THE UNIVERSITY OF ARIZONA
COLLEGE OF ENGINEERING
Systems & Industrial Engineering

SIE 503 - DIGITAL THREAD AND MODEL MANAGEMENT

COURSE DESCRIPTION

This course covers **the design and management of digital threads**, exploring digital engineering, model-based engineering, digital twins, and interoperability. Students will learn about data standards, APIs, ontologies, and change management, applying these concepts to real-world digital thread deployment.

EXPECTED LEARNING OUTCOMES

- Explain the defining characteristics of model-based engineering and digital engineering, and the relationship between digital engineering and key concepts such as digital thread, digital engineering environment, and digital twin.
- Justify the need for digital threads in the form of use cases.
- Apply the concepts of data and technical interoperability within a digital thread.
- Evaluate the advantages and limitations of various tools and approaches to support interoperability such as APIs, data standards, data transformations, and ontologies.
- Apply change management approaches to a digital thread.
- Design a digital thread considering different elements, including purpose, organizational structure, digital engineering environment architecture, interoperability constraints, software requirements, product lifecycle, and model management.

COURSE FORMAT

The course will use a flipped classroom instructional approach. The student will read the required material and attempt to complete the homework on their own before coming to class.

PROGRAM DIRECTOR
Dr. Alejandro Salado
alejandrosalado@arizona.edu

ENROLLMENT
Graduate Coordinator
graduateadvisor@sie.arizona.edu

COURSE SCHEDULE

SESSION 0.5
- Course introduction and Overview

SESSION ONE
- The need for digital threads and main use cases
- Key architectural drivers for the digital thread
- Existing capabilities and a look at future possibilities

SESSION TWO
- Concepts of data and technical interoperability
- Challenges in data interoperability
- Introduction to APIs and data standards
- Data transformations and ontologies

SESSION THREE
- The need for digital threads and main use cases
- Key architectural drivers for the digital thread
- Existing capabilities and a look at future possibilities

SESSION FOUR
- Fundamentals of change management
- Change management in the digital thread

SESSION FIVE
- Elements of a digital thread design
- Organizational structures and their impact
- DE environment architecture
- Interoperability constraints and software requirements
- Product lifecycle and model management in DE

SESSION SIX
- Implementation of a digital thread

SESSION SEVEN
- Usability and maintenance of a digital thread

Pioneering SE since 1961

Built-in MBSE/DE

Bridge Theory & Practice

Hands-on Virtual Lab

Distinguished Faculty

MASTERING DISRUPTIVE TRANSFORMATION & **LEADING THE FUTURE** OF SYSTEMS ENGINEERING