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| **Assurance of Student Learning Report****2020-2021** |
| Ogden College of Science and Engineering | School of Engineering and Applied Sciences |
| Computer Science 629 |
| Director of department: Stacy Wilson; Program Coordinator for CS: Guangming Xing, Assessment Coordinator |

***Is this an online program***? [ ]  Yes [x]  No

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| ***Use this page to list learning outcomes, measurements, and summarize results for your program. Detailed information must be completed in the subsequent pages.*** |
| **Student Learning Outcome 1: Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline.** |
| **Instrument 1** | Design a solution for a given problem  |
| **Instrument 2** | Implement a solution for a given design |
| **Instrument 3** | Evaluate an implementation of a design |
| **Based on your results, check whether the program met the goal Student Learning Outcome 1.** | **[x]  Met** | **[ ]  Not Met** |
| **Student Learning Outcome 2:**  **Communicate effectively in a variety of professional contexts.**  |
| **Instrument 1** | Ability to give effective in-class oral presentation |
| **Instrument 2** | Ability to write research paper or research report |
| **Instrument 3** | Ability to write cover letter for application |
| **Based on your results, check whether the program met the goal Student Learning Outcome 2.** | **[ ]  Met** | **[x]  Not Met** |
| **Student Learning Outcome 3: Function effectively as a member or leader of a team engaged in activities appropriate to the program’s discipline.**  |
| **Instrument 1** | Ability to work well together as a team and team’s ability to set goals. |
| **Instrument 2** | Team’s ability to set goals  |
| **Instrument 3** | Team’s ability to manage the project and to manage risk |
| **Instrument 4** | Team’s ability to create final deliverables |
| **Based on your results, check whether the program met the goal Student Learning Outcome 3.** | **[x]  Met** | **[ ]  Not Met** |
| **Program Summary (Briefly summarize the action and follow up items from your detailed responses on subsequent pages.)**  |
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| **Student Learning Outcome 1** |
| **Student Learning Outcome**  | **Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline.** |
| **Measurement Instrument 1**  | Design a solution for a given problem:In an upper-level course (CS 425), students have to develop a design for a given problem. The design is evaluated based on a rubric established by the program.

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| **Evaluation item** | **Novice** | **Intermediate** | **Proficient** |
| **Conceptualize/design a component to given requirements** | Don't meet major desired needs | Meet major desired needs but lack of clarity or structural optimization | Meet major desired needs with clear and optimized structure |
| Number of Students |  1 | 5 | 17 |

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| **Criteria for Student Success** | Students will perform at or above the performance level measured with the ‘proficient’ rubric.  |
| **Program Success Target for this Measurement** | 70% of students should score at the proficient level. | **Percent of Program Achieving Target** | **74%** |
| **Methods**  | The sampled student population is the set of students (all 23) who were enrolled in the CS 425 course during the fall semester 2021. The material assessed were the design specifications turn in by students as part of their completion of the 1st course project. |
| **Measurement Instrument 2** | Implement a solution for a given designIn an upper-level course (CS 425), students have to implement a design. The implementation is evaluated based on a rubric established by the program. (Note: A different project was used for measurement instruments 2 & 3 than for measurement instrument 1).

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| **Evaluation item** | **Novice** | **Intermediate** | **Proficient** |
| **Implementing a given design** | Important component design criteria are not implemented or implemented incorrectly (incorrect on basic test cases) | Some important design criteria are implemented and work reasonably well | All important component criteria implemented and work reasonably well; but 1 or 2 minor issues are missing |
| Number of students | 2 | 3 | 18 |

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| **Criteria for Student Success** | Students will perform at or above the performance level measured with the ‘proficient’ rubric.  |
| **Program Success Target for this Measurement** | 70% of students should score at the proficient level. | **Percent of Program Achieving Target** | 78% |
| **Methods** | The sampled student population is the set of students (all 25) who were enrolled in the CS 425 course during the fall semester 2020. The material assessed were the design evaluations turn in by students as part of their completion of the 2nd course project (CS 425) and an implementation of a hash table with chaining. |
| **Measurement Instrument 3** | Evaluate an implementation of a designIn an upper-level course (CS 351, CS 425), students have to evaluate the implementation of a design. The implementation is evaluated based on a rubric established by the program.

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| **Evaluation item** | **Novice** | **Intermediate** | **Proficient** |
| **Evaluate and test the resulting system (Ability to collect and analyze data for evaluation of the performance)** | No collection or no analysis | Collect data but few analysis | Collect data and sufficient analysis with reasonable conclusions or observations |
| CS 425 results: Number of students |  5 | 2 | 16 |

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| **Criteria for Student Success** | Students will perform at or above the performance level measured with the ‘proficient’ rubric.  |
| **Program Success Target for this Measurement** | 70% of students should score at the proficient level. | **Percent of Program Achieving Target** | **70%** |
| **Methods** | The sampled student population is the set of 23 students who were enrolled in the CS 425 course during the fall semester. The material assessed were the design evaluations turn in by students as part of their completion of the 2nd course project (CS 425) . |
| **Based on your results, highlight whether the program met the goal Student Learning Outcome 1.** | **[x]  Met** | **[ ]  Not Met** |
| **Actions** (Describe the decision-making process and actions planned for program improvement. The actions should include a timeline.) |
| In the prior assessment cycle, no changes are suggested after the presentation of the assessment result.  |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| Will continue the assessment. |
| **Next Assessment Cycle Plan**  |
| Student outcome 1 will be assessed by CS 425) in fall semester 2022. The artifacts to be collected are samples of the required design (measure 1), implementation (measure 2), and evaluation report (measure 3). The instructor on record for the course is responsible for collecting the artifacts, assessing them against the given rubrics, and making that information available to the program prior to the program evaluation meeting the Wednesday after grades are due in the semester the courses were taught. |

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| **Student Learning Outcome 2** |
| **Student Learning Outcome**  | **Communicate effectively in a variety of professional contexts.** |
| **Measurement Instrument 1** | Ability to give effective in-class oral presentation.In some upper-level courses (CS 396) students have to make presentations about their work for the course.Each student’s work is evaluated based on a rubric established by the program. Note: The evaluation info for each rubric is given as n1/n2 where n1 is the number of students in the CS 360 course who scored at that performance level and n2 is the number of students in the CS 396 course who scored at that performance level.

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| **Evaluation item** | **Novice** | **Intermediate** | **Proficient** |
| Structure of the Presentation | Order of topics is unclear and presentation is unstructured.  | The topics are not in a good order and/or topic are missing which should have been addressed. Presentation deviates from given time frame. | Outline is presented to audience and includes an introduction and a summary/conclusion. Presentation covers the topic in logical order. Presentation stays within allotted time frame. |
| Number of students | 2 | 2 | 25 |
| Understanding of Topics | Substantive information is inaccurate. Examples do not clarify the topic. | Some errors are made throughout the presentation. Examples are not appropriate to illustrate important concepts. | No significant errors are made. Appropriate terminology is used and explained where needed. Examples help the audience to understand the presented concepts. |
| Number of students | 2 | 2 | 25 |
| Visual Aids | No visual aids are used, or they are poorly prepared. | Visual aids contribute little to the understanding of the presented topics. They contain too much and/or badly formatted information, are visually confusing or contain info which the presenter skips. | The visual aids support the presentation effectively and important topics stand out clearly. The aids are well organized. |
| Number of students | 2 | 2 | 25 |
| Presentation Skills & Response to Questions | The presenter is lacking most basic presentation skills. | The presenter often depends on written information and does not establish a rapport with the audience. Questions are not handled well. | The presenter maintains eye contact and talks to the audience and ensures that the audience can see and hear the presentation. The presenter can answer questions.  |
| Number of students | 2 | 2 | 25 |
| na: This cannot be effectively evaluated since the students presented using Zoom. Presenters always checked their camera and microphone before the presentation to make sure that everyone could hear and see them. Presenters were also able to answer questions. |

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| **Criteria for Student Success** | Students will perform at or above the performance level measured with the ‘proficient’ rubric.  |
| **Program Success Target for this Measurement** | 70% of the students score at the proficiency level | **Percent of Program Achieving Target** | **86%** |
| **Methods**  | The sampled student population was the set of the 29 students enrolled in CS 396 during fall 2021.  |
| **Measurement Instrument 2** | Ability to write research paper or research reportIn some upper-level course (CS 382) students are asked to write a report on a programming language of their choice (other than basic programming languages covered in the program). Each student’s work is evaluated based on a rubric established by the program.

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| **Evaluation item** | **Novice** | **Intermediate** | **Proficient** |
| **Introduction:****Problem Statement** | No introduction of problem statement | Problem statement is introduced with certain abruption | Problem statement is introduced clearly |
| Number of Students | 9 | 0 | 25 |
| **Breadth and depth** | No enough neither in breadth or depth | Breadth and depth are not well balanced, e.g., only focusing on the study area without a broader context, or only having a few topics presented without any focus | Good balanced between breadth and depth, e.g., more than two related topics are discussed with a focus on a theory or technique within the proposed study area |
| Number of Students | 0 | 0 | 34 |
| **Citations/****References:**  | Reference section is not presented, or no in-text citation | Most references do not follow a standard format (such as IEEE, ACM, and APA), or are not cited in text | Most references follow a standard format (such as IEEE, ACM, and APA), and are cited in text. The reference list should include several good references (such as published papers) |
| Number of Students | 6 | 4 | 24 |
| **Writing** | Persistently unclear and many grammar errors. | At least half of writing is clear but with many grammar errors | Majority of writing is clear and with a few grammar errors |
| Number of Students | 0 | 2 | 32 |
| **Organization** | More than one section (e.g., Introduction, Conclusion, etc.) are missing and sections are disorganized. | One section is missing and sections are unbalanced. | Sections are completed, well organized, and well balanced. |
| Number of Students | 0 | 2 | 32 |

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| **Criteria for Student Success** | Students will perform at or above the performance level measured with the ‘proficient’ rubric |
| **Program Success Target for this Measurement** | 70% of the students score at the proficiency level | **Percent of Program Achieving Target** | **>70%** |
| **Methods** | The sampled student population was the set of students 34 who are enrolled in the CS 382 course during the spring semester 2021.  |
| **Measurement Instrument 3** | Ability to write cover letter for application.In an upper level course (CS 496) students are asked to write a cover letter for a job application. Each student’s work is evaluated based on a rubric established by the program.

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| **Evaluation item** | **Novice** | **Intermediate** | **Proficient** |
| **Business format and overall quality of writing ability; is on one page.** | Business formatting is not used in this letter. | Letter is formatted okay into section but does not use business format. | This letter uses correct business format, sections, and reads well (spelling, grammar, etc.) |
| Number of students |  2 | 1 | 23 |
| **Section 1: Introduction (1st paragraph)—why was this letter sent their way? Tell them where you found the position (date), why you are qualified, and that you would like an interview.** | Introduction is not professional and does not provide context information for reader (why is student writing the letter/ what does student want to happen?) | Professional style introduction provides limited or weak context information for reader | Professional style introduction provide broad context information for reader (why are you writing the letter/ what do you want to happen) |
| Number of students | 2 | 3 | 21 |
| **Section 2: Identification of skills and experiences as related to position; give an example of a project that relates to the position, have a beginning, middle, and end so the reader can follow the project’s completion.** | Student has not written a focused paragraph that describes a project, student's given tasks, and what the results were achieved after project completion. | This letter identifies one qualification of the student but it is not related to the position at hand. This letter restates what is in the résumé with minimal additional information. The student explains why he/she is interested in this position but is too vague. | This letter identifies one or two strongest qualifications of the student and relates how his/her skills apply to the job you want. This letter explains specifically why the student is interested in this position and this type of job, company, and/or location. |
| Number of students | 2 | 0 | 24 |
| **Section 3: Closing segment thanks the reader, gives them a reason to call you and a cellphone number (give days and times), a professional email address to contact, ask again for an interview.** | Student has not given any information for follow up if the employer needs to contact student. Student has been nonprofessional. | The student thanks the reader for taking time to read this letter. Student does not refer the reader to his/her résumé or application materials. | This letter refers the reader to the résumé or any other enclosed documents and thanks the reader for taking time to read the letter and review the résumé. The letter specifies how and when they can contact the student to set-up an interview. |
| Number of students | 2 | 3 | 21 |

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| **Criteria for Student Success** | Students will perform at or above the performance level measured with the ‘proficient’ rubric.  |
| **Program Success Target for this Measurement** | At least 70% of students score at the proficient level. | **Percent of Program Achieving Target** | **80%** |
| **Methods** | The sampled student population was the set of students (21) who are enrolled in the CS 496 course during the spring semester 2021.  |
| **Based on your results, highlight whether the program met the goal Student Learning Outcome 2.** | **[x]  Met** | **[ ]  Not Met** |
| **Actions** (Describe the decision-making process and actions for program improvement. The actions should include a timeline.) |
| CS program changes the writing requirements to ENG 300. Since there is no English requirements to CS 381, the program faculty have also decided to move this assessment to CS 396. |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| The assessment will be moved to CS 396, which will be completed in fall 2022.  |
| **Next Assessment Cycle Plan**  |
| Student outcome 2 will be assessed in CS 396 (measure 1 and 2) in fall semester 2022, and CS 496 (measure 3). The artifacts to be collected are samples of the required paper or report (measure 2), and the required cover letter for a job application (measure 3). No artifact is collected for the presentation (measure 1) which is assessed against the rubrics in real time. The instructor on record for each course is responsible for collecting the artifacts, assessing them against the given rubrics, and making that information available to the program prior to the program evaluation meeting the Wednesday after grades are due in the semester the courses were taught. |

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| **Student Learning Outcome 3** |
| **Student Learning Outcome**  | Function effectively as a member or leader of a team engaged in activities appropriate to the program’s discipline. |
| **Measurement Instrument 1** | Ability to work well together as a team.In an upper level course (CS 496) students’ teamwork is assessed through peer-assessment as well by the instructor based on weekly interactions with the teams. Each student’s/team’s work is evaluated based on a rubric established by the program.

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| **Evaluation item** | **Novice** | **Intermediate** | **Proficient** |
| **2a) Teamwork (assessed with a team project survey: self-, peer-, and instructor assessment)** | Team did not collaborate well | Team collaborated well with only a few occurrences of communication breakdowns | Team collaborated well |
| Number of teams |  1 |  0 |  8 |
| **2b) Contribution (assessed with a team project survey)** | Contribution of each member is not balanced at all | All team members have contributed significantly to each phase but overall contribution was not balanced | All team members have contributed significantly to each phase and overall contribution was well-balanced |
| Number of teams | 1 | 0 | 8 |

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| **Criteria for Student Success** | Student teams will perform at or above the performance level measured with the ‘proficient’ rubric.  |
| **Program Success Target for this Measurement** | At least 70% of students/teams score at the proficient level. | **Percent of Program Achieving Target** | 89% |
| **Methods**  | The sampled student population was the set of students who are enrolled in the CS 496 course during the spring semester 2022. The material assessed were the results of weekly meetings of the teams with the instructor and a team survey. |
| **Measurement Instrument 2** | Team’s ability to set goals In an upper level course (CS 496) team’s ability to set goals is assessed through reports written about the progress students make on the course project. Each student’s/team’s work is evaluated based on a rubric established by the program.

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| **Performance Indicator**  | **1** | **2** | **3** |
|  | **Novice** | **Intermediate** | **Proficient**  |
| **Goal Setting** | Goals for the project is inappropriate for the level of the course. Low level of clarity in system requirements document | Goals for the project is appropriate for the level of the course. Low level of clarity in system requirements document | Goals for the project is appropriate for the level of the course. Acceptable documentation for system requirements |
| Number of teams | 0 | 0 | 9 |

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| **Criteria for Student Success** | Student teams will perform at or above the performance level measured with the ‘proficient’ rubric.  |
| **Program Success Target for this Measurement** | At least 70% of students/teams score at the proficient level. | **Percent of Program Achieving Target** | **100%** |
| **Methods** | The sampled student population was the set of students who are enrolled in the CS 496 course during the spring semester 2022. The material assessed were the requirement specifications written by the students for the teams cap stone project. |
| **Measurement Instrument 3** | Team’s ability to manage the project and to manage risk In an upper level course (CS 496) team’s ability to manage their project and to manage risk is assessed through reports written about the progress students make on the course project. Each student’s/team’s work is evaluated based on a rubric established by the program.

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| **Performance Indicator**  | **1** | **2** | **3** |
|  | **Novice** | **Intermediate** | **Proficient**  |
| **Project management** | Poor planning for the project lead to major delay/breakdown of the project | Mediocre planning. Overall scope has to be revised due to the delays in the project | Documented efforts in project. Overall smooth execution of the project plan with minor delays and/or revision of milestones |
| Number of students | 0 | 1 | 8 |
| **Risk management** | Poor risk management leading to three or more of the problems listed below.  | Mediocre risk management leading to at least two of the problems listed below. | Documented efforts in risk management leading to one or less of the following:  |
|  | **Problems:**Missed deliverables Underestimation of task completion time Functional requirements\* not met Non-functional requirements\* not metSoftware defects |
| Number of students | 0 | 1 | 8 |

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| **Criteria for Student Success** | Teams will perform at or above the performance level measured with the ‘proficient’ rubric.  |
| **Program Success Target for this Measurement** | At least 70% of teams score at the proficient level. | **Percent of Program Achieving Target** | **89%** |
| **Methods** | The sampled student population was the set of students who are enrolled in the CS 496 course during the spring semester 2022. The material assessed were weekly progress reports and the assessment of the required final deliverables for the project. |
| **Measurement Instrument 4** | Team’s ability to create final deliverables In an upper level course (CS 496) team’s ability to create final deliverables is assessed through the final report about the course project. Each student’s/team’s work is evaluated based on a rubric established by the program.

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| **Performance Indicator**  | **1** | **2** | **3** |
|  | **Novice** | **Intermediate** | **Proficient**  |
| **Final Deliverable**  | The final deliverable does not satisfy most of the requirements. Poor documentation. | The final deliverable does not satisfy some major requirements. Major components are missing in the final documentation. | The final deliverable satisfied most of the requirements. Presents all required items at the acceptable level of quality. |
| Number of students | 0 | 1 | 8 |

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| **Criteria for Student Success** | Teams will perform at or above the performance level measured with the ‘proficient’ rubric.  |
| **Program Success Target for this Measurement** | At least 70% of students/teams score at the proficient level. | **Percent of Program Achieving Target** | **89%** |
| **Methods** | The sampled student population was the set of students who are enrolled in the CS 496 course during the spring semester 2022. The material assessed were the requirement specifications written by the team for the cap stone project and the (finals) deliverables for the project. |
| **Based on your results, highlight whether the program met the goal Student Learning Outcome 3.** | **[x]  Met** | **[ ]  Not Met** |
| **Actions** (Describe the decision-making process and actions for program improvement. The actions should include a timeline.) |
| In the prior assessment cycle, no changes are suggested after the presentation of the assessment result.  |
| **Follow-Up** (Provide your timeline for follow-up. If follow-up has occurred, describe how the actions above have resulted in program improvement.) |
| Will continue the assessment. |
| **Next Assessment Cycle Plan** (Please describe your assessment plan timetable for this outcome) |
| Student outcome 3 will be assessed in CS 496 during the spring semester.  |

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| **Program name:** | Computer Science |   |  |  |
| **Department:** | School of Engineering and Applied Sciences |  |  |
| **College:** | Odgen |   |   |  |  |
| **Contact person:** | Guangming Xing |   |  |  |
| **Email:** | guangming.xing@wku.edu |   |  |  |
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| **KEY:** |  |  |  |  |  |
| I = Introduced |  |  |  |  |  |
| R = Reinforced/Developed |  |  |  |  |  |
| M = Mastered |  |  |  |  |  |
| A = Assessed |  |  |  |  |  |
|  |  |  | **Learning Outcomes** |  |  |
|  |  |  | **LO1:** | **LO2:** | **LO3:** |
|  |  |  | Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions. | Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program’s discipline. | Communicate effectively in a variety of professional contexts. |
| **Course Subject/Core Course** | **Number** | **Course Title** |   |   |   |
| CS | 180 | Computer I | I | I | I |
| CS  | 290 | Computer Science II | I | I | I |
| CS  | 325 | Computer Organization and Architecture | R | R |   |
| CS | 331 | Data Structures | I | I | I |
| CS | 339 | Discrete Structures | R |   |   |
| CS | 351 | Database Management Systems | R | R | R |
| CS | 360 | Software Engineering I | R | R | M/A |
| CS | 382 | Programming Languages | R/A | R |   |
| CS | 396 | Intermediate Software Project | M/A | M | M/A |
| CS | 421 | Data Structures and Algorithm Analysis | M | M/A |   |
| CS | 425 | Operating System I | R | R/A |   |
| CS | 496 | CS Senior Project and Professional Practice | M | M | M/A |

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| **Program name:** | Computer Science |  |  |  |
| **Department:** | School of Engineering and Applied Sciences |  |  |  |
| **College:** | Odgen |   |  |  |  |
| **Contact person:** | Guangming Xing |  |  |  |
| **Email:** | guangming.xing@wku.edu |  |  |  |
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| **KEY:** |  |  |  |  |  |
| I = Introduced |  |  |  |  |  |
| R = Reinforced/Developed |  |  |  |  |  |
| M = Mastered |  |  |  |  |  |
| A = Assessed |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  | **LO4:** | **LO5** | **LO6** |
|  |  |  | Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles. | Function effectively as a member or leader of a team engaged in activities appropriate to the program’s discipline. | Apply computer science theory and software development fundamentals to produce computing-based solutions. |
| **Course Subject/Core Course** | **Number** | **Course Title** |   |   |   |
| CS | 180 | Computer I | I |   | I |
| CS  | 290 | Computer Science II | I |   | I |
| CS  | 325 | Computer Organization and Architecture |   |   | R |
| CS | 331 | Data Structures | I |   | I |
| CS | 339 | Discrete Structures |   |   | R |
| CS | 351 | Database Management Systems | R |   | I |
| CS | 360 | Software Engineering I |   | R/A | R |
| CS | 382 | Programming Languages | R |   | R |
| CS | 396 | Intermediate Software Project | R | R | M/A |
| CS | 421 | Data Structures and Algorithm Analysis |   |   | M |
| CS | 425 | Operating System I | R |   | R |
| CS | 496 | CS Senior Project and Professional Practice | M/A | M/A | M/A |