BSCE, BSConE, MSCE, MSE(Env), and PhD Student Learning Outcomes Rubric / Level of Achievement

Outcome		Level 1: Knowledge	Level 2: Comprehension	Level 3: Application	Level 4: Analysis	Level 5: Synthesis	Level 6: Evaluation
F1 (BS: Level 3)	**math and science**	**Define** key factual information related to mathematics through differential equations, probability and statistics, calculus-based physics, general chemistry, and one additional area of science.	**Explain** key concepts and problem-solving processes in mathematics through differential equations, probability and statistics, calculus-based physics, general chemistry, and one additional area of science.	**Solve** problems in mathematics through differential equations, probability and statistics, calculus-based physics, general chemistry, and one additional area of science. (BS)			
F2 (BS: Level 3)	**humanities and social behavior**	**Define** key facts from (1) humanities, literature, and fine arts, and (2) history and social behavior.	**Discuss** the key facts of (1) humanities, literature, and fine arts, and (2) history and social behavior.	**Explain** the importance of (1) humanities, literature, and fine arts, and (2) history and social behavior. (BS)			
T1 (BS: Level 4)	**material science and mechanics**	**Define** key factual information related to material science and engineering mechanics.	**Explain** key concepts and problem-solving processes in material science and engineering mechanics.	**Solve** problems in material science and engineering mechanics.	**Analyze** and **solve** problems in material science and engineering mechanics. (BS)		
T2 (BS: Level 4) (MS: Level 5) (PhD: Level 6)	**experiments & data analysis**	**Identify** the procedures and equipment necessary to conduct engineering related experiments.	**Explain** the purpose, procedures, equipment, and practical applications of engineering related experiments.	**Conduct** program-relevant civil or construction engineering related experiments according to established procedures, and **report** the results.	**Select** and **conduct** program-relevant civil or construction engineering experiments to meet a need, and **analyze** and **evaluate** the resulting data. (BS)	**Specify** or **design** an experiment to meet a need, conduct the experiment, and analyze and **explain** the resulting data. (MS)	**Evaluate** the effectiveness of a designed experiment and the implications of the resulting data. (PhD)
T3 (BS: Level 3) (MS: Level 4) (PhD: Level 6)	**tools & engineering problems**	**Identify** the techniques, skills, and modern engineering tools that are necessary for civil or construction engineering practice.	**Explain** how relevant techniques, skills, and modern engineering tools are used in civil or construction engineering practice, including key concepts and problem-solving processes appropriate to civil or construction engineering.	**Apply** relevant knowledge, techniques, skills, and modern engineering tools to **identify**, **formulate**, and **solve** engineering problems, including: *BSCE* – problems in at least four technical areas appropriate to civil engineering. *BSConE* – problems in construction processes, communications, methods, materials, systems, equipment, planning, scheduling, safety, economics, accounting, cost analysis and control, decision analysis, and optimization. (BS)	Identify, **formulate,** and solve complex civil or environmental engineering problems by **selecting** and **applying** appropriate tools and techniques. (MS)	**Synthesize** and **explain** the solution to complex civil engineering problems, including the use of appropriate tools and techniques.	**Verify** and **justify** the solution to a complex civil engineering problem, including the use of appropriate tools and techniques. (PhD)
T4 (BS: Level 3)	**impacts of historical and current events**	**Define** the impacts of specific historical and contemporary issues on civil or construction engineering.	**Discuss** the impact of historical and contemporary issues on civil or construction engineering.	**Explain** the impact of historical and contemporary issues on civil or construction engineering. (BS)			
T5 (BS: Level 3)	**project management**	**List** key principles of project management.	**Explain** what a project is and the key aspects of project management.	**Develop** solutions to well-defined project management problems within civil or construction engineering. (BS)			
T6 (BS: Level 5)	**design**	**Define** engineering design; **list** the major steps in the engineering design process; and **list** constraints that affect the process and products of engineering design.	**Describe** the engineering design process; **explain** how real-world constraints affect the process and products of engineering design.	**Apply** the engineering design process to a component to meet a well-defined set of requirements and constraints.	**Illustrate** the engineering design process for a basic civil or construction engineering system or process to meet a well-defined set of requirements and constraints.	**Design** a system or process in more than one program-relevant civil or construction engineering specialty field to meet desired needs, including sustainability and within other realistic constraints such as economic, environmental, social, political, ethical, health and safety, and constructability. (BS)	
T7 (BS: Level 2) (MS: Level 5) (PhD: Level 6)	**specialization**	**Define** key aspects of at least one traditional or emerging area of program-relevant area of advanced specialization.	**Explain** key aspects of at least one traditional or emerging area of program-relevant area of advanced specialization. (BS)	**Apply** specialized knowledge to **solve** problems in a traditional or emerging area of program-relevant area of advanced specialization.	**Analyze** complex system of process in a traditional or emerging area of program-relevant area of advanced specialization.	**Synthesize** advanced technical knowledge in a specialized area of civil or environmental engineering. (MS)	Develop and **evaluate** new, advanced technical knowledge in a specialized area of civil engineering. (PhD)

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Outcome		**Level 1: Knowledge**	**Level 2: Comprehension**	**Level 3: Application**	**Level 4: Analysis**	**Level 5: Synthesis**	**Level 6: Evaluation**
P1 (BS: Level 4)	**professional, ethical, & legal aspects**	**List** the professional, legal, and ethical responsibilities of a civil or construction engineer.	**Describe** the professional, legal, and ethical responsibilities of a civil or construction engineer.	**Apply** standards of professional, legal, and ethical responsibility in a relatively clear-cut situation, to determine an appropriate course of action.	**Analyze** a situation involving multiple conflicting professional, legal, and ethical interests, to determine an appropriate course of action. (BS)		
P2 (BS: Level 4) (PhD: Level 5)	**communication**	**List** the characteristics of effective verbal, written, and graphical communications.	**Describe** the characteristics of effective verbal, written, and graphical communications.	**Apply** the rules of grammar, composition and appropriate graphical standards to **deliver** verbal, written, and graphical communications.	**Organize** and **deliver** effective written, verbal, graphical, and virtual communications. (BS)	**Synthesize** and **explain** the relevance and application of new, advanced technical knowledge in both technical and non-technical terms. (PhD)	
P3 (BS: Level 3)	**independent study**	**Define** life-long learning.	**Explain** the need for life-long learning and **describe** the skills required of a life-long learner.	**Demonstrate** the ability to learn through independent study, without the aid of formal instruction. (BS)			
P4 (BS: Level 3)	**attributes, leardership, and teaming**	**Describe** attributes supportive of the professional practice of engineering, and key aspects of leadership and teamwork.	**Discuss** attributes supportive of the professional practice of engineering, leadership principles, and the principles of collaborative teaming.	**Demonstrate** attributes supportive of the professional practice of engineering; **apply** leadership principles to direct the efforts of a small group to solve a relatively constrained problem; and **function** effectively as a member of a multidisciplinary team to solve open-ended engineering problems. (BS)			
P5 (BS: Level 2)	**licensure, business, globalization**	**List** key concepts of licensure, engineering management, business, law, public administration, public policy, and globalization.	**Explain** the importance of licensure, and basic concepts in engineering management, business, law, public administration, public policy, and globalization as related to the professional practice of civil or construction engineering. (BS)				