

Behavioral Sciences 473



Human Factors in Systems Design

Spring 2006

Beh Sci 473 Course Syllabus

INSTRUCTOR

	<u>Sections</u>	<u>Office</u>	<u>Phone</u>
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**I also teach BS373 during T5*

COURSE OVERVIEW & OBJECTIVES

Overview

Welcome to Behavioral Sciences 473, Human Factors in Systems Design! In this course you will learn about the process and procedures implemented by engineering design teams and how the human factors specialist fits into such teams. As a senior capstone course, BehSci 473 will require you to immediately apply what you learn about the system design process in the completion of a human factors-oriented design project. Successful completion of this project will require you to draw upon the knowledge and expertise that you have developed in previous courses, including your introductory HF course, Engineering Psychology, I/O Psychology, Aviation Psychology, and your core engineering courses. I hope you find the completion of your project and this course a rewarding and valuable experience.

You will notice very quickly this course has no GRs or final exam (feel free to dance around the room). The "test" for you as a student will be your effectiveness in defining, developing, testing, and delivering a single design project over the entire semester. This will obviously require a different kind of effort than what you typically produce when studying for an exam. Since all of you will be stepping into 2Lt shoes in a few months (go ahead and dance some more), BehSci 473 should provide a natural stepping stone into the real world of problem solving--and in the "real world," approved solutions do not always exist. Also like your time as an Air Force officer, you will be required to complete your semester project as the member of a team. You will be expected to work together and come to a solution together, just like when you graduate.

This course was one of the most challenging, yet rewarding courses I took at the Air Force Academy--I hope you find the same!

Objectives

The purpose of this course is to let you experience the system design process from a human factors perspective. Upon completion of this course, you should be able to participate as a member of a design team and contribute the human factors data and analysis necessary to develop a system that considers the capabilities and limitations of the human operator. Some top-level objectives of the course are:

- a. Understand how to use the system design process.
- b. Be able to analyze a system and define the human factors and human performance issues necessary for successful operator interaction.
- c. Be able to use various human factors tools in analyzing and developing a system.

- d. Know how to find design guideline resources (both hardcopy and electronic sources) and use them in the system design process.
- e. Know how to account for human error when designing a system. Be able to provide the necessary design features to reduce the potential for human error.
- f. Be able to develop systems that are reliable and easy to maintain.
- g. Be able to develop appropriate training for operators of the system.
- h. Know when and how to test and evaluate the system before delivering to the user.
- i. **HAVE FUN DOING REAL HUMAN FACTORS STUFF!**

One objective I have as your instructor is to be a mentor to students during project analysis and development. The syllabus obviously allows for formal instruction during the course, but I have built in significant time for students to work as teams and seek out appropriate expertise when needed. Some of that expertise may come from me, other instructors in the department, or from sources outside the department. I encourage you to use all resources available to you in accomplishing your group project. Don't just rely on book knowledge. Use your team resources effectively by depending on each other to give the very best.

RESOURCES

Text

Andre, T. S., & Schopper, A. W. (Eds.). (1997). *Human factors engineering in system design*. Wright-Patterson Air Force Base, OH: HSIAC.

Additional Reference Material (available for check-out from instructor or the library)

Chapanis, A. (1996). *Human factors in systems engineering*. New York: John Wiley & Sons.

Wickens, C. D., & Hollands, J. G. (2000). *Engineering psychology and human performance* (3rd ed.). Upper Saddle River, NJ: Prentice Hall

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.

GRADING & ASSIGNMENTS

As mentioned before, there will be no GRs or final exam in this course (you can dance again if you like). The primary part of your grade will be the evolution of one single assignment. That one assignment will have various milestones, or Progress Reports (PRs), culminating in a final report. This course will not be graded on a curve. I will assess how well you are able to meet deadlines, contribute to your team, integrate human factors material, and follow-through on specific actions. Each person on the team will be individually graded based on my assessment and inputs from your team members.

Types of Evaluation

There are five types of evaluations in this course: project topic presentation, lab project, project meetings, PRs, and instructor prerogative points.

Project Topic Presentation (50 points): Each group will have 10 minutes to present their group design project in class. The presentation will include, at a minimum, the following:

- Customer description
- Description of design problem
- Perceived shortcomings of the existing system (or needs of system if it currently doesn't exist)
- Human factors design principles that are relevant to the project
- Timeline for completing the project

Authorized Resources: Your instructor, assigned team members, course notes, course text, and references you obtain.

Lab Project (100 points): You will be introduced to 2 HF design tools during the course. You will have a total of 6 "lab lessons" where we spend time in a computer lab (location TBD) learning these lab tools. You will pick **one** of these tools as your lab project. The lab project requires you to use the design tool on a "small-scale" system design exercise. Authorized Resources: Your instructor, course notes, course text (individual effort).

Project Meetings (5 @ 30 points each): Your team will meet with me 5 different times during the semester as part of your group design project. For each meeting, I will provide you with action items and objectives to accomplish for the next meeting. I will assess your progress, planning, leadership, and ability to follow directions during each meeting. Authorized Resources: Your instructor, assigned team members, course notes, course text, and references you obtain.

Final Project (600 points total): The Final Project is broken down into three parts, following the system design process. Groups of 2 or 3 students will apply the system design process to their respective project and deliver written reports and an oral presentation on the dates noted in the syllabus. Points for each PR will also be allocated to a project binder which must neatly and methodically organize all of the project's assignments.

The first Project Report (PR #1) will involve a system analysis of your selected project. PR #1 should address the definition and analysis of your system, major issues, desired objectives for what you want to accomplish organization and responsibility of your team, and a schedule for delivering your final project. Include a review of the relevant literature for your project as well as any documentation on existing systems that are similar or earlier versions of the system. PR #1 should focus on user needs, the operational requirements and constraints, and the major functions of the system you are investigating.

The second PR (PR #2) will involve a preliminary design and more detailed analysis of your system. PR #2 should include a trade-off analysis of various design considerations, task analysis, and an initial design (or re-design) of your system. Include how you will implement iterative design and prototyping of your system. PR #2 should provide much more detail than PR #1 where the design concept takes shape and is justified by a thorough analysis of the specific tasks and trade-off decisions.

The Final Report (PR #3) is your final written report and should incorporate the items completed in PR #1 and PR #2. PR #3 should address each area of the course: system planning and

analysis, preliminary design, detail design, and test and evaluation. In addition to stages already addressed, PR #3 should focus on the detail design and how you tested and evaluated your system. For most projects, your test and evaluation will be in the form of a detailed “test plan” that describes how you would go about testing and evaluating your final solution.

You will also give an oral presentation before turning in your PR #3 written report. Interested DFBL personnel as well as users/customers involved in the project will be invited to your oral presentation. The presentation should provide sufficient background on the subject, describing the historical literature in the area, and it should present your process and final design. In short, the presentation should be a distillation of PR #3.

Authorized Resources (for all PRs and Oral Presentation): Your instructor, assigned team members, course notes, course text, and references you obtain.

Preparation (IP Points, 100 points): I will judge your individual preparation by how well you participate in discussions, your professionalism and attitude, and your contributions to the course throughout the semester. I will ask you to keep a time log and journal of work and turn in with each PR. Authorized Resources: None.

Graded Events Summary:

Graded Event	Prog	Final	Weight
Project Topic Presentation	50		5%
PR #1	150		15%
Project Meetings (5 @ 30 pts each)	60	90	15%
IP Points	40	60	10%
Lab Project		100	10%
PR #2		150	15%
Oral Presentation		100	10%
PR #3		200	20%
Total	300	700	100%

Note: It’s important to reiterate that 80% of your grade in this course is related to your team’s design project! Do not take this project lightly!

COURSE POLICIES

This course is not like any other course you have taken at the Academy. You are Senior-level Human Factors professionals in a capstone course. What does this mean to you? I will not be *lecturing* you like in many other courses; rather we will be *discussing* course content. However, to make this work, you must do the assigned readings and come prepared to apply them to real world examples. In short, I will not accept inattentive, disrespectful, or unprofessional behavior--these behaviors will not be tolerable in the Air Force or this class, in addition to having a substantial impact on your 100 IP points.

In return, it is my agreement with you to bring new and insightful ways of looking at course material. I will create a fun and relaxed learning environment, and I will treat you like the mature professionals you are. In addition to teaching, I will also be a mentor to you as you accomplish your projects not unlike a manager in a Human Factors workgroup.

Finally, it is imperative that you work with your team members in an effective way. The course has some built in “comp lessons” for you to prepare your final project--***don't let these lessons go to waste!*** Use them wisely. I will be assessing both individual and team progress as the design project is completed. Be active participants in your teams and come prepared for every meeting; this is the only way to succeed and meet your own goals in the course.

Academic Integrity

Learning is facilitated by open dialogue and sharing of ideas. As a result, I would 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. Having said that, this is an academic class, and part of my job is to evaluate how much each of you has learned. Therefore, I have developed assessments that are designed to provide information about how much you know. In order to be fair, I have a few ground rules for acceptable behavior.

All written assignments will be required in an APA format. More guidance will be provided on this during the semester.

Authorized resources are referenced for each of the assignments above. You may not receive any help other than what is listed. When in doubt, ask me and always document. No assignments will be accepted without proper documentation. If no help was received, a “Documentation: None” statement must be included.

I certainly do not need to tell Spring-semester Firsties, but in short: do not violate academic integrity. If you do, academic and honor consequences will result if needed.

Late Work

All work is due at the beginning of the class period on the due date. If you run into problems, you need to see your instructor before the due date—it is your responsibility to keep your instructor informed. Work turned in late will receive a 10% grade reduction per 24-hour period, to include weekends. Therefore, if a written assignment is due on a Friday and you do not turn it in during class, you must e-mail it to your instructor on Saturday by the time class usually starts during the week, otherwise it will be considered late for another 24-hour period. 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!

COURSE SCHEDULE
(shaded areas are times we do not meet in class)

Block I: System Planning & Analysis			
Lsn	Date	Topic	Assignment
1	9 Jan	Course Introduction/Admin	None
2	11 Jan	Design Project Focus	Syllabus
3	13 Jan	The Role of Human Factors in System Development	Chapter 1
4	18 Jan	System Analysis - Mission Analysis - Function Analysis	Chapter 2
5	20 Jan	System Analysis - Task Analysis	
6	24 Jan	Group Project Time	Meet with group/customer
7	26 Jan	Modeling & Simulation in the Design Process	Chapter 3
8	30 Jan	Group Project Time	Meet with group/customer
9	1 Feb	Project Topic Presentation	Project Topic Due
10	3 Feb	Group Project Time	Meet with group/customer
11	7 Feb	Project Meeting with Instructor	Project Meeting #1
12	9 Feb	TOOLS: MicroSaint	MicroSaint Manual
13	13 Feb	TOOLS: MicroSaint	MicroSaint Manual
14	15 Feb	TOOLS: MicroSaint	MicroSaint Manual
15	17 Feb	Group Project Time	Meet with group/customer
16	22 Feb	Group Project Time	Meet with group/customer
17	24 Feb	Project Meeting with Instructor	Project Meeting #2
18	28 Feb	Progress Report #1 - System Analysis	PR #1 Due Written Report

Block II: Preliminary Design

Lsn	Date	Topic	Assignment
19	2 Mar	Iterative Design and Prototyping	Chapter 6
20	6 Mar	TOOLS: Altia Design	Altia Design Manual
21	8 Mar	TOOLS: Altia Design	Altia Design Manual
22	10 Mar	TOOLS: Altia Design	Altia Design Manual
23	14 Mar	Project Meeting with Instructor	Project Meeting #3
24	16 Mar	Group Project Time	MicroSaint/Altia Lab Due
25	20 Mar	Group Project Time	Meet with group/customer
26	22 Mar	Group Project Time	Meet with group/customer
27	24 Mar	Progress Report #2 - Preliminary Design	PR #2 Due Written Report
		SPRING BREAK	
Block III: Detail Design, Test, and Evaluation			
28	4 Apr	Human Factors Testing Issues in the Design of Human-Machine Systems	Chapter 10
29	6 Apr	Project Meeting with Instructor	Project Meeting #4
30	10 Apr	Selecting Methods for Human Factors Testing	Chapter 11
31	12 Apr	Developing & Using HF Questionnaires	Chapter 12
32	14 Apr	Group Project Time	Meet with group/customer
33	18 Apr	Group Project Time	Meet with group/customer
34	20 Apr	Project Meeting with Instructor	Project Meeting #5
35	24 Apr	Group Project Time	Meet with group/customer
36	26 Apr	Group Project Time	Meet with group/customer
37	28 Apr	Group Project Time	Meet with group/customer
38	2 May	Presentations	Oral Presentation
39	4 May	Presentations	Oral Presentation
40	8 May	Final Project Prep	
41	10 May	Progress Report #3 - Final Design	PR #3 Due Written Report
42	12 May	Course Critique & Wrap-up	