WSU Five-Year Graduate Program Review
Self-Study

Cover Page

Department/Program: Master of Science in Computer Science

Semester Submitted: Fall 2023

Self-Study Team Chair: Robert Ball

Self-Study Team Members: Robert Ball, Brian Ragué

Information Regarding Current Review Team Members:

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A. Brief Introductory Statement

Administration: Dr. Robert Ball and Dr. Brian Rague proposed the Master of Science in Computer Science (MSCS) in 2017. Dr. Ball was appointed as Graduate Director by The College of Engineering, Applied Science & Technology (EAST) Dean Dr. David Ferro effective July 2018. Dr. Ball continues to serve as the Graduate Director of MSCS.

Organization: The Master of Science in Computer Science (MSCS) is located in the School of Computing, a department within the College of EAST Although the Dean's office in EAST administers and oversees all Masters/graduate programs in the college, management and operations reside with individual departments, as is the case with MSCS, which is one of many programs under the School of Computing. In addition to the MSCS, the School of Computing also administers an AAS in Computer Science, BS in Computer Science, BS in Computer Science Teaching, minor in Computer Science, minor in Computer Science Teaching, post baccalaureate certificate in Computer Data Science and Machine Learning, as well as several certificates. The school also offers several other computing-related degrees such as several Web and User Experience (Web/UX) degrees (AAS, BS, and BIS) and Cybersecurity and Network Management degrees (AAS, BS, and BIS).

The School of Computing consists of 35 full-time faculty and 17 adjunct faculty. For the MSCS, fifteen of those full-time faculty support the program by teaching and/or being thesis advisors for the students:

- Dr. Abdulmalek Al-Gahmi
- Dr. Noel Alton
- Dr. Nicole Anderson
- Dr. Robert Ball
- Dr. Arpit Christi
- Dr. Kyle Feuz
- Dr. Richard Fry
- Dr. Nils Murrugarra-Llerena
- Dr. Matthew Paulson
- Dr. Brad Peterson
- Dr. Brian Rague

- Dr. Meher Shaikh
- Dr. Hugo Valle
- Dr. Yong Zhang
- Dr. Dylan Zwick

The MSCS program offers day classes at Ogden campus and evening classes at Davis campus. In general, most classes are offered face-to-face with a few sections of hybrid and online classes offered as needed.

The MSCS program is designed to help professionals advance in their respective careers. It has served predominantly as a professional degree with only one known graduate continuing on to earn a Ph.D since the inception of the program.

MSCS students fall into three primary categories:

- Full-time working students. These students fund their education along a range from paying their own tuition to being reimbursed for their tuition by their employer. This distribution is always in flux. These students represent approximately 2/3 of the enrollments in the program.
- Palace Acquire (PAQ) students. These students work at Hill AFB and must work for Hill AFB for at least one year before being accepted into the PAQ program. These students are then given three semesters in which they are paid by the US Air Force to go to school. During this three-semester period, the students are allowed to dedicate full-time to their studies. After they finish the program, they are then committed to working for the US Air Force for another three years. These students represent approximately 1/3 of the enrollments in the program.
- Non-working or part-time students. These students either do not work or work only part-time and focus most of their time on their studies. These students are considered “traditional graduate students” and make up a very small percentage of the enrollments in the program.

One area of ongoing frustration is that of class scheduling. No matter how many times we ask students about their scheduling preferences for classes it appears to differ the next semester. If we had infinite resources then we would offer a section of every course offered in the morning, midday, evening, and online. However, with finite resources, we cannot offer all the scheduling preferences that students desire. As the saying goes, “When you try to make everyone happy, no one is.”

The Department responds to workforce needs by having two Industry Advisory Council (IAC) meetings per year – one in the Fall and one in the Spring. The Fall meetings are smaller meetings based on topics (e.g., embedded systems, web and mobile development, security, data science, etc.). The Spring meeting is a large meeting where all the committee members come together. The IAC gives general direction and insight into what courses and topics should be taught as well as what should be removed from the curriculum.

In general, the IAC is an amazing assessment tool for validating what we do correctly and what we need to change. However, like all assessment tools, it cannot be the only metric that we use, mainly because the different committee members have different requirements due to the diverse nature of Computer Science. For instance, most committee members agree that Github should be taught and used. However, only a handful of members view any particular CS topic as essential to the curriculum. Due to the nature of Computer Science, there is no graduate course that all potential employers agree on as vital to the success of the student.

We offer two main routes: (1) thesis and project options or (2) course-work option.

The thesis-based option is based on a research question and hypothesis and adheres to the scientific method. The project option follows a more professionally oriented proposal. From the student's perspective, the thesis-option can be thought of as "I would like to learn more about research and contribute to the research community." From the student's perspective, the project-option can be thought of as "I see an interesting technology that I would like to gain experience doing."

In general, the thesis and project options are very similar. They both have the following elements:

- Thesis/project advisor: A full-time faculty member in the School of Computing with a terminal degree (e.g., Ph.D.). The student and the advisor meet often – usually once a week – to discuss the direction of the thesis/project and report on progress.
- A committee that consists of the thesis/project advisor plus two others. The requirements for the other two committee members are as follows:
    - One must be a full-time faculty member in the School of Computing with a terminal degree (e.g., Ph.D.).
    - The other person can either be a full-time faculty member in the School of Computing with a terminal degree (e.g., Ph.D.) or be considered an exception, such as a full-time faculty member without a terminal degree (e.g., M.S.) or from outside the department or university. All exceptions must be vetted and approved by the graduate director.

The coursework-only option exists primarily for competitive reasons. Students often look for the easiest route. If no university offers the coursework-only option, then students must complete the thesis option because it is the only option that exists. However, as time has passed more and more universities have offered the coursework-only option. As a result, the MSCS program also offers the coursework-only option to stay competitive with other similar university programs.

B. Mission Statement
    a. Description of Program Mission

The mission of the Master of Science Program in Computer Science, in adherence to the core themes of the mission of Weber State University, is to provide students with a high-quality graduate-level education in Computer Science. This education, which emphasizes advanced computer science principles coupled with hands-on experience, enables students to make significant contributions to society as professionals. The program stresses design and problem-solving using math, science and advanced computer science principles.

    b. Brief discussion of the alignment of the program mission with the mission, core themes, and strategic plans of Weber State University
    (see http://weber.edu/universityplanning/Mission_and_core_themes.html)

Weber State University Mission:
Weber State University provides transformative educational experiences for students of all identities and backgrounds through meaningful personal connections with faculty and staff in and out of the classroom. The university promotes student achievement, equity and inclusion, and vibrant community relationships through multiple credentials and degree pathways, experiential learning, research, civic engagement, and stewardship.

Vision:
Weber State University will be a leader in transforming lives by meeting all students where they are, challenging and guiding them to achieve their goals academically and in life.

Values

Weber State University values:

- EVERY INDIVIDUAL
  - Embracing all identities through the promotion of belonging, creativity, uniqueness, and self-expression;
- COLLECTIVE EXCELLENCE
  - Fostering achievement and transparency in learning and discovery through collaboration; and
- TRANSFORMATIVE EXPERIENCES
  - Nurturing success through engaging, supportive, and personalized opportunities in a rapidly changing world.

Weber State University's Core Themes Model identifies three key themes through which the institution's mission is defined and measured: access, learning, and community.

1. Access

Application to the MSCS program is encouraged and available to all who possess a bachelor's degree or be in the final stage of completing the degree. Admission to the Master of Science in Computer Science (MSCS) is selective to screen for potential student success in the program, to ensure the integrity of the classroom experience, and to prepare graduates for leadership positions in their professional careers. MSCS tuition is among the most competitive in the region, which is reflected in the total tuition cost for the degree. The MSCS admission process requires a 3.25 GPA to reflect the higher standard that it holds its students.

2. Learning

The WSU core theme of learning emphasizes student engagement, support, success, and inquiry.
Student engagement. The class sizes of the MSCS are small enough that students are able to engage in meaningful exchanges with both faculty and peers, which is further facilitated by the extensive use of online discussions outside of class.
Student support. In exit interviews, MSCS students consistently praise the level of support provided by the MSCS Program staff and the caring nature of a majority of the graduate faculty.
Student Success. Overall program assessment results indicate success in the attainment of program learning outcomes, as measured by course-embedded assessments.

Inquiry. MSCS faculty are considered scholarly academics, which entails an active research agenda, peer-reviewed publications, grants, outside contracts, and other scholarly contributions (presentations, etc.) as well as excellence in teaching.

3. Community

The MSCS Program engages with the community of northern Utah by contributing to economic development through its curricular innovations to enhance the region's workforce skills, particularly in the aerospace industry at Hill AFB. In addition, as mentioned above, the MSCS Program regularly meets with industry advisors to assess every Fall and Spring how well the program is performing and future emphases and direction.

C. Program and Curriculum

a. Program Description

i. Include all admission, retention, and degree requirements. Include GPA, standardized test scores, English language proficiency requirements, etc.
(Alternatively, include a link to the online catalog or website that provides this information)

The following information can be found at the following link:
https://catalog.weber.edu/preview_program.php?catoid=22&poid=11233

Grade Requirements: An MSCS student must complete all program courses, including electives, with a grade of "B-" or higher. In addition, the overall program GPA must be 3.0 or higher.
Credit Hour Requirements: The program requires a minimum of 30 semester hours beyond a bachelor's degree in computer science.

Admissions Requirements
Applicants for admission into the Master of Science in Computer Science program must possess a bachelor's degree or be in the final stage of completing the degree. An overall GPA of 3.25 is required from the undergraduate program in which the bachelor's degree is earned.
Applicants will submit:

- Completed application.

- Current resume.
- Official transcripts from every institution of higher education attended.
- Scores from the GRE. NOTE: Individuals who have already completed a graduate-level program and are well into established careers in a related field may be admitted without the GRE requirement, based on admission committee approval.
- Contact information for three references, at least one from a professional context and one from an academic context.

Additional Admission Requirements for International Students
All international students and any applicant educated outside the U.S. must demonstrate proficiency in English. Those whose native language is not English, or whose language of instruction for their undergraduate degree was not English, will be required to submit a score from the Test of English as a Foreign Language (TOEFL) or International Language Testing System (IELTS) which is not more than two years old. Applicants are required to have an internet-based TOEFL score of 79-80 or a minimum IELTS score of 6.0.

Application
The application for admission to the Master of Science in Computer Science program must be submitted online. Official transcripts from each institution of higher education attended and all test scores must be sent directly to the WSU School of Computing.
Deadlines for application are October 15, for students enrolling in spring semester and March 15, for students enrolling in fall semester. Completed applications are considered by the Admissions Committee after each application deadline.

ii. List the program level learning outcomes

The following information can be found at the following link:
https://catalog.weber.edu/preview_program.php?catoid=22&poid=11233

Program Learning Outcomes

- Demonstrate the ability to apply knowledge of math, science and engineering.
- Demonstrate the ability to design a system, component or process.
- Demonstrate the ability to identify, formulate and solve computer science problems.
- Demonstrate the ability to apply master's level knowledge to the specialized area of computer science.

- Include a list of course titles and numbers (combine ii and iii in a curriculum-grid like chart, see example – Curriculum map on next page)

  The following are the MSCS title and number:
  - CS 6000 (Fundamentals of Graduate Studies)
  - CS 6010 (Design Project)
  - CS 6011 (Thesis Research)
  - CS 6100 (Distributed Operating Systems)
  - CS 6200 (The Internet of Things)
  - CS 6420 (Advanced Algorithms)
  - CS 6450 (Software Evolution and Maintenance)
  - CS 6500 (Advanced Artificial Intelligence)
  - CS 6550 (Advanced Database Management Systems)
  - CS 6570 (Data Science Algorithms I)
  - CS 6580 (Advanced Data Science Algorithms and Visualization)
  - CS 6600 (Machine Learning)
  - CS 6610 (Computer Architecture)
  - CS 6650 (Interaction Design)
  - CS 6700 (Deep Learning Theory)
  - CS 6705 (Applied Cloud Computing)
  - CS 6710 (Software Testing)
  - CS 6720 (Program Debugging and Repair)
  - CS 6820 (Compiler Design)
  - CS 6740 (Computer Systems Security)

- CS 6830 (Special Topics in Computer Science)
- CS 6840 (Formal System Design)
- CS 6850 (Parallel Programming and Architecture)

iii. Web address for WSU catalog page AND any program webpages which provide a description of the program's curriculum, degree requirements, and course descriptions.

The general catalog page: https://catalog.weber.edu/preview_program.php?catoid=22&poid=11233

Curriculum Map

Core Courses in Department/Program	Department/Program Learning Outcomes			
	Demonstrate the ability to apply knowledge of math, science and engineering	Demonstrate the ability to design a system, component, or process	Demonstrate the ability to identify, formulate and solve computer science problems	Demonstrate the ability to apply master's level knowledge to the specialized area of computer science
CS 6000 (Fundamentals of Graduate Studies)				
CS 6010 (Design Project)	A	A	A	A
CS 6011 (Thesis Research)	A	A	A	A
CS 6100 (Distributed Operating Systems)	A	A	E	E
CS 6200 (The Internet of Things)	U	U		E
CS 6420 (Advanced Algorithms)	A		A	A
CS 6450 (Software Evolution and Maintenance)			A	E
CS 6500 (Advanced Artificial Intelligence)	U			
CS 6550 (Advanced Database Management Systems)		U		
CS 6570 (Data Science Algorithms I)	U	U		
CS 6580 (Advanced Data Science Algorithms and Visualization)	U	U		

CS 6600 (Machine Learning)	A			
CS 6610 (Computer Architecture)	U	A	U	
CS 6650 (Interaction Design)				
CS 6700 (Deep Learning Theory)	A			E
CS 6705 (Applied Cloud Computing)	U		U	U
CS 6710 (Software Testing)		U	A	E
CS 6720 (Program Debugging and Repair)		U	A	E
CS 6820 (Compiler Design)	A	A	A	A
CS 6740 (Computer Systems Security)	U		E	E
CS 6830 (Special Topics in Computer Science)				
CS 6840 (Formal System Design)	U	A	A	A
CS 6850 (Parallel Programming and Architecture)	U	A	E	A

Note: E = Emphasized, U = Utilized, A = Assessed Comprehensively

b. Evidence of ongoing demand for the program

Please provide data on the last five academic years on admissions, enrollments, and degrees awarded:

In order to provide consistent data that conforms to the format for reporting to the Utah Board of Regents, some data will be provided by the Office of Institutional Effectiveness. Contact that office at extension 8586 for assistance.

NOTES:

1. The IR data above is collected in a manner that may not match departmental data on enrollment.
2. An applicant may be enrolled, but not matriculated if they are limited to 5000-level courses

ii.

Academic Year	New applications	Admitted Applicants	Selectivity (%)	Applicants Enrolled	Yield (%)	Total Matriculated Students [IR]	Matriculated Domestic Students	Matriculated International Students [IR]	Number of Graduates (Sum, Fall, Spr) [IR]
2022-23	19	18	94%	15	83%	15	14	1	3
2021-22	15	12	80%	8	67%	8	8	0	6
2020-21	17	14	82%	11	78%	11	10	1	7
2019-20	21	19	90%	15	71%	15	15	0	12
2018-19	5	5	100%	4	80%	4	4	0	3

iii. Enrollment History:

Academic Year	Number of Majors
2022-23	15
2021-22	8
2020-21	11
2019-20	15
2018-19	4

Academic Year	Faculty/Student ratios across program curr.	Average class size
2022-23	0.33	15
2021-22	0.5	8
2020-21	0.27	11
2019-20	0.2	15
2018-19	0.75	4

iv. Average time to degree completion (months): __18/24_(see below)_____

(Note: If the program has different timeline options, please explain this in your narrative and organize your data based on the different options/tracks.)

PAQ (Palace Acquire) students are required to finish their degree by the US military in 3 semester, making their average 18 months.

Non-PAQ students do not have any such requirement and usually finish their degree in 24 months (4 semesters).

v. Enrollment projections – briefly describe enrollment patterns and factors influencing demand for the degree. (Note: programs are not expected to project an exact number of expected students, but rather a qualitative assessment of potential opportunities and/or threats to enrollment as well as any strategies for maximizing opportunities and managing threats.).

Predicting the future is a very difficult thing and is usually based on past behavior. If we continue to have the same level of support in marketing, then we anticipate the same level of enrollment in the future. However, if other factors change then enrollment will change. For example, if our level of marketing increases then we foresee an increase in enrollment. Also, if we offer a totally online offering then we also anticipate that enrollment will increase.

c. Student profile

i. Please provide information on the entering class for each of the past 5 years:

Entering Class	Ave. GRE	Ave. GMAT	Ave. GPA	Ave. Age (years)	Ave. Relevant Work Experience (months) (optional)
2022-23	n/a	n/a	3.34	32	
2021-22	n/a	n/a	3.70	30	
2020-21	n/a	n/a	3.66	30	
2019-20	n/a	n/a	3.30	32	
2018-19	n/a	n/a	3.75	35	

NOTE: The GRE was dropped as a requirement and the GMAT was never required.

ii. Success rate of your students' post-graduation regarding employment and/or further graduate education. Add narrative if desired.

Graduating Class	# of Graduates (A)	# of Graduates Employed in Field (B)	# of Graduates in Add'l Graduate Program (C)	# of Graduates with unknown status	Placement Rate (B+C)/A
2022-23	3	3	0		100%
2021-22	6	6	0		100%
2020-21	7	7	0		100%
2019-20	12	11	1		100%
2018-19	3	3	0		100%

Note: This is not a mistake. All our MSCS students either had a job upon graduation or the one exception that went on to get his Ph.D. Also note that close to 100% of students had a job upon starting the MSCS program.

iii. List the most common career fields represented among your students (optional):

The most common career field is that of direct or indirect support of the local military aerospace industry, particularly at Hill AFB. Aside from the military, student careers are as diverse as the field of computer science itself. Computer science can be found in every industry, from oil refining to medical disciplines, manufacturing to the humanities and arts.

iv. Does your program provide career placement services: Describe:

Yes, but they are seldomly (only once to our knowledge) used by our MSCS students. The college (EAST) has career placement services, but so few of our students are seeking jobs when they graduate that they hardly use the services. As explained above, almost all our students either work for the military full time or already have full-time employment locally.

Summary Information (as needed)

D. Student Learning Outcomes and Assessment

Measureable Learning Outcomes

Student outcomes for this program will be consistent with those required for ABET accreditation, which includes:

- a demonstrated ability to apply knowledge of math, science and engineering
- a demonstrated ability to design a system, component or process
- a demonstrated ability to identify, formulate and solve engineering problems.

An additional criterion specific to graduate programs is that students demonstrate an ability to apply master's level knowledge to the specialized area of computer science. Students will be required to maintain a reasonably high level of performance while enrolled in the program. Students must achieve a B- or better in all required classes for the MS degree and graduate with a GPA of 3.2 or higher. Students must also satisfactorily pass a defense of their MS project or thesis.

Assessment of Graduating Students

Please provide a brief narrative describing the assessment processes for graduating students.

Following PPM 3.4.4 (https://www.weber.edu/ppm/Policies/11-1_GraduatePrograms.html), all MSCS students must have a thesis or non-thesis degree option.

Students that follow the thesis or project track are required to be assessed by a rigorous process of proposing their thesis or project to a committee with a formal presentation and paper. Next, the student does the work – usually meeting regularly with an advisor on a weekly (or similar) basis. At the conclusion of the work the student then writes a written report (usually between 40 – 120 pages), and makes a formal presentation to their committee. This constitutes 6 semester credits of research.

For students that follow the course-work option, they are required to take a course that includes a major project, paper, and presentation.

Summary Information (as needed)

Evidence of Learning: Courses within the Program (replicate as needed or place in appendix)

Evidence of Learning: Courses within the Program					
Measurable Learning Outcome Students will…	Method of Measurement Direct and Indirect Measures*	Threshold for Evidence of Student Learning	Findings Linked to Learning Outcomes	Interpretation of Findings	Action Plan/Use of Results
Learning Outcome 1.A: Demonstrate the ability to apply knowledge of math, science and engineering.	Measure 1: This is applied in multiple courses (see the curriculum map table). All courses require projects and exams to assess how well students have learned the material.	Measure 1: Students must pass the projects and exams in order to pass the respective courses with a grade of B- or higher.	Measure 1: Looking at all the matriculated students for the first three years of the program, we have a 67% graduation rate. (The last two years are not included because students are still graduating from those years.)	Measure 1: In one sense, we are not just letting students pass simply because they are admitted into the program. From a different perspective, the mapping from exams, projects, courses to graduation is much bigger than simply passing or failing. Of the 1/3 of the students that are matriculated, only some of them do not graduate because of program content, delivery, and material. Many of these students drop out because they get other jobs, find the material too rigorous, or do not explain their reasoning for withdrawal, but simply never come back.	Measure 1: We have begun surveys to ask students what motivates them, when classes should be taught, what they expect the rigor of the courses to be, etc.
Learning Outcome 2.A: Demonstrate the ability to design a	Measure 1: This is applied in multiple courses (see the	Measure 1: Students must pass the projects and exams in order to pass the	Measure 1: Looking at all the matriculated students for the first three years	Measure 1: In one sense, we are not just letting students pass simply because they are admitted into the program. From a different perspective, the mapping from	Measure 1: We have begun surveys to ask students what motivates them, when classes should be taught,

system, component or process	curriculum map table). All courses require projects and exams to assess how well students have learned the material.	respective courses with a grade of B- or higher.	of the program, we have a 67% graduation rate. (The last two years are not included because students are still graduating from those years.)	exams, projects, courses to graduation is much bigger than simply passing or failing. Of the 1/3 of the students that are matriculated, only some of them do not graduate because of program content, delivery, and material. Many of these students drop out because they get other jobs, find the material too rigorous, or do not explain their reasoning for withdrawal, but simply never come back.	what they expect the rigor of the courses to be, etc.
Learning Outcome 2.A: Demonstrate the ability to identify, formulate and solve computer science problems.	Measure 1: This is applied in multiple courses (see the curriculum map table). All courses require projects and exams to assess how well students have learned the material.	Measure 1: Students must pass the projects and exams in order to pass the respective courses with a grade of B- or higher.	Measure 1: Looking at all the matriculated students for the first three years of the program, we have a 67% graduation rate. (The last two years are not included because students are still graduating from those years.)	Measure 1: In one sense, we are not just letting students pass simply because they are admitted into the program. From a different perspective, the mapping from exams, projects, courses to graduation is much bigger than simply passing or failing. Of the 1/3 of the students that are matriculated, only some of them do not graduate because of program content, delivery, and material. Many of these students drop out because they get other jobs, find the material too rigorous, or do not explain their reasoning for withdrawal, but simply never come back.	Measure 1: We have begun surveys to ask students what motivates them, when classes should be taught, what they expect the rigor of the courses to be, etc.
Learning Outcome 2.A:			Measure 1: Pass/fail.	Measure 1: In order to pass a thesis/project, a student must meet	Measure 1: (Ex. Faculty agree to include review of transfer

	Measure 1: Thesis or project	Measure 1: Pass/Fail for thesis or project	Students must repeat until they pass.	the (subjective) requirements of his or her committee.	in all related courses; this outcome will be reassessed during next review
Demonstrate the ability to apply master's level knowledge to the specialized area of computer science	Measure 2: Create a formal report and presentation on a particular CS subject	Measure 2: A formal grade from CS 6000	Measure 2: Students are taught how to do formal citations, reference papers, etc. CS 6000 was created because we found that students were not prepared for research investigations from their BS experience.	Measure 2: CS 6000 prepares students for research. Before we created CS 6000 we found that students were insufficiently prepared to write a formal thesis, which put the onus on the thesis advisors.	Measure 2: We are evaluating the effectiveness of CS 6000 at this time. It is currently a 1-credit class. Should it be a two or three credit class to better reflect the needs of the students?

*At least one measure per objective must be a direct measure. Indirect measures may be used to supplement evidence provided via the direct measures.

Summary Information (as needed)

Evidence of Learning: High Impact or Service Learning (if applicable)

The following courses are mentioned are the core courses for either the thesis/project tracks or the coursework-only option:

Courses	HIEE 1: Graduate research	HIEE 2: Mentored Literature review	HIEE 3: Capstone course or experience	HIEE 4: Project-based learning
CS 6010 (Design Project)	X	X		
CS 6011 (Thesis Research)	X	X		
CS 6450 (Software Evolution and Maintenance)			X	
CS 6820 (Compiler Design)				X
CS 6610 (Computer Architecture)				X
CS 6420 (Advanced Algorithms)				X

*At least one measure per objective must be a direct measure. Indirect measures may be used to supplement evidence provided via the direct measures.

Summary Information (as needed)

E. Academic Advising

Advising Strategy and Process

The MSCS program is committed to helping new MSCS students get the best start possible in the program. All new MSCS students are required to come to an orientation session to help them understand the requirements of the program. In addition, personal advising is available to all students by the program director and the enrollment director. Advising and guidance is integrated into CS 6000 – Fundamentals of Graduate Studies, which is a requirement for the program and introduces students in graduate programs in the College of Engineering, Applied Science, and Technology to the expectations and prospects of graduate study

Effectiveness of Advising

The goal of advising in the WSU MSCS program is to create a connection and a sense of belonging for each individual student as early as possible. Some students will need more advising than others but knowing that an advisor is available at any time during a student's studies is paramount.

Advising MSCS students in an appropriate, precise and timely manner is the key to an effective start. Some students have an unrealistic idea regarding how much time it will take to complete the MSCS program. Honesty about program rigor from the advisor helps students register for the right amount of credit hours in relationship to other obligations in their lives and can save much time and money for the student.

Past Changes and Future Recommendations

Recent changes to the advising process have been minimal due to the effectiveness of the process. For those who inquire about the program by email or over the phone, the adviser makes every attempt to invite the person to meet individually. Once an admission decision has been made for an individual applicant, the adviser contacts students with a follow-up email.

F. Faculty and Teaching

a. Describe the minimum qualifications required of graduate faculty (e.g., degree, professional experience):

Faculty who are assigned to teach courses in the MSCS Program are considered qualified under the following guidelines that are in alignment with ABET. All MSCS faculty are categorized as Scholarly Academics or Instructional Practitioners.

Scholarly Academics (SA) – In order to qualify for SA, a faculty member will normally have a Ph.D. or terminal degree related to their area of teaching. Within the most recent

five-year period, the SA faculty member will actively publish in relevant journal articles or conferences.

Instructional Practitioners (IP) – In order to qualify for IP, a faculty member will normally have a Ph.D. or terminal degree related to their area of teaching. Within the most recent five-year period, the IP faculty member will demonstrate currency in their field as evidenced by professional activities.

b. Faculty Demographic Information – list all faculty who teach in the program:

Name	Home Dept	Title/Qual	Type (tenure, tenure track, contract or adjunct)	Gender	Ethnicity
Dr. Abdulmalek Al-Gahmi	School of Computing	Associate Professor	Tenured	M	Caucasian/Middle eastern
Dr. Noel Alton	School of Computing	Assistant Professor	Tenure track	F	White/Non-Hispanic
Dr. Nicole Anderson	School of Computing	Associate Professor	Tenured	F	White
Dr. Robert Ball	School of Computing	Associate Professor	Tenured	M	White
Dr. Arpit Christi	School of Computing	Assistant Professor	Tenure track	M	Asian
Dr. Kyle Feuz	School of Computing	Associate Professor	Tenured	M	White
Dr. Richard Fry	School of Computing	Professor	Tenured	M	Caucasian/White
Dr. Nils Murrugarra-Llerena	School of Computing	Assistant Professor	Tenure track	M	Latin
Dr. Matthew Paulson	School of Computing	Assistant Professor	Tenure track	M	White
Dr. Brad Peterson	School of Computing	Associate Professor	Tenured	M	Caucasian/White
Dr. Brian Rague	School of Computing	Professor	Tenured	M	Caucasian
Dr. Meher Shaikh	School of Computing	Assistant Professor	Tenure track	F	Asian
Dr. Hugo Valle	School of Computing	Associate Professor	Tenured	M	Hispanic

Dr. Yong Zhang	School of Computing	Professor	Tenured	M	Asian
Dr. Dylan Zwick	School of Computing	Assistant Professor	Tenure track	M	Caucasian/White

c.

i. Percentage of graduate courses and/or credits taught:

	# of courses or credits taught in-load (by School of Computing faculty)	# of courses or credits taught in overload (by School of Computing faculty)	Percentage of courses or credits taught in overload
2022-23	14	0	0%
2021-22	10	0	0%
2020-21	8	0	0%
2019-20	7	0	0%
2018-19	5	0	0%

d. *Describe the faculty compensation model for thesis advising, directed study, supervision of student consulting projects / internships, etc.*

Faculty who mentor MSCS students in their thesis/project are compensated with $1,000 with a successful proposal and $2,000 with a successful defense. This is similar pay to teaching a full course, which in terms of time for the faculty is similar. The time to advise a student for a thesis/project typically is about 18 months. Committee members are also compensated with $200 and $400 for the proposal and defense respectively.

Programmatic/Departmental Teaching Standards

Faculty Qualifications align with the minimum qualifications required of graduate faculty listed above.

Faculty who are assigned to teach courses in the MSCS Program are considered qualified under the following guidelines that are in alignment with ABET. All MSCS faculty are categorized as Scholarly Academics or Instructional Practitioners.

Scholarly Academics (SA) – In order to qualify for SA, a faculty member will normally have a Ph.D. or terminal degree related to their area of teaching. Within the most recent five-year period, the SA faculty member will actively publish in relevant journal articles or conferences.

Instructional Practitioners (IP) – In order to qualify for IP, a faculty member will normally have a Ph.D. or terminal degree related to their area of teaching. Within the most recent five-year period, the IP faculty member will demonstrate currency in their field as evidenced by professional activities.

Evidence of Effective Instruction

i. Regular Faculty

Reviews of teaching performance are conducted in tenure, post-tenure review processes, and annual performance reviews.

ii. Adjunct Faculty

Not applicable: No adjunct faculty have been used up to this point in the MSCS program.

Mentoring Activities

As faculty prepare to teach in the MSCS Program they meet with the MSCS Program Director to discuss best practices and guidance in order to follow appropriate PPM requirements.

Diversity of Faculty

There are many ways to define "diversity" – from race, ethnicity, gender, sex, areas of interest, location of birth, religion, universities that faculty graduated from, areas they have lived, etc. Looking at diversity mathematically, in one extreme, there is no diversity in the faculty because they are all human. On the other extreme, there is an infinite diversity because all the faculty are unique people with unique personalities, backgrounds, and perspectives.

Ultimately, diversity of MSCS faculty is dependent on the diversity and availability of faculty in the school of computing and the willingness of the faculty to be part of the MSCS program.

Ongoing Review and Professional Development

Tenured, tenure-track, and contract faculty are evaluated annually within the school of computing. Tenured faculty are subject to post-tenure reviews. Tenure-track faculty are reviewed as part of the tenure and promotion process. All faculty are evaluated annually.

G. Support Staff, Administration, Facilities, Equipment, and Library

Adequacy of Staff

i. Ongoing Staff Development

Staff training is completed as needed depending on changes made to key student-facing processes and university systems.

Adequacy of Administrative Support

MSCS Program Director (Dr. Robert Ball):
The program director, who is a faculty member, is responsible for program curriculum, strategic planning, stakeholder relations, and represents the MSCS Program in EAST Executive committee meetings and at Graduate Council.

Graduate Enrollment Director (Rainie Ingram)
Full-time, salaried professional staff position, 12-month contract. Primary responsibilities include program marketing, student recruitment, MSCS student advisement, alumni relations, course scheduling, program data collection and reporting. Responsibilities shared with MSCS program director include curriculum development, strategic planning, faculty relations, stakeholder relations, career services, program assessment and reporting, attendance at Graduate Council.

MSCS Program Secretary (Isabell Vivier)
Full-time classified staff position, 12-month contract. Primary responsibilities include office management and communications, customer service (current and potential students, teaching faculty) oversight of course schedule entry.

Adequacy of Facilities and Equipment

All MSCS program classes are taught either at the WSU Ogden Campus or Davis Campus, in regular classrooms (in which classes are capped at 12 students). MSCS

students also have access to multiple study rooms for study purposes, and there are group study rooms available.

MSCS students also have exclusive access to computer labs and Linux servers that online.

Adequacy of Library Resources

The WSU Library resources are sufficient for the needs of students and faculty in the MSCS Program.

H. Relationships with External Communities

Description of Role in External Communities

As mentioned above, the school of computing has two Industry Advisory Council (IAC) meetings per year – one in the Fall and one in the Spring. The Fall meetings are smaller meetings based on topics (e.g., embedded systems, web and mobile development, security, data science, etc.). The Spring meeting is a large meeting where all the committee members come together. The IAC gives general direction and insight into what courses and topics should be taught as well as what should not be taught anymore.

In general, the IAC is an amazing assessment tool for validating what we do correctly and what we need to change. However, like all assessment tools, it cannot be the only metric that we use, mainly because the different committee members have different requirements due to the diverse nature of Computer Science. For instance, most committee members agree that Github should be taught and used. However, only a handful of members think that any particular topic is important. Due to the nature of Computer Science, there is no graduate course that all potential employers agree on as important.

Summary of External Advisory Committee Minutes

The minutes of the IAC meetings are extensive and are beyond the scope of this document. Suffice it to say that many suggestions are made on a regular basis. In addition, we hand out written surveys to gauge how the direction of the many programs that the department supports are going. The verbal feedback and written feedback are scrutinized and make up a significant portion of the rationale for new courses and adjustments to courses.

Commented [BR1]: If there is any record of recent IAC minutes, these could be placed in an appendix.

I. Results of Previous Program Reviews

This is a new program and has never been formally reviewed in the past.

Summary Information (as needed)

J. Action Plan for Ongoing Assessment Based on Current Self Study Findings

Action Plan for Evidence of Learning Related Findings

This is a new program and has never been formally reviewed in the past.

Summary Information (as needed)

Action Plan for Staff, Administration, or Budgetary Findings

This is a new program and has never been formally reviewed in the past.

Summary Information (as needed)

K. Summary of Artifact Collection Procedure

Artifact	Learning Outcome Measured	When/How Collected?	Where Stored?
Project and thesis reports	Demonstrate the ability to apply knowledge of math, science and engineering.	At the end of finished presentation and written report.	electronic copies
General information assessment survey	This survey asks the students about appropriate times for courses. As well as the general rigor of the courses. It also asks them what their own motivation is.	Once per semester	electronic format
In course projects and test	These in course projects and tests are in course assessment of all the learning outcomes based per course.	Multiple times per semester	Canvas

Summary Information (as needed)

APPENDICES

Appendix A: Student and Faculty Statistical Summary

Master of Computer Science	2018-19	2019-20	2020-21	2021-22	2022-23*
School of Computing Student Credit Hours Total [1]	**23,802**	**23,477**	**24,958**	**23,668**	**23,363**
Master of Computer Science FTE	48	205	352	463	365
School of Computing Student FTE Total [2]	**795.0**	**786.0**	**838.0**	**796.0**	**767.0**
Master of Computer Science FTE	2.0	10.0	17.0	23.0	18.0
Student Majors [3]	2	12	27	28	25
Program Graduates [4]					
Masters Degree	0	0	8	10	12
Student Demographic Profile [5]					
Female	0	0	1	1	1
Male	2	12	26	27	24
School of Computing Faculty FTE Total [6]	**49.05**	**48.53**	**53.23**	**53.96**	N/A
Adjunct FTE	23.22	23.27	21.46	23.10	N/A
Contract FTE	25.83	25.26	31.77	30.86	N/A
Student/Faculty Ratio [7]	**16.21**	**16.20**	**15.74**	**14.75**	**#VALUE!**

*Subject to change as dashboard are updated
*Data pulled August 2023

Note: Data provided by the Office of Institutional Effectiveness

Appendix B: Contract/Adjunct Faculty Profile

Name	Gender	Rank	Tenure Status	Highest Degree	Years of Teaching	Areas of Expertise
Dr. Abdulmalek Al-Gahmi	M	Professor	Tenured	Ph.D.	7	Software engineering; Machine Learning; Database Management
Dr. Noel Alton	F	Assistant Professor	Tenure track	D.Sc.	3	Accessibility, User Experience Design, User Experience Research, Linguistics
Dr. Nicole Anderson	F	Associate Professor	Tenured	Ph.D.	21	HCI, Software Engineering, Applied AI
Dr. Robert Ball	M	Associate Professor	Tenured	Ph.D.	16	HCI, Information Visualization, Data Science
Dr. Arpit Christi	M	Assistant Professor	Tenure track	Ph.D.	4	Program Debugging, Self-Adaptive Software, Software Testing
Dr. Kyle Feuz	M	Associate Professor	Tenured	Ph.D.	9	Machine Learning, Cybersecurity, CS Education
Dr. Richard Fry	M	Professor	Tenured	Ph.D.	23	Full stack web development, Software Engineering
Dr. Nils Murrugarra-Llerena	M	Assistant Professor	Tenure track	Ph.D.	1	Multimodal Learning, Computer Vision, Natural Language Processing, and Machine Learning
Dr. Matthew Paulson	M	Assistant Professor	Tenure track	Ph.D.	7	Cybersecurity, Security Policies, Security Management
Dr. Brad Peterson						
Dr. Brian Rague	M	Professor	Tenured	Ph.D.	26	Software engineering, data science, parallel computing, programming languages and compilers, formal system analysis – model checking, machine learning, and simulation
Dr. Meher Shaikh	F	Assistant Professor	Tenure track	Ph.D.	3	Machine learning

Dr. Hugo Valle	M	Associate Professor	Tenured	Ph.D.	11	Back-end development, IoT, data visualization
Dr. Yong Zhang	M	Professor	Tenured	Ph.D.	10	Machine learning, text and image processing, software development
Dr. Dylan Zwick	M	Assistant Professor	Tenure track	Ph.D.	1	Data science, theoretical computer science, tropical geometry

Summary Information (as needed)

Appendix C: Staff Profile

Name	Gender	Job Title	Years of Employment	Areas of Expertise
Rainie Ingram	F	Graduate Enrollment Director, Adjunct Faculty	3	Admissions, Marketing, Recruitment, Literature Review Writing
Isabelle Vivier	F	Administrative Specialist	1	Budgeting, planning, scheduling, and communication

Summary Information (as needed)

Appendix D: Financial Analysis Summary

School of Computing					
Funding	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**
Appropriated Fund	3,295,541	3,033,253	3,310,970	3,265,184	3,148,912
Other: IW Funding from CE	520,456	506,335	439,168	477,350	478,251
Special Legislative Appropriation					
Grants or Contracts	0	270,915	81,104	4,083	0
Special Fees/Differential Tuition	265,242	172,516	149,430	147,833	260,820
Total	4,081,239	3,983,019	3,980,672	3,894,450	3,887,983
Student FTE Total	795.00	786.00	838.00	796.00	767.00
Cost per FTE	5133.63	5067.45	4750.21	4892.53	5069.08

(Total cost/Student FTE) = cost per FTE

Note: Data provided by Provost's Office

Summary Information (as needed)

Appendix E: External Community Involvement Names and Organizations

Name	Organization