

**DoD HSI**



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# **COURSE CATALOG**

**This is a descriptive catalog of courses available from  
DoD educational resources for  
Human Systems Integration Practitioners**



*Published by the Joint HSI Working Group in conjunction with HSI program representatives.*

**Table of Contents**

1. Executive Summary	Pg. 3
2. DAU Courses	Pg. 4
A. HSI- & Domain-Specific Courses – Pg. 4	
B. Applicable HSI Practitioner Courses – Pg. 5	
C. Requirements & Capability Development Courses – Pg. 10	
3. AFIT Courses	Pg. 11
A. HSI-Specific Courses – Pg. 11	
B. Applicable HSI Practitioner Courses – Pg. 11	
C. Requirements & Capability Development Courses – Pg. 12	
D. SOH Courses – Pg. 12	
4. General Familiarization and Domain Courses	Pg. 14
A. Army HSI Familiarization Course – Pg. 14	
B. NPS Aircraft Combat Survivability Short course – Pg. 14	
C. Ground Vehicle Survivability and Force Protection Short course – Pg. 14	
5. HSI Graduate Certificate Programs	Pg.16
A. NPS Graduate Certificate in HSI – Pg. 16	
B. AFIT Graduate Certificate in Human Systems – Pg. 17	
6. NPS HSI Graduate Degree Programs	Pg. 20
A. Master of HSI – Pg. 20	
B. Master of Science in HSI – Pg. 24	
7. AFIT HSI Graduate Degree Programs	Pg. 32
A. Systems Engineering (M.S.) (GSE <sup>1</sup> ): Human Systems – Pg. 32	
B. Systems Engineering (M.S.) (ASE): Human Systems– Pg. 35	
C. Systems Engineering (PhD): Human Systems—Pg. 40	
8. Acronym List	Pg. 41
9. Program and Institution Contact Information	Pg. 42

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<sup>1</sup> GSE – Graduate Systems Engineering program (individual thesis or group project required)  
2019 DoD HSI Course Catalog

## **1 – Executive Summary**

The Department of Defense (DoD) Human Systems Integration (HSI) Course Catalog provides a comprehensive listing of HSI courses, classes, graduate certificates, and graduate degree programs available to government personnel (military & civilian) and government affiliates (contractors, academia, and HSI community of interest). With assistance from the Joint HSI Working Group (JHSIWG) and academia representatives, this catalog is updated and maintained to be available to increase HSI awareness in the DoD systems acquisition community by providing resources for training new HSI practitioners, providing advanced courses and program offerings to current HSI practitioners, and educating the acquisition workforce on the value and role of HSI in systems acquisition.

The information presented in this catalog is the result of a joint vetting effort by HSI representatives from the Services, Naval Postgraduate School (NPS), Defense Acquisition University (DAU), Air Force Institute of Technology (AFIT), the Army HSI Program, as well as the JHSIWG and operational HSI subject matter experts (SMEs). From these efforts, the DoD HSI Course Catalog aims to accomplish the following functions:

1. Analyze and establish a set of courses, some available at no cost, from DAU, AFIT, and the Army HSI Program that will introduce HSI concepts and establish DoD HSI practitioners with contextual knowledge of HSI application throughout the DoD acquisition lifecycle. The outlined courses represent core, HSI-centric topics, as well as systems engineering and acquisition topics that provide a more complete understanding of the DoD acquisition lifecycle and how HSI interacts with, and fits into the involved processes.

The DAU courses are presented in order of increasing depth of understanding and thoroughness that provide the HSI practitioner with a practical viewpoint of the acquisition process, systems engineering, and how HSI fits into both processes using curriculums from the Program Management (PM) and Engineering (ENG) Certification levels (1, 2, & 3) – managed as part of the Defense Acquisition Workforce Improvement Act (DAWIA) qualification coding system.

2. Identify HSI Graduate Certificate programs offered by AFIT and NPS available to all government and affiliated personnel. The NPS Graduate Certificate in HSI is a four course, distance learning program. The AFIT Graduate Certificate in Human Systems is a five course plan of study, available as an in-resident program or through a distance learning format. These programs and their curriculums are explored in-depth.
3. Explore the HSI graduate degree and certificate programs available through AFIT and NPS. NPS offers a distance learning Master of HSI program as well as an in-resident Master of Science degree in HSI program. AFIT offers a Master of Science in Systems Engineering degree, with a Human Systems focus sequence, including the option of a thesis (GSE) or a non-thesis (IDE) program track. These programs and their curriculums are explored in-depth.

## 2 – DAU Courses

### 2A – DAU – HSI- & Domain-Specific Courses

#### **CLE 062 – Human Systems Integration (distance learning)**

- **Description:** This module is designed to provide the learner with the basic understanding of HSI as part of the DoD's Total Systems Engineering approach for optimizing system performance and minimizing total ownership costs. Students will also be introduced to the HSI domains of human factors engineering, personnel, habitability, manpower, training, safety and occupational health (SOH), and survivability.
- **Target Audience:** Members of the acquisition workforce who are interested in understanding how to effectively apply HSI in programs.
- **Course Details:** Approximately 2 hours to complete; 2 Continuous Learning Points (CLPs); Prerequisites: None.

#### **CLE 030 – ESOH in JCIDS (distance learning)**

- **Description:** This course is designed to help the ESOH practitioner generate concise ESOH verbiage appropriate for JCIDS documents. The module offers practical guidance in negotiating the JCIDS process where different interests, ESOH related and non-ESOH related, often compete among stakeholders in a resource-constrained context.
- **Target Audience:** ESOH practitioners, ESOH subject matter experts (SMEs), and members of the acquisition workforce who are interested in understanding how to effectively apply ESOH practices into the JCIDS process.
- **Course Details:** Approximately 4 hours to complete; 4 CLPs; Prerequisites: None.

#### **CLE 009 – ESOH in Systems Engineering (distance learning)**

- **Description:** This module integrates the ESOH considerations into the DoD systems engineering process. It is based on the requirements of DoD Instruction (DoDI) 5000.02, Operation of the Defense Acquisition System, and identifies the key ESOH activities that are conducted as part of systems engineering during each phase of the system's life cycle. DoDI 5000.02 requires programs to either eliminate identified hazards or reduce the associated risks to acceptable levels for hazards that cannot be eliminated.
- **Target Audience:** Systems engineers, project managers, logisticians, T&E personnel, ESOH SMEs, as well as other program technical IPT members
- **Course Details:** Approximately 3.5 hours to complete; 4 CLPs; Prerequisites: None.

## **2B – DAU – Applicable HSI Practitioner Courses**

### *DAWIA PM and ENG Level I Applicable Courses*<sup>2</sup>

#### **ACQ 101 – Fundamentals of Acquisition Management (distance learning)**

- **Description:** This course provides a broad overview of the DoD systems acquisition process, covering all phases of acquisition. It introduces JCIDS; the Planning Programming Budgeting and Execution (PPBE) process; DoD 5000-series policy documents; and current issues in systems acquisition management.
- **Target Audience:** Open to all ranks and grades, but is designed for military officers, O-1 through O-3, and DoD civilians, GS-5 through GS-9. Specifically designed for individuals who have little or no experience in DoD acquisition management – this course has proven very useful to personnel in headquarters, program management, and functional or support offices.
- **Course Details:** Approximately 30 hours to complete; 30 CLPs; Prerequisites: None.

#### **ENG 101 – Fundamentals of Systems Engineering (distance learning)**

- **Description:** This course is a technically rigorous, comprehensive introduction to systems engineering and the various technical management and technical processes involved in its application. Based around the systems engineering processes outlined in the Defense Acquisition Guidebook (DAG), this course provides the essential foundations needed for systems engineers and others to effectively participate in the application and the management of DoD systems engineering processes and their related activities.
- **Target Audience:** Systems engineer in the acquisition workforce. This course is also suitable for acquisition personnel in technical and program management positions who want to understand more about systems engineering processes.
- **Course Details:** Approximately 35 hours to complete; 35 CLPs; Prerequisites: ACQ 101.

#### **CLB 007 – Cost Analysis (distance learning)**

- **Description:** Cost Analysis focuses on the basic cost analysis process. Cost estimates are one of the fundamental building blocks of any acquisition program. At the end of this module, you should be able to define various financial management terms as they relate to the defense acquisition process, determine when various cost estimates are required to be prepared, determine what estimating methodology is most appropriate, and determine what cost data is of interest to various program stakeholders.
- **Target Audience:** All.
- **Course Details:** Approximately 4 hours to complete; 4 CLPs; Prerequisites: None.

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<sup>2</sup> Courses shown do not reflect full curriculum and requirements for DAWIA PM and/or ENG Level I Certification; for full certification criteria, visit [www.dau.mil](http://www.dau.mil)

**CLV 016 – Introduction to Earned Value Management (EVM) (distance learning)**

- **Description:** The Introduction to EVM module introduces the basics of EVM as it relates to acquisition program management. You will learn the five independent earned value variables and the three most common EVM metrics. At the conclusion of this module, you should be familiar with EVM-related laws passed by Congress, the Office of Management and Budget's (OMB) implementation of these laws, and current DoD policy guidance regarding EVM requirements. Additionally, you should recognize how work scope, schedule, and resources are combined to establish the EVM performance measurement baseline.
- **Target Audience:** All.
- **Course Details:** Approximately 1 hour to complete; 1 CLP; Prerequisites: None.

**CLM 017 – Risk Management (distance learning)**

- **Description:** Risk is always a concern in the DoD systems acquisition process. The acquisition process itself is designed, to a large degree, to allow risk to be managed from conception to delivery for the system. Although risk is inherent in any program, risk management ensures that managers take measures to assess and handle risks. This module focuses on tools and processes that can be used to manage risk on a defense system acquisition project.
- **Target Audience:** All
- **Course Details:** Approximately 8 hours to complete; 8 CLPs; Prerequisites: None.

**LOG 101 – Acquisitions Logistics Fundamentals (distance learning)**

- **Description:** The course provides a broad overview of the role of acquisition logistics in the systems acquisition life cycle and systems engineering processes. Modules cover the logistics-relevant aspects of requirements identification, life-cycle costing, integrated product and process development, product support including supportability in system design and supportability analysis, sustainment logistics including logistics processes, life cycle sustainment plan, management tools, and management functions and processes.
- **Target Audience:** Professionals responsible for planning, establishing, and maintaining the logistics-support infrastructure for DoD systems and equipment in each phase of the acquisition life cycle.
- **Course Details:** Approximately 27 hours to complete; 27 CLPs; Prerequisites: ACQ 101.

**TST 102 – Fundamentals of Test and Evaluation (distance learning)**

- **Description:** This course emphasizes basic DoD test and evaluation (T&E) principles, policies, processes, and practices. TST 102 covers the integrated T&E processes outlined in the DAG and provides the essential foundation knowledge needed by T&E professionals and others to more effectively participate in DoD T&E activities.
- **Target Audience:** This course is part of the level I certification training requirement for the T&E career field. Additionally, as a basic introduction to T&E, it is suitable for personnel in other technical acquisition management and program management

positions who want to understand more about T&E and the critical role it plays in system acquisition.

- **Course Details:** Approximately 18 hours to complete; 18 CLPs; Prerequisites: ACQ 101 & ENG 101.

### *DAWIA PM and ENG Level II Applicable Courses*<sup>3</sup>

#### **ACQ 202 – Intermediate Systems Acquisition, Part A (distance learning)**

- **Description:** Part A of a two-course series designed for mid-level acquisition professionals. It provides a dynamic, real-time learning environment oriented towards developing the requisite skills and knowledge to work in IPTs by providing an overview of systems acquisition principles, policies, and processes.
- **Target Audience:** All DoD acquisition professionals at level II and industry counterparts.
- **Course Details:** Approximately 35 hours to complete; 35 CLPs; Prerequisites: ACQ 101.

#### **ACQ 203 – Intermediate Systems Acquisition, Part B (in-resident)**

- **Description:** Part B of a two-course series designed for mid-level acquisition professionals. It provides a dynamic, real-time learning environment oriented towards developing the requisite skills and knowledge to work in IPTs by providing an overview of systems acquisition principles, policies, and processes.
- **Target Audience:** All DoD acquisition professionals and industry counterparts.
- **Course Details:** 4.5 in-class days to complete; 35 CLPs; Prerequisites: ACQ 202.

#### **PMT 251 – Program Management Tools, Part I (distance learning)**

- **Description:** Program Management Tools provides application skills needed in a program office as an integrated product team lead. It is a follow-on course to ACQ 203 and is designed to enhance journeyman-level skills. This course prepares defense acquisition professionals for work in the program offices and for the Program Management Office Course, PMT 352, Parts A and B.
- **Target Audience:** This course is designed for military officers O-3 through O-4, and civilians, GS-12 through GS-13, in the program management career field.
- **Course Details:** Approximately 20 hours to complete; 20 CLPs; Prerequisites: ACQ 203.

#### **PMT 257 – Program Management Tools, Part II (facilitated/online)**

- **Description:** Program Management Tools provides application skills needed in a program office as an integrated product team lead. It is a follow-on course to PMT 251 and is designed to enhance journeyman-level skills.

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<sup>3</sup> Courses shown do not reflect full curriculum and requirements for DAWIA PM and/or ENG Level II Certification; for full certification criteria, visit [www.dau.mil](http://www.dau.mil)

- **Target Audience:** This course is designed for military officers O-3 through O-4, and civilians, GS-12 through GS-13, in the program management career field.
- **Course Details:** 4.5 facilitated class days (students required to participate in telephone conferences beginning at 8:00 am and lasting until 5:00 pm (EST) Monday through Thursday and ending at 2:30 pm on Friday); 43 CLPs; Prerequisites: ACQ 203, EVM 101, & PMT 251.

**ISA 101 – Basic Information Systems Acquisition (distance learning)**

- **Description:** Within the framework of a program office integrated product team (IPT), this course covers introductory-level concepts in DoD information systems and software acquisition management. Key areas covered include DoD regulatory and technical frameworks, common software risks, software and system architectures, lifecycle reviews, software development, integration processes, software standards, information assurance, software and system measures, testing, contracting issues, software quality, and the role of process maturity, as well as best practices for the management of software systems are also introduced.
- **Target Audience:** Acquisition personnel in the information technology (IT) and program management career fields.
- **Course Details:** Approximately 23 hours to complete; 23 CLPs; Prerequisites: ACQ 101 & 1 year of acquisition experience.

*DAWIA PM and ENG Level III Applicable Courses <sup>4</sup>*

**LOG 103 – Reliability, Availability, and Maintainability (RAM) (distance learning)**

- **Description:** Professionals who take this course will be able to understand the relationship between RAM as a critical factor in design, performance, cost, and sustainment. The course addresses the cross-disciplinary actions of Program Management, Systems Engineering, Test & Evaluation and both acquisition logistics and sustainment to evaluate the impact of reliability and maintainability decisions. Stressing a conceptual approach, the course presents basic RAM terminology and engineering practices. It discusses current legislative and DoD policy that have invigorated systems engineering and logistics engineering processes to improve the requirements process, minimize risk through reliability growth programs and ensure effectiveness and suitability through developmental and operational T&E.
- **Target Audience:** Life Cycle Logisticians; Program Managers and Engineers
- **Course Details:** Approximately 22 hours to complete course; 22 CLPs; Prerequisites: ACQ 101.

**PMT 355 – Program Management Office Course, Part A (distance learning)**

- **Description:** This course builds on the foundational and intermediate systems acquisition courses as well as the program management tools course. By focusing on the knowledge and skill requirements of upper mid-level and more senior leadership

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<sup>4</sup> Courses shown do not reflect full curriculum and requirements for DAWIA PM and/or ENG Level III Certification; for full certification criteria, visit [www.dau.mil](http://www.dau.mil)



positions in a program office, the student's analysis, synthesis, and evaluative skills are exercised to help these become more effective when occupying these leadership positions in a program office.

- **Target Audience:** Military officers, O-4 through O-5, and civilians, GS-13 through GS-14, in the program management career field.
- **Course Details:** Approximately 22 hours to complete; 22 CLPs; Prerequisites: ACQ 203, BCF 103, ISA 101, LOG 103, PMT 257, & SYS 202; **PMT 352A accepted as substitute for PMT 355 until 01-Oct-2019.**

#### **PMT 360 – Program Management Office Course, Part B (in-resident)**

- **Description:** Expanding on Part A, this course continues to reinforce the student's knowledge and hone their analysis, synthesis, and evaluative skills through the use of individual examinations, case studies and team exercises. Students completing this course are expected to be effective leaders in program offices at the upper mid and senior level positions while serving in program management positions.
- **Target Audience:** Military officers, O-4 through O-5, and civilians, GS-13 through GS-14, in the program management career field.
- **Course Details:** 18.5 class days; 119 CLPs; Prerequisites: PMT 355; **PMT 352B accepted as substitute for PMT 360 until 01-Oct-2019.**

#### **ENG 201 – Applied Systems Engineering in Defense Acquisition, Part I (replacing SYS 202; expected to deploy Q1 FY18\*) (distance learning)**

- **Description:** This distance-learning course provides an understanding of how DoD's systems engineering technical and technical management processes can be applied to a notional system within the context of the acquisition life cycle. The course content provides the student with information on the scope and role of systems engineering, its major inputs and outputs, timing of technical baselines, the role of technical reviews, important design considerations, and other related areas.
- **Target Audience:** Those in the engineering career field and members of other career fields who require an understanding of how systems engineering is applied to systems acquisition and sustainment.
- **Course Details (UNDER DEVELOPMENT):** CLPs TBD; Prerequisites: ACQ 203, ENG 101, & 2 years of technical experience in an acquisition position; **SYS 202 accepted as substitute for ENG 201 until 31-Dec-2018.**

#### **\*SYS 202 – Intermediate Systems Planning, Research, Development, and Engineering, Part I<sup>4</sup> (distance learning) (Course expected to retire and be replaced by ENG 201)**

- **Description:** This distance-learning course provides an understanding of how the DoD's systems engineering technical and technical management processes can be applied to a notional system within the context of the acquisition lifecycle. Course content includes the scope and role of systems engineering and its major technical inputs and outputs, timing of technical baselines, the role of technical reviews, important design considerations and other related areas throughout a systems' life.

- **Target Audience:** This course is part of the Level II certification training requirement for the engineering career field. Additionally, members of other career fields who require an understanding of how S is applied to systems acquisition and sustainment.
- **Course Details:** Approximately 9 hours to complete; 9 CLPs; Prerequisites: ACQ 203, ENG 101, & 2 years of technical experience in an acquisition position.

### **ENG 202 – Applied Systems Engineering in Defense Acquisition, Part II <sup>5</sup> (in-resident)**

- **Description:** This course allows students to use the DoD systems engineering processes and techniques learned in Part I. Participants will work in IPTs and apply systems engineering technical processes and technical management processes to a defense system as it gets developed across the various phases of the acquisition lifecycle.
- **Target Audience:** Those in the engineering career field and members of other career fields who require an understanding of how systems engineering is applied to systems acquisition and sustainment.
- **Course Details:** 4.5 class days; 36 CLPs; Prerequisites: ACQ 203, SYS 202, CLE 003, & 2 years of technical experience in an acquisition position.

## **2C – DAU – Requirements & Capability Development Courses**

### **CLR 101 – Introduction to the Joint Capabilities Integration & Development System (JCIDS) (distance learning)**

- **Description:** This module provides an overview of JCIDS. The five lessons focus on terms, definitions, basic concepts, processes, and roles and responsibilities involved within JCIDS as well as JCIDS' interaction with both the Defense Acquisition System (DAS) and the PPBE process.
- **Target Audience:** DoD professionals who contribute to requirements generation and capability development processes to include JCIDS analysis, subject matter or domain expertise, document staffing and coordination and/or administrative support.
- **Course Details:** Approximately 3.5 hours to complete; 4 CLPs; Prerequisites: None.

### **RQM 110 – Core Concepts for Requirements Management (distance learning)**

- **Description:** This course allows professionals to study the role of both the requirements manager and requirements management within the DoD “Big A” acquisition construct. It examines the capabilities identification and requirements development processes from an end-to-end perspective, highlighting the intersection between the DoD “Big A” decision support systems of acquisition, resourcing, and requirements.
- **Target Audience:** Those significantly involved with DoD capability identification and requirements development to include: study leadership; planning, writing, and adjudicating comments; and facilitating the development and coordination of requirements documents within organizations.
- **Course Details:** Approximately 18 hours to complete; 18 CLPs; Prerequisites: CLR 101.

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<sup>5</sup> This course is also part of the Level II certification training requirement for the Engineering (ENG) career field; for full certification criteria, visit [www.dau.mil](http://www.dau.mil)

### 3 – AFIT Courses

#### 3A – AFIT – HSI-Specific Courses

The AFIT course information and registration webpage is:

<https://www.afit.edu/LS/courseList.cfm>

Navigate to the course of interest for a unique registration link.

#### **SYS 169 – Introduction to HSI (distance learning)**

- **Description:** The goal of this course is to introduce acquisition professionals to HSI across the acquisition life cycle. This course will discuss the seven HSI domains, and the why, what, and who of HSI with regard to the development and sustainment of systems. Program managers are required to implement a plan for HSI early in the program life cycle and ensure that HSI considerations are included in all key acquisition documents. This course will give acquisition professionals the knowledge they need to comply with these requirements.
- **Target Audience:** All ranks and grades, but this course is designed for military personnel E-5 through E-7 & officers O-1 through O-5 and civilians GS-07 through GS-14.
- **Course Details:** Approximately 5 hours to complete; 5 CLPs; Prerequisites: None.

#### **SYS 269 – Intermediate HSI (in-resident & on-site)**

- **Description:** This comprehension-level course builds upon the foundational knowledge from SYS 169, Introduction to HSI. It will help students comprehend the role of HSI as part of the systems engineering process in the requirements, acquisitions, and sustainment lifecycle phases by answering the how, when, and where for HSI. Graduates will comprehend how HSI is woven throughout the entire lifecycle and where to find technical assistance in order to help requirements developers, acquisitions and sustainment personnel make timely, effective, and efficient technical and programmatic decisions.
- **Target Audience:** All ranks and grades, but this course is designed for personnel within the acquisition and sustainment community of practice.
- **Course Details:** 3 class days to complete; 21 CLPs; Prerequisites: SYS 169.

#### 3B – AFIT – Applicable HSI Practitioner Courses

#### **AFFAM 103 – Air Force Fundamentals of Acquisition Management (in-resident)**

- **Description:** This course provides an in-depth study of the activities necessary to identify, develop, and validate capability requirements documents in support of Doctrine, Organization, Training, Material, Leadership, Personnel, Facilities, and Policy (DOTmLPF-P) change recommendations, acquisition development, production decisions, and milestones. Students participate in a group activity to demonstrate development of requirements and associated performance attributes. In addition, students are exposed to best practices and lessons learned via case studies of actual Air Force (AF)-sponsored capability requirements documents.

- **Target Audience:** MAJCOM and HQ AF requirements managers and other stakeholders who participate in writing or reviewing AF-sponsored capability requirements documents.
- **Course Details:** 3 class days to complete; 18 CLPs; Prerequisites: None.

### **3C – AFIT – Requirements and Capability Development Courses**

#### **REQ 211 – Air Force Capability Requirements Development (in-resident & on-site)**

- **Description:** This course provides an in-depth study of the activities necessary to identify, develop, and validate capability requirements documents in support of Doctrine, Organization, Training, Material, Leadership, Personnel, Facilities, and Policy (DOTmLPP-P) change recommendations, acquisition development, production decisions, and milestones. Students participate in a group activity to demonstrate development of requirements and associated performance attributes. In addition, students are exposed to best practices and lessons learned via case studies of actual Air Force (AF)-sponsored capability requirements documents.
- **Target Audience:** MAJCOM and HQ AF requirements managers and other stakeholders who participate in writing or reviewing AF-sponsored capability requirements documents.
- **Course Details:** 3 class days to complete; 18 CLPs; Prerequisites: None.

#### **SYS 112 – Systems Requirement Document (SRD) Development (distance learning)**

- **Description:** Using MIL-HDBK-520 “SRD Guidance” as a primary source, this course provides students a basic understanding of why effectively translating war fighter capabilities-based requirements documents (e.g. ICD, CDD, CPD) into a SRD is a critical step in both systems engineering and the overall acquisition process. In order to give the student a better understanding of how the SRD is developed, this course will discuss the different types of requirements, the requirements analysis and management processes, and how requirements traceability is created/maintained.
- **Target Audience:** All ranks and grades, but this course is designed for military personnel E-7 through E-9 & officers O-1 through O-6 and civilians GS-07 through GS-14.
- **Course Details:** 1 day to complete; 8 CLPs; Prerequisites: None.

### **3D – AFIT – SOH Courses**

#### **SYS 196 – Integration of ESOH into Systems Engineering for Weapon System Acquisition (distance learning)**

- **Description:** This course includes nine modules and is an introduction to the three distinct areas of Environment, Safety, and Occupational Health, or ESOH, risk management using the Dod Standard Practice for System Safety, MIL-STD- 882. Students will be able to recognize the ESOH regulatory drivers. In addition, students will acquire an understanding of the Programmatic ESOH Evaluation (PESHE) document requirement and the integration of ESOH into Systems Engineering and the Acquisition Strategy. Upon completion, students will be able to identify the ESOH aspects of Systems Engineering.

- **Target Audience:** Acquisition and Sustainment Personnel
- **Course Details:** Approximately 8 hours to complete; 8 CLPs; Prerequisites: None.

**SYS 197 – Integrating ESOH into Systems Engineering, A Practitioner's Guide, Part I (distance learning)**

- **Description:** This course comprises six modules that describe and illustrate the integration of ESOH principles into the systems engineering process using the DOD Standard Practice for System Safety, MIL-STS-882D. The course will identify ESOH considerations and illustrate how to develop and apply an ESOH risk management approach. It will relate those ESOH considerations to the systems engineering inputs, outputs, activities, and analyses for the Materiel Solution Analysis and Technology Development phases of the DOD Systems Acquisition framework described in the DUSD(I&E)-DUSD(A&T) publication, "ESOH in Acquisition- Integrating ESOH into Systems Engineering."
- **Target Audience:** Acquisition and Sustainment Personnel, 03-06, GS 12-GS 15
- **Course Details:** Approximately 6 hours to complete; 6 CLPs; Prerequisites: SYS 196 Integration of ESOH into Systems Engineering for Weapon System Acquisition

**SYS 198 – Integrating ESOH into Systems Engineering, A Practitioner's Guide, Part II (distance learning)**

- **Description:** Course for employees who integrate ESOH into the Acquisition Strategy and Systems Engineering processes or manage the people who use those processes. The objective of this course is for each student to: identify ESOH considerations, apply an ESOH risk management strategy, to document hazards and risks, identify methods for implementing a hazardous material management program, recall an approach for developing a NEPA compliance schedule and apply ESOH criteria for system acquisitions in the Engineering and Manufacturing Development, Production and Deployment, and Operations and Support phases of the DoD System Acquisition Framework.
- **Target Audience:** Acquisition and Sustainment Personnel, 03-06, GS12-GS15
- **Course Details:** Approximately 6 hours to complete; 6 CLPs; Prerequisites: SYS 197 - Integrating ESOH into Systems Eng, A Practitioner's Guide, Part 1

#### **4 – General Familiarization and Domain Courses**

##### **Army HSI Practitioner’s Course (in-resident & on-site)**

- **Description:** Provides selective information on the Army HSI process pertinent to target audience scheduled to attend given class offering; class content may be customized with topics requested by agency representatives and coordinated with the course administrator.
- **Target Audience:** All.
- **Course Details:** The availability of this course is pending.

##### **NPS Aircraft Survivability Short Course (on-site) sponsored thru Defense Systems Information Analysis Center (DSIAC) and Joint Aircraft Survivability Program (JASP) by Office of the Director, Operational Test and Evaluation (DOT&E), Live Fire Test & Evaluation (LFT&E)**

- **Description:** 3-day short course in aircraft combat survivability is designed to provide an overview of the aircraft combat survivability discipline.
- **Target Audience:** The course is intended for Department of Defense (DoD), active duty military and government contractors who need to better understand how to increase the survivability and combat effectiveness of air platforms, both manned and unmanned systems. Restrictions: OPEN TO U.S. CITIZENS WITH A SECRET CLEARANCE ONLY
- **Course Details:**
  - \$100-\$750 range
  - Many students typically work in aircraft survivability fields such as susceptibility reduction and vulnerability reduction, survivability modeling and simulation, ballistic and vulnerability testing, and systems engineering. However, the course will also greatly benefit personnel working program management and acquisition of DoD aircraft, as well as military pilots and personnel in aviation commands
  - Continuing Education Unit (CEU) credit will be awarded for successful completion.
  - Recent offering 2018: <https://www.dsiac.org/events/2018-aircraft-combat-survivability-short-course-0>
- **Registration: 2019 offering is pending**

<https://www.dsiac.org/events/>

NPS offering:

<https://calhoun.nps.edu/handle/10945/55831>

##### **Ground Vehicle Survivability (GVS) and Force Protection (FP) Short Course (on-site) sponsored thru Defense Systems Information Analysis Center (DSIAC) by Office of the Director, Operational Test and Evaluation (DOT&E), Live Fire Test & Evaluation (LFT&E)**

- **Description:** The 3-day short course in ground vehicle survivability is designed to provide an overview of the Ground Vehicle Survivability & Force Protection discipline.

- **Target Audience:** The course is intended for Department of Defense personnel and Government Contractors who work in ground vehicle survivability fields such as survivability modeling and simulation, integration, ballistic and vulnerability testing, susceptibility reduction and vulnerability reduction, and systems engineering.  
Restrictions: OPEN TO U.S. CITIZENS WITH A SECRET CLEARANCE ONLY
- **Course Details:** The course is classified Secret and is based upon numerous published documents and research in the field of GVS&FP and will highlight the important concepts necessary to understand the breadth of the survivability discipline.
  - **Registration:**
    - \$750
    - The course will also benefit personnel working program management and acquisition of DoD ground vehicles.
    - Students will be awarded continuing education unit (CEU) credit for successful completion of the short course.
    - Recent offering 2017:

<https://www.dsiac.org/events/2017-ground-vehicle-survivability-force-protection-short-course>

## **5 – HSI Graduate Certificate Programs**

### **5A – NPS Graduate Certificate in HSI**

- **Program Details:** Distance Learning; 12 months (4 consecutive quarters; 4 courses taken in series)
- **Program Prerequisites:** Baccalaureate Degree; Minimum 2.2 GPA; One lower level calculus course earning C or better – Waivers may be considered.
- **Eligibility:** Government personnel (military & civilian) and contractors (on space available basis).
- **Tuition:** \$2,250 per course for non-mission funded students; including all government contractors. Non-mission funded students must be sponsored by employer, have a Memorandum of Agreement, and a funding document in place.

### **Program Overview**

- This program will challenge students to examine how best to integrate human considerations into all phases of the lifecycle of a complex system. Students will be able to participate in the lifecycle acquisition process as HSI practitioners. They will be able to evaluate system acquisition programs for HSI compliance. Students will also be able to conduct tradeoff analyses by assessing the contributions of manpower, personnel, training, human factors engineering, safety and occupational health, force protection and survivability, and habitability with respect to cost, schedule, risk, and performance.

### **Required Courses (shown in required series; beginning in Fall Term)**

#### **Core** (3 Courses)

#### **1. OA3411: Introduction to Human Systems Integration**

This course serves as the framework for examining HSI in the context of DoD Systems Acquisition as mandated by DoDI 5000.02, Enclosure 7. This course provides an overview of the HSI domains: human factors engineering, personnel, habitability, manpower, training, safety and occupational health, and force protection and survivability. Principles of individual physiological and psychological capabilities and limitations and team attributes are also introduced. Terms Offered: Fall; Prerequisite: None.

#### **2. OA3412: Human Systems Integration in the DoD Acquisition Lifecycle**

This course further expands on the role of HSI within the context of the DoD Systems Engineering Process in the DoD Acquisition Lifecycle. Students examine select acquisition activities (e.g. JCIDS) and the manner in which HSI practitioners influence these activities. This course also focuses on leveraging the unique activities of HSI practitioners to assist/support program managers and lead systems engineers in developing human-centered systems that optimize total system performance while minimizing cost and risk. Terms Offered: Winter; Prerequisite: OA3411.

#### **3. OA3413: Human Systems Integration Tools, Tradeoffs, and Processes**

This course provides a description and evaluation of tools and techniques available to facilitate the acquisition of human-centered military systems. It also provides an overview of techniques employed by practitioners within the sub-disciplines of HSI.



The focus of this course is on tool inputs and outputs and their utility. This course also examines the manner in which HSI trade space analysis is performed; one of the most important roles of the HSI practitioner in the acquisition process. Terms Offered: Spring; Prerequisite: OA3412.

**Capstone** (1 course)

**1. OA4414: Human Systems Integration Case Studies and Application**

This capstone course provides students the opportunity to integrate and apply the materials from previous courses through the examination of actual military acquisition programs. One of the course objectives is to provide a historical analysis of both small and large military acquisition programs. The lessons learned from these historical case studies will reinforce best practices for HSI practitioners. Terms Offered: Summer; Prerequisite: OA3413.

**5B – AFIT Graduate Certificate in Human Systems**

- **Program Details:** In-Resident/Distance Learning; 15 months (5 courses); Program can be used as a Human Systems minor concentration in an AFIT Systems Engineering or Engineering Management degree program.
- **Program Prerequisites:** Baccalaureate Degree in engineering or scientific field; Completion of basic calculus & statistics; Minimum 3.0 overall GPA – Waivers may be considered.
- **Eligibility:** Government and affiliates.
- **Tuition:** \$370 per credit hour if sponsored by a military organization or contractor. Tuition is free to individual Air Force military or civilians on a space available basis.

**Program Overview**

- The AFIT Department of Systems Engineering and Management offers a Human Systems Certificate, which provides a set of graduate level courses to support the Air Force and DoD-wide focus on human factors and HSI. These courses are intended to aid individual contributions towards HSI research and application across the DoD.

**Required Courses**

**Core** (2 courses)

**1. SENG 520: Systems Engineering Design**

This course provides a broad instruction to a systematic approach for the conceptualization, design, analysis, operation, and sustainment of complex systems within the DoD. Terms Offered: Fall (in-resident and distance), Spring (distance with approval); Prerequisite: None.

**2. HFEN 560: Human Factors**

This course examines the study and application of humans and the system interface, including the knowledge of human cognitive/social/physical behavior, capabilities, and limitations. Topics include anthropometrics, sensation-perception, decision-making, mental workload, situational awareness, display/control design,

warnings/alerts, human error and accident investigation. Numerous case studies are used to highlight course topics. Terms Offered: Winter (in residence and distance); Prerequisite: None.

**Elective** (Select 2 courses)

**1. HFEN 620: Human Performance Modeling**

This course introduces students to using discrete event simulation to model complex human-machine systems. Through this course students will gain an appreciation of defining systems, processes, and workflows using task network analysis. This course is intended to provide students with the requisite knowledge to construct and validate discrete event simulations as well as use simulation outputs to interpret system behavior and evaluate potential solutions with respect to impacts on system performance, human performance, and operator workload. Through this course students will develop an appreciation for the interaction of system components and interface design decisions, and the impacts that individual parts of a system have on other parts of the system as well as the system as a whole. Terms Offered: Winter (distance) and Spring (in residence); Prerequisite: STAT583, STAT587 or equivalent.

**2. HFEN 663: Human Computer Interaction**

This course covers the principles of human-computer interaction in the design and evaluation of useful, usable interfaces as well as the social consequences of technological innovations. Topics include the joint performance of tasks by humans and machines, the structure of communication between human and machines (including machine response to changes in user state), algorithms and programming of the interface itself, engineering concerns that arise in the design and construction of interfaces, the process of specification, design, and implementation of interfaces, and design trade-offs. Terms Offered: Spring (in residence and distance); Prerequisite: HFEN 560.

**3. HFEN665: Human-Agent Interaction**

This course explores operator interaction in human-machine teams to understand significant design trade-offs during the design of the Human - Agent (H-A) Interface. Topics to be covered include: Task Allocation, Trust, Interaction Styles, Implicit/Explicit Communication, Relevant Human Biases, Automation Classification/Taxonomies and influences of automation limitations. Interface design decisions and trade-offs will be explored through readings from the course text and select academic articles, as well as analysis and development of design options. Terms Offered: Summer (in residence and distance); Recommended Prerequisite: SENG 520 and HFEN 560.

**4. SENG 560: Human Systems Integration**

A human-centered design approach is explored through readings, discussion and a project. Included are discussions of HSI domains (human factors engineering, personnel, habitability, manpower, training, safety and occupational health, and force protection and survivability) and a method for considering these domains within the Systems Engineering Lifecycle. Terms Offered: As Needed; Prerequisite: None.

**5. HFEN 610: Human Performance Measurement**

Theories, concepts, and methods for measuring and evaluating human performance will be discussed with an emphasis on facilitating the design of systems having enhanced human performance and satisfaction. The student will gain practice in measuring human performance and applying the results to suggest and validate system design improvements. Influence of fatigue, environmental/task stressors, and social/team factors will be discussed. Terms Offered: As needed; Prerequisite: None.

**6. HFEN 670: Human Interaction Technologies**

Robust human-system interaction requires information flow between the system and human brain. This course will introduce technologies available to mediate this flow of information, discussing the important characteristics and considerations for input and output technologies. Emphasis will be provided on visual information processing and visual display design. Human auditory processing and various input device technologies will also be discussed. Terms Offered: As needed; Prerequisite: None.

**Capstone** (1 course)

**1. SENG 798: Master's Capstone Project**

A topic is selected from a wide variety of problems of current interest to the AF and/or the DoD. The Capstone Project is performed as a group or individual project under the supervision of departmental faculty. Results are provided in a formal written report. Terms Offered: All (distance learning – thesis).

## **6 – HSI Graduate Degree Programs from NPS**

### **6A – NPS Master of HSI Degree Program**

- **Program Details:** Distance Learning; 24 months (8 quarters; 2 courses per quarter); Non-thesis program.
- **Program Prerequisites:** Baccalaureate degree; Minimum 2.2 GPA; Completion of lower-level calculus sequence earning C or better – Waivers may be considered.
- **Eligibility:** Government personnel (military & civilian) and contractors (on space available basis)
- **Tuition:** \$2,250 per course for non-mission funded students; including all government contractors. Non-mission funded students must be sponsored by employer, have a Memorandum of Agreement, and a funding document in place.

### **Program Overview**

- The goal of the Master of HSI distance learning program is to educate eligible personnel in the federal government and defense contractor organizations in HSI. Graduates of this program will possess the skills necessary to function as a practitioner in HSI, earning the NPS Master of HSI degree, NPS Graduate Certificate in HSI, and DAU equivalencies in ACQ 101, ACQ 202, ACQ 203, ENG 201, and TST 204.

### **Required Courses**

#### **Quarter 1** (2 courses)

##### **1. OA3411: Introduction to HSI**

This course serves as the framework for examining HSI in the context of DoD Systems Acquisition as mandated by DoD Instruction 5000.2, Enclosure 7. This course provides an overview of the HSI domains. Principles of individual physiological and psychological capabilities and limitations and team attributes are also introduced. Terms Offered: Fall; Prerequisites: None.

##### **2. MN3301: Acquisition of Defense Systems**

This course introduces the principles and concepts that underlie successful defense acquisition management. The course focuses on management of the acquisition process for defense systems from the development of an initial desired capability or need through design, development, production, fielding, sustainment, and disposal. Students gain an understanding of successful acquisition as an interdisciplinary activity through contributions and applications of principles from business, management, and technical disciplines. The course also emphasizes the statutory, regulatory, and policy environment of acquisition. Numerous case studies illustrate the application of concepts and principles in actual acquisition programs. DAU has granted MN3301 equivalency for ACQ 101, ACQ 201, ACQ 202, ACQ 203, BCF 102 and BCF 103. Terms Offered: Fall, Spring; Prerequisites: None.

**Quarter 2** (2 courses)

**1. OA3412: HSI in the DoD Acquisition Lifecycle**

This course further expands on the role of HSI within the context of the DoD Systems Engineering Process in the DoD Acquisition Lifecycle. Students examine select acquisition activities (e.g. JCIDS) and the manner in which HSI practitioners influence these activities. This course also focuses on leveraging the unique activities of HSI practitioners to assist/support program managers and lead systems engineers in developing human-centered systems that optimize total system performance while minimizing cost and risk. Terms Offered: Winter; Prerequisite: OA3411.

**2. SE3100: Fundamentals of Systems Engineering**

Introduction to systems thinking and the processes and methods of systems engineering. The course covers fundamentals of systems engineering and system architecting, requirements analysis, functional analysis and allocation, preliminary system architecture, systems analysis, system design, and the basics of test and evaluation. Various perspectives, from frameworks, processes, and standards, such as the DoD Architecture Framework (DoDAF), DoD JCIDS, EIA 632, ISO 15288, IEEE 1220, IEEE 1471, and the International Council on Systems Engineering (INCOSE) models, are presented. Students analyze case studies. Students also use spreadsheet software for modeling and analyzing requirements and conceptual design alternatives. The course includes the application of fundamental systems engineering processes and methods to an integrative project, as well as development of communication skills through oral presentations and written reports. Terms Offered: All; Prerequisite: None.

**Quarter 3** (2 courses)

**1. OA3413: HSI Tools, Tradeoffs, and Processes**

This course provides a description and evaluation of tools and techniques available to facilitate the acquisition of human-centered military systems. It also provides an overview of techniques employed by practitioners within the sub-disciplines of HSI. The focus of this course is on tool inputs and outputs and their utility. This course also examines the manner in which HSI trade space analysis is performed – one of the most important roles of the HSI practitioner in the acquisition process. Terms Offered: Spring; Prerequisite: OA3412.

**2. OA3401: Human Factors in System Design**

This course will provide an introduction to the field of human factors with an emphasis on military systems. Humans are the most important element of any military system. Consequently, the design of effective systems must take into account human strengths and limitations as well as considerations of human variability. The course surveys human factors and human-centered design and system effectiveness and safety. Topics include human cognition and performance as

they are influenced by physiological, anthropometric, and environmental considerations. Terms Offered: Fall, Spring; Prerequisite: None.

**Quarter 4** (2 courses)

**1. OA4414: HSI Capstone Seminar (Capstone Part 1)**

This is the capstone course in the HSI Certificate Program. This course provides students the opportunity to integrate and apply the materials from previous courses through the examination of actual military acquisition programs. One of the course objectives is to provide an historical analysis of both small and large military acquisition programs. The lessons learned from these historical case studies will reinforce best practices for HSI practitioners. Terms Offered: Summer; Prerequisite: OA3413.

**2. OS3111: Probability and Statistics for HSI and Modeling, Virtual Environments, and Simulation (MOVES)**

Non-calculus based introduction to basic probability theory and statistics for the non-statistician. Descriptive statistics and graphical techniques. Probability rules including Bayes Rule and independence. Discrete and continuous distributions (Boolean, geometric, binomial, exponential, normal). Expected values, quantiles, variance, covariance, correlation. Expected values and variance of linear combinations of random variables, notably the sample mean. Central Limit Theorem. Student's t-distribution and test, normalization (z-scores), confidence intervals, and introduction to hypothesis testing for the one sample dataset, including categorical data. Additional topics may include paired designs, contingency tables and chi-squared test. Terms Offered: Summer; Prerequisite: None.

**Quarter 5** (2 courses)

**1. OA4401: Individual Performance and Personnel Considerations**

This course provides students with a working knowledge of current theories regarding individual human performance and the methods used to measure individual states and traits that affect that performance. In addition, the course includes familiarization with tests and procedures used by the DoD and industry for personnel selection and job/task assessment procedures. The course builds on information covered in OA3401. Terms Offered: Fall; Prerequisite: OA3401.

**2. OS3112: Statistics and Design of Experiments**

This course covers fundamentals of experimental design, analysis of categorical data, the general linear model, and regression. Students will learn how to set and analyze experiments using basic experimental design starting with two-sample methods and advancing to designs such as factorials, fractional factorials, and randomized block designs. Designs appropriate for human research (such as repeated measure designs) and /or largescale simulation experiments (such as Latin hypercube designs) are included. Parametric and nonparametric approaches are compared and contrasted. Datasets and motivational examples are drawn from recent research relevant to HSI and/or MOVES. Terms Offered: Fall; Prerequisite: College algebra and OS3111.

**Quarter 6** (2 courses)

**1. OA4406: Survivability, Habitability, and ESOH**

This course will provide an overview of personnel survivability methodology in safety, health hazards, and occupational health concepts. The evaluation of new and modified military systems and equipment for safety and potential health hazards will be addressed through reviewing models, methods, and processes available to help identify and mitigate the potential harm from accidents and hostile environments. Occupational health concerns will be addressed and methods of alleviating or minimizing workplace hazards will be analyzed. Risk analysis and mitigation models also will be examined for their contribution to increased safety and operational effective-ness. Terms Offered: Winter; Prerequisite: None.

**2. OA4408: Macroergonomics and Organizational Behavior in HSI**

This course systematically examines the application of macroergonomic concepts and organizational processes in orchestrating HSI efforts in acquisition programs. The key concepts, principles, and theories of macroergonomics are defined and then applied to analyze organizational structures, policies, and processes that impact effective HSI efforts. Specific attention will be paid to leadership, organizational, group, and team behaviors as they impact HSI strategy, planning, program execution, and risk assessment. The material covered will then be applied to manning, training, and safety challenges in current acquisition pro-grams. Terms Offered: Winter; Prerequisite: None.

**Quarter 7** (2 courses)

**1. OA4402: Training and Simulation**

This course will provide an overview of learning principles, training system development and evaluation, the Instructional System Development approach, Navy training practices, and simulation training systems. Tradeoffs among personnel selection, training, and other domains of HSI will be addressed. Terms Offered: Spring; Prerequisite: None.

**2. OA4702: Cost Estimation**

This course provides a broad-based understanding of the cost analysis activities involved in the acquisition and support of DoD weapon systems. In addition, it introduces operations research techniques fundamental to the field of cost estimation. The course covers the defense systems acquisition process, time value of money, and economic analysis; it develops, uses, and analyzes estimating techniques commonly encountered in both the DoD and industry, including statistical and non-statistical cost estimating relationships, inflation indices, cost improvement curves, time phasing, and un-certainty analysis. Terms Offered: Fall, Spring; Prerequisite: None.

**Quarter 8** (2 courses)

**1. OA4603: Test & Evaluation**

This course is designed to cover Developmental and Operational T&E and Military Experimentation, including statistical concepts and methods frequently used in weapon system testing and experimentation environments. The course is taught from the perspective of the Program Manager, Test Project Officer, Test Engineer, Test Analyst, and Statistician. A number of actual military cases are used for examples. Topics include the Role of T&E in Systems Engineering and Acquisition Management, Test Planning and Design, Development of Measures of Effectiveness and Measures of Performance, Conduct of Tests, Data Analysis, and Reporting of Test Results. A detailed group test planning project and design exercise are included. Upon successful completion of this course, students receive DAWIA Level II and Level III Intermediate and Advanced Test and Evaluation certification. Terms Offered: Winter, Summer; Prerequisite: A previous course in probability and statistics, or consent of the instructor.

**2. OA4415: HSI Case Studies & Applications (Capstone Part 2)**

This is the final course in the NPS's distance learning Master of Human Systems Integration Program. Students will engage in a capstone project that builds on the activities in the OA4414 HSI Case Studies and Applications (Capstone Part 1 – for HSI Certificate) and all other previous courses. A typical capstone project would require a student to create a detailed HSI process document for his or her organization. This document would describe the HSI processes and activities that should be employed by that organization to design, develop, produce, deploy, operate, and support a system with an appropriate focus on the operators, maintainers, supporters, and trainers. Terms Offered: Summer; Prerequisite: OA4414.

**6B – NPS Master of Science in HSI Degree Program**

- **Program Details:** In-Resident; 24 months (8 quarters); Thesis required.
- **Program Prerequisites:** Baccalaureate degree; Minimum 2.2 GPA; Completion of lower-level calculus sequence earning C or better – Waivers may be considered.
- **Eligibility:** Government personnel (military & civilian) and contractors (on space available basis)
- **Tuition:** \$2,250 per course for non-mission funded students; including all government contractors. Non-mission funded students must be sponsored by employer, have a Memorandum of Agreement, and a funding document in place.

**Program Overview**

- HSI is based on the understanding that people (operators, maintainers, and support personnel) are critical elements of the system and that a human-centered design perspective promotes system effectiveness, safety, and cost savings. This degree will provide students with the knowledge, skills, and abilities to be effective leaders in the assessment, design, testing, and management of a total human machine system throughout its life cycle. Graduates of the program earn the NPS Master of HSI degree, NPS Graduate Certificate in HSI, and DAU equivalencies in ACQ 101, ACQ 202, ACQ 203, ENG 201, and TST 204.



## **Required Courses**

### **Quarter 1** (4 courses)

#### **1. OA3411: Introduction to HSI**

This course serves as the framework for examining HSI in the context of DoD Systems Acquisition as mandated by DoD Instruction 5000.2, Enclosure 7. This course provides an overview of the HSI domains. Principles of individual physiological and psychological capabilities and limitations and team attributes are also introduced. Terms Offered: Fall; Prerequisites: None.

#### **2. OS3111: Probability and Statistics for HSI & MOVES**

Non-calculus based introduction to basic probability theory and statistics for the non-statistician. Descriptive statistics and graphical techniques. Probability rules including Bayes Rule and independence. Discrete and continuous distributions (Boolean, geometric, binomial, exponential, normal). Expected values, quantiles, variance, covariance, correlation. Expected values and variance of linear combinations of random variables, notably the sample mean. Central Limit Theorem. Student's t-distribution and test, normalization (z-scores), confidence intervals, and introduction to hypothesis testing for the one sample dataset, including categorical data. Additional topics may include paired designs, contingency tables and chi-squared test. Terms Offered: Fall, Spring; Prerequisite: None.

#### **3. OA3401: Human Factors in System Design**

This course will provide an introduction to the field of human factors with an emphasis on military systems. Humans are the most important element of any military system. Consequently, the design of effective systems must take into account human strengths and limitations as well as considerations of human variability. The course surveys human factors and human-centered design and system effectiveness and safety. Topics include human cognition and performance as they are influenced by physiological, anthropometric, and environmental considerations. Terms Offered: Fall, Spring; Prerequisite: None.

#### **4. MN3331: Principles of Acquisition & Program Management**

This course provides the student with an understanding of the underlying concepts, fundamentals and philosophies of the DoD systems acquisition process and the practical application of program management methods within this process. The course examines management characteristics and competencies, control policies and techniques, systems analysis methods and functional area concerns. Techniques for interpersonal relationships will be examined in team exercise settings. Topics, from a program management perspective, include the evolution and current state of systems acquisition management, the system acquisition life cycle, requirements analysis, systems engineering, contract management, resource management, test and evaluation, user-producer acquisition management disciplines and activities; and program planning,

organizing, staffing, directing and controlling. Case studies are used to analyze various acquisition issues. DAU has granted MN3331 equivalency for ACQ 101, ACQ 201, ACQ 202, ACQ 203, PMT 251, PMT 257, BCF 102 and BCF 103. Terms Offered: All; Prerequisite: None.

**Quarter 2** (4 courses)

**1. OA3402: Research Methods for Performance Assessment**

Well-constructed research is invaluable; informing and enabling decision makers to make better choices. This course covers the research process from beginning to end and explores the types of research conducted in a variety of laboratory and field settings. Topics include institutional approval and ethical use of human subjects; research reliability and validity; formulation of the research question; research designs ranging from experimentation to systematic observational techniques and subjective surveys; database management considerations; analytical approaches; and writing and presenting the research paper. Terms Offered: Winter; Prerequisite: None.

**2. OS3113: Data Analysis for HSI and MOVES**

Introduction to common types of data collection (sampling methods, surveys, observational studies, and experiments) and the link between data collection methods and data analytic procedures. Non-calculus based introduction to conducting statistical inference for estimation of population parameters and hypothesis testing with common parametric methods (confidence intervals, z-tests, t-tests, ANOVA, regression, chi-square). Datasets and motivational examples are drawn from recent research relevant to HSI and/or MOVES. Terms Offered: Winter; Prerequisite: None.

**Quarter 3** (4 courses)

**1. OA3412: HSI in the DoD Acquisition Lifecycle**

This course further expands on the role of HSI within the context of the DoD Systems Engineering Process in the DoD Acquisition Lifecycle. Students examine select acquisition activities (e.g., JCIDS) and the manner in which HSI practitioners influence these activities. This course also focuses on leveraging the unique activities of HSI practitioners to assist/support program managers and lead systems engineers in developing human-centered systems that optimize total system performance while minimizing cost and risk. Terms Offered: Winter; Prerequisite: OA3411.

**2. OS3112: Statistics and Design of Experiments**

This course covers fundamentals of experimental design, analysis of categorical data, the general linear model, and regression. Students will learn how to set and analyze experiments using basic experimental design starting with two-sample methods and advancing to designs such as factorials, fractional factorials, and randomized block designs. Designs appropriate for human research (such as repeated measure designs) and/or largescale simulation experiments (such as Latin hypercube designs) are included. Parametric and nonparametric approaches are compared and contrasted. Datasets and

motivational examples are drawn from recent research relevant to HSI and/or MOVES.  
Terms Offered: Spring; Prerequisite: College algebra and OS3111.

**3. OA4407: Anthropometry and Biomechanics**

This course will cover current techniques for combining anthropometric and biomechanical data to model the relationships among people, tasks, equipment, and the workplace. The historical development of anthropometric databases and human engineering models will be reviewed and current techniques and multivariate models will be introduced. Both military and commercial guidelines for ergonomic design will be covered and emphasis will be given to software tools for 3-D modeling, visualization, and workstation design. Terms Offered: Spring; Prerequisite: None.

**4. SE3100: Fundamentals of Systems Engineering**

Introduction to systems thinking and the processes and methods of systems engineering. The course covers fundamentals of systems engineering and system architecting, requirements analysis, functional analysis and allocation, preliminary system architecture, systems analysis, system design, and the basics of test and evaluation. Various perspectives, from frameworks, processes, and standards, such as the DoDAF, DoD JCIDS, EIA 632, ISO 15288, IEEE 1220, IEEE 1471, and the INCOSE models, are presented. Students analyze case studies. Students also use spreadsheet software for modeling and analyzing requirements and conceptual design alternatives. The course includes the application of fundamental systems engineering processes and methods to an integrative project, as well as development of communication skills through oral presentations and written reports. Terms Offered: All; Prerequisite: None.

**Quarter 4** (4 courses)

**1. OA4406: Survivability, Habitability, and ESOH**

This course will provide an overview of personnel survivability methodology in safety, health hazards, and occupational health concepts. The evaluation of new and modified military systems and equipment for safety and potential health hazards will be addressed through reviewing models, methods, and processes available to help identify and mitigate the potential harm from accidents and hostile environments. Occupational health concerns will be addressed and methods of alleviating or minimizing workplace hazards will be analyzed. Risk analysis and mitigation models also will be examined for their contribution to increased safety and operational effectiveness. Terms Offered: Winter; Prerequisite: None.

**2. OA4603: Test and Evaluation**

This course is designed to cover Developmental and Operational T&E and Military Experimentation, including statistical concepts and methods frequently used in weapon system testing and experimentation environments. The course is taught from the perspective of the Program Manager, Test Project Officer, Test Engineer, Test Analyst, and Statistician. A number of actual military cases are used for examples. Topics include the Role of T&E in Systems Engineering and Acquisition Management, Test

Planning and Design, Development of Measures of Effectiveness and Measures of Performance, Conduct of Tests, Data Analysis, and Reporting of Test Results. A detailed group test planning project and design exercise are included. Upon successful completion of this course, students receive DAWIA Level II and Level III Intermediate and Advanced T&E certification. Terms Offered: Winter, Summer; Prerequisite: A previous course in probability and statistics, or consent of the instructor.

**3. OA4109: Survey Research Methods**

The course will cover the basic principles of survey research methods. It will provide students with a practical grounding in all aspects of survey methodology, from survey instrument design, to sample design, to modes of data collection, to methods for survey data analysis. Students will be able to immediately apply course work to their theses and other real-world applications, including a class capstone project in which students will design, field, and analyze a survey on behalf of a DoD organization. Terms Offered: Summer; Prerequisite: OA3103 & OS3101.

**4. SI3400: Fundamentals of Engineering Project Management**

This course examines modern techniques of engineering project management from a systems perspective, including project planning, organization, and control. Specific topics include discussion of the systems engineering management process, risk management, scheduling methodologies, the DoD acquisition environment, management of design activities, PERT, CPM, and project control mechanisms. Case studies are used to examine application of principles. Large-scale system management, mitigation of technical risk, integrated product and process development, quality management, contracting, and the international environment are discussed. Large scale systems management problems are examined using commercial software suites. Covers application of fundamental systems project management processes and methods to an integrative system project. Development of communication skills is accomplished through oral presentations and written reports. Terms Offered: All; Prerequisite/co-requisite: SE3100.

**Quarter 5** (4 courses)

**1. OA3413: HSI Tools, Tradeoff, and Processes**

This course provides a description and evaluation of tools and techniques available to facilitate the acquisition of human-centered military systems. It also provides an overview of techniques employed by practitioners within the sub-disciplines of HSI. The focus of this course is on tool inputs and outputs and their utility. This course also examines the manner in which HSI trade space analysis is performed — one of the most important roles of the HSI practitioner in the acquisition process. Terms Offered: Spring; Prerequisite: OA3412.

**2. MN4115: Foundations of Education and Learning in DoD Organizations**

Analysis of issues in DoD education, learning and training (ELT). Major course themes focus on understanding adult military ELT from a strategic systems perspective; analyzing instructional pro-gram design, implementation, and technologies and applying

methods of needs analysis and program evaluation. Examination of how DoD can become a learning organization to respond to the dynamic demands of both the organization and its military members. Guest speakers, military publications, student cases, and discussion based on the experience of the instructor and the students are utilized to maintain the necessary focus on current military applications. Terms Offered: Fall; Prerequisite: GB3010.

**3. OA4401: Individual Performance and Personnel Considerations**

This course provides students with a working knowledge of current theories regarding individual human performance and the methods used to measure individual states and traits that affect that performance. In addition, the course includes familiarization with tests and procedures used by the DoD and industry for personnel selection and job/task assessment procedures. The course builds on information covered in OA3401, Human Factors in Systems Design. Terms Offered: Fall; Prerequisite: OA3401.

**4. SE3302: System Security**

This course presents the techniques of system design and assessment for operational feasibility, including reliability, maintainability, usability (including human factors and human performance), supportability, and producibility. Design methods for open architecture of hardware and software are presented. Software integration and management from a systems perspective is presented. Terms Offered: Spring, Fall; Prerequisites: SE3100.

**Quarter 6** (4 courses)

**1. OS4701: Techniques in Manpower Modeling Cost Estimation**

The objective of this course is to introduce the student to the major types of manpower and personnel models for estimating the effects of policy changes on the personnel system. Topics include longitudinal and cross-section models, optimization models, data requirements, and validation. Application in the form of current military models is included. Terms Offered: Winter, Summer; Prerequisite: GB3040 & GB4043; or OA3103.

**2. OA4702: Cost Estimation**

This course provides a broad-based understanding of the cost analysis activities involved in the acquisition and support of DoD weapon systems. In addition, it introduces operations research techniques fundamental to the field of cost estimation. The course covers the defense systems acquisition process, time value of money, and economic analysis; it develops, uses, and analyzes estimating techniques commonly encountered in both the DoD and industry, including statistical and non-statistical cost estimating relationships, inflation indices, cost improvement curves, time phasing, and un-certainty analysis. Terms Offered: Winter, Summer; Prerequisite: None.

**3. OA4408: Macroergonomics and Organizational Behavior in HSI**

This course systematically examines the application of macroergonomic concepts and organizational processes in orchestrating HSI efforts in acquisition programs. The key concepts, principles, and theories of macroergonomics are defined and then applied to analyze organizational structures, policies, and processes that impact effective HSI efforts. Specific attention will be paid to leadership, organizational, group, and team behaviors as they impact HSI strategy, planning, program execution, and risk assessment. The material covered will then be applied to manning, training, and safety challenges in current acquisition pro-grams. Terms Offered: Winter; Prerequisite: None.

**4. SE4150 Systems Architecting and Design**

The use of models, from stakeholder needs to requirements, to system functional and physical architecture, through performance specification, for the basis for architecting and designing complex technical systems. This course provides the student with the language, terminology, concepts, methods, and tools of system architecting and design, including exploring the relationship between science, art, and deductive and inductive processes. Topics covered include architecture modeling (e.g. Hatley/Hruschka/Pirbhai and Rummler-Brache Methods), architectural frameworks (including Zachman and DoDAF), object oriented modeling approaches using Unified Modeling Language (UML) and Systems Modeling Language (SysML), human and cultural aspects of architecting and design, requirements generation and definition, and knowledge formation and distribution. Students carry out projects and assignments both individually and as teams. Terms Offered: As Required; Prerequisite: SE3100 or SI4021

**Quarter 7** (4 courses)

**1. MN3111: Analysis of Human Resource Management**

A broad coverage of human behavior in the work situation, with key emphasis on the issues of work in the Navy Manpower Personnel and Training Environment. Topical areas covered include selection, placement, training development, and evaluation of personnel; motivation, remuneration, morale, supervision, and working conditions in military organizations; job design and organization development within complex military bureaucracies; equipment design and man-machine interface, and the impact of technological pro-grams within the military. Terms Offered: Spring; Prerequisite: GB3010.

**2. OA0810: Thesis Research for Operations Analysis Students**

Every student conducting thesis research will enroll in this course. Terms Offered: All; Prerequisite: None.

**3. OA0810: Thesis Research for Operations Analysis Students**

Every student conducting thesis research will enroll in this course. Terms Offered: All; Prerequisite: None.

**4. Elective**

**Quarter 8** (4 courses)

**1. OA0810: Thesis Research for Operations Analysis Students**

Every student conducting thesis research will enroll in this course. Terms Offered: All;  
Prerequisite: None.

**2. OA0810: Thesis Research for Operations Analysis Students**

Every student conducting thesis research will enroll in this course. Terms Offered: All;  
Prerequisite: None.

**3. OA4414: HSI Capstone Seminar**

This is the capstone course in the HSI Certificate Program. This course provides students the opportunity to integrate and apply the materials from previous courses through the examination of actual military acquisition programs. One of the course objectives is to provide an historical analysis of both small and large military acquisition programs. The lessons learned from these historical case studies will reinforce best practices for HSI practitioners. Terms Offered: Summer; Prerequisite: OA3413.

**4. Elective**

## 7 – HSI Graduate Degree Programs from AFIT

### 7A – Graduate Systems Engineering (M.S.) (GSE) Program – Human Systems Focus Area

- **Program Details:** In-Resident (18 months; 6 quarters) or Part-Time Distance Learning (24 -36 months; 6 quarters); Thesis (individual or group project) required.
- **Program Prerequisites:** Baccalaureate degree in engineering or engineering science; Minimum 3.0 undergraduate GPA; Completion of calculus-based physics, dynamical systems, & ordinary differential equations; GRE required.
- **Eligibility:** Government personnel (military & civilian) and contractors (on space available basis).
- **Tuition:** Students sponsored by military/government organizations incur no financial liability for tuition. Non-military-/government-sponsored students are responsible for tuition (\$370 per credit hour).

#### Program Overview

- The AFIT Graduate Systems Engineering (GSE) program is an ABET accredited program leading to a Master of Science (M.S.) degree in Systems Engineering. The Human Systems Focus Area sequence is designed to provide students with graduate level education and the fundamentals of human factors engineering with an understanding of human systems integration and particular emphasis on the DoD applications. This focus area will prepare students to apply state of the art analytical and problem solving techniques to design of systems having a significant human component.

#### Required Courses

**Core** (4 courses – SENG 520, 610, & 640; Select 1 between CSCE 593 & SENG 593)

#### **1. SENG 520: Systems Engineering Design and Analysis**

This course provides a broad introduction to a systematic approach for the conceptualization, design, analysis, operation, and sustainment of complex systems within the DoD. While this course serves as a stand-alone introduction to Systems Engineering, it also provides the foundation for further study in Systems Architecture and Engineering Software Systems. Terms Offered: Fall, Spring (with permission); Prerequisite: None.

#### **2. SENG 610: Systems Engineering Management**

Provides knowledge and tools to manage projects or effectively contribute as a project member. Framed by the systems development cycle, course explains challenges specific to three major project types: systems engineering, software systems, and construction. Basic topics include project life cycle, project planning/selection, cost estimating, scheduling, and risk management. Advanced topics include critical chain analysis, adaptive project management, acquisition logistics and contracting. A one hour lab (SENG 610L) illustrates course principles using Microsoft Project software. Terms Offered: Spring, Summer; Prerequisite: None.

#### **3. SENG 640: Systems Architecture**



This course provides the foundation for developing and evaluating system architectures through an intensive study of the relationships between different types of system representations and the methodologies used to obtain them. Approaches include a variety of model-based systems engineering (MBSE) techniques and heuristics to assess behavior and performance. Students will select a military concept, and iterate its design solution guided by the DoDAF. Terms Offered: Winter; Prerequisites: SENG 520, SENG 593.

**4. SENG 593: Agile Software Systems Engineering**

This course provides a foundation for System Engineers into both design and management of software intensive systems. Topics include requirements elicitation, object-oriented modeling using the UML, design patterns, and iterative software development. Then, the course examines software management through DoD/AF guidance, project case studies, software management best practices and software estimation. Terms Offered: Fall, Winter; Prerequisites: None.

**Mathematics** (1 course)

**1. STAT 583: Introduction to Probability and Statistics**

Basic concepts of probability and statistics with applications are covered. Topics include: Permutations and combinations; random variables; probability distributions; estimation and confidence intervals; hypothesis testing. Terms Offered: Fall, Winter, Spring; Prerequisites: None.

**Research Methods**

**1. RSCH 630 - Research Methods**

Research methods is one of the foundation courses in a management-related master of science degree program. It provides an understanding of the basic methods of conducting research and concepts related to scientific inquiry. This course is designed to advance students along the research process by introducing the basic tools needed to critically analyze claims made through the written body of knowledge and determine the degree to which these claims are valid. As such, the course should help students not only in conducting research, but also in judging the validity of any claims made verbally or in writing. An important part of the process is an understanding of the statistical procedure used to analyze the data (such as linear regression reliability of measures, correlation, and causality) to support drawing conclusions about the research question. Additionally, the course will provide a foundation for students in designing and conducting their own research projects and determine how close to the truth they have come in their own efforts. Terms Offered: Winter and Spring (in residence), Fall (distance); Prerequisites STAT 525, STAT 583, or STAT 587.

**Human Systems Focus Area** (5 courses)

**1. SENG 560: Human Systems Integration**

A human-centered design approach (i.e., “system” includes people within an organization that apply technology to accomplish a task) is explored through readings, discussion and a project. Included are discussions of the HSI (manpower, personnel, training, human factors, system safety, environmental safety, occupational health and survivability) and a method for considering these domains within the Systems Engineering Lifecycle. Terms Offered: As Needed; Prerequisites: None.

**2. HFEN 560: Introduction to Human Factors**

This course examines the study and application of humans and the system interface, including the knowledge of human cognitive/social/physical behavior, capabilities, and limitations. Topics include anthropometrics, sensation-perception, decision-making, mental workload, situational awareness, display/control design, warnings/alerts, human error and accident investigation. Numerous case studies are used to highlight course topics. Terms Offered: Winter (in-residence and distance); Prerequisite: None.

**3. HFEN 610: Human Performance Measurement**

Theories, concepts, and methods for measuring and evaluating human performance will be discussed with an emphasis on facilitating the design of systems having enhanced human performance and satisfaction. The student will gain practice in measuring human performance and applying the results to suggest and validate system design improvements. Influence of fatigue, environmental/task stressors, and social/team factors will be discussed. Terms Offered: As needed; Prerequisites: None.

**4. HFEN 620: Human Performance Modeling**

This course introduces students to using discrete event simulation to model complex human-machine systems. Through this course students will gain an appreciation of defining systems, processes, and workflows using task network analysis. This course is intended to provide students with the requisite knowledge to construct and validate discrete event simulations as well as use simulation outputs to interpret system behavior and evaluate potential solutions with respect to impacts on system performance, human performance, and operator workload. Through this course students will develop an appreciation for the interaction of system components and interface design decisions, and the impacts that individual parts of a system have on other parts of the system as well as the system as a whole. Terms Offered: Winter (distance) and Spring (in residence); Prerequisite: STAT583, STAT587 or equivalent.

**5. HFEN 663: Human-Computer Interaction**

This course covers the principles of human-computer interaction in the design and evaluation of useful, usable interfaces as well as the social consequences of technological innovations. Topics include the joint performance of tasks by humans and machines, the structure of communication between human and machines (including machine response to changes in user state), algorithms and programming of the interface itself, engineering concerns that arise in the design and construction of interfaces, the process of

specification, design, and implementation of interfaces, and design trade-offs. Terms Offered: Spring (in residence and distance); Prerequisites: HFEN 560.

**6. HFEN665: Human-Agent Interaction**

This course explores operator interaction in human-machine teams to understand significant design trade-offs during the design of the Human - Agent (H-A) Interface. Topics to be covered include: Task Allocation, Trust, Interaction Styles, Implicit/Explicit Communication, Relevant Human Biases, Automation Classification/Taxonomies and influences of automation limitations. Interface design decisions and trade-offs will be explored through readings from the course text and select academic articles, as well as analysis and development of design options. Terms Offered: Summer (in residence and distance); Recommended Prerequisite: SENG 520 and HFEN 560.

**7. HFEN 670: Human Interaction Technologies**

Robust human-system interaction requires information flow between the system and human brain. This course will introduce technologies available to mediate this flow of information, discussing the important characteristics and considerations for input and output technologies. Emphasis will be provided on visual information processing and visual display design. Human auditory processing and various input device technologies will also be discussed. Terms Offered: As Needed; Prerequisites: None.

**Individual Thesis or Group Project** (12 credit hours)

**1. SENG 799: Independent Study**

A topic is selected from a wide variety of problems of current interest to the AF and the DoD. The independent study is performed as a group or individual project under the supervision of a departmental faculty. Results are reported in a written thesis and presented in a formal oral presentation. Terms Offered: All.

**7B – Graduate Applied Systems Engineering (M.S.) (ASE) Program: Human Systems**

**Focus Area**

- **Program Details:** Distance; 36 month (12 quarter); Non-thesis program.
- **Program Prerequisites:** Baccalaureate degree in engineering or engineering science; Minimum 3.0 undergraduate GPA; Completion of calculus-based physics, dynamical systems, & ordinary differential equations; GRE required.
- **Eligibility:** Government personnel (military & civilian) and contractors (on space available basis).
- **Tuition:** Students sponsored by military/government organizations incur no financial liability for tuition. Non-Air Force-/government-sponsored students are responsible for tuition (\$370 per credit hour). Free to Air Force military and Civilians on a space available basis.

**Program Overview**

- The AFIT Applied Systems Engineering (ASE) Graduate Systems Engineering program is a non-ABET accredited in-resident program leading to a Master of Science degree in Systems Engineering. The ASE program requirements are identical to the GSE program with the exception that a thesis is not required. In place of the thesis, the program requires 8 additional hours of course work and a capstone project.

The Human Systems Focus Area sequence is designed to provide students with graduate level education and the fundamentals of human factors engineering with an understanding of human systems integration and particular emphasis on the DoD applications.

### **Required Courses**

**Core** (4 courses – SENG 520, 610, & 640 and select 1 between CSCE 593 & SENG 593)

**1. SENG 520: Systems Engineering Design and Analysis**

This course provides a broad introduction to a systematic approach for the conceptualization, design, analysis, operation, and sustainment of complex systems within the DoD). While this course serves as a stand-alone introduction to Systems Engineering, it also provides the foundation for further study in Systems Architecture and Engineering Software Systems. Terms Offered: Fall and Spring (with permission); Prerequisite: None.

**2. SENG 610: Systems Engineering Management**

Provides knowledge and tools to manage projects or effectively contribute as a project member. Framed by the systems development cycle, course explains challenges specific to three major project types: systems engineering, software systems, and construction. Basic topics include project life cycle, project planning/selection, cost estimating, scheduling, and risk management. Advanced topics include critical chain analysis, adaptive project management, acquisition logistics and contracting. A one hour lab illustrates course principles using Microsoft Project software. Terms Offered: Spring, Summer; Prerequisite: None.

**3. SENG 640: Systems Architecture**

This course provides the foundation for developing and evaluating system architectures through an intensive study of the relationships between different types of system representations and the methodologies used to obtain them. Approaches include a variety of model-based systems engineering techniques and heuristics to assess behavior and performance. Students will select a military concept, and iterate its design solution guided by the DoDAF. Terms Offered: Winter; Prerequisite: None.

**4. SENG 593: Agile Software Systems Engineering**

This course provides a foundation for System Engineers into both design and management of software intensive systems. Topics include requirements elicitation, object-oriented modeling using the Unified Modeling Language, design patterns, and iterative software development. Then, the course examines software management through DoD/AF guidance, project case studies, software management best practices and software estimation. Terms Offered: Fall, Winter; Prerequisite: None.

## **Mathematics**

### **1. STAT 583: Introduction to Probability and Statistics**

Basic concepts of probability and statistics with applications are covered. Topics include: Permutations and combinations; random variables; probability distributions; estimation and confidence intervals; hypothesis testing. Terms Offered: Fall, Winter; Prerequisite: None.

## **Analytics**

### **1. QMGT 680: Project Risk Analysis**

This course covers the concept of project risk with an emphasis on formal risk analysis methods. The course exposes students to a variety of approaches for evaluating risk and uncertainty as they apply to a dynamic decision-making environment. Topics include defining risk, DoD risk policy, risk identification, risk handling, qualitative and quantitative risk methods. Both analytical and simulation methods for quantifying cost risk will be discussed. In order to cover simulation methods, the general method of Monte Carlo simulation will be introduced. Terms Offered: All; Prerequisite: STAT 525.

### **2. HFEN 620: Human Performance Modeling**

This course introduces students to using discrete event simulation to model complex human-machine systems. Through this course students will gain an appreciation of defining systems, processes, and workflows using task network analysis. This course is intended to provide students with the requisite knowledge to construct and validate discrete event simulations as well as use simulation outputs to interpret system behavior and evaluate potential solutions with respect to impacts on system performance, human performance, and operator workload. Through this course students will develop an appreciation for the interaction of system components and interface design decisions, and the impacts that individual parts of a system have on other parts of the system as well as the system as a whole. Terms Offered: Winter (distance) and Spring (in residence); Prerequisite: STAT583, STAT587 or equivalent.

### **3. SENG 570: Systems Process Improvement**

This course introduces students to the concepts of Business Process Reengineering, Lean, Six Sigma and other related methodologies. The course will take a historical look at why organizations are structured the way they are. Students will then learn to re-conceptualize the organization in terms of systems and processes with the goal of improving the organizations effectiveness and efficiency. The students will then apply Lean and Six Sigma concepts to re-engineered business and system processes to ensure long term process improvement. Topics for this course will also include people, process, technology, and management dimensions of a Lean enterprise with particular focus on systems applications for scientists and engineers. Upon completion of the course students will be well versed in these methodologies and prepared to contribute to any continuous process improvement activity such as AFSO21. Terms Offered: Spring; Prerequisites: None

**4. SENG 620 Quantitative Analytical Methods**

This course builds on the material presented in SENG 520, presenting additional depth and breadth in topics related to systems engineering. The focus of this course is on the quantitative analysis of engineering-related problems using mathematical/statistical techniques to assist with various aspects of system development, particularly those related to system dynamics, decision-making, and value assessments. Topics may include decision/analysis, utility theory, decision trees, optimization and queueing theory. Terms Offered: Fall; Prerequisites: SENG 520.

**Human Systems Focus Area**

**1. SENG 560: Human Systems Integration**

A human-centered design approach (i.e., “system” includes people within an organization that apply technology to accomplish a task) is explored through readings, discussion and a project. Included are discussions of the HSI (manpower, personnel, training, human factors, system safety, environmental safety, occupational health and survivability) and a method for considering these domains within the Systems Engineering Lifecycle. Terms Offered: As Needed; Prerequisites: None.

**2. HFEN 560: Introduction to Human Factors**

This course examines the study and application of humans and the system interface, including the knowledge of human cognitive/social/physical behavior, capabilities, and limitations. Topics include anthropometrics, sensation-perception, decision-making, mental workload, situational awareness, display/control design, warnings/alerts, human error and accident investigation. Numerous case studies are used to highlight course topics. Terms Offered: Winter (in residence and DL); Prerequisites: None.

**3. HFEN 610: Human Performance Measurement**

Theories, concepts, and methods for measuring and evaluating human performance will be discussed with an emphasis on facilitating the design of systems having enhanced human performance and satisfaction. The student will gain practice in measuring human performance and applying the results to suggest and validate system design improvements. Influence of fatigue, environmental/task stressors, and social/team factors will be discussed. Terms Offered: As needed; Prerequisites: None.

**4. HFEN 620: Human Performance Modeling**

This course introduces students to using discrete event simulation to model complex human-machine systems. Through this course students will gain an appreciation of defining systems, processes, and workflows using task network analysis. This course is intended to provide students with the requisite knowledge to construct and validate discrete event simulations as well as use simulation outputs to interpret system behavior and evaluate potential solutions with respect to impacts on system performance, human performance, and operator workload. Through this course students will develop an appreciation for the interaction of system components and interface design decisions, and the impacts that individual parts of a system have on other parts of the system as well as the system as a whole. Terms Offered: Winter (distance) and Spring (in residence); Prerequisite: STAT583, STAT587 or equivalent.

**5. HFEN 663: Human Computer Interaction**

This course covers the principles of human-computer interaction in the design and evaluation of useful, usable interfaces as well as the social consequences of technological innovations. Topics include the joint performance of tasks by humans and machines, the structure of communication between human and machines (including machine response to changes in user state), algorithms and programming of the interface itself, engineering concerns that arise in the design and construction of interfaces, the process of specification, design, and implementation of interfaces, and design trade-offs. Terms Offered: Spring (in residence and distance); Prerequisite: HFEN 560.

**6. HFEN665: Human-Agent Interaction**

This course explores operator interaction in human-machine teams to understand significant design trade-offs during the design of the Human - Agent (H-A) Interface. Topics to be covered include: Task Allocation, Trust, Interaction Styles, Implicit/Explicit Communication, Relevant Human Biases, Automation Classification/Taxonomies and influences of automation limitations. Interface design decisions and trade-offs will be explored through readings from the course text and select academic articles, as well as analysis and development of design options. Terms Offered: Summer (in residence and distance); Recommended Prerequisite: SENG 520 and HFEN 560.

**7. HFEN 670: Human Interaction Technologies**

Robust human-system interaction requires information flow between the system and human brain. This course will introduce technologies available to mediate this flow of information, discussing the important characteristics and considerations for input and output technologies. Emphasis will be provided on visual information processing and visual display design. Human auditory processing and various input device technologies will also be discussed. Terms Offered: As Needed; Prerequisites: None.

**Capstone Project** (9 credit hours over 3 quarters)

**1. SENG 798: Master's Capstone Project**

A topic is selected from a wide variety of problems of current interest to the AF and/or the DoD. The Capstone Project is performed as a group or individual project under the supervision of departmental faculty. Results are provided in a formal written report. This course is similar to SENG 799, but is for non-thesis students. Terms Offered: All.

**7C – Doctor of Philosophy Systems Engineering (PhD) Program: Human Systems Focus Area**

- **Program Details:** In-Resident; 36 month (12 quarter); Program.
- **Program Prerequisites:** Master of Science degree in engineering or engineering science; Minimum 3.0 undergraduate GPA; Completion of calculus-based physics, dynamical systems, & ordinary differential equations; GRE required.
- **Eligibility:** Government personnel (military & civilian) and contractors.
- **Tuition:** Students sponsored by military/government organizations incur no financial liability for tuition. Non-Air Force-/government-sponsored students are responsible for tuition (\$370 per credit hour). Free to Air Force military and Civilians on a space available basis.

**Program Overview**

The AFIT Doctor of Philosophy in Systems Engineering program is a research-based PhD program. Students are required to complete a total of 36 credit hours of course work, including 8 hours of advanced Math or Stat courses and 28 credit hours of courses supporting their specialization. Courses in support of the student's specialization are selected by the student working with their Pro-Tem Advisor and approved by the department PhD committee. Successful students will typically complete this course work during their first 4 quarters at AFIT and complete their dissertation research over the subsequent 2 years of study. Students are required to complete three quarters of full time (in residence) study within a period of four contiguous quarters in support of their research.



## **8 – Acronyms**

AF – Air Force  
AFIT – Air Force Institute of Technology  
ASE – Applied Master of Systems Engineering  
CLP – Continuous Learning Point  
DAG – Defense Acquisition Guidebook  
DAS – Defense Acquisition System  
DAU – Defense Acquisition University  
DAWIA – Defense Acquisition Workforce Improvement Act  
DoD – Department of Defense  
DoDAF – DoD Architecture Framework  
DOTmLPF-P – Doctrine, Organization, Training, Material, Leadership, Personnel, Facilities, Policy  
ELT – Education, Learning and Training  
ENG – Engineering (DAWIA Career Field Certification)  
ESOH – Environmental Safety and Occupational Health  
EVM – Earned Value Management  
GSE – Graduate Systems Engineering  
HSI – Human Systems Integration  
IDE – Intermediate Development Education  
INCOSE – International Council on Systems Engineering  
IPT – Integrated Product Team  
IT – Information Technology  
JCIDS – Joint Capabilities Integration & Development System  
MBSE – Model-Based Systems Engineering  
NPS – Naval Postgraduate School  
OMB – Office of Management and Budget  
PPBE – Planning Programming Budgeting and Execution  
PM – Program Management (DAWIA Career Field Certification)  
RAM – Reliability, Availability, and Maintainability  
SME – Subject Matter Expert  
SOH – Safety and Occupational Health  
SRD – Systems Requirement Document  
T&E – Test and Evaluation  
UML – Unified Modeling Language  
VE – Virtual Environment

## **9 – Program and Institution Contact Information**

The course information presented in the 2018 DoD HSI Course Catalog is current as of January, 2019. Please validate currency of course information, offerings, and availability prior to compiling an academic plan of study using any of the program offerings mentioned in the catalog. For questions or updates to Catalog content, please contact your HSI representative within your agency or Service.

For more information on the courses or institutions described in this catalog, including registration information, availability, tuition, or tuition assistance, you are encouraged to reach out to them directly via the websites listed below:

### **Defense Acquisition University – [www.dau.mil](http://www.dau.mil)**

- DAU Online Course Catalog
  - <http://icatalog.dau.mil/>

### **Air Force Institute of Technology – [www.afit.edu](http://www.afit.edu)**

- General Coursework (requires CAC, some online classes available without CAC access)
  - <https://www.atrrs.army.mil/channels/afitnow/>
- Graduate Certificate in Human Systems
  - <https://www.afit.edu/env/programs.cfm?p=43&a=pd>
- Master of Systems Engineering (GSE): Human Systems Focus Area
  - <https://www.afit.edu/ENV/programs.cfm?p=39&a=pd>
- Applied Master of Systems Engineering (ASE): Human Systems Focus Area
  - <https://www.afit.edu/ENS/programs.cfm?p=76&a=pd>
- Systems Engineering (PhD): Human Systems Focus Area
  - <https://www.afit.edu/ENC/programs.cfm?p=18&a=pd>

### **General Familiarization and Domain Courses**

#### **Army HSI Program – <http://www.armyg1.army.mil/HSI/>**

- Army HSI Practitioner’s Course (Pending offering)
  - <http://www.armyg1.army.mil/HSI/>

#### **DSIAC**

- Aircraft Survivability Course
  - The Lecturer-in-Charge is Prof. Christopher Adams of the NPS, caadams@nps.edu, 831-656-3400.
  - DSIAC registration questions: Brian Benesch (brian.benesch@dsiac.org, 443-360-4600).
- Ground Vehicle Survivability and Force Protection Course
  - DSIAC registration questions: Brian Benesch (brian.benesch@dsiac.org, 443-360-4600).

### **Naval Postgraduate School – [www.nps.edu](http://www.nps.edu)**

## 2019 DoD HSI Course Catalog

- Graduate Certificate in HSI
  - [https://my.nps.edu/web/dl/cert\\_hsi](https://my.nps.edu/web/dl/cert_hsi)
- Master of HSI (distance learning)
  - [https://my.nps.edu/web/dl/degProgs\\_MHSI](https://my.nps.edu/web/dl/degProgs_MHSI)