

BEHAVIORAL SCIENCES 373

Introduction to Human Factors Spring 2006

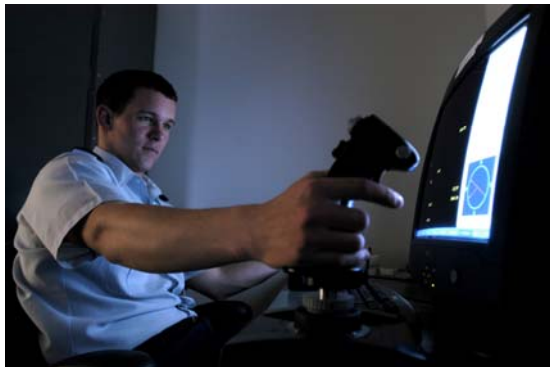
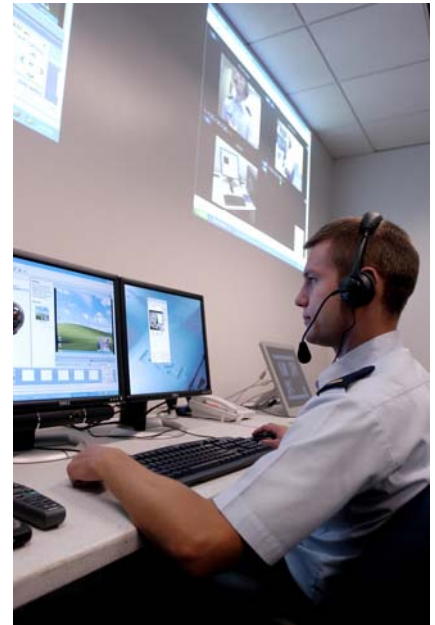
The Ergo Class



Figure 5: Hybrid III 50th % Male Dummy
(Photograph Courtesy
First Technology Safety Systems)



"Darn these hooves! Who designs these cockpits anyway...Raccoons?"



Beh Sci 373 Course Syllabus

INSTRUCTORS

	<u>Sections</u>	<u>Office</u>	<u>Phone</u>
Capt Adam Larson (Course Director)	T2-4	6J141	x2905
Lt Col Terence Andre	T2-4	5L50	x2972
Lt Col Wes Olson	M1-2	6L164	x4879
Capt Chris McClernon	T5	6L103	x8645

REQUIRED COURSE TEXTS

Wickens, C. D., Lee, J. D., Liu, Y., & Gordon-Becker, S. E. (2004). *An Introduction to Human Factors Engineering* (2nd ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Norman, D. A. (2002). *The Design of Everyday Things*. New York: Basic Books.

or

Norman, D. A. (1988). *The Psychology of Everyday Things*. New York: Basic Books.

Norman, D. A. (1990). *The Design of Everyday things*. New York: Basic Books.

INTRODUCTION

Welcome to Behavioral Sciences 373, Introduction to Human Factors! Not only will you find this course interesting, but useful as well. As a cadet (or future pilot, navigator, maintenance officer, space officer, or support officer), how many systems do you interact with on a day-to-day basis? Do you ever find yourself confused or frustrated while trying to operate one of these systems? Does this table 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: No show, you now have no idea what's happening on <i>The OC</i> .
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 budding Human Factors Engineer, your job will be to understand users (like yourselves) and apply this knowledge to 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.

COURSE 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 Engineering (HFE) data and principles to the design and evaluation 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.
- Produce scholarly work according to the appropriate writing format [American Psychological Association (APA) for DFBL majors; MLA for others].
- Demonstrate the **critical thinking** skills of a Human Factors Engineer.

COURSE EXPECTATIONS

Your Role

We have designed this course to be both challenging and rewarding. In this regard, we are going to emphasize a critical thinking approach to learning. A critical thinking approach to education takes the view that a student's knowledge is not passively absorbed from an instructor's lectures. In contrast, **critical thinking assumes students must create knowledge in their own mind by actively thinking about the material.**

It is crucial that you prepare for each lesson, reading and reviewing the material before coming to class. Your instructor 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. Your instructor 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 to make you better officers. In addition to your readings, **in-class lectures will provide additional information that will be testable.**

Instructor's Role

As instructors, our primary goal is to help you learn. Our experience has shown us that learning is facilitated by open dialogue and sharing of ideas. Therefore, we require you to come to class prepared, and your instructor will also come prepared, ready to facilitate conversation rather than regurgitate textbook information. We strongly encourage you to talk to other people about the course material. You can really learn a lot by seeking out interactions with classmates, your instructor, other faculty members in DFBL, etc. By actively engaging in this process, we can all learn a lot more!

Most importantly, your instructors' role is to **make Human Factors FUN!** This can be a very fun and exciting course, but only if you come prepared and ready to discuss.

POLICIES AND PROCEDURES

Late Work

All work is due at the **beginning of the class period** on the due date. See your instructor before the due date if you run into problems. Work turned in late will receive a 10% grade reduction per 24-hour period, to include weekends.

If you know you will be gone, you must coordinate an acceptable turn-in date with your instructor prior to the due date. Your instructor will work with you to give you every opportunity to turn in top-quality work, but you must coordinate in advance!

NOTE: Computer/printer glitches are not acceptable reasons for turning in work late. If you are going to use a computer, you need to make sure you back up your work so you do not lose it. If the squadron printer is down, you need to network to another squadron's printer, go to a computer lab, or find someone with his/her own printer that you can use.

Academics with Integrity

All course assignments and projects are individual effort, unless otherwise noted in this syllabus, on the assignment, or by the instructor. However, you are encouraged to make use of your fellow students to proofread your work for such things as grammar, spelling, and content. Additional guidance for all of the graded events in this course can be found in the appropriate sections of this syllabus. Appropriate format (depending on your major) and documentation will be expected for all work submitted by each student.

Violations of academic standards (e.g. plagiarism, lack of documentation, over-reliance on outside sources or someone else's work [even if properly documented]), whether or not an Honor Code violation is suspected, will receive an academic penalty. Such

penalties may include receiving a failing grade on the assignment, being required to reaccomplish the assignment, receiving a controllable incomplete (IC) for the course, and / or failing the course.

This is an academic class, and part of our job is to evaluate how much each of you has learned. Therefore, we have developed assessments (e.g., quizzes and exams) that are designed to provide us with information about how much you know. In order to be fair, we have a few ground rules for acceptable behavior.

With respect to exams:

- Prior to taking GRs or the final exam, you are welcome to study with anyone. We encourage you to work with classmates, cadets in other sections of this course, your instructor, etc. This kind of collaboration will increase your learning.
- Once you have taken an exam, you are “off the playing field.” That is, you are not allowed to talk to anyone about the exam, even those people who have already taken the exam. The only exception to this rule is that you are allowed to speak to your instructor and/or the course director.

With respect to the Written Assignments:

- Individual Design Project: You are free to consult any outside materials or people (e.g., the library, the Writing Center, other cadets, your instructor). You must, however, document thoroughly any assistance that you receive (or state documentation: “none”). Be specific in your documentation. We would like to know exactly what help you received and from whom. In giving credit to others, err on the side of overdocumentation, and quote any words that are not your own. However, although copying an entire assignment with proper documentation is not dishonorable, it is a breach of academic integrity and will result in a failing grade for that assignment. If you do not receive any outside assistance whatsoever, please indicate this on your documentation page by annotating “Documentation: none.”
- Lab Assignments: These assignments will be done in groups of 2-3 cadets. You should only collaborate with cadets in your own group. You can get help from the library, the Writing Center, and your instructor for these assignments. Again, document any outside help you receive.
- The lab write-ups and IDP will not be accepted without a documentation statement/page. **An assignment without a documentation statement will not be accepted or will be returned ungraded to the cadet and a late penalty will be assessed based on when the documentation statement was completed.**
- Please recognize that turning in other people’s work as your own is academically inappropriate, even if you document thoroughly. While you are welcome to talk to other people about your papers, we expect that you will turn in your own work.

Plagiarism: All assignments are subject to scanning for plagiarism IAW the procedures specified in the Honor and Academics Policy Letter (posted in classrooms).

Documentation: A documentation statement is required on all graded homework (projects, papers, etc.). If no resources or help was received, a "Documentation: None" statement must be included with the assignment. An assignment without a documentation statement will not be accepted or will be returned ungraded to the cadet and a late penalty will be assessed based on when the documentation statement was completed.

Mandatory Lesson Outside of Class: The only course-required mandatory lessons outside of regularly scheduled class time will be for evening lectures by 2 guest speakers. Compensatory time will be given for these lectures. Excusals from the lectures must be cleared with your instructor before the scheduled day of the event.

Requirements to pass the class: The IDP, Lab reports, and all examinations are required graded events for this course. Failure to complete any one of these assignments will result in a Controllable Incomplete ("IC") grade for the course. Failure to resolve an ("IC") within the timeline established by the course director will result in the conversion of the "IC" to an "F" in the course.

Extra Credit: Extra credit is not given in this course.

Final Exam Validation: This course does not allow validation of the final exam.

CAS Accountability: Simple coordination between you and me should alleviate all CAS problems. Whenever you are absent I want you to send me your reason via e-mail. If you know you will be gone on a trip or for some appointment, it is your duty to notify me in advance! You must have my approval prior to missing class.

Course Web site: <http://inraweb.usafa.af.mil/dfbl/classes/courses/behsci373/index.cfm>
This web site is your one stop location for course information. It will contain the latest version of the syllabus, many of the handouts, class slides as well as other important information.

COURSE EVALUATION

There are four types of evaluations in this course: exams (GRs and Final Exam), labs, individual design project, and concept quizzes/homework checks. All of them are designed to be challenging, thought provoking, and mentally stimulating.

Graded Reviews (GRs): The course has two GRs (worth 125 points each). The GRs will consist of some combination of multiple choice, matching, fill-in-the-blank, short answer, and essay questions. The exams will also be conceptual in nature. We will test your ability to think about the material, not just memorize it! Authorized resources: None.

Labs: To help you apply selected human factors concepts from the textbook and gain experience collecting data, you will participate in five laboratory experiments and produce two laboratory reports based on the in-class experiments. These lab assignments will be done in groups of 2-3 cadets. The writing of the lab reports must be shared by all members of the group and formatted according to the lab guide. The specific instructions for each lab assignment will be given in class. The lab assignments are worth 100 points each. Authorized resources: Other lab group members, lab guide, course text, library materials, and internet resources.

Individual Design Project (IDP): The IDP consists of human factors analyses of a system (tool, object, interface, etc.) of your choosing. Specifically, **you must use three human factors principles** from the course for the IDP. The IDP will be graded based on content (demonstrated depth and breadth of understanding), format (APA for DFBL majors, MLA for non-DFBL majors), and mechanics (spelling, grammar, and composition). There is one IDP worth 150 points. Authorized resources: Course text, library materials, and internet resources.

Specifics: The IDP will be a 5-6 page paper (plus the title page, abstract, reference and documentation page). You should describe the design strengths based upon the human factors principles discussed in class and the design weaknesses (i.e. how the object/machine could have been better designed if the human factors issues discussed in this class had been better integrated). Be sure to show your understanding of the design concepts you use; don't just list them—explain and apply them. As a suggestion to help you generate ideas, you may want to ask different users (they must be people who have not taken this class) to try your object/machine/interface and tell you what they like and do not like about your chosen subject, WITHOUT giving them your perspective first. Summarize the results of your informal “user testing.” Additional considerations:

- You should perform your IDP on a product you've actually used / interacted with in the past
- Must reference web sources if used (pictures, articles, etc.)
- Pictures are worth a thousand words... a “before redesign” and an “after redesign” sketch can help make your points more salient. It is highly recommended you include pictures to show your product. Please ensure that picture quality is sufficient to provide the relevant information.

Quizzes/Homework: There will be 10 (8 quizzes and 2 homework assignments) graded assignments during the semester, each worth 10 pts (100 pts total). Before prog, there will be 1 announced quiz on Lab 1 and 3 unannounced quizzes. After prog, there will also be 1 announced quiz on Lab 2 and 3 unannounced quizzes. Additionally, the homework assignment before prog entails each student providing a 1 page (maximum) summary on a HF article (found by the student) from the proceedings of the Human Factors and Ergonomics Society. A copy of the article, a reference in the appropriate format, and the summary write-up is due on or before lesson 19. Topics available are those covered before lesson 19 and it is up to the student to choose. After prog, the homework assignment will be conducted on applying HF principles from the course to the T-6 simulators in the 2nd floor Air Warfare Laboratory. **Authorized Resources:** Quiz – none. Article summary; Journal Article. T-6 evaluation: other group members, course text, class notes.

Final Exam: At the end of the course, you will take a comprehensive final exam worth 250 points. The exam will consist of some combination of multiple-choice, matching, fill-in-the-blank, short-answer, and essay questions.

Instructor Prerogative (IP) Points: Your IP points will be based on class preparation, class participation, and professional behavior (e.g., attitude and teamwork) throughout the semester. It is important that you come to class having read that day's material in order to help facilitate a learning environment where we have meaningful discussions. IP points are worth 50 points total (25 before PROG/25 after).

Graded Events Summary

Graded Event	Prog Pts.	Final Pts.	Weight
Lab 1	100		10%
Graded Review 1	125		12.5%
Quizzes / Homework (5 x 10 pts each)	50		5%
IP points	25	25	5%
Lab 2		100	10%
Graded Review 2		125	12.5%
Individual Design Project		150	15%
Quizzes / Homework (5 x 10 pts each)		50	5%
Final Exam		250	25%
Total	300	700	100.0%

Grade Calculations

Grades in Beh Sci 373 are determined by the number of points you earn in the course. There are 1000 points possible this semester. Each instructor will be responsible for assigning grades based on their students' levels of performance. Grades are traditionally based on the scale below. Each student in the course has the opportunity to do well – you are not competing against one another for any particular quota of grade distributions. Specific cut lines may be adjusted to accommodate the performance of students who are grouped near a particular cut line.

A = 90 - 100%

B = 80 - 89%

C = 70 - 79%

D = 60 - 69%

F = 0 - 59%

Spring 2006 Syllabus Schedule

Lesson	Topic	Reading	Due
INTRODUCTION TO HUMAN FACTORS			
1	Admin/Introduction	Syllabus & Handouts	
2	The Psychopathology of Everyday Things	Norman 1	
3	The Field of Human Factors	Wickens 1, Wickens 3 (pgs 30-36)	
4	Human Factors Methods / APA	Wickens 3 (pgs 36-60)	
HUMAN CAPABILITIES & LIMITATIONS			
5	The Visual System I: Seeing	Wickens 4 (pgs 61-78)	Textbook
6	The Visual System II: Search & Detect	Wickens 4 (pgs 78-90)	
7	Lab 1: Experiment I & II		Quiz
8	The Auditory System I: Auditory Concepts	Wickens 5 (pgs 91-104)	
9	The Auditory System II: Sound Transmission	Wickens 5 (pgs 104-119)	
10	Lab 1: Experiment III		
11	Cognition I: Information Processing / Memory	Wickens 6 (pgs 120-143)	
12	Cognition II: Situation Awareness / Attention	Wickens 6 (pg 143-145, 149-155)	Lab 1
13	Cognition III: Knowledge in the Head & World	Norman 3	
14	GR 1		GR 1
15	GR Review / Group Retake		
	Guest Speaker: Dr. Tony Andre -- HF: Here, There and Everywhere (1900-2000)		
CONTROLS & DISPLAYS			
16	The Psychology of Everyday Actions	Norman 2	
17	Knowing What to Do	Norman 4	
18	Displays I: Display Design Concepts	Wickens 8 (pgs 184-198)	
19	Displays II: Multiple Displays & Layout	Wickens 8 (pgs 198-213)	HF Article
20	Controls I: Control Concepts	Wickens 9 (pgs 218-231)	
21	Controls II: Continuous Control/Tracking	Wickens 9 (pgs 231-242)	
	Guest Speaker: Dr. Chris Wickens -- HF Applications (1900-2000)		
PROG			
22	Comp Time (for Dr. Wickens lecture)		
23	Controls III	Sanders/McCormick chapter 11 (pgs 334-378)	
24	Application: T-6 Simulators		HW

Lesson	Topic	Reading	Due
WORKSPACE DESIGN & PHYSICAL ACTIVITY			
25	Anthropometry	Wickens 10 (pgs 243-258)	
26	Workspace Design	Wickens 10 (pgs 258-268)	
27	Lab 2: Experiment I		Quiz
28	Biomechanics	Wickens 11 (pgs 269-287)	
29	Lab 2: Experiment II		
30	Workload	Wickens 13 (pgs 334-350)	
31	Guest Speaker: Lt Col Olson – Accident Investigation		Lab 2
32	GR2		GR 2
33	GR Review / Group Retake		
SPECIAL TOPICS IN HUMAN FACTORS ENGINEERING			
34	Human Computer Interaction	Wickens 15 (pgs 383-390, 396-410)	
35	Application: HCI Lab		
36	Comp Time (for Dr. Andre's lecture)		
37	Guest Speaker: Capt McClernon -- Air Force Application (Test and Evaluation)		IDP
38	Guest Speaker: Dr. Dyche -- Sleep		
39	Virtual Reality	Handout	
40	Training	Wickens 18 (pgs 477-491)	
41	Special Topic (TBD)		
42	Course Summary & Critiques		
	Final: Period <u>5 and 13</u>		Final