05-413/05-813: Human Factors
Carnegie Mellon University
Syllabus
Fall, 2008

Lecture: TR 12-1:20 PM, WEH 5409

Credits: 9 units

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OVERVIEW

Welcome to the Human Factors course! I think you will find this course interesting and useful. In this course you will learn basic methods and principles to investigate and analyze problems that involve human factors such as: perception, cognition, decision making and human errors; and you will also learn to use technology design to help improve these processes and avoid error.

Do the situations below sound familiar?

Alarm Clock	"I thought I set it for 6 AM, but it didn't go off until 6 PM." Result: Unexcused late to class.
Computer Workstation	"The hourglass is still there. Is my file saved or gone forever?" Result: Late paper, another all-nighter.
Entertainment Center	"I'm pretty sure this is how you program this DVR." Result: You missed the show.
Telephone Menu	"How do I speak to a real person about this billing error?" Result: Give up, hang up and later find your phone is disconnected.
Aircraft Controls	"It definitely feels like a spin. My instruments must be lying." Result: Injury, death.

Life shouldn't be this difficult. As a Human Factors consultant, your job will be to understand problems and apply human factors knowledge to analyze these problems, find sources of error, and propose the design (or redesign) of systems in order to improve human-system interactions. Thus, the focus of this course will be to introduce you to the capabilities and limitations of human performance, to present several guidelines and principles of design that accommodate these factors, and to encourage you to apply human factors' processes to produce human-system interactions that are safe, effective, and efficient.

OBJECTIVES

By the end of the course, you should be able to:

- Appreciate the breadth and depth of the Human Factors discipline.
- Apply Human Factors (HF) methods and principles to the evaluation and design of systems in the world around you.
- Understand human limitations and capabilities and how they impact the design of controls, displays, and related devices.
- Appreciate how human factors can influence the design and resulting effectiveness of human-system interactions.
- Demonstrate the **critical thinking** skills of a Human Factors consultant.

This course will provide you with problem-solving exercises similar to those required from Human Factors consultants. I emphasize a critical thinking approach to learning. Thus, you will not passively absorb knowledge from my slides. In contrast, **you must create knowledge in your own mind by actively thinking about the material.**

Thus, it is crucial that you prepare for each lesson, reading and reviewing the material before coming to class. I will use class time to clarify difficult concepts, to expand your knowledge of selected topics, and to challenge you intellectually. This means you are responsible for more material than is covered in class. I will not teach straight out of the book. Instead, the readings will be used as a springboard for classroom activities and discussions. Classroom work will blend lectures, discussions, movies, exercises, and demonstrations in order to give you the breadth and depth of experience necessary for analyzing human factors problems.

This is a nine-hour credit course, which means that the course requires 9 hours of your time per week: 3 hours of class per week and 6 hours of reading and preparation of assignments. Students signed up for the graduate level course will be expected to take additional responsibility in the class, and will be held to a higher standard in grading.

TEXTBOOKS AND READINGS

Required Textbook:

An Introduction to Human Factors Engineering by Wickens, Lee, Liu, & Gordon Becker, 2nd Edition.

Readings:

List of supplementary and recommended readings can be accessed electronically through blackboard.

BLACKBOARD

We will be using the university-supported system for course delivery called Blackboard. You will be able to access class slides and project assignments, read announcements, hold discussions about the course and submit homework etc. through Blackboard. To get started, go to www.cmu.edu/blackboard and login using your CMU ID and password. Our class is found under F08-Human Factors.

Please make a regular habit of checking the Blackboard because all course announcements will appear there!!! It is your responsibility to be informed of the announcements posted in Blackboard.

REQUIREMENTS AND GRADING

You will be scored on the following requirements:

	Points
5 Case Analyses (Your choice from 6 possible)	
Each case	12
Total Case Analyses	**60**
2 Exams (individual), during class hours	
Each exam	10
Total Exams	**20**
Semester project (report and presentation)	20
Total	**20**
Attendance and class participation	**Up to +5**
Total POINTS	**100 (+5)**

Case Analyses.

Case analyses will help you practice the concepts presented in the lectures and also help you prepare for the exams. The case analysis is a problem-solving exercise, similar to those required from Human Factors consultants. All of the cases will be graded according to how well you answer the guideline questions and use the relevant readings to evaluate the case. In the class where the case is discussed, students will be chosen at random to discuss their recommendations for solving the problem represented in the case.

I am flexible with your case analyses. We will distribute 6 cases, of which you need to complete only 5 to get full credit, any of your choice. Only 5 case assignments will be counted towards your grade. If you have an illness, scheduling problem, or need a break, you can simply skip that case.

Be on time with your case analyses. Project assignments are **due at 11:00 AM** on the day appearing on the schedule. An assignment is classified as *late* if received after 11:00 AM on its due day. **Late submissions of project assignments will automatically reduce 3 points on the assignments**. Thus, if turned in late the maximum number of points in the assignment will be 9. An assignment is classified as *missing* if not received within 24 hours of its due day. **Missing project assignments will automatically reduce 12 points on the assignments with no possibility of extra points.**

I expect your case analyses to be of high quality. Points will be subtracted for unprofessional assignments. A case analysis that receives all the 12 points is one that is complete, correct, and convincing in every respect. It demonstrates the student's initiative as well as thoughtfulness, insight, and depth of analysis into the methodologies and techniques. Obtaining the total number of points in each homework project means that you have demonstrated outstanding effort and that you have exceeded my expectations in every dimension.

Case analyses should be **done individually and independently**. You are not allowed to share any information concerning the solution of the project assignments with other students in this course**.** Any form of **cheating/copying/plagiarism will not be excused and will lead to failure in the course**.

Exams.

There will be 2 exams in the semester during class times. One will be in the middle of the semester and a second one towards the end. Exact dates are shown in the schedule, below. Exams will be based upon the readings, lectures, and assignments. I will hold in-class review sessions the class before the exams. Exams are to be taken individually. The exams are cumulative, meaning that they will include all taught in the course before the exam date. I expect you to use the readings as a resource rather than as a document to memorize. You also will need to read the class material carefully to understand human factors principles, and to look up facts and figures. Exams will be open book and case study oriented. That is, the exams will test your ability to apply the principles of human factors and your ability to think about human error and technology from a human factors perspective.

Semester project.

The week-to-week work in class does not emphasize sustained thinking and information gathering on human factors issues. The semester project fills this gap. Each student should pick a realistic and novel human factors problem in which you are interested. The goal of this project is to use the Human Factors methods and ideas developed through the semester to propose a solution to the problem. The topics for the semester project are flexible, but they must be approved by me, so as early as possible, send your ideas or feel free to stop by my office to discuss. Possible examples: design of doors (push vs pull), radio controls in car, phone interfaces, copy machine controls, light switches, faucets design, etc.

Components of the paper include: (1) identify a design problem (2) conduct a task analysis (3) discuss the relevant limits and capabilities of human behavior that are critical for the task (4) based on literature on human behavior and human factors, provide recommendations for a better design; list advantages and disadvantages of the new design (5) describe how you would evaluate your design with experiments and present detail design of at least one experiment. More detailed information on the final paper will be given later in the semester.

The last week of classes will be devoted to presentations of these projects (required attendance). The final written report of your project must be handed in on the date marked in the class schedule. The final project will be broken down in several phases and the deadlines for milestones are marked in the class schedule.

Attendance and class participation.

Class attendance is the easiest way to learn the material fundamental to this class. Given the interactive character of the course, you obviously need to be present in class as often as

possible and be **able to make your contributions** to class by participating in class discussions and activities. Attendance can give you up to 5 extra final points in the semester. There are 29 classes scheduled for the term. You will receive extra credit for full attendance (+5 points) if you are present in all of those sessions and if you contributed to the discussions and exercises in the class regularly. You must also attend all the final project presentations to get full attendance extra credit.

Use of E-mail.

Please be advised that sending email to your Professor or TA does not shift any responsibility from you to us; you are still responsible for the on-time, high quality completion of assignments and projects. Do not send complicated questions or requests to us via email. Replies will not be given for email questions or problems requiring lengthy (more than a couple of sentences) or complicated responses. These types of communications should be done in person preferably during office hours.

Religious observance.

If you cannot attend a particular class because of religious reasons, please arrange with me at **least one week ahead of time** so we can make alternate plans for covering the material. If you find a conflict in the schedule, please tell me within the first week of the semester.

THE SCHEDULE

August	***Topic***	***Readings Due***	***Homework***	***In-class Exercise/Video***
1. T 8-26	Discussion of Goals, Syllabus, Grading policies. Introduction to Human Factors.			Video: Intro to Human Factors Time permitting: Human Factors in Emergency situations
2. TR 8-28	Accidents & Human Error	Case: Zeebrugge WLLG Chapters 1, 14		Video: Zeebrugge
September	***Topic***	***Reading Due***	***Homework***	***In-class Exercise/Video***
3. T 9-2	Human Factors Methods 1: Introduction and Fault Tree Analysis (FTA) *By Sara Kiesler*	WLLG Chapter 2: Descriptive Methods (pp. 24-29).		FTA of Zeebrugge
4. TR 9-4	Human Factors Methods 2: Task Analysis (TA)	WLLG Chapter 2 (pp. 14-24). WLLG Chapter 3 (pp. 38-50).		TA exercise

5. T 9-9	Introduction to Human Information Processing System – Human Vision & Attention	WLLG Chapter 4	DUE: Case Analysis 1	Videos: Tenerife island Combat Identification
6. TR 9-11	Signal Detection Theory *By Angela Brunstein (Coty out of town)*	WLLG Chapter 4 (pp. 82-87) Handed out chapter on SDT		Luggage Screening simulation
7. T 9-16	Cognition: Human memory	WLLG Chapter 6		Memory exercises
8. TR 9-18	Situation Awareness	Situation awareness handout Case: Leap of Faith	DUE: Case Analysis 2	Video: Flight TWA-800
9. T 9-23	MID-TERM EXAM *Coty out of town in the HFES 08*			
10. TR 9-25	Discussion of exam. Highlights from HFES 08			
11. T 9-30	Cognition: Static Decision Making and Naturalistic Decision Making	WLLG Chapter 7	DUE : Milestone 1, FINAL Project	Firechief simulation
October	***Topic***	***Reading Due***	***Homework***	***In-class Exercise/Video***
12. TR 10-2	Cognition: Dynamic Decision Making	Dynamic Decision Making handout		Water Purification Plant simulation
13. T 10-7	VISIT PITTSBURGH SIMULATION CENTER: WISER- 2 45-minute sessions 12-12:45 and 12:45-1:30		DUE: Case Analysis 3	
14. TR 10-9	Cognition: Learning and Expertise	Case: Double Vision		
15. T 10-14	Displays	WLLG Chapter 8		
16. TR 10-16	Control Systems and Devices	WLLG Chapter 9		Dynamic Stocks and Flows simulation
17. T 10-21	Games and Simulations		DUE: Case Analysis 4	
18. TR 10-23	Automation	WLLG Chapter 16		
19. T 10-28	Transportation & Driving	WLLG Chapter 17	DUE: Milestone 2, FINAL Project	

20. TR 10-30	Work Physiology	WLLG Chapter 12 Handout of Sago mine disaster		Video: Sago Mine disaster
November	***Topic***	***Reading Due***	***Homework***	***In-class Exercise/Video***
21. T 11-4	VISIT FROM NIOSH HUMAN FACTORS GROUP		DUE: Case Analysis 5	
22. TR 11-6	Stress and Workload	WLLG Chapter 13		
23. T 11-11	Training	WLLG Chapter 18		
24. TR 11-13	Social Factors	WLLG Chapter 19	DUE: Case Analysis 6	
25. T 11-18	Review for second exam and discussions for final presentations			
26. TR 11-20	SECOND EXAM			
27. T 11-25	Final Presentations			
TR 11-27	Thanksgiving NO CLASSES			
December	***Topic***	***Reading Due***	***Homework***	***In-class Exercise/Video***
28. T 12-2	Final Presentations			
29. TR 12-4	Final Presentations			
T 12-9			DUE: FINAL PROJECT	