

Sys 623 - Cognitive Systems Engineering, Spring, 2006

Class Times: Mon, Wed, 3:30PM – 4:45PM, MEC 215

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Office Hours: By email or appointment

Course Website: http://toolkit.its.virginia.edu/2006_Spring_SYS623-1

UVA HCI Website: www.sys.virginia.edu/hci

Class Email List: sys623-1@toolkit.virginia.edu

ASRS Monthly Reports – Aviation Safety Reporting System. These are interesting to read.

Refworks is an online bibliographic management system available at:

<https://www.refworks.com/Refworks/login.asp?WNCLang=false>

The login name is: hfes

The password is: hfes

Course Objectives: To learn basic aspects of human factors in the design of information support systems. We will cover: 1) human performance issues (memory, learning, problem-solving and human error), 2) characteristics of complex, socio-technical systems (automation, dynamic processes, open systems, naturalistic decision making), 3) knowledge acquisition methods, 4) types of decision support systems, 5) the design process (task analysis, product concept, functional requirements, prototype, design, and testing). We will look at different kinds of decision support systems, including rule-based expert systems, critiquing systems, and representation aiding systems. Students will gain skills in these areas through in-class exercises and a course project. The course is also designed to help you practice different communication skills (interviewing, written analysis, and oral presentation).

What fundamental questions will this course help you answer? What is Cognitive Systems Engineering? How is it different from traditional human factors? What methods can I use to analyze a human/systems interaction? What are the human information processing fundamentals to understand for designing and evaluating human-systems interactions? What theories explain the kinds of errors people make? What causes human error? What are the different kinds of human error? How do I design and conduct an effective usability evaluation? What are the advantages and disadvantages of the different usability evaluation methods? What are some different approaches to designing decision support systems? What effects can these designs have on performance? What is representation aiding? How does distributed cognition affect task performance?

Course Format: We will be designing, as a group, an online cognitive systems engineering compendium. Thus, by the end of month 1, we will have the requirements for the system designed, as well as 3 possible methods for achieving the compendium. By the end of month 2, we will have decided on the method to use for creating the compendium. By the end of the class, we will have begun to populate the compendium based on the research each of you will perform during the class. Thus, it is intended that you will learn the human-centered design process as well as have learned a bit about the challenges in creating a group design, as well as learned specific content about human factors, particularly cognitive systems engineering. In parallel, each of you will be responsible for developing and understanding the literature and work related to a particular cognitive engineering researcher and the topics that they write about, which will be what the contents of the compendium will be about.

Grading:
Attendance and Class Participation: 25%
Assignments 75%

SOME KEY WORDS:**The effects of automation on performance**

- Supervisory Control
- Human-computer cooperative problem solving
- Clumsy Automation
- Trust
- Situation Awareness

Decision Aiding Systems

- Directions vs. Maps
- Representation Aiding
 - Affordances, Saliency, Mapping
- Consultant Systems
- Critiquing Systems
- Computer Supported Cooperative Work

Naturalistic Decision Making

- Skills-Rules-Knowledge
- Abstraction Hierarchy
- Decision Ladder
- Mental Models
- Recognition-Primed Decisions
- Knowledge-based expert systems
- Team performance
- Domain characteristics and constraints
- Expert-novice differences
 - chunking
- Strategies
- Heuristic Reasoning
- Decision Biases
- Problem-solving as search through a problem-space
- Use of tools

Cognitive Task Analysis

- Cognitive Work Analysis
- Knowledge Acquisition
- Information Flow
- Communication Paths
- Tools used
- Constraints
- Distributed cognition - "knowledge in the head" and "knowledge in the world".
- Field studies and observation
- Disturbance Management
- Alarm Management
- Latent Errors
- Human Error
- Usability Testing

Problem Types

- Problem Solving
- Information Retrieval
- Diagnosis
- Planning
- Scheduling
- Resource Allocation

Domains

- Aviation, Driving, Trains, Dispatching, Emergency Management, Health Care, Process Control, Military Command and Control

References

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