Fall 2018

AD 201-001: Human Factors/Ergonomics

Mathew Schwartz

Human Factors:

AD-201 | Fall 2018

Wednesday 8:30 -11:20 A.M. | CKB 220
Professor Mathew Schwartz | cadop@njit.edu
OFFICE HOURS: | Tuesday 1:15-2:15 PM by appointment (Weston 675)

Overview:

Human factors in design is often misunderstood. While numerous designers and firms have written books on how people function, these sources are sometimes out-dated and almost always provide over simplified information. This class is designed to teach students how to find information on human factors and test their designs on people. The most novel and revolutionary designs may not have a long history of user testing, and as such, to know how it functions the designer must know how to test it. Even well known designs and standards are outdated and misinformed. While a great step in accessibility, the famous ADA (Americans with Disabilities Act) guidelines are full of over simplified diagrams and reasoning, many of which are over 40 years old. Similarly, resources such as "The Measure of Man And Woman" also use generalized information, something that made sense when computing power was limited. Manufacturing technology, computational power, and understanding of the human have drastically changed in the last few decades, allowing designers to more accurately and correctly design for people.

Along with the testing of designs on people comes the ethical issues. This class will go over Institutional Review Board (IRB), a federal requirement for receiving approval of an ethical testing strategy that aligns with international treaties developed after the Nazi experiments. Human factors is a subsection of biomechanics, a large discipline that goes much further into the human than this class will. However, these general topics will be covered. Successful students will be able to apply these techniques to their own projects and interests without the need for a specialized class. Those interested in way-finding will be able to find the information necessary for informing their design, while others interested in cups will be able to find and test the kinematics and dynamics of the human hand. Likewise, students should pay attention to the lectures, information, and peer presentations before assuming the material is un-related to them, as often times inspiration and unique designs come from a more thorough understanding of people. The majority of the projects and work in this class is self-directed and continuous.

Plagiarism of outside work or other student work is not acceptable and will be reported to the dead of students, in many cases without notice. Students are expected to take notes in class. Not paying attention and missing vital information is not an excuse for incomplete work.

Schedule

Week | Date	Topic (subject to change)	Information

1 | September 5
A&D Library
	Tools & Techniques for this class
	
	Introduction
		- Class is held in A&D Library by Danielle Reays
		- Google scholar is the google of academic sources, largely peer reviewed
		  o Will be the main source of information in class
		  o Provides access to the most recent knowledge on human factors
		- Project & Assignment Explanations
		- Class Expectations
		- Student Introductions

2 | September 12	**IRB (Institutional Review Board)**	**Research Assignment – Due: September 18 11:59 PM**
3 |September 19	**Biomechanics**	**IRB RCR Basic Completion: September 25 11:59 PM**
4 | September 26	**Presentations**	**Evaluation Project Idea Presentations**
5 |October 3	**Electric Body Signals & Sensing**	
6 |October 10	**Motion Capture**	**IRB Social & Behaviour Completion: October. 16 11:59 PM**
7 | October 17	**Mocap Data Processing**	**IRB Biomedical Completion: October. 23 11:59 PM**
8 | October 24	**Presentations**	**Accessibility Project Due October 30th 11:59 PM**
9 | October 31	**Surveys**	
10 | November 7	**Forward Kinematics**	**Revised Evaluation Project Presentations - Must show Evaluation Method**
11 | November 14 **Last Class Before Withdraw date**	**Evaluation Project Planning**	
12 | November 21 **NO CLASS** **Friday Class Meets**		
13 | November 28	**Working with Data**	
14 | December 5	**Algorithms/Robotics /Python in Rhino and Maya**	**Evaluation Projects Submissions DUE: December 11 11:59 PM**
15 | December 12	**Evaluation Project Presentations**	

Research Assignment

Reading a peer reviewed research paper and preparing a pdf presentation. The elements of the assignment include:

1) Statement of hypothesis
2) Summary of methodology
3) How methodology was used to prove hypothesis.
4) Analysis of methodology and any issues that the methodology has (including aspects that may affect the results but have not been considered).
5) How the methodology or results apply to your major
6) Randomly selected people will give 4-7 minute presentation to class of learned material.

Further details are given on the Assignments document.

Accessibility Project

This project is meant to make you think about accessibility in various aspects of life, and within the context of design. Students will work in groups with one person from each major (ID, INT, DD). Using various tools that simulate a range of abilities and experiences in the general population, you will explore problems, as well as develop solutions. The submission is a video and pdf documenting the process and design. Physical infrastructure of NJIT should be analyzed for compliance with human factors. Document designs that contribute or hinder occupant use of the space. Objects like door knobs, electrical outlets, light switches, and more should be documented. Pictures and video while using or attempting to use the design should demonstrate how it allows or hinders accessibility.

Evaluation Project

Ergonomic Analysis

Stage 1: Based on your research assignments and interests, develop a tool or system to analyze human factors on a design project. You must have at least 3 iterations of the design that you will evaluate . For example, if you are interested in how to measure keyboard design, design a modifiable keyboard (where the modifications can be easily recorded) that would allow you to conduct typing speed experiments as you change key spacing or shape of the keyboard. On the virtual side, develop a program that allows this same aspect. On a larger scale, create various signs to check wayfinding times or circulation patterns.

NOTE: This is not a mockup, if you do something on the computer, it must be functional.

Stage 2: Application of Analysis Tools

Using the analysis tool, conduct an experiment to analyze human factors and record the data. Analyze and interpret the data, creating infographics and charts to demonstrate the 'best' option based on the analysis criteria.

Presentations: For both projects, the presentation time will be 5 minutes total. The presentation must include academic and peer reviewed references. These references should act as the motivation and arguments for why the project or design makes sense and is valid. Methods for testing the design of the final project should be backed up with references that show similar methods of validating design.

Submission

- All Research Assignments are submitted on **MOODLE**
- All IRB Certificates are submitted on **MOODLE**
- All Exercises are submitted on **MOODLE**
- The Evaluation Project is submitted on **MOODLE**,

- Moodle is used for grading. For COAD Students, all work submitted on moodle must be submitted on Kepler by the end of the semester to receive a grade. Paper Assignments go in Folder 1, IRB certificates in Folder 2, Exercises in Folder 3, and Evaluation Project in Folder 4.

Quizzes: At various points in the class, a quiz will be given. Dates are unannounced, with no make-up time without a notice from the dead of students. In general, the quiz will cover information from the IRB training as well as anatomy, biomechanics, tools for evaluating design, and other topics covered both in class and through projects/assignments.

Grading:

10% Participation

10% Exercises

10% Quizzes

10% IRB RCR Basic Completion

10% IRB Biomedical Basic Completion

10% IRB Social & Behavioral Basic Completion

10% Research Assignments

10% Accessibility Project

20% Evaluation Project

Grading Criteria (Equal Weight)

Novelty

How unique is your project? Does it do something other projects do not (both in class and in the world)? Does it achieve something other people have not, or does it explain something unique?

Relevance

Is the project based on the guidance given in the class? Does it achieve the goals of the project? Is it related to Design or Architecture?

Feasibility

Does the project make sense in general? Does it work? If it is a small scale version, would it work at full scale? Is it useable? If it is a tool, can it actually be used?

Submission

Are the submission guidelines followed? Are files named correctly?

Late Work:

Late work is accepted with a half (½) point reduction per hour after the deadline. Each hour is rounded up. For example, a grade of 95 will become a 92 if submitted 5.2 hours late. In the case of a presentation or quiz, this policy does not apply and make-up presentations are not accepted.

Readings

Suggested readings will be provided, but no books are required for purchase. Most of the reading for this class will be decided by the student (under specific parameters) to individualize the reading to their project and interest.

Plagiarism

Plagiarism refers to text, visual, and intellectual property. Not citing work, misleading during a presentation or submission on where the idea came from, or using words from a paper without quotations will be reported to the dean of students.

Lates

Arrival to class on time, and remaining for the duration of class, is mandatory. Attendance is taken at the beginning of class. If a student is late they must notify the professor at the class break (1.5 hours after the start) and have their name recorded as late. Not doing this will count as an absence and will affect the grade. Arrival later than 1.5 hours into class is recorded as absent. Each late is 2 points off of the participation grade. Each Absent is 5 points off of the participation grade.

University/College Rules

Academic integrity and honesty are of paramount importance in this class. The NJIT "University Code on Academic Integrity" will be upheld and any violation can, and will be, brought to the immediate attention of the Dean of Students by either a faculty member or student.

Regular attendance is expected. When possible, please give advance notice of your absence. NJIT requires attendance for ALL students. After 3 recorded absences, your grade will be lowered by ONE (1) letter grade for each additional absence, if you are not carrying a medical, school or religious related excuse. This means that any student who would have received an "A" will now receive a "B", a "B+" reverts to a "C+", etc. No excuses will be accepted without a written note from the Dean or a doctor. Students with particular needs and foreseen absences should present them to their instructor within the first week of class. Attendance for student athletes: No student athlete may miss any regularly scheduled classes for any practice activities. This means students can neither miss nor leave class early (or arrive late) to attend a practice. While student athletes may miss class when participating in intercollegiate competition, it is the responsibility of the student athlete to proactively inform the instructor well in advance to make appropriate arrangements to complete or make up any assignments or exams in a timely fashion.

Students with disabilities should see me at the start of the semester to discuss any needs.

The syllabus is an outline for the class, and subject to change. Students are required to regularly check changes of the syllabus.

"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. ***Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.*** *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu"*