Georgia Institute of Technology

ASE6131 Syllabus

Human Systems Integration Analysis and Synthesis

Summer, 2026

Delivery: 100% Web-Based, Asynchronous

Dates course will run: May 18 – July 5, 2026

Instructor Information

Larry T. Kimm, Ph.D., Principal Research Engineer, Georgia Tech Research Institute, larry.kimm@gtri.gatech.edu, (404) 407-8500

Office Hours: Weekly office hours via Zoom, generally on Thursdays, 6:30 to 7:30 pm Eastern Time. Attendance is optional but highly encouraged.

General Course Information

Description

This course is one of three domain-specific electives in the PMASE curriculum and serves as the Complex Systems elective, introducing the principles and practices of Human Systems Integration (HSI) Analysis and Synthesis. HSI is a systems engineering process that ensures all human-related technical considerations are addressed throughout system definition, design, development, and implementation. A key component of the course focuses on the theory and methods of cognitive systems engineering (CSE). CSE is an approach to analyzing and designing joint cognitive systems. Students will explore cognitive work analysis, techniques for identifying critical units of analysis, methods of data collection for design insight, and analysis approaches for evaluating design solutions. This includes coverage of the five steps of cognitive systems analysis, system modeling, cognitive requirements derivation, and human-machine function allocation. By the end of the course, students will understand how to apply HSI and CSE methods to enhance performance support and decision aiding in cyber-physical systems operating in complex environments.

Pre- &/or Co-Requisites

None

Course Goals

1. Equip systems engineers with a working knowledge of Human Systems Integration (HSI) as a critical component of the systems engineering process.
2. Introduce key HSI concepts, principles, and activities—including cognitive systems engineering—that support a comprehensive systems engineering approach.

3. Apply HSI methods and principles to a collaborative problem involving a notional cyber-physical system (CPS) solution.
4. Describe analytical, design, and evaluation techniques essential to HSI success, including selected model-based methods.
5. Emphasize the value of integrating HSI expertise within multidisciplinary systems engineering teams.
6. Provide a thorough introduction to cognitive systems engineering as an essential element of HSI, focused on the analysis, design, and evaluation of complex human-machine systems.
7. Teach methods and techniques for defining, analyzing, and developing design recommendations across all stages of cognitive systems engineering.
8. Supply students with practical artifacts and tools to support effective cognitive systems engineering analysis.

Course Learning Outcomes
By the end of the course, students will be able to:

1. Explain the rationale for integrating Human Systems Integration (HSI) into the systems engineering process.
2. Describe the key domains of HSI and identify areas of overlap and common concern across domains.
3. Apply HSI analytical methods to assess human-related considerations throughout system design and development.
4. Interpret HSI design requirements and evaluate methods for incorporating them into system solutions.
5. Assess HSI evaluation approaches and select appropriate methods for different phases of the system lifecycle.
6. Compare and contrast cognitive systems engineering (CSE) with traditional HSI approaches, including their theoretical foundations.
7. Conduct each of the five stages of cognitive work analysis (CWA) and produce the associated analytical artifacts.
8. Develop a model of joint cognitive system performance using the outputs of CWA.
9. Derive performance requirements and system design specifications from cognitive work analysis and system models.
10. Construct a function allocation chart that reflects cognitive, physical, and automated roles within a joint cognitive system.

Course Materials

Course Text

Recommended: Booher, Harold R. (Ed). (2003). *Handbook of Human Systems Integration.* John Wiley and Sons. (Print ISBN:9780471020530 |Online ISBN:9780471721178).

Recommended: Stanton, N. A., Salmon, P. M., Walker, G. H., & Jenkins, D. P. (Eds.). (2017). *Cognitive work analysis: applications, extensions and future directions*. CRC Press. Chapter 1. (ISBN-10: 1472443926, ISBN-13: 978-1472443922).

Additional Materials/Resources
Will be provided on the Canvas Learning Management System

Course Website and Other Classroom Management Tools
This course is conducted via the Canvas Learning Management System. The official course website will be provided to students before the course begins.

Course Requirements, Assignments & Grading

Submitting Assignments
All assignments (homework and presentation slides) must be completed and submitted in Canvas. If there are technical issues, please notify the help desk, as well as the professor immediately.

Assignment Due Dates
All assignments are due by Tuesday, 11:59 pm EST, of Tuesday following the week of the assignment. This includes the presentation slides regardless of the day your team presents. If there is a change to these times, it will be posted on Canvas and an email will be sent to all students in advance.

Timing
The seven course modules follow a logical sequence that includes knowledge-building and experience-building. Individual lessons are presented within five modules via videos that are available on the Canvas Learning Management System and can be viewed any time. Two additional modules consist of two live sessions over two days where students and teams present their respective analyses and their system design recommendations. Peer assessments for these live sessions must also be completed by the next day in order to give timely feedback.

Course Module Schedule
Module 0, Course Introduction, Introduction to Cyber-Physical Systems (Week 1, 18 May 26)
Module 1, Introduction to Human Systems Integration and Top-Down Functional Analysis (Week 1, beginning 18 May 26)
Module 2, HSI Domains and Function Allocation (Weeks 1 and 2, beginning18 and 25 May 26)
Module 3, Analytical Methods for HSI and Introduction to User-Centered Design (Week 3, beginning 1 June 26)
Module 4, Mid-term Presentations Live Sessions (Week 4, 12-13 June 26)
Module 5, Cognitive Systems Engineering (CSE) (Week 5, beginning 15 June 26)
Module 6, HSI Test and Evaluation (Week 6, beginning 22 June 26)
Module 7, Final Presentations Live Sessions (Week 6/7, 26-27 June 26)

Grading and Feedback
The assignments will normally be graded by the next assignment due date. Grading is based on compliance with the written guidance provided for each graded item. Office hours is an opportunity for students to ask questions before assignments are due or discuss any parts that are still unclear. Personal feedback is provided on Canvas, with email available for further communication/clarification.

Assignment Descriptions and Grading

Assignment Name	**Type**	**Weight (%)**	**Description and Due Date**
Final Project		**40%**	
Mission Task Analysis Document	Final Project	20%	Final mission task analysis document. Should contain scenarios, functional breakout with function allocation (designation of operator roles), task list, and task descriptions for critical tasks in terms of performance requirements, information requirements, and potential errors (Individual Grade, Due 23 June 26).
Presentation	Final Project	20%	Class presentation of integrated HSI analysis and impacts on systems engineering process, system design and testing (Team Grade, Due 26-27 June 26).
Mid-Term Project		**40%**	
First Deliverable	Mid-Term Project	5%	First deliverable: System description and concept of operation, Week 1 Team Assignment, Problem/System Description and Heilmeier Cathechism Analysis (Individual Grade, Due 26 May 26).
Second Deliverable	Mid-Term Project	10%	Second deliverable: First draft of mission element matrix and functional breakout (Individual Grade, Due 2 June 26).
Third Deliverable	Mid-Term Project	10%	Third deliverable: Complete first draft of mission task analysis (scenarios/use cases, functional breakout, task list). (Individual Grade, Due 9 June 26).
Presentation	Mid-Term Project	15%	Class presentation of HSI analysis and impacts on systems engineering process and initial system design (Team Grade, Due 12-13 June 26).

Lab Exercises		**20%**	
Exercise 1	Lab Exercise	5%	HSI Domain and Tradeoff Exercise (Due 26 May 26)
Exercise 2	Lab Exercise	5%	Identify HSI issues for a sample problem ("intelligent" robotic system, Due 2 June 26)
Exercise 3	Lab Exercise	5%	For the design exercise that will be used for the cognitive systems engineering section of the course, properly organize a cognitive systems analysis of the system used in the exercise, using correct terminology and methodology (Due 23 June 26)
Exercise 4	Lab Exercise	5%	Prepare a draft HSI Test Plan for the group project (Due 30 June 26)

Grading Scale
Your final grade will be assigned as a letter grade according to the following scale:
A 90-100%
B 80-89%
C 70-79%
D 60-69%
F 0-59%

Attendance and Late and Make-up Work Policy
This is a 100% web-based, asynchronous class. Attendance at the mid-term and final live session project presentations is mandatory. Participation in office hours is optional, but highly encouraged. Proactive communication between the student and instructor if assignments will be late is essential. Due dates can be adjusted for valid personal reasons. All assignments are due by the course end date, 5 July 26.

Additional Criteria for Successful Course Completion
This elective course is intended to allow the students to contribute to group projects using the individual knowledge and skills gained through the course. It is important for those contributions to be clearly visible with impacts to the system design(s) presented during team mid-term and final presentations. However, it is just as important to demonstrate through work on individual deliverables and exercises that students have a mastery of the concepts presented. An appropriate level of effort should be applied to all graded assignments. The majority of course grades come from team efforts. ASE6131 students should be active participants and contributors to the overall success of their team.

Academic Integrity
Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech's Honor Code and the student Code of Conduct.

Any student suspected of cheating or plagiarism on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Student-Faculty Expectations Agreement

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.