

Fort Hays State University
Master of Science in Computer Science
Program Approval

I. General Information

A. Institution Fort Hays State University

B. Program Identification

Degree Level: Master's
Program Title: Computer Science
Degree to be Offered: Master of Science in Computer Science
Responsible Department or Unit: Department of Computer Science and Information Science Engineering
CIP Code: 11.0201
Modality: Online
Proposed Implementation Date: Fall 2022

Total Number of Semester Credit Hours for the Degree: 33 credit hours

II. Clinical Sites: Does this program require the use of Clinical Sites? No

III. Justification

A master's degree provides a career boost by enabling professionals to expand their expertise in the areas of data science, network security, software development, or artificial intelligence. Earning a Master's Degree in Computer Science provides a competitive edge over other candidates when searching for new employment. More than 850 full-time job listings at Google currently mention a master's degree as a preferred qualification. Employers typically expect computer and information research scientists to hold master's degrees at minimum. Our Master's Degree in Computer Science will focus on data science which is currently an area of high demand. (Google Careers, n.d.)

The FHSU Bachelor of Science in Computer Science has grown from 220 students in 2017 to 457 in 2020. Much of this growth has come from our online program, and with this growth has come requests for a master's program. Currently, the only Kansas university that offers a master's in Computer Science with the same CIP as our proposed program is Kansas State University (MSE in Software Engineering), although K-State, KU, and Wichita State offer MS in Computer Science with a different CIP, and K-State and WSU offer an MS in Electrical Engineering. Also, KU is in the process of KBOR approval for an M. Eng. Electrical Engineering & Computer Science. Since our program is online, it will be completely accessible to a large area of place-bound students with undergraduate credentials in computer science in our service region.

IV. Program Demand

A. Survey of Student Interest

Number of surveys administered:	386
Number of completed surveys returned:	147
Percentage of students interested in program: ...	68%

The survey was sent to 327 online students and 59 on-campus students in fall 2019. Eighty-eight online surveys were returned and 59 on-campus surveys were returned. Seventy-three percent of the online students replied that they are interested in a master’s program in Computer Science, and 25% indicated that they are possibly interested. Sixty-one percent of on-campus students indicated that they are interested in the program. Overall, 68% of all respondents indicated interest in pursuing a Master’s Degree in Computer Science. Another 16% replied that they might be interested in the program.

B. Market Analysis

According to the U.S. Department of Labor Bureau of Labor Statistics, the rate of growth in the computer and information technology field is expected to be 13 percent from 2016 – 2026, exceeding the growth rate of all other occupations. By that time, an additional 557,100 jobs will be added. On the supply side, there may be a shortage of 1.1 million workers globally in technology, media, and telecommunications industries, and this shortage could increase to 4.3 million by 2030 (National University, 2019).

The 2019 Hanover Research, Market Opportunity Scan identifies a Master’s Degree in Computer Science as high growth in student demand, labor demand, and overall growth. Seventeen Computer Science Master’s programs are available in the Plains states of which only one is offered online (Hanover, 2019).

Large companies rely on data analysis to make decisions. Algorithms used by companies such as Google, Amazon, and Facebook require large amounts of data to be analyzed efficiently. Data science provides the ability to collect, manage, and analyze data to create the algorithms. Because of the need for data scientists, the U.S. Bureau of Labor Statistics predicts an increase of about 28% in jobs in data science by 2026. (Zita, 2021)

LinkedIn named data scientist as the second fastest-growing job in 2017 (LinkedIn, 2017), and Glassdoor ranked data scientist as the best job in the United States in 2018 (Forbes, 2018). At the regional/state level, The Kansas Department of Labor identifies software developers and software quality assurance analysts and testers, computer system analysts, computer programmers, and other computer occupations as high demand, high wage occupations (Kansas Department of Labor, January 2021). Information specific to master’s degrees was not provided.

V. Projected Enrollment for the Initial Three Years of the Program

Year	Headcount Per Year		Sem Credit Hrs Per Year	
	Full- Time	Part- Time	Full- Time	Part- Time
Implementation	15	0	270	0
Year 2	30	0	495	0
Year 3	30	0	495	0

Enrollment projections are based on the available capacity of our courses if one new position is created to aid in the implementation of this program. Although some students will be part-time students, enrollment projections are stated as the equivalent of 15 or 30 full-time students enrolled in 9 credit hours of courses for three semesters and 6 credit hours for one semester.

VI. Employment

This program will reinforce knowledge and skills in software, digital storage and retrieval, networks, human-computer interaction, information security, digital design, and electronic media. Students will develop a high degree of specialization in data science, an important area of computer science that holds great growth potential

(see Market Analysis above).

A Master’s degree in Computer Science provides a graduate with the opportunity to advance his/her career within an organization and lead to higher earnings. Individuals with a master's degree in Computer Science earn significantly higher annual salaries than people who have a bachelor's degree. According to PayScale.com, professionals who had completed their Master's of Computer Science earned an average salary of \$103,179 as of March 2021, whereas those with a Bachelor's of Computer Science averaged \$86,095 per year at the same time period. (PayScale, n.d.)).

VII. Admission and Curriculum

A. Admission Criteria

Students must have completed a bachelor’s in Computer Science or a related field from a regionally accredited college or university and have earned a minimum GPA of 3.0 in the most recent 60 hours of undergraduate college credits. Students will complete the graduate school application for admission and provide a personal statement of interest, undergraduate transcripts, and a minimum of two recommendation letters. A student may enter the program in the spring or fall as required courses may be taken in either order.

B. Curriculum

Year 1: Fall

SCH = Semester Credit Hours

Course #	Course Name	SCH....
CSCI 601	Advanced Programming	3
CSCI 811	Advanced Database Management	3
CSCI 663	Introduction to Cryptography	3

Year 1: Spring

Course #	Course Name	SCH....
CSCI 831	Advanced Operating Systems	3
CSCI 841	Advanced Software Engineering	3
CSCI 612	Fundamentals of Research	3

Year 2: Fall

Course #	Course Name	SCH....
CSCI 896	Digital Image Processing	3
CSCI 866	Data Mining	3
CSCI 851	Advanced Data Structures	3

Year 2: Spring

Course #	Course Name	SCH....
CSCI 897	Project	6

Total Number of Semester Credit Hours [33]

VIII. Core Faculty

Note: * Next to Faculty Name Denotes Director of the Program, if applicable
 FTE: 1.0 FTE = Full-Time Equivalency Devoted to Program

Faculty Name	Rank	Highest Degree	Tenure Track Y/N	Academic Area of Specialization	FTE to Proposed Program
Hong Zeng	Professor	PhD	Y	Algorithm Design	0.2
Anas Hourani	Asst. Professor	PhD	Y	Machine Learning	0.2
Hussam Ghunaim	Asst. Professor	PhD	Y	Data Mining	0.2
Dr. Hieu Vu*	Asst. Professor	PhD	N	Cloud Computing	0.0
Pending hire	Asst. Professor	PhD	Y		0.2
New hire	Asst. Professor	PhD	Y		0.2

* Dr. Vu will continue to support the undergraduate program.

Number of graduate assistants assigned to this program **10**

IX. Expenditure and Funding Sources (List amounts in dollars. Provide explanations as necessary.)

A. EXPENDITURES	First FY	Second FY	Third FY
Personnel – Reassigned or Existing Positions			
Faculty	\$64,000	\$64,640	\$65,286
Administrators (other than instruction time)	\$0	\$0	\$0
Graduate Assistants	\$0	\$0	\$0
Support Staff for Administration (e.g., secretarial)	\$0	\$0	\$0
Fringe Benefits (total for all groups)	\$14,080	\$14,220	\$14,363
Other Personnel Costs	\$0	\$0	\$0
Total Existing Personnel Costs – Reassigned or Existing	\$78,080	\$78,860	\$79,649
Personnel – New Positions			
Faculty	\$16,000	\$16,160	\$16,322
Administrators (other than instruction time)	\$0	\$0	\$0
Graduate Assistants	\$0	\$0	\$0
Support Staff for Administration (e.g., secretarial)	\$0	\$0	\$0
Fringe Benefits (total for all groups)	\$3,520	\$3,555	\$3,591
Other Personnel Costs	\$0	\$0	\$0
Total Existing Personnel Costs – New Positions	\$19,520	\$19,715	\$19,913
Start-up Costs - One-Time Expenses			
Library/learning resources	\$0	\$0	\$0
Equipment/Technology	\$3,000	\$1,000	\$1000
Physical Facilities: Construction or Renovation	\$0	\$0	\$0
Other	\$0	\$0	\$0
Total Start-up Costs	\$3,000	\$1,000	\$1000

Operating Costs – Recurring Expenses			
Supplies/Expenses	\$1,000	\$1,000	\$1,000
Library/learning resources	\$0	\$0	\$0
Equipment/Technology	\$0	\$0	\$0
Travel			
Other	\$0	\$0	\$0
Total Operating Costs	\$2,500	\$2,500	\$2,500
GRAND TOTAL COSTS	\$103,100	\$102,075	\$103,062

B. FUNDING SOURCES <i>(projected as appropriate)</i>	Current	First FY (New)	Second FY (New)	Third FY (New)
Tuition / State Funds		\$80,609	\$147,782	\$147,782
Student Fees		\$0	\$0	\$0
Other Sources		\$0	\$0	\$0
GRAND TOTAL FUNDING		\$80,609	\$147,782	\$147,782
C. Projected Surplus/Deficit (+/-) (Grand Total Funding <i>minus</i> Grand Total Costs)		-\$22,491	\$45,707	\$44,720

X. Expenditures and Funding Sources Explanations

A. Expenditures

Personnel – Reassigned or Existing Positions

Personnel expenditures are based on 1.0 FTE among five faculty members. Five graduate courses will be taught by these faculty members each semester.

This proposal is part of the undergraduate expansion proposal. The remaining .8 FTE for each faculty member will be dedicated to undergraduate offerings and development of master's courses. The undergraduate expansion proposal includes the addition of two faculty members to the existing four full-time faculty members, Dr. Zeng, Dr. Hourani, Dr. Ghunaim, and Dr. Vu.

Personnel – New Positions

One new position in addition to the pending hire will be added with 0.2 FTE dedicated to this program. The addition of one position with a 0.8 undergraduate/0.2 graduate split in responsibilities will allow for the other four faculty members to each dedicate 0.2 FTE to the master's program.

Start-up Costs – One-Time Expenses

The only anticipated start-up costs involve the purchase of licenses for software.

Operating Costs – Recurring Expenses

Money identified in recurring costs will contribute to the purchasing of office supplies and normal operating expenses. Administrative support is currently provided by the department's senior administrative assistant, and she will be assisted by the student secretary for the Department of Mathematics. Faculty development costs are included in Travel.

B. Revenue: Funding Sources

Revenue will be generated through online graduate tuition and fees at \$298.55 per credit hour for 15 students taking eighteen hours per year for the first year, and 15 second-year students taking 15 hours and 15 first-year students taking 18 hours the second year and the third year. The projected increase in SCH is expected to provide funding needed to support the master's program after the first year as shown in Section IX.

C. Projected Surplus/Deficit

Assuming the program attracts the equivalent of 15 new full-time students each year, a deficit of \$22,491 is expected the first year, a surplus of \$45,707 is expected the second year, and a surplus of \$44,720 is expected the third year. The program would break even in Year 1 with 20 full-time (18 graduate credit hours per year) students.

XI. References

Bureau of Labor Statistics, U.S. Department of Labor. (n.d.). Occupational Outlook Handbook.

<https://www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm>

Forbes. (January 29, 2018). *Data Scientist is the Best Job in America According to Glassdoor's Rankings*.

<https://www.forbes.com/sites/louiscolombus/2018/01/29/data-scientist-is-the-best-job-in-america-according-glassdoors-2018-rankings/?sh=24fceb6d5535>

Google Careers. (n.d.).

https://careers.google.com/jobs/results/?company=Google&company=YouTube°ree=MASTERS&distance=50&employment_type=FULL_TIME&hl=en_US&jlo=en_US&q=master%27s%20degree&sort_by=relevance

Hanover Research Group. (2019). *Market Opportunity Scan: Bachelor's and Master's Degree Programs*. Report prepared for Fort Hays State University.

Kansas Department of Labor. (January 2021). <https://klic.dol.ks.gov/gsipub/index.asp?docid=403>

LinkedIn. (December 7, 2017). *The Fastest-Growing Jobs in the U.S. Based on LinkedIn Data*.

<https://blog.linkedin.com/2017/december/7/the-fastest-growing-jobs-in-the-u-s-based-on-linkedin-data>

National University. (2019). *Are Computer Science Jobs in Demand?* <https://www.nu.edu/resources/are-computer-science-jobs-in-demand/>

PayScale. (n.d.). payscale.com

Zita, Christopher. (January 26, 2021). *Is Data Science Still a Rising Career in 2021?*

<https://towardsdatascience.com/is-data-science-still-a-rising-career-in-2021-722281f7074c>