TEXAS A&M UNIVERSITY KINGSVILLE

NIST National Institute of Standards and Technology U.S. Department of Commerce

Curricular Integration of Design and Material Standards in Engineering (CID-MaSE)

Award No. 70NANB21H175

Period of Performance: 09/15/2021 - 09/14/2023

Project Team

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Project Objectives

Goal: Stimulate students' interest in standards and standardization methods in a way that will increase their use of standards throughout their professional career.

Focus: Standards related to engineering design, and material testing and characterization.

Specific Objectives:

- Educate engineering students about design- and materials-related standards, the standardization procedures and standards-related organizations.
- Through repeated classroom practice, embed a deep appreciation and understanding of standards in students.
- Through reinforcement in multiple courses and a certificate program, instill the importance of standards and standardization into students in a way that will promote life-long use of standards in their professional careers.

Project Update

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Standards-related Course Module Implementation

Level	Mechanical Engineering	Civil and Architectural Engineering
Freshman	**GEEN 1201**: Engineering as a Career (**Fall 2022**).	
Sophomore	**MEEN 3145**: Material Science Laboratory (**Spring 2022**). **MEEN 3344**: Materials Science (**Spring 2022**). **CEEN 3311**: Strength of Materials (**Spring 2022**).	**CEEN 3311**: Strength of Materials (**Spring 2022**).
Junior	**MEEN 3349**: Fundamentals of Manufacturing Processes (**Spring 2022**).	**CEEN/AEEN 3303**: Structural Analysis (**Spring 2022**). **CEEN/AEEN 3304**: Reinforced Concrete Design (**Spring 2022**). **CEEN 3145**: Construction Materials Lab (**Spring 2022**). **CEEN 3244**: Construction Materials (**Spring 2022**).

Project Update (Cont'd)

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Standards-related Course Module Implementation

Level	Mechanical Engineering	Civil and Architectural Engineering
Senior	**MEEN 4382**: Polymer Science & Engineering (**Spring 2022**). **MEEN 4385**: Manufacturing of Composites (**Spring 2022**). **Senior Design Project** (**1 lecture in Spring 2022**).	**CEEN/AEEN 4316**: Structural Steel Design (**Fall 2022**). **AEEN Senior Design Project** (**Spring 2023**). **CEEN Senior Design Project** (**Fall 2022**).
Graduate	**MEEN 5301**: Advanced Manufacturing (**Fall 2022**). **MEEN 5331**: Advanced Materials Science (**Fall 2022**). **MEEN 5333**: Polymer Science (**Spring 2022**).	**CEEN 5361**: Advanced Structural Steel Design (**Spring 2023**).

Project Update (Cont'd)

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Transcripted Certificate on Standards for Material Testing, Characterization and Applications

Undergraduate:

- Attend 6 one-hour seminars, offered through the certificate program
- Complete 12 credits from a list of courses with a grade of "B" or better in each
- Senior Design Project that has significant components on standards

Graduate:

- Attend 6 one-hour seminars, offered through the certificate program
- Complete 9 credits (3 courses) from a list of courses with a grade of "B" or better in each
- MS Thesis that has significant components on standards

Project Update (Cont'd)

Spring 2022 Seminar Series on Standards

Date	Speaker	Affiliation
March 9, 2022	Mr. Antonio Reyna	TxDOT
March 23, 2022	Mr. Travis Murdock	ASTM International
March 30, 2022	Dr. Larry D. Peel	TAMUK
April 6, 2022	Dr. Mohammad M. Hossain	TAMUK
April 13, 2022	Dr. Hoang Pham	Avery Dennison
April 20, 2022	Dr. Pavan Valavala	Dow Inc.

Project Update (Cont'd)

Spring 2023 Seminar Series on Standards

Date	Speaker	Affiliation
February 8, 2023	Dr. Brian McFall	US Army Corps of Engineers
February 15, 2023	Dr. Ruth Chatelain-Jardon	TAMUK
February 22, 2023	Mr. Steven Bailey	Nine Energy Service
March 1, 2023	Mr. Erik Puskar & Dr. Titilayo Shodiya	NIST

9 Recorded Presentations

Project Impact

- 478 students were registered in the classes where standards related course modules were implemented in Spring 2022
- 276 students were registered in the classes where standards related course modules were implemented in Fall 2022
- 93 students attended the seminars on standards in Spring 2022
- 3 students applied for the transcripted certificate in Spring 2023; 2 applications received initial approval
- Project Website at TAMUK
  - All standards-related modules, revised course syllabi, and related publications will be posted and updated on this website
- Submitted a conference paper on February 28, 2023, after the Abstract was accepted (*Title: Curricular Integration of Design and Material Standards in Engineering*) at the American Society of Engineering Education (ASEE) Conference to be held in Baltimore Convention Center, MD, June 25-28, 2023

Project Evaluation

Summary of Survey Conducted in Spring 2022

Survey Questions: On a scale of 1 to 5, indicate your…	Responses Intermediate or Above
Overall understanding of standards	86%
Overall appreciation of standards	93%
Understanding of standards for engineering design / materials	86%
Appreciation of standards for engineering design / materials	93%
Ability to identify relevant standards	86%
Ability to apply relevant standards	86%

- **Only 14 students completed the survey**
- Strict IRB Regulations
- Need more Participation
- **Suggestions?**

Project Evaluation

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Summary of Survey Conducted in Fall 2022

Survey Questions: On a scale of 1 to 5, indicate your…	Responses High or Very High Early Sem.	Late Sem.
Overall understanding of standards	57%	77%
Overall appreciation of standards	69%	85%
Understanding of standards for engineering design / materials	57%	77%
Appreciation of standards for engineering design / materials	74%	85%
Ability to identify relevant standards	43%	77%
Ability to apply relevant standards	61%	62%

- **Addition of course modules is making a difference**
- **Only 23-early/13-late in semester, students completed survey**
- Strict IRB Regulations
- Need more Participation