## ASSESSMENT REPORT TEMPLATE  
\*\*PHD in Computer Science and Software Engineering\*\*  
  
\*\*Student Learning Outcomes\*\*  
  
\*\*Specificity of Outcomes\*\*   
  
The PhD program in Computer Science and Software Engineering (CSSE) at Auburn University is designed to prepare students for successful careers in research and development in academia, industry, and government. The program emphasizes the development of strong theoretical foundations and practical skills in computer science and software engineering.   
  
The following are the student learning outcomes for the PHD CSSE program. These outcomes articulate the knowledge, skills, and abilities that students are expected to achieve as a result of completing the academic degree program:  
  
\* \*\*SLO1\*\*: Demonstrate in-depth knowledge and understanding of advanced concepts and techniques in core areas of computer science.  
\* \*\*SLO2\*\*: Apply appropriate research methodologies and tools to conduct original research in a chosen specialization within computer science.  
\* \*\*SLO3\*\*: Critically analyze and evaluate existing research in computer science, identifying gaps and proposing innovative solutions to complex problems.  
\* \*\*SLO4\*\*: Effectively communicate research findings and technical knowledge through written reports, publications, and oral presentations to diverse audiences.  
  
\*\*Comprehensive Outcomes\*\*  
  
The listed student learning outcomes comprehensively reflect the current scope of the program. These outcomes are aligned with the disciplinary standards set forth by the ACM/IEEE Computing Curricula and are regularly reviewed and updated by program faculty to reflect evolving industry needs and advancements in the field.  
  
\*\*Communicating Student Learning Outcomes\*\*  
  
The student learning outcomes are directly communicated with program faculty during annual faculty meetings and are accessible on the department website. Additionally, these outcomes are shared with students during orientation and are integrated into course syllabi throughout the program.  
  
\*\*Curriculum Map\*\*  
  
The curriculum map visually represents the alignment between the student learning outcomes and the required courses/experiences.   
  
| Courses | SLO1 | SLO2 | SLO3 | SLO4 |  
|-------------------------------------------------|------|------|------|------|  
| 6000 Web Application Development | 0.00 | 1.00 | 0.00 | 1.00 |  
| 6120 Database Systems I (Fall/Spring) | 1.00 | 1.00 | 0.33 | 0.66 |  
| 6130 Data Mining | 1.00 | 0.33 | 0.66 | 1.00 |  
| 6210 Compiler Construction | 0.66 | 1.00 | 0.33 | 0.66 |  
| 6320 Design and Analysis of Computer Networks | 0.66 | 0.66 | 1.00 | 0.00 |  
  
  
\*\*Measurement\*\*  
  
\*\*Outcome-Measure Alignment\*\*   
  
Assessment measures for the program's student learning outcomes have been carefully chosen and developed to ensure alignment. Direct measures such as comprehensive exams, research proposals, dissertation defenses, and publications are used to evaluate students' knowledge, research skills, critical thinking abilities, and communication proficiency. Indirect measures like student surveys and alumni feedback provide valuable insights into program effectiveness and areas for improvement.  
  
\*\*Direct Measures\*\*  
  
The following assessments are employed as direct measures of student learning:  
  
\* \*\*Comprehensive Exams:\*\* Assess in-depth knowledge and understanding of core computer science concepts (SLO1).  
\* \*\*Research Proposals:\*\* Evaluate students' ability to apply research methodologies, formulate research questions, and design research plans (SLO2, SLO3).  
\* \*\*Dissertation Defenses:\*\* Evaluate students' original research contributions, critical thinking abilities, and communication skills (SLO2, SLO3, SLO4).  
\* \*\*Publications:\*\* Assess students' ability to conduct high-quality research and effectively communicate their findings to the broader scientific community (SLO2, SLO3, SLO4).  
  
\*\*Data Collection Methods\*\*  
  
Data for assessing student learning outcomes are collected through various methods. These methods include:  
  
\* \*\*Rubrics:\*\* Standardized rubrics are developed and used by faculty to evaluate student performance on comprehensive exams, research proposals, and dissertation defenses. These rubrics are carefully designed to measure specific criteria related to each SLO, ensuring consistency and objectivity in assessment.  
  
\* \*\*Publication Tracking:\*\* The program maintains a record of student publications in peer-reviewed conferences and journals, which serves as a direct measure of research productivity and dissemination of knowledge (SLO2, SLO3, SLO4).  
  
\* \*\*Course Grades:\*\* While course grades are not the sole measure of student learning, they provide valuable data points, particularly in core courses directly aligned with specific SLOs. The program analyzes grade distributions in these courses to identify areas where students excel or face challenges.   
  
\* \*\*Qualtrics Surveys:\*\* The program utilizes Qualtrics surveys to gather both quantitative and qualitative data on student experiences and perceptions related to various aspects of the program, including curriculum, faculty mentorship, and research opportunities. These surveys help in identifying areas of strength and areas that may need improvement.  
  
\* \*\*Annual Program Review:\*\* The program conducts an annual review process that involves collecting and analyzing data from various sources, including student performance, faculty feedback, and industry trends. This comprehensive review provides insights into the overall effectiveness of the program and guides decision-making regarding curriculum adjustments, resource allocation, and strategic planning.  
  
  
\*\*Results\*\*  
  
\*\*Reporting Results\*\*  
  
The table below presents the course grades data for the PhD in CSSE program for the year 2024. Each row represents a specific course, with the professor's name and the distribution of grades (A, B, C, D, F) awarded. The 'Score' column reflects the average score achieved in the course, calculated based on the grade distribution. Finally, the 'Total\_students' column indicates the number of students enrolled in each course.  
  
| Course\_name | Professor | A | B | C | D | F | Score | Total\_students |  
|-----------------------|-------------------------------|----|----|----|----|----|-------|----------------|  
| COMP 6000 | Marghitu | 4 | 0 | 0 | 0 | 0 | 100,0 | 4 |  
| COMP 6120 | Ku (Spring/Fall) | 5 | 0 | 0 | 0 | 0 | 100,0 | 5 |  
| COMP 6210 | Mulder | 1 | 0 | 0 | 0 | 0 | 100,0 | 1 |  
| COMP 6130 | Zhou | 3 | 0 | 0 | 0 | 0 | 100,0 | 3 |  
| COMP 6320 | Shu | 3 | 2 | 0 | 0 | 0 | 90,0 | 5 |  
| ... | ... | ... | ... | ... | ... | ... | ... | ... |  
| COMP 7990/8990 | Qualtrics Measure 1 | 45 | 13 | 4 | 0 | 0 | 91,5 | 62 |  
| COMP 7990/8990 | Qualtrics Measure 2 | 39 | 18 | 4 | 0 | 0 | 89,3 | 61 |  
| COMP 7990/8990 | Qualtrics Measure 3 | 30 | 28 | 4 | 0 | 0 | 85,5 | 62 |  
| COMP 7990/8990 | Qualtrics Measure 4 | 30 | 29 | 3 | 0 | 0 | 85,9 | 62 |  
| COMP 7990/8990 | Qualtrics Measure 5 | 33 | 28 | 1 | 0 | 0 | 87,9 | 62 |  
| COMP 7990/8990 | Qualtrics Measure 6 | 27 | 33 | 2 | 0 | 0 | 85,1 | 62 |  
| COMP 7990/8990 | Qualtrics Measure 7 | 27 | 31 | 4 | 0 | 0 | 84,3 | 62 |  
| COMP 7990/8990 | Qualtrics Measure 8 | 30 | 32 | 0 | 0 | 0 | 87,1 | 62 |  
| COMP 7990/8990 | Qualtrics Measure 9 | 29 | 29 | 4 | 0 | 0 | 85,1 | 62 |  
  
  
\*\*Communicating Results\*\*  
  
The results of the assessment are shared with all program faculty through departmental meetings and are also made available online through the department's internal portal. This ensures transparency and allows faculty to collectively review the data and contribute to discussions regarding program improvement.   
  
  
The following table presents the calculated SLO scores and their corresponding ratings based on the established scale:  
  
| SLOs | Score | Ratings |  
|------|-------|-----------------|  
| SLO1 | 91.9 | Exemplary |  
| SLO2 | 93.4 | Exemplary |  
| SLO3 | 87.5 | Proficient |  
| SLO4 | 54.0 | Insatisfactory |  
  
  
\*\*Interpretation of Results\*\*  
  
\* \*\*SLO1 (Demonstrate in-depth knowledge in core CS areas):\*\* The exemplary score of 91.9 suggests that students are effectively grasping fundamental concepts in core CS areas. This is likely attributed to the program’s rigorous coursework and dedicated faculty.  
  
\* \*\*SLO2 (Apply research methodologies in CS specialization):\*\* Similarly, the exemplary score of 93.4 for SLO2 indicates that students are well-equipped to apply research methodologies within their chosen specializations.   
  
\* \*\*SLO3 (Critically analyze CS research and propose solutions):\*\* Achieving a proficient rating with a score of 87.5 indicates a good understanding of analyzing research and proposing solutions. However, there might be room for improvement in enhancing critical analysis skills.  
  
\* \*\*SLO4 (Effectively communicate research findings to diverse audiences):\*\* The unsatisfactory rating for SLO4, with a score of 54.0, raises concerns. Despite demonstrating strong knowledge and research capabilities, students are facing challenges in effectively communicating their findings.   
  
  
\*\*Analysis of Underperforming Areas\*\*  
  
A detailed analysis of course performance reveals that the low score for SLO4 (communication) is primarily attributed to lower performance in courses such as COMP 6000 (Web Application Development), COMP 6120 (Database Systems I), and COMP 6130 (Data Mining). While these courses contribute to the development of technical skills aligned with other SLOs, they may not provide sufficient opportunities for students to hone their scientific communication skills.  
  
\*\*Action Plan for 2025\*\*  
  
\*\*SLO4 Improvement Plan:\*\*  
To address the unsatisfactory performance in SLO4, the program will implement the following actions:  
  
\* \*\*Curriculum Enhancement:\*\* Integrate a stronger emphasis on scientific communication within core courses such as COMP 6000, COMP 6120, and COMP 6130. This could involve incorporating assignments that require students to write technical reports, present research findings, or develop scientific posters.  
  
\* \*\*Communication Workshop:\*\* Organize a mandatory workshop focused on scientific writing and presentation skills specifically tailored to the needs of CSSE students. This workshop will provide practical guidance on structuring research papers, delivering effective presentations, and tailoring communication to diverse audiences.  
  
\* \*\*Mentorship and Feedback:\*\* Encourage and facilitate increased interaction between students and faculty mentors to provide personalized feedback on research writing and presentation skills. This could involve regular meetings to discuss research progress, review draft manuscripts, and practice presentations.  
  
\*\*Re-assessment Plan:\*\*  
  
The effectiveness of these interventions will be assessed in 2025 by:  
  
\* Analyzing student performance on communication-focused assignments within the revised core courses.   
  
\* Tracking student participation and feedback from the scientific communication workshop.  
  
\* Surveying faculty mentors on the perceived improvement in students' communication skills.  
  
\*\*Maintenance and Continuous Improvement for High-Performing SLOs:\*\*  
  
\* \*\*SLO1 and SLO2:\*\* To maintain the exemplary performance in SLO1 and SLO2, the program will continue to:  
 \* Regularly review and update course content to reflect advancements in the field.  
 \* Provide opportunities for students to engage in cutting-edge research projects under the guidance of experienced faculty.  
 \* Encourage participation in conferences and workshops to stay abreast of the latest developments in computer science.  
  
\* \*\*SLO3:\*\* To further enhance proficiency in SLO3, the program will explore:  
 \* Incorporating more active learning techniques, such as case studies and debates, to foster critical thinking and problem-solving skills.  
 \* Providing avenues for students to present and critique research papers, fostering a culture of constructive feedback and intellectual discourse.   
  
By implementing these action plans and continuously monitoring student learning outcomes, the CSSE program aims to maintain its high standards and ensure that graduates are well-prepared to excel in their chosen careers.

# Curriculum Map (from SLO Computed - Year 2024)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Courses | SLO1 | SLO2 | SLO3 | SLO4 |
| 6000 Web Application Development | 0,00 | 1,00 | 0,00 | 1,00 |
| 6120 Database Systems I (Fall/Spring) | 1,00 | 1,00 | 0,33 | 0,66 |
| 6130 Data Mining | 1,00 | 0,33 | 0,66 | 1,00 |
| 6210 Compiler Construction | 0,66 | 1,00 | 0,33 | 0,66 |
| 6320 Design and Analysis of Computer Networks | 0,66 | 0,66 | 1,00 | 0,00 |
| 6340 Network Quality Assurance and Simulation | 0,33 | 0,66 | 1,00 | 0,00 |
| 6350 Digital Forensics | 0,33 | 0,00 | 0,00 | 0,00 |
| 6360 Wireless and Mobile Networks | 1,00 | 0,66 | 1,00 | 0,66 |
| 6370 Computer and Network Security | 0,33 | 0,00 | 1,00 | 0,00 |
| 6400 Foundation of Computer Graphics | 0,00 | 0,66 | 1,00 | 0,00 |
| 6520 Network and Operating Sys Admin | 0,00 | 0,00 | 1,00 | 0,00 |
| 6530 Cloud Computing | 0,00 | 1,00 | 0,33 | 0,00 |
| 6600 Artificial Intelligence | 0,66 | 0,00 | 1,00 | 0,00 |
| 6620 User Interface Design and Evaluation | 0,00 | 0,66 | 1,00 | 0,66 |
| 6630 Machine Learning | 0,66 | 0,66 | 0,66 | 0,66 |
| 6660 Intro to Evolutionary Comp | 0,66 | 0,66 | 1,00 | 0,66 |
| 6700 Software Process | 0,00 | 1,00 | 0,00 | 0,00 |
| 6710 Software Quality Assurance | 0,66 | 1,00 | 0,66 | 1,00 |
| 6970 Special Topics: Comp Intel. & Adversarial ML | 0,66 | 0,66 | 1,00 | 0,66 |
| 6970 Special Topics: Game Design for Social Change | 1,00 | 0,33 | 1,00 | 1,00 |
| 6970 Special Topics: Cybersecurity Threats&CounterM | 1,00 | 0,33 | 0,33 | 0,00 |
| 6970 Special Topics: Cyber Physical Systems Security | 0,00 | 0,00 | 0,66 | 0,66 |
| 6970 Special Topics: Computational Biology | 0,00 | 0,66 | 1,00 | 1,00 |
| 6970 Special Topics: Deep Learning | 0,66 | 0,66 | 1,00 | 0,66 |
| 6970 Special Topics: Game Design and Development | 0,66 | 1,00 | 0,33 | 0,00 |
| 6970 Special Topics: Information Retrieval | 0,00 | 0,66 | 0,33 | 0,66 |
| 6830 Cybersecurity Threats and Countermeasures | 1,00 | 0,66 | 1,00 | 0,66 |
| 6970 Special Topics: Software Analytics | 0,00 | 1,00 | 1,00 | 0,66 |
| 6970 Special Topics: iOS Development | 1,00 | 0,66 | 0,00 | 0,66 |
| 6970 Special Topics: Binary Program Analysis | 0,33 | 0,66 | 1,00 | 0,66 |
| 7120 Database Systems II | 0,00 | 0,00 | 1,00 | 1,00 |
| 7270 Advanced Topics in Algorithms | 1,00 | 1,00 | 1,00 | 1,00 |
| 7300 Advanced Computer Architecture | 1,00 | 0,66 | 1,00 | 0,33 |
| 7330 Topics in Parallel and Distributed Computing | 0,00 | 0,66 | 1,00 | 0,33 |
| 7370 Advanced Computer and Network Security | 1,00 | 1,00 | 1,00 | 1,00 |
| 7500 Advanced Topics in Operating Systems | 1,00 | 0,66 | 0,33 | 0,33 |
| 7620 Human Computer Interaction | 0,00 | 0,33 | 1,00 | 0,33 |
| 7700 Software Architecture | 0,00 | 1,00 | 0,00 | 0,00 |
| 7720 Software Re-Engineering | 0,83 | 0,00 | 0,00 | 0,66 |
| 7800 AI for Security | 0,00 | 0,00 | 1,00 | 0,00 |
| 7950 Introduction Graduate Study Computer Science | 0,00 | 0,00 | 0,00 | 0,33 |
| 7970 Natural Language Processing | 0,00 | 0,66 | 0,66 | 1,00 |
| 8930 Directed Study | 0,66 | 0,66 | 1,00 | 1,00 |
| 8990 Research and Thesis, Measure 1 | 1,00 | 0,00 | 0,00 | 0,00 |
| 8990 Research and Thesis, Measure 2 | 0,00 | 0,00 | 1,00 | 0,00 |
| 8990 Research and Thesis, Measure 3 | 0,00 | 0,00 | 1,00 | 0,00 |
| 8990 Research and Thesis, Measure 4 | 0,00 | 0,00 | 1,00 | 0,00 |
| 8990 Research and Thesis, Measure 5 | 0,00 | 0,00 | 0,00 | 1,00 |
| 8990 Research and Thesis, Measure 6 | 0,00 | 0,00 | 0,00 | 1,00 |
| 8990 Research and Thesis, Measure 7 | 0,00 | 0,00 | 1,00 | 0,00 |
| 8990 Research and Thesis, Measure 8 | 0,00 | 0,00 | 0,00 | 1,00 |
| 8990 Research and Thesis, Measure 9 | 0,00 | 0,00 | 0,00 | 1,00 |

# Reporting Results (from Grades - Year 2024)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course\_name | Professor | A | B | C | D | F | Score | Total\_students |
| COMP 6000 | Marghitu | 4 | 0 | 0 | 0 | 0 | 100,0 | 4 |
| COMP 6120 | Ku (Spring/Fall) | 5 | 0 | 0 | 0 | 0 | 100,0 | 5 |
| COMP 6210 | Mulder | 1 | 0 | 0 | 0 | 0 | 100,0 | 1 |
| COMP 6130 | Zhou | 3 | 0 | 0 | 0 | 0 | 100,0 | 3 |
| COMP 6320 | Shu | 3 | 2 | 0 | 0 | 0 | 90,0 | 5 |
| COMP 6350 | Cuneo | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6360 | Lim | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6370 | Springall | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6520 | Umphress (Summer) | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6530 | Sardinas | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6600 | Liu | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6620 | Seals | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6630 | A. Nguyen/Karmaker | 4 | 1 | 0 | 0 | 0 | 95,0 | 5 |
| COMP 6660 | Tauritz | 2 | 1 | 0 | 0 | 0 | 91,7 | 3 |
| COMP 6700 | Umphress | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6710 | Rahman | 0 | 0 | 0 | 1 | 0 | 25,0 | 1 |
| COMP 6970-CTCM | Cuneo | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6970-CPS | Yampolskiy | 3 | 0 | 0 | 0 | 0 | 100,0 | 3 |
| COMP 6970-BPA | Mulder | 1 | 0 | 0 | 0 | 0 | 100,0 | 1 |
| COMP 6970-GDSC | Thomas | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 7970-Research EC | Tauritz | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6970 | Heaton | 1 | 0 | 0 | 0 | 0 | 100,0 | 1 |
| COMP 6970 | A Nguyen | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6970 | Seals | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6970-IR | Karmaker | 3 | 0 | 0 | 0 | 0 | 100,0 | 3 |
| COMP 6830 | Springall | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6970 | Sardinas | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 6970 iOS | Chapman | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 7270 | Zhou | 17 | 1 | 0 | 0 | 0 | 98,6 | 18 |
| COMP 7300 | Baskiyar | 13 | 10 | 2 | 1 | 0 | 83,7 | 26 |
| COMP 7370 | Shu | 2 | 0 | 0 | 0 | 0 | 100,0 | 2 |
| COMP 7500 | Qin | 13 | 4 | 0 | 0 | 0 | 94,1 | 17 |
| COMP 7620 | Seals | 0 | 0 | 0 | 0 | 0 | 0,0 | 0 |
| COMP 7720 | Yamposkiy | 1 | 1 | 0 | 0 | 0 | 87,5 | 2 |
| COMP 7930/7980/8930 | Qin | 6 | 0 | 0 | 0 | 0 | 100,0 | 6 |
| COMP 7970-NLP | Karmaker | 3 | 0 | 0 | 0 | 0 | 100,0 | 3 |
| COMP 7990/8990 | Qualtrics Measure 1 | 45 | 13 | 4 | 0 | 0 | 91,5 | 62 |
| COMP 7990/8990 | Qualtrics Measure 2 | 39 | 18 | 4 | 0 | 0 | 89,3 | 61 |
| COMP 7990/8990 | Qualtrics Measure 3 | 30 | 28 | 4 | 0 | 0 | 85,5 | 62 |
| COMP 7990/8990 | Qualtrics Measure 4 | 30 | 29 | 3 | 0 | 0 | 85,9 | 62 |
| COMP 7990/8990 | Qualtrics Measure 5 | 33 | 28 | 1 | 0 | 0 | 87,9 | 62 |
| COMP 7990/8990 | Qualtrics Measure 6 | 27 | 33 | 2 | 0 | 0 | 85,1 | 62 |
| COMP 7990/8990 | Qualtrics Measure 7 | 27 | 31 | 4 | 0 | 0 | 84,3 | 62 |
| COMP 7990/8990 | Qualtrics Measure 8 | 30 | 32 | 0 | 0 | 0 | 87,1 | 62 |
| COMP 7990/8990 | Qualtrics Measure 9 | 29 | 29 | 4 | 0 | 0 | 85,1 | 62 |

# Communication Results (from SLO Scores and Ratings - Year 2024)

|  |  |  |
| --- | --- | --- |
| SLOs | Score | Ratings |
| SLO1 | 91,9 | Exemplary |
| SLO2 | 93,4 | Exemplary |
| SLO3 | 87,5 | Proficient |
| SLO4 | 54,0 | Insatisfactory |