USD(R&E)

Workforce Development
Defense Acquisition University Courses on Artificial Intelligence and System Safety Engineering

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Agenda

1. System Safety Line of Efforts: Workforce Development
2. Artificial Intelligence I System Safety Engineering - 1 Course
3. AI System Safety Engineering- 2 Course
4. Other System Safety Engineering Courses

Specialty Engineering: System Safety (SS) Line of Efforts (LOEs)

ENG 1410 - Intro to AI System Safety Engineering - 1

- Objective: Develop a foundational course in AI SS Engineering that delivers guidance on how System Safety Engineers and others can evaluate AI capabilities for safety
  - This is an introduction to early-to-mid-career engineers
  - The student should have some basic knowledge or experience in DoD acquisitions including:
    - Planning the scope of the System Safety Program and Software System Safety
    - Familiar with Functional Hazard Analysis, and other hazard analyses
- This is an online training course
- The courses is based on:
  - Requirements of MIL-STD-882E w/CHANGE 1
  - Machine Learning and Level of Rigor System Safety Guidance
  - Operation of the Adaptive Acquisition Framework
  - System Safety activities that are conducted as part of System Safety Engineering during each phase of the system's lifecycle

Upon completion of this course, the student will be able to:

- Describe the importance of AI-enabled systems in SS Engineering as an integral part of the DOD acquisition lifecycle.
- Describe the importance of AI and Data as an element of technology development and an integral part of the DOD acquisition lifecycle.
- Describe the key activities and deliverables for implementing AI capabilities for SS during system development, and test and evaluation of fieldable systems.
- Describe the importance of SS processes to identify and assess AI-related hazards, and associated AI risks.

ENG 1410 - Intro to AI System Safety Engineering - 1

Terminal Learning Objectives (TLOs): Overarching, high-level learning goals that students should achieve by the end of a course or training program

- Purpose: TLOs guide the design of the curriculum, ensuring that all training activities align with the desired end-state competencies. TLOs are broad and focused on what learners will be able to do after the course
- Refer as Modules

Enabling Learning Objectives (ELOs): Specific, supporting objectives that break down the TLOs into smaller, actionable steps. These are the foundational skills, knowledge, or attitudes that learners need to master to achieve the TLOs

- Purpose: ELOs guide the instructional design and learning assessments by focusing on specific tasks or knowledge areas. They ensure that learners build the necessary competencies in a logical, step-by-step manner, contributing to the achievement of the TLO
- Refer as Lessons

TLO 1: Describe the importance of AI- enabled systems in System Safety Engineering as an integral part of the Department of Defense (DOD) acquisition lifecycle

ELOs (Lessons)

1. AI and SS Terms and definitions
   - Artificial Intelligence
   - Algorithm
   - Model
   - Machine Learning
   - Neural Networks
   - Deep Learning
   - Reinforcement Learning
   - Large Language Models
   - Data
   - Safety Data
2. Policies, standards, guidance, strategies, and best practices for System Safety Engineering and the use of AI
3. AI vs non-AI development approaches
4. System safety assessment considerations and AI contributions to system level hazards, mitigations, risk, and mishaps
5. AI/Machine Learning Safety Function Criticality Index
6. AI Development lifecycles and alignment with DOD Acquisition lifecycle models

TLO 2: Describe the importance of Artificial Intelligence (AI) and data as an element of technology development and an integral part of the Department of Defense (DOD) acquisition lifecycle

ELOs (Lessons)

1. Describe how requirements for weapon SS and AI influence selection of AI features, algorithms, and data characteristics
2. Describe the AI algorithm selection and model training approach
3. Describe the importance of AI data to System Safety engineering
4. Identify the features addressing the significant and persistent nature of AI data sets for Safety Trending, Reliability & Maintainability (R&M), and Sustainment

TLO 3: Describe the key activities and deliverables for implementing AI capabilities for System Safety during system development, and test and evaluation of fieldable systems.

ELOs (Lessons)

1. Identify the AI development environment, tools, and role considerations for system safety applications
2. Recognize how to measure performance of AI
3. Recognize the criticality of data for safety significant Applications
4. Describe key considerations for data lifecycle management

TLO 4: Describe the importance of system safety processes to identify and assess AI-related hazards and associated AI risks

ELOs (Lessons)

1. Describe how to mitigate safety risks allocated to an AI implementation
2. Identify evidence of the completed and satisfied AI Level of Rigor (LOR) tasks
3. Describe the AI and Machine Learning ML methods to augment System Safety Analyses

AI System Safety Engineering - 2 Course - TLOs & ELOs

- **Objective:** To develop an advanced follow-up course on the System Safety Engineering of Artificial Intelligence Systems, offering detailed instructions on how System Safety Engineers and related professionals can evaluate the safety aspects of AI functionalities.
  - The student should have completed AI SS I
  - Established TLOs/ELOs,
  - Five (5) TLOs), Sixteen (16) ELOs
  - Module 1-4 content currently under development and review by Team

Module 1: Explain How Relevant Department Of Defense (Dod) Key Topics, Policy, And Guidance Are Used In Typical Ai Projects For System Safety (Ss) Engineering And Systems Engineering (SE) Workflows
Module 2: Integrate goals, roles, responsibilities, and requirements when performing system safety engineering on AI-enabled systems across all life cycles
Module 3: Integrate AI technologies into system safety hazard analyses and risk assessments
Module 4: Develop the AI-relevant portions of system safety content of the Safety Data Package (SDP)
Module 5: Determine key system safety attributes in emerging AI capabilities

Future System Safety Engineering Workforce Development Efforts

- SpE conducts outreach activities throughout the International System Safety Society Summit and Training to ensure DoD incorporates best practices and current technologies into engineering workforce competencies and guidance.
  - DoD-Industry Roundtable, 2022 ISSS Conference, Cincinnati, OH,
    - Twenty-six (26) pain points were listed, which were then distributed for review and comments
  - DoD-Industry Roundtable, 2023 ISSS Summit and Training, Portland, OR
    - Top four (4) pain points were selected
      - Lack of Defense Acquisition University (DAU) System Safety Training across DoD and Industry
  - Hosting System Safety Engineering Pain Points Meetings

- Other DAU System Safety Engineering Courses:
  - Software System Safety Course - Funded by System Engineering & Architecture, NOSSA/BAH. In-Progress
  - System Safety Engineering Basics - Unfunded Requirement Request - FY25

Contact

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