Mappings – PEOs to SOs

Program Education Objectives (PEOs) or "Unit Goals":

1. Graduates will be competent professionals, able to:
   a) Employ a pallet of multiple hardware platforms and software development environments, integrated with the appropriate theoretical constructs, to develop practical solutions to technological problems, (b) Deploy those solutions, and (c) Provide for their maintenance and administration.
2. Graduates will be able to effectively integrate research methods, appropriate theory, mathematics, and computational technology to analyze and solve problems encountered in the development of technological solutions.
3. Graduates will be able to assimilate new methodologies and advances in computer technology in an ever-evolving discipline.
4. Graduates will be effective in the elicitation of requirements for a software specification, and the written and oral communication of results to technical and non-technical colleagues and clients.
5. Graduates will be able to work independently and in collaboration with colleagues.
6. Graduates will be able to integrate the ethical standards of the profession and their professional knowledge and skills to contribute to society.

Student Learning Outcomes (SLOs) or "Measurable Outcomes":

The student outcomes, encompassing all the ABET outcomes for Computer Science, are listed below:

1. Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.
2. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. Communicate effectively in a variety of professional contexts.
4. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. Apply computer science theory and software development fundamentals to produce computing-based solutions.

	PEO1	PEO2	PEO3	PEO4	PEO5	PEO6
SO[1]	X	X	X			
SO[2]	X	X		X	X	
SO[3]		X		X		
SO[4]						X
SO[5]				X	X	
SO[6]				X		

Table [1] Program Educational Objectives and Student Outcomes

Mappings – Courses to SOs

Course	1	2	3	4	5	6
161	x	x				
257	x					
280	x	x				
285		x	x	x	x	
290	x	x				
315		x		x		
329		x		x		
340	x	x				
375	x	x				
383		x	x	x	x	
390	x	x				
391	x	x				
401	x	x				x
409		x		x		x
411	x	x	x		x	x
415	x	x	x	x	x	
420		x	x	x	x	x
431	x	x				x
434		x				x
439		x				x
441	x	x				
447	x	x				x
451	x	x				x
455	x	x				x
470	x	x				x
473	x	x				x
479	x					x
482			x	x		

Table [2] Course – Student Outcome Mapping

Specific Performance Indicators for each SO

(These are Measured by the Corresponding Rubric)

Student Outcomes	Performance Indicators
1	• Students are able to formulate and decompose a problem into appropriate components. • Students are able to apply the knowledge of the foundations of math, logic, and statistics to algorithm development • Students are able to estimate resources required for the proposed solution
2	• Students will demonstrate the ability to conceptualize • Students will demonstrate the ability to develop • Students will demonstrate the ability to validate
3	• Preparing Documents and Presentation Materials • Presentation Delivery
4	• Students will demonstrate an understanding of the responsibilities of a computing technology professional with respect to individuals and society • Students will demonstrate understanding of intellectual property issues. • Students will demonstrate working knowledge of a code of ethics.
5	• Organization and Responsibilities • Interaction • Productivity
6	• Students demonstrate an ability to apply mathematical foundations in the modeling and design of computer-based systems • Students demonstrate an ability to apply algorithmic principles in the modeling and design of computer-based systems • Students demonstrate an ability to apply computer science theory in the modeling and design of computer-based systems

Table [3] Student outcomes and performance indicators

Rubric 1

for assessing Student Learning Outcome [1]

"Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions."

Criteria	Exemplary (5 points each)	Accomplished (3 points each)	Need Improvement (1 pt each)	Score
Students are able to formulate and decompose a problem into appropriate components.	● Students are able to decompose a problem for efficient implementation, modify the problem definition as new information arrives, and conduct feasibility studies.	● Students are able to cast a problem as a computing problem, adequately decompose the problem into components, and formulate solution strategies.	● Students are able to produce computing formulations only for simple problems that do not require decomposition.	
Students are able to apply the knowledge of the foundations of math, logic, and statistics to algorithm development	● Students are able to: ● model and critique complex processes using math expressions, logic, and statistics; ● construct formal proofs; ● apply models to solve problems. ● Students can translate a complex model into code, analyze its complexity and efficiency, and provide formal verification of its correctness.	● Students are able to ● produce simplified models for processes ● understand and reproduce mathematical definitions ● apply standardized solution formulas. ● Students can implement mathematical algorithms and can correctly code logical expressions.	● Students are able to recite mathematical definitions but are unable to relate these concepts to typical problems instances. Students are unable to apply standard math techniques or formulas. ● Students can implement limited mathematical solutions that operate correctly under normal conditions.	
Students are able to estimate resources required for the proposed solution.	● Students are able to evaluate the space, time, and financial demands of the solution.	● Students are able to map problems components to appropriate languages, platforms, and hardware.	● Students are able to select adequate resources but their choices may not be the most practical or justified.	
			Total	

Threshold: 70% of the students that pass the course should achieve a score of 10 or better.

Rubric 2

for assessing Student Learning Outcome [2]

"Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline."

Criteria	Exemplary (5 points each)	Accomplished (3 points each)	Need Improvement (1 pt each)	Score
Students will demonstrate the ability to conceptualize	● Able to construct standard design documents to support the approach to a project.	● Able to produce an ad-hoc logical plan and organization of approach.	● Appreciated by project colleagues for contribution, but unable to document role.	
Students will demonstrate the ability to develop	● Able to engage in research to find multiple alternatives to well-understood technologies and development methodologies, and use them to produce solutions to a problem.	● Able to apply software engineering principles to produce multiple solutions to a problem, using two or more high level languages.	● Able to produce code in a high-level language to implement a given solution to a problem.	
Students will demonstrate the ability to validate	● Able to produce metrics for testing/verification and can identify and minimize sources of experimental uncertainty.	● Able to create a structured set of tests and use them to validate a system's specifications and identify a system's faults.	● Students are able to measure system performance	
			Total	

Threshold: 70% of the students that pass the course should achieve a score of 10 or better.

Rubric 3

for assessing Student Learning Outcome [3]

"Communicate effectively in a variety of professional contexts."

Criteria	Exemplary (5 points each)	Accomplished (3 points each)	Need Improvement (1 pt each)	Score
Preparing Documents and Presentation Materials	● Citations provide insightful connections to existing work	● Presentation is free from distracting errors ● Citations provide accurate connections to existing work	● Presentation is organized ● Citations are inappropriate or incomplete	
Presentation Delivery	● Engaging the audience / motivate ● Answers technical and non-technical questions at the appropriate level for each. ● Visual aids are original and enhance the presentation	● Students will demonstrate ability to deliver formal oral presentations ● Appropriate visual aids are provided ● Answers questions	● Visual aids are distracting or non-existent ● Inadequate development ● No eye contact ● Improper tone of voice	
			Total	

Threshold: 70% of the students that pass the course should achieve a score of 7 or better

Rubric 4

for assessing Student Learning Outcome [4]

"Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles."

Criteria	Exemplary (5 points each)	Accomplished (3 points each)	Need Improvement (1 pt each)	Score
Students will demonstrate understanding of various ways in which computing technology impacts individuals, organizations, and society.	● Key concepts, definitions, and facts associated with positive and negative impacts of computer technology are thoroughly identified, defined and described. ● Significant facts and supporting details obtained through appropriate research are included and accurately described. ● Has little or no factual inaccuracies.	● Key concepts, definitions, and facts associated with positive and negative impacts of computer technology are adequately identified, defined and described. ● Adequate attempts at supporting arguments based on facts or research	● Given a scenario, student is not able to identify any key concepts or ways of potential impact of computing on individuals and society. ● Supporting arguments are improvised and not based on facts or research.	
Students will demonstrate understanding of intellectual property issues.	● Students can articulate understanding of multiple points-of-view in an intellectual property issue.	●Students can cite a particular point-of-view relating to an intellectual property issue.	● Students have no more than a personal opinion regarding intellectual property issues.	
Students will demonstrate working knowledge of a code of ethics.	● Students can identify and articulate appropriate elements of a code of ethics in reference to a specific situation.	●Students cite ad-hoc ethical standards or recognize elements of a code of ethics in reference to a situation.	● Students are unable to identify the ethical issues in a situation.	
			Total	

Threshold: 70% of the students that pass the course should achieve a score of 10 or better.

Rubric 5

for assessing Student Learning Outcome [5]

"Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline."

Criteria	Exemplary (5 points each)	Accomplished (3 points each)	Need Improvement (1 pt each)	Score
Organization and Responsibilities	• Students recognize team dynamics and work in leadership and non-leadership roles. • Students are able to delegate and accept responsibilities effectively.	• Students can demonstrate the ability to assume a designated role in the group	• Team Roles, leadership roles can be identified	
Interaction	• Students can value alternative perspectives	• Diversity of strengths mutually respected • Sharing and acceptance of ideas	• Dominating individual; limits participation of others. Little contribution to group. Intolerant of other ideas and perspectives	
Productivity	• Students are competent with tools used for team projects. • Students can mentor others	• Students can work with others on teams to solve computer system and software problems • Students can contributes a fair share to the project workload	• Students can routinely present at team meetings or work sessions • Students can share information with others	
			Total	

Threshold: 70% of the students that pass the course should achieve a score of 10 or better.

Rubric 6

for assessing Student Learning Outcome [6]

"*Apply computer science theory and software development fundamentals to produce computing-based solutions."*

Criteria	Exemplary (5 points each)	Accomplished (3 points each)	Need Improvement (1 pt each)	Score
Students demonstrate an ability to apply mathematical foundations in the modeling and design of computer-based systems	Students are able to: ● model and critique complex processes using math expressions, logic, and statistics; ● construct formal proofs; ● apply models to solve problems.	Students are able to ● produce simplified models for processes ● understand and reproduce mathematical definitions ● apply standardized solution formulas.	● Students are able to recite mathematical definitions but are unable to relate these concepts to typical problems instances. Students are unable to apply standard math techniques or formulas.	
Students demonstrate an ability to apply algorithmic principles in the modeling and design of computer-based systems	● Students can translate a complex model into code, analyze its complexity and efficiency, and provide formal verification of its correctness.	● Students can implement mathematical algorithms and can correctly code logical expressions.	● Students can implement limited mathematical solutions that operate correctly under normal conditions.	
Students demonstrate an ability to apply computer science theory in the modeling and design of computer-based systems	● Students can apply more than one computer science theory in the modeling and design of computer-based systems.	● Students can apply one computer science theory in the modeling and design of computer-based systems.	● Students can recall at least one computer science theory but cannot apply it in the modeling and design of computer-based systems.	
			Total	

Threshold: 70% of the students that pass the course should achieve a score of 10 or better.

Detailed Data Collection Table for Rubric 1

Student Learning Outcome [1]

Course:		**Semester:**		
Number of BSCS Students:		**Number of BSCS Students who satisfied all performance indicators:**		
Performance Indicator	1. Students are able to formulate and decompose a problem into appropriate components.			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				
Performance Indicator	2. Students are able to apply the knowledge of the foundations of math, logic, and statistics to algorithm development			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				
Performance Indicator	3. Students are able to estimate resources required for the proposed solution.			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				

Detailed Data Collection Table for Rubric 2

Student Learning Outcome [2]

Course:		**Semester:**	
Number of BSCS Students:		**Number of BSCS Students who satisfied all performance indicators:**	
Performance Indicator	1. Students will demonstrate the ability to conceptualize.		
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*			
Use of Results:			
Performance Indicator	2. Students will demonstrate the ability to develop		
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*			
Use of Results:			
Performance Indicator	3. Students will demonstrate the ability to validate.		
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*			
Use of Results:			

Detailed Data Collection Table for Rubric 3

Student Learning Outcome [3]

Course:		**Semester:**	
Number of BSCS Students:		**Number of BSCS Students who satisfied all performance indicators:**	
Performance Indicator	1. Preparing Documents and Presentation Materials		
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*			
Use of Results:			
Performance Indicator	2. Presentation Delivery		
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*			
Use of Results:			

Detailed Data Collection Table for Rubric 4

Student Learning Outcome [4]

Course:		**Semester:**		
Number of BSCS Students:		**Number of BSCS Students who satisfied all performance indicators:**		
Performance Indicator	1. Students will demonstrate an understanding of the responsibilities of a computing technology professional with respect to individuals and society			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				
Performance Indicator	2. Students will demonstrate understanding of intellectual property issues.			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				
Performance Indicator	3. Students will demonstrate working knowledge of a code of ethics.			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				

Detailed Data Collection Table for Rubric 5

Student Learning Outcome [5]

Course:		**Semester:**		
Number of BSCS Students:		**Number of BSCS Students who satisfied all performance indicators:**		
Performance Indicator	1. Organization and Responsibilities			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				
Performance Indicator	2. Interaction			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				
Performance Indicator	3. Productivity			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				

Detailed Data Collection Table for Rubric 6 - Only BSCS

Student Learning Outcome [6]

Course:		**Semester:**		
Number of BSCS Students:		**Number of BSCS Students who satisfied all performance indicators:**		
Performance Indicator	1. Students demonstrate an ability to apply mathematical foundations in the modeling and design of computer-based systems			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				
Performance Indicator	2. Students demonstrate an ability to apply algorithmic principles in the modeling and design of computer-based systems.			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				
Performance Indicator	3. Students demonstrate an ability to apply computer science theory in the modeling and design of computer-based systems.			
Methods of Assessment and Detailed Performance *copy/paste example questions, assignments, etc in this table*				
Use of Results:				