Integrating Standards into Aviation/Aerospace and Engineering Curriculum

NIST Award 70NANB23H240

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Today's Presentation Agenda

- Introduction of Principal Investigator and Project Team
- Grant Overview and Objectives
- Work Completed and Course Development
- Course Curriculum Enhancements and Pedagogical Innovations
- Technology, Access, and Flexible Delivery
- Publication, Dissemination, and Conference Participation
- Lessons Learned and Challenges
- Current Status, Next Steps, and Future Vision

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Residential Campuses

Daytona Beach, Florida

Prescott, Arizona

Worldwide (Online Campus)

- Over 100 campuses across the U.S., Europe, Asia, and South America with multiple modalities, including online, blended, and in person
- Three colleges: College of Aviation (COA), the College of Arts & Sciences (COAS), and the College of Business (COB)

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Introduction of Principal Investigator and Project Team

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Principal Investigator , Co PIs and Students

- **Principal Investigator**

Leila Halawi holds a DBA and FRAeS designation, serving as Associate Professor and Research Coordinator, College of Aviation, WW Depts of Aeronautics

- **Co-Principal Investigators**

Dr. Marwa El Sayed, Associate Professor, DB Civil Engineering

Dr. Mark Miller, Associate Professor and MSA Program Coordinator, WW Dept of Aeronautics

Mrs. Sophia White, Director of Instructional Design and Development, WW-Instructional Design and Development, College of Arts and Sciences

- **Students**

2 **Graduate DB** Engineering Students: Sapkota Dhakal, Shreya, and Ghosh, Tonmoy

Grant Period and Project Scope

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Grant Details: Funding, Period, and Objectives

Grant Funding Details

The grant amount is $150,000, provided for integrating standards into the aviation and engineering curriculum.

Grant Period

The performance period for the grant spans three years from September **15, 2023, to September 14, 2026**.

Project Objectives

- Create two customizable modules on engineering and aviation standards into higher education curricula to enhance learning outcomes.
- Evaluate student outcomes with input from university boards and subject matter experts across campuses.
- Develop a model curriculum for wider use in colleges to integrate standards and support certifications

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Work Completed and Course Development

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Enhancements and Outcomes for ASCI 693: Current Research Problems in Aviation/Aerospace

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Comprehensive Curriculum Enhancements

The course expanded from 2 to 4.5 extensive modules, incorporating research fundamentals, industry standards, and problem-solving.

Industry Standards Updates

Anticipating AS 9100 revision to IA9100 and ISO 9001 changes, the course includes ethics, cybersecurity, and technology adoption.

Project-Based Learning Improvements

Modules 4, 5, and 7 updated with clearer project requirements and embedded standards to boost practical skills.

Pedagogical and Access Innovations

Implemented flashcards, improved standards access, social media/gamification conversation platform, and open-access research guides for wider reach.

Course Updates for CIV 222: Introduction to Environmental Engineering

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Updated Foundational Module

Module 1 was updated to maintain consistency and introduce key standards shared with other programs.

ISO Standards Module

Module 2 covers ISO 9001 and ISO 14001 standards, focusing on sustainability and quality management.

Hybrid Learning Approach

The course uses hybrid teaching methods with asynchronous and interactive tools for flexible learning.

Engagement and Assessment

Interactive discussions, critical assignments, and surveys ensure student engagement and knowledge consolidation.

Development of CIV 417: Fundamentals of Air Pollution

Two-Module Course Structure

The course features two modules covering indoor air quality and ambient air quality standards with interactive learning.

ASHRAE Standards Focus

Module 1 emphasizes ASHRAE indoor air quality standards and their application in engineering settings.

NAAQS and Air Quality Analysis

Module 2 covers National Ambient Air Quality Standards and includes practical air quality analysis exercises.

Flexible, Career-Oriented Design

The course offers flexible asynchronous learning with career-relevant assessments for engineering professionals.

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Course Curriculum Enhancements and Pedagogical Innovations

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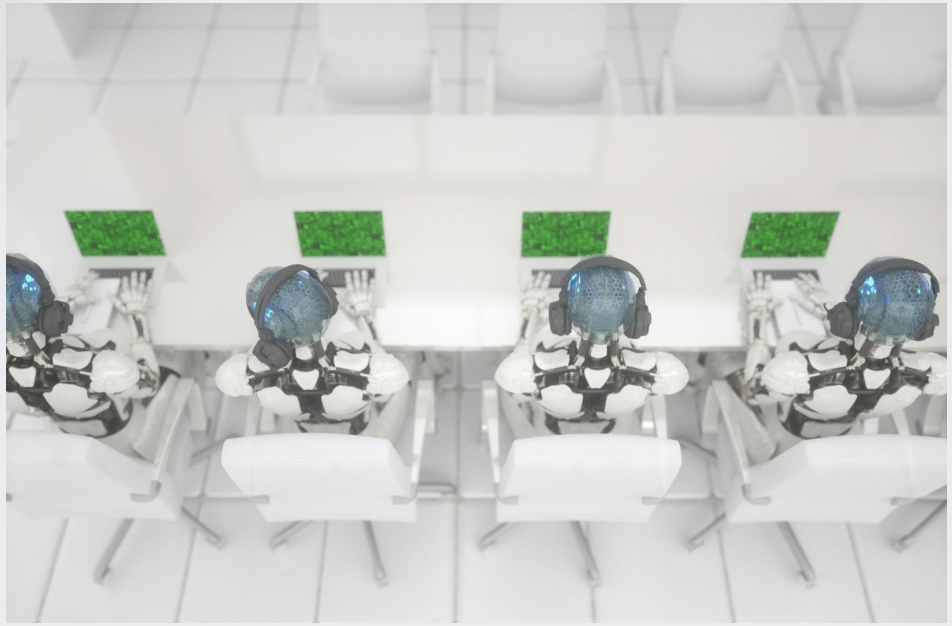

Enhancements in ASCI 693: Module Improvements, Ethics Integration, and Industry Alignment

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Course Curriculum Expansion

The course expanded from 2 to 4.5 comprehensive modules focused on research, standards, and problem-solving.

Industry Standards Evolution

Major updates to aerospace quality standards, like AS 9100 transitioning to IA9100, are integrated to keep content current.

Ethics Integration

A dedicated ethics lecture was added to emphasize ethical decision-making throughout the aerospace project stages.

Standards Update Awareness

New sections preview upcoming ISO 9001 and IA9100 changes, helping students stay informed on evolving standards.

Project-Based Learning, Feedback Mechanisms, and Resource Development

Project-Based Learning Updates

Modules 4, 5, and 7 were improved with clearer project requirements and updated quantitative and qualitative scenarios.

Continuous Feedback Mechanisms

Each module ends with a survey that guides iterative improvements, reflecting systematic evaluation and refinement.

Open Access Research Guide

The ASCI 693 Open Access Guide offers publicly accessible aerospace research tools, supporting student projects and development.

Technology, Access, and Flexible Delivery

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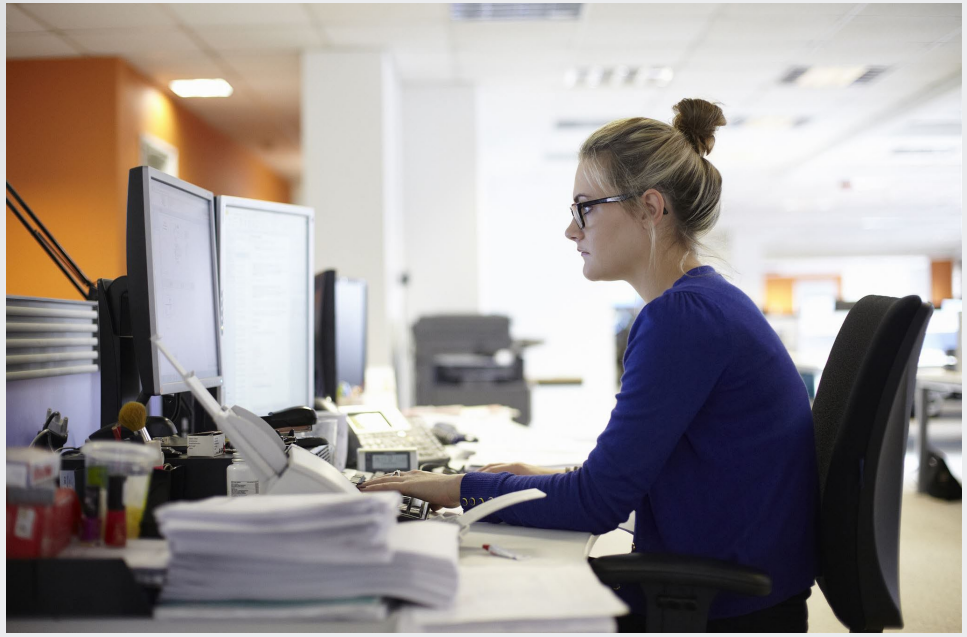

Public and Protected Research Guides for Standards Access

Public vs Protected Guides

Two research guides exist: one public, open-access, and one protected, requiring ERAU credentials.

Open Access Guide Features

The open access guide offers structured access to aerospace standards and research methodologies.

Key Standards Organizations

The guide includes access to AIAA, ASTM International, and SAE International standards crucial for aerospace research.

Research and Academic Support

Provides guidance on NIST research, methodology, and aerospace-specific academic writing and professional development.

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Flexible, Asynchronous-Compatible Design for Continuity

Continuity in Instruction

Flexible design ensures continuous instruction during travel, illness, or other disruptions.

Asynchronous Learning Benefits

Asynchronous components allow students to engage independently and maintain learning momentum.

Adaptability for Professionals

Design supports professionals balancing education with work commitments effectively.

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Publication, Dissemination, and Conference Participation

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Approach to Academic and Industry Publication

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Conference Proceedings

Halawi, L., El Sayed, M., Miller, M., White, S., & Dhakal, S. S. (2024). Eagles flight: A curriculum blend of aviation, engineering, and industry standards. *Collegiate Aviation Review International, 42*(2), 237-246.http://ojs.library.okstate.edu/osu/index.php/CARI/article/view/10017/8906

Conference Presentation

Presentation was delivered at the University Aviation Association (UAA) 2024 Collegiate Aviation Education Conference & Expo in Memphis, TN (25-27 Sept 2024):[Proposal title: Eagles Flight: A Curriculum Blend of Aviation, Engineering and Industry Standards]

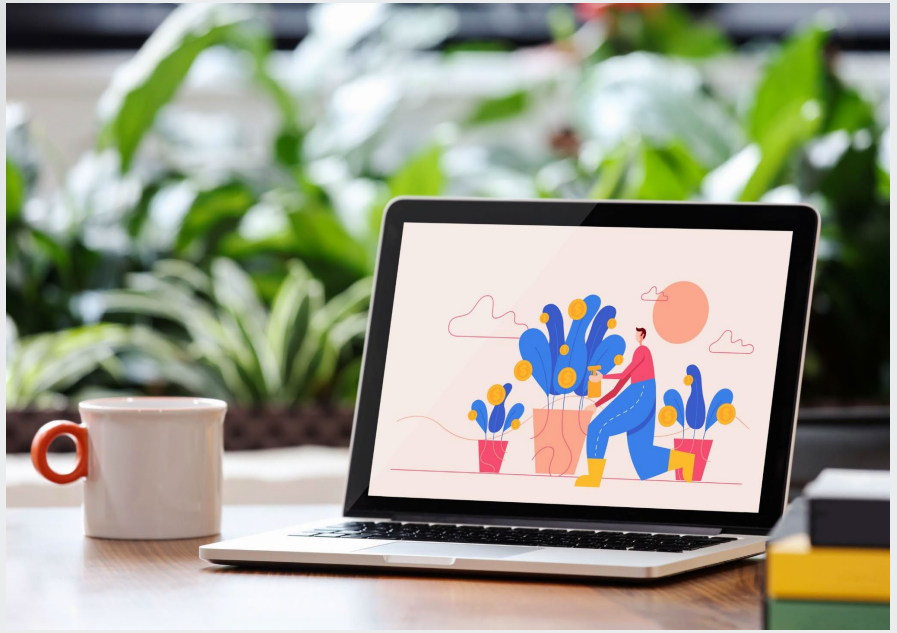
Book Chapter

Halawi, Leila, Miller, Mark, & Holley, Sam. Beyond the Blue Skies: A Comprehensive Guide for Risk Assessment in *Aviation* Book Chapter, Intechopen. https://www.intechopen.com/chapters/1194684.

Library Open Source and ERAU Guides:

guides.erau.edu/NIST

https://guides.erau.edu/asci693-nist/standards



Conference Participation and Submitted Abstracts

Conference Attendance Plan (DSI Orlando Nov 22-24, 2025)

- Halawi, L., Miller, M., White, S., & El Sayed, M. (2025). Bridging Academia and Industry: A NIST Research Initiative" (accepted) for the 2025 Decision Sciences Institute Annual Conference- November 22 – 24, 2025 | Orlando, FL Revolutionizing Decision-Making: Technology and Human Collaboration
- Halawi, L., Miller, M., White, S., & El Sayed, M. (2025). Pedagogical Models and Teaching Standards: A Framework for Higher Education Curriculum (accepted) for the 2025 Decision Sciences Institute Annual Conference, November 22 – 24, 2025 | Orlando, FL Revolutionizing Decision-Making: Technology and Human Collaboration

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Lessons Learned and Challenges

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Personnel changes and administrative solutions

Personnel Change Challenge

Replacing a Co-PI was a key challenge that required careful coordination and approval.

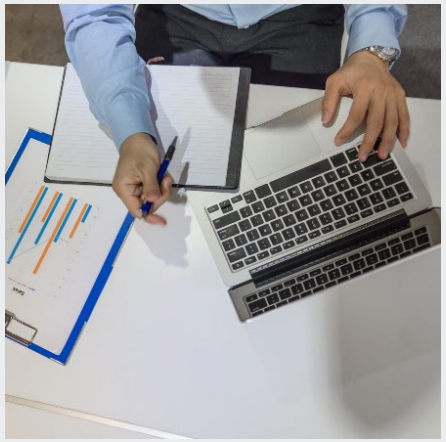
Administrative Process

The solution involved notifying the NIST office and obtaining official approval for the change.

Student recruitment and compliance with grant requirements

Recruitment Process

A job description was posted internally, enabling recruitment of graduate engineering students from the Daytona Beach Campus.



Compliance with Grant Requirements

Coordination with budget officer and OSRA ensured student work hours complied with grant policies and regulations.

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Lessons Learned

- Select stable standards for long-term curriculum development: Choose standards that are unlikely to undergo major revisions within the 5-year project cycle to ensure the curriculum remains relevant and avoid costly material updates •
- Early budget planning is critical for travel and conference participation
- Flexibility in funding allocation is essential for dynamic project needs
- Cross-institutional coordination requires more lead time than anticipated
- Technical standard implementation timelines often conflict with academic calendars•

Current Status, Next Steps, and Future Vision

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Year Three Timeline and Future Plans

Quarter 1 Activities

Launch three ASCI 693 sections and one CIV 222 section; complete CIV 417 content development; collect feedback.

Quarter 2 Progress

Deliver CIV 417; start manuscript publication preparation; continue teaching ASCI 693.

Quarter 3 Development and Future Plans

Complete final curriculum refinement; work on scholarly publications; plan for open-source repository launch in fall 2026.

Quarter 4 Wrap-up

Conclude grant activities and prepare a comprehensive final report.

NIST Branding Integration

Appy NIST award branding consistently to ensure recognition and proper attribution in materials.

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Vision for Advancing Standards Education and Ongoing Commitment

Comprehensive Course Structure

The curriculum fulfills grant objectives by offering adaptable, high-quality education across various delivery methods.

Integration of Industry Standards

Standards are integrated throughout modules, ensuring theoretical knowledge and practical skills development.

Continuous Assessment and Improvement

Ongoing evaluation of content mastery and career relevance ensures academic rigor and prepares students for professional success.

Ongoing Progress and Feedback

Course modules have evolved since launch through valuable input from instructors, students, and advisory board members.

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NIST Acknowledgement

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NIST Acknowledgement

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- The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Institute of Standards and Technology or the U.S. Department of Commerce.

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Thank you, NIST

Q& A

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