**ASE 6131**

**Analysis and Synthesis: Human Systems Integration**

**COURSE OUTLINE**

# Textbook and Class Materials

## Primary Text (PT):

Course Handouts.

INCOSE Systems Engineering Handbook (selected readings).

APA Handbook of Human Systems Integration (selected readings)

## Course Notes (CN):

Numerous handouts will be given out in class or referenced to the web to complement course materials

# Professors/Instructors

## Primary Instructor:

Dennis Folds, PhD

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## Other Instructors:

Larry Kimm, PhD

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# Grading

A summary of the graded events is provided in Table 1 below. Additional details are provided in the following sections.

Table 1: Graded Events and Weightings

|  |  |  |  |
| --- | --- | --- | --- |
|  | Graded Event Title | Points | Percent of Course |
| Individual | Exercise 1 | 50 | 5% |
| Lab 1 Individual Project - 1st Deliverable | 10 | 1% |
| Review APA HSI Handbook Chapter | 50 | 5% |
| Lab 1 Individual Project - 2nd deliverable | 100 | 10% |
| Arctic Crawler Upgrade | 100 | 10% |
| Lab 1 Individual Project - 3rd Deliverable | 100 | 10% |
| Individual Project - final deliverable | 200 | 20% |
| Arctic Crawler Cognitive System Upgrade | 100 | 10% |
| Group | TDFA for Group Project | 100 | 10% |
| Lab 2 - Final Group Project HSI content | 100 | 10% |
| Lab 3 - Draft HSI Test Plan for Group Project | 100 | 10% |
| Total: | | 1010 | 100% |

## Individual Assignments

Individual homework, in the form of labs and exercises, and projects will be given that address the various techniques learned in the class and will constitute 70% of your grade. Individual projects will contribute to the team project.

## Team Project

A Team Project (including presentations and written reports) will be identified at the beginning of the course and will incorporate concepts and students from the other domain electives that are in session at the same time as this course. The team project will be worth 30% of your grade.

# Attendance and Course Participation:

This is a distance learning course. Course attendance is measured by participation in on-line office hours, submission of homework assignments, and participation in live WebEx sessions scheduled during the middle and end of the course. Participation in the live WebEx sessions is mandatory unless coordinated in advance with the instructor.

# Prerequisites:

ASE 6006 and Graduate standing in the Professional Masters in Applied Systems Engineering program or permission of the instructor.

# Goals:

Introduce Human Systems Integration (HSI) concepts, principles, and activities that form an integral part of a complete SE process. Describe analysis, design, and evaluation methods important for HSI success. Promote the value of integrating HSI into a SE team

# Learning Objectives

## Understand the rationale for conducting an HSI program as part of an SE process

## Become familiar with each of the HSI domains and the areas of common concern across domains

## Become familiar with the analyses that support the HSI program

## Understand HSI design requirements and methods

## Understand HSI evaluation methods

# Course Overview

Human Systems Integration (HSI) unites 8 technical domains and allows the practitioner to address human-related issues in system development in an integrated manner. The course presents principles and methods from human factors engineering, personnel selection, training, safety, and other HSI technical domains, and explains how these activities across these separate areas should be integrated into an overall systems engineering process to reduce total ownership costs and improve system performance.

# Course Description

Human Systems Integration (HSI) unites the 8 technical domains of human factors engineering, personnel, manpower, training, safety, occupational health, survivability, and habitability, to allow all human-related issues in system development to be addressed in an integrated manner. The motivation for conducting an HSI program is to control cost of ownership while still getting acceptable system performance and effectiveness. Systems engineering decisions are constrained by manpower restrictions (limits on the number of people that are required to operate, maintain, and support a system), and by personnel restrictions (the knowledge, skills, and abilities that are required of operators, maintainers, and support staff.) Longer-term risks associated with safety, occupational health, environmental concerns, and habitability must be considered during systems engineering in order to be addressed effectively. The concerns across all these domains must be addressed conjointly during system design and development.

The course presents principles of HSI and reviews issues and concerns of each of the domains, and explains how these activities across these separate areas should be integrated to improve system life-cycle costs related to personnel while also leading to improved system performance. The course includes an individual project and a team project in which HSI issues are identified, and the appropriate analysis methods are used to address them.

# Academic Integrity and Honor Code:

Students are expected to abide by the Honor Code of the Georgia Institute of Technology. Information on the Honor Code can be found at: <http://www.honor.gatech.edu/>

Violations to the Honor Code have serious consequences and will be enforced at all times.

# Learning Accommodations:

If needed, we will make accommodations for students with documented disabilities. These accommodations must be arranged in advance and in accordance with the Office of Disability Services (http://disabilityservices.gatech.edu/).

# Class Topics: Analysis and Synthesis: Human Systems Integration

1. Introduction to Human Systems Integration
   1. Overview of course, expectations, and learning objectives
   2. Motivation for HSI
   3. Goals of HSI
   4. Domains of HSI
      1. Human Factors Engineering
      2. Manpower
      3. Personnel
      4. Training
      5. Safety
      6. Occupational Health
      7. Human Survivability
      8. Habitability
   5. Issues in the HSI Domains
2. HSI Analyses - Overview of Analysis Methods
   1. Top Down Functional Analysis
      1. Mission Task Analysis
         1. Mission Analysis
         2. Function Analysis
         3. Task Analysis
   2. Job Analysis
      1. Analysis Techniques
      2. Knowledge, Skills, and Abilities (KSAs)
      3. Task List and Job Description
      4. Job Analysis and Reduction of Total Ownership Costs
   3. Manning and Workload Analysis
      1. General estimates of manpower requirements
      2. Types of Workload
      3. Estimation of Operator Workload
         1. Qualitative Analysis
         2. Quantitative Analysis
   4. Error Analysis
      1. Error identification
      2. Error prediction and modeling
3. User Centered Design
   1. Physical layout and anthropometric accommodation
   2. Information representation on visual displays
   3. Advanced visualization techniques
   4. Auditory displays
   5. Formative evaluation methods
   6. Cognitive Systems Engineering
4. HSI Test and Evaluation
   1. Overview
   2. Human Engineering Test Plan
   3. Checklist Evaluation
   4. User-in-the-Loop Testing
      1. Summative Evaluations
      2. Critical Evaluations
   5. HSI Demonstration
5. HSI Program Planning and Participation
   1. HSI Activities and Program Milestones
   2. IPT participation
   3. HSI Tools
   4. HSI Research
   5. Technical Challenges for HSI