduate Schools, Department of Labor Bureau of Labor Statistics, Office of Employment Projections, Missouri Department of Economic Development, Missouri Economic Research and Information Center, Missouri Department of Higher Education, CIO Insight online and some professional journals. The specific references are listed at the end of this proposal.

2. Duplication and Collaboration: If similar programs currently exist in Missouri, what makes the proposed program necessary and/or distinct from the others at public institutions, area vocational technical schools, and private career schools? Does delivery of the program involve a collaborative effort with any external institution or organization? If yes, please complete Form CL.

Given the University of Central Missouri's statewide mission in applied sciences and technology programs, UCM is in some ways a natural home for the M.S. in Computer Science program. The following universities in Missouri are currently offering master programs in Computer Science. UM-Columbia, UMKC, UMSTL, MS&T, Northwest Missouri State University, Washington University, and Webster University. As our state's research campuses, the graduate programs in UMC, UMKC, UMSTL, MS&T and Washington University are mainly designed to train students in independent research skills and prepare them to continue on to doctoral programs in a specific emphasis area. Accordingly, all of their programs offer a thesis option which emphasizes independent research, and some of their programs offer two or three specific concentration areas (e.g., bioinformatics, networking/telecommunications, software engineering, etc.). On the other hand, our program is designed to produce senior computer professionals in the computer related industry, and its focus is on the application of technology to solve a variety of practical problems and to prepare students to enter a competitive job market by increasing their skills in high-demand areas and emerging technologies. It is not mainly designed to prepare students to

pursue a doctoral degree. Our curriculum is also generally based without a concentration area. Furthermore, our university's student population is quite different from these research campuses in terms of their career goals, academic preparations and/or geographic locations. As a result, there will not be duplication with these institutions.

Northwest Missouri State University's graduate program has a fixed 33 credit hour curriculum (no elective courses are available) while our program has an 18 credit hour core and 12 credit hours in electives which provides more flexibility for the students. As a result, there is no duplication with Northwest Missouri State University. Webster University offers a master program with emphasis in Distributed Systems. Since our curriculum is more generally based, there is no duplication with Webster University as well.

There is a geographical unbalance among locations of graduate Computer Science programs in Missouri (5 out of 7 programs are located in the eastern half of the state among which 3 programs are located in St. Louis). A clear majority of UCM students are from our traditional 21 service counties and are tied to this area by jobs and/or family responsibilities. Many of the students have circumstances which make going elsewhere to college impossible. The options available to them are largely determined by the options provided at UCM. Furthermore, there are family concerns requiring entry into the selected program as fast as feasible for financial reasons. This situation is further exacerbated by the continuing deteriorating economic conditions of the university's service region. As shown in Table 2 in Form SE, the average poverty rate for the UCM service area is above the state figure, and the average median household income is significantly below the state figure. Furthermore, according to the Educational Needs Index project sponsored by the Tennessee Higher Education Commission, 16 out of UCM's 21 service counties have educational needs index in the most critical or critical category. As a comprehensive regional university with a statewide mission in applied sciences and technology programs, it is our mission to provide Missouri citizens in our service region and/or beyond more access to affordable graduate study in Computer Science within reasonable driving distance.

Finally, Computer Science belongs to one of the four categories identified by the Missouri CBHE as a field representing needs [2] (<http://www.dhe.mo.gov/clarifyingcomments.shtml>). In fact, Missouri employers cannot find enough computer science graduates to fill the vacancies. According to the 2007 Missouri Job Vacancy Survey, developed by the Missouri Department of Economic Development's Division of Workforce Development and Missouri Economic Research and Information Center, employers indicated they had either "some" or "great difficulty" filling the opening for 47% of the vacancies in computer science or engineering disciplines. In other words, the current existing Computer Science programs cannot produce enough graduates to meet the workforce needs of our state. Off-site delivery of the M.S. in Computer Science at UCM's Summit Center should help expand and sustain a quality IT workforce in Missouri.

The current Computer Science faculty members are qualified and sufficient to handle the program. Delivering the program will not involve collaborative efforts with any external institution or organization.

Form FP: Financial Projections

Program Name: Master of Science in Computer Science

Date: October 2012

Student Preparation

- **Any special admissions procedures or student qualifications required for this program which exceed regular university admissions, standards, e.g., ACT score, completion of core curriculum, portfolio, personal interview, etc. Please note if no special preparation will be required.**

Students entering this program are expected to have an undergraduate major in a computing related discipline. Candidates must complete the Graduate Record Examination (GRE) with a minimum combined score of 291 in Verbal and Quantitative reasoning (1000 in old score scale).

- **Characteristics of a specific population to be served, if applicable.**

Students entering this program are expected to have an undergraduate major in a computing related discipline. This program is designed to produce senior computer professionals in the computer related industry, and its focus is on the application of technology to solve a variety of practical problems.

Faculty Characteristics

- **Any special requirements (degree status, training, etc.) for assignment of teaching for this degree/certificate.**

Ph.D. in Computer Science or a closely related field

- **Estimated percentage of credit hours that will be assigned to full time faculty. Please use the term "full time faculty" (and not FTE) in your descriptions here.**

All courses will be taught by full-time faculty

- **Expectations for professional activities, special student contact, teaching/learning innovation.**

Faculty teaching in this program will be expected to be professionally active, as evidenced by peer reviewed publications and/or externally funded grants. Faculty will also be expected to attend and/or present at professional meetings, participate in workshops/seminars in areas related to their specialties and be involved in other related professional activities (e.g. editor of a professional journal, referee for peer reviewed journals and conference proceedings, hold an office in a regional, national or international organization, etc.)

Besides class meeting times, faculty are required to hold regular office hours each week. Faculty advisers will have a high degree of interaction with the students who choose the master project option. Faculty are expected to continue improving their teaching by keeping up to date on material or pedagogy.

Enrollment Projections

- **Student FTE majoring in program by the end of five years.**

5 students

- **Percent of full time and part time enrollment by the end of five years.**

37.5% full time, 62.5% part time

Student and Program Outcomes

- **Number of graduates per annum at three and five years after implementation.**

Three years: 1, five years: 5

- **Special skills specific to the program.**

Graduates of this program will have special skills and advanced knowledge in algorithms and data structures, programming languages, database systems, operating systems, computer architecture, software engineering, computer networks and security, etc. Students will also be able to address the needs of society with a sense of professionalism and adapt to a dynamic multidisciplinary technological environment through teamwork, ethical concerns, and effective communication.

- **Proportion of students who will achieve licensing, certification, or registration.**

N/A

- **Performance on national and/or local assessments, e.g., percent of students scoring above the 50th percentile on normed tests; percent of students achieving minimal cut-scores on criterion-referenced tests. Include expected results on assessments of general education and on exit assessments in a particular discipline as well as the name of any nationally recognized assessments used.**

None available

- **Placement rates in related fields, in other fields, unemployed.**

95% in computing related fields, 5% in other fields, 0% unemployed

- **Transfer rates, continuous study.**

5% transfer rates, 5% continuous study in graduate school

Program Accreditation

- **Institutional plans for accreditation, if applicable, including accrediting agency and timeline. If there are no plans to seek specialized accreditation, please provide reasons.**

No accreditation body exists for this program at this time.

Alumni and Employer Survey

- **Expected satisfaction rates for alumni, including timing and method of surveys**

Around 90% satisfaction. A paper survey will be sent to graduates at periods of one and three years after their graduation to gauge how the program has prepared them for their careers. Data from the survey will be compiled and analyzed to improve the quality of the program. An electronic version of the survey will also be available on the department website. Graduating students will be given an exit interview with the Graduate Committee.

- **Expected satisfaction rates for employers, including timing and method of surveys**

Around 90% satisfaction. Surveys will be sent to employer(s) every summer. Data from the survey will be compiled and analyzed to improve the quality of the program. An electronic version of the survey will also be available on the department website.

Accreditation: If accreditation is not a goal for this program, provide a brief rationale for your decision. If the institution is seeking program accreditation, provide any additional information that supports your program.

No accreditation body exists for this program at this time.

Institutional Characteristics: Please describe succinctly why your institution is particularly well equipped or well suited to support the proposed program.

Founded as a teacher's college in 1871, the University of Central Missouri has maintained its commitment to excellent teaching. UCM has a statewide mission in applied sciences and technology programs. Our average class size is 23. UCM's six-month job-placement rate for undergraduates is 94 percent, and, reflecting our excellent financial support packages, our students benefit from one of the lowest student-debt ratios in the state. Publicly supported, richly diverse in our people and programs, UCM offers a remarkable educational experience. Of recent University of Central Missouri graduates:

- 90% were satisfied with the quality of education they received.
- 84% were satisfied with the quality of education in their major.
- 91% rated the practical experience in their courses as excellent or good.
- 89% indicated the quality of education they received at UCM increased their confidence in their knowledge and abilities.
- 85% rated the quality of academic advice they received from faculty as excellent or good.
- 86% felt faculty care about their academic success and welfare.
- 93% would recommend UCM to a family member or friend considering college.

5. Quality Assurance for Off-Site Programs:

General Oversight: Consistent with other off-campus programs at the University of Central Missouri, the M.S. in Computer Science degree will be jointly administered by the academic department and the School of Graduate and Extended Studies. The Department of Mathematics and Computer Science will be responsible for all matters related to the academic administration of the program, including course

selection and scheduling, and faculty selection. The School of Graduate and Extended Studies will provide administrative support that will rely on the administrative staff at the Central Summit Center.

Faculty Qualifications: Program courses will be taught face-to-face and/or through ITV by fulltime computer science faculty from the main campus at Warrensburg. The faculty qualifications can be found under the Faculty Characteristics Section in Form PG.

Support Services: The administrative staff at the Central Summit Center maintains a close working relationship with on-campus administrative and support programs. Consequently, the same level and quality of support services are available to students at the Summit Center as is available to on-campus students. In particular, the University of Central Missouri's Summit Center provides a variety of main campus services to the metropolitan students of the University, including a full-time Student Services Coordinator to assist both current and prospective students in the following services:

- Admissions
- Enrollment
- Liaison services with graduate advisors
- Programs of study

Courier

The Summit Center offers students and faculty a courier service that transports educational material between the Summit Center and the main campus in Warrensburg.

Textbooks

The Summit Center and the University Store have made it possible to purchase textbooks without having to travel to Warrensburg.

Library Services

The James C. Kirkpatrick Library offers students at the Summit Center many different services and resources.

Instructional Support

The Summit Center includes 26 multi-use classrooms. The Summit Center also offers:

- Three interactive television classrooms
- Video conference rooms
- Three computer labs
- Wireless Internet
- A student lounge
- A bookstore

6. Any Other Relevant Information: N/A

References

1. Jeffrey Allum, Nathan Bell and Robert Sowell, "Graduate Enrollment and Degrees: 2001 to 2011," Council of Graduate Schools, September 2012.
2. "Clarifying Comments on CBHE Policies and Procedures for the Review of Academic Program Proposals," Missouri Department of Higher Education, February 2003.
<http://www.dhe.mo.gov/clarifyingcomments.shtml>
3. Schwarzkopf, A.B., Mejias, R.J., Jasperson, J., Saunders, C.S. & Gruenwald, H, "Effective practices for IT skills staffing," Communications of the ACM, 47(1), January 2004.