

PSYC 2270: Engineering Psychology, Fall 2017
Georgia Institute of Technology

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|--------------------------------|---|
| Course meeting time | Mon/Wed/Fri 1:55p-2:45p |
| Course meeting location | JS Coon building – Room 250 |
| Instructor | Dar-Wei Chen (darwei.chen@gatech.edu) |
| Office hours | Tue 9:30a-10:30a or appointment (J.S. Coon building – Room 119) |
| Teaching assistant | Rachel Stuck (stuck.rachel@gatech.edu) |
| Office hours | Tue 3:30p-5p, or appointment (J.S. Coon building – Room G87) |

Course description

Engineering psychology, sometimes referred to as human factors, explores the interactions between humans and technology (e.g., computer interfaces, work spaces, automation). More specifically, engineering psychologists aim to improve user performance, increase satisfaction, and ensure safety. Principles of engineering psychology apply to everyday facets of life such as mobile devices, websites, transportation, household appliances, and road signs.

This course will introduce you to the field of engineering psychology. By the end of the course, you will have had the opportunity to achieve the learning objectives listed later in the syllabus. Being able to apply your knowledge to technology in the world is important in engineering psychology, and is therefore important in this course. For this reason, most of the course content will be disseminated through readings on your own time, and class time will be used for activities.

When you're in class, you can expect me to be approachable and for the class to have a relaxed atmosphere. I firmly believe that the best learning happens when students are not afraid to ask anything and feel that the classroom is a friendly environment. That being said, I expect that when you are in class, you are paying attention and participating, because that is how the course will be most useful to everyone.

Texts

No textbook is required for this course. All readings will be posted on T-Square and/or available for free on the Internet. The readings will come from these sources:

Few, S. (2005). *Effectively Communicating Numbers*. Boise, ID: ProClarity.

Goldstein, E.B. (2010). *Sensation and Perception* (8th ed.). Belmont, CA: Wadsworth.

Kahneman, D. (2011). *Thinking, Fast and Slow*. New York: Farrar, Straus, and Giroux.

Konnikova, M. (2014). *The Hazards of Going on Autopilot*. Retrieved from:
<http://www.newyorker.com/science/maria-konnikova/hazards-automation>

Lobel, T. (2014). *Sensation – The New Science of Physical Intelligence*. New York: Atria.

Nielsen, J. (1995). *10 Usability Heuristics for User Interface Design*. Retrieved from:
<http://www.nngroup.com/articles/ten-usability-heuristics/>

Nielsen, J. (2006). *F-Shaped Pattern For Reading Web Content*. Retrieved from:
<http://www.nngroup.com/articles/f-shaped-pattern-reading-web-content/>

Silver, N. (2012). *The signal and the noise: Why so many predictions fail – but some don't*. New York: Penguin Press.

Trochim, W.M. (2006). *The Research Methods Knowledge Base*. Retrieved from:
<http://www.socialresearchmethods.net/kb/index.php>

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

Learning objectives

General learning objectives: If you complete this course, you will be able to...

- Articulate the importance, on a general level, of accounting for user needs in design
- Analyze a given system, interface, or process, in terms of how it can be improved using engineering psychology principles
- Communicate about engineering psychology issues using the language of the field
- Explain key methods, concepts, and theories of the field
- Design an experiment to evaluate a system, interface, or process
- Use data to draw appropriate conclusions about a system, interface, or process

Content-specific learning objectives: If you complete this course, you will be able to...

- Unit 1: Front-end analysis
 - Use widely-accepted techniques to extract information from an expert
 - Organize extracted information in the form of a task analysis
- Unit 2: Sensation and perception
 - Explain the fundamental concepts of signal detection theory
 - Account for human perceptual abilities/limitations when designing systems/interfaces
- Unit 3: Data visualization
 - Explain and correct common issues in everyday data visualizations
 - Implement human factors principles in your own visualizations
- Unit 4: Interfaces, human-computer interaction, human-robot interaction
 - Perform a simple usability test
 - Analyze a website in terms of design issues
 - Discuss recent developments and current issues in robotics research
- Unit 5: Attention, situation awareness, errors
 - Explain factors that can affect a person's awareness of a situation
 - Explain popular techniques that engineering psychologists use to measure situation awareness
 - Discuss factors that contribute to accidents
- Unit 6: Decision making
 - Discuss factors/biases that can affect a person's decision-making processes
 - Describe the models that have been developed for decision making

Grading

Grading scale

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|-------------|---|
| 90+ | A |
| 80-89 | B |
| 70-79 | C |
| 60-69 | D |
| 59 or lower | F |

Late work

- 20% deducted for each day late
- Arrangements concerning documented excuses will be handled on case-by-case basis

Grades table

| Due date | Item | Points earned | Points possible |
|-----------|---|---------------|-----------------|
| Fri 9/1 | Homework 1 – Task analysis | | 10 |
| Fri 9/1 | Quiz 1 – Front-end analysis | | 5 |
| Wed 9/13 | Homework 2 – Signal detection theory | | 10 |
| Wed 9/20 | Quiz 2 – Sensation and perception | | 5 |
| Fri 10/6 | Homework 3 – Visualize a day in your life | | 10 |
| Fri 10/6 | Quiz 3 – Data visualization | | 5 |
| Fri 11/3 | Homework 4 – Usability test report | | 15 |
| Fri 11/3 | Quiz 4 – Interfaces, HCI, HRI | | 5 |
| Fri 11/10 | Quiz 5 – Attention, SA, errors | | 5 |
| Mon 11/13 | Homework 5 – Attention/SA/error analysis | | 15 |
| Mon 11/20 | Quiz 6 – Decision making | | 5 |
| Mon 12/4 | Letter to Grandma | | 10 |
| Mon 12/4 | Extra credit | | 0 |
| | TOTAL | | 100 |

*Extra credit opportunities:

- Option 1: Participating in School of Psychology research experiments (gatech-psych.sona-systems.com)
 - 1% extra credit for each hour of participation, maximum of 3% extra credit
- Option 2: Writing research reports
 - Summarize a journal article pertaining to engineering psychology in 350-400 words
 - Parts of the report: Motivation for the research, research question(s), key methods, independent/dependent variables, key results, your interpretation of the results
 - Each report can earn a maximum of 1% extra credit (check-plus = 1%, check = 0.75%, check-minus = 0.5%), maximum of 3% extra credit
- Option 3: Some combination of the above two options, maximum of 3% extra credit

Students with disabilities and/or in need of special accommodations

Georgia Tech complies with the regulations of the Americans with Disabilities Act of 1990 and offers accommodations to students with disabilities. If you are in need of a classroom accommodation, please make an appointment with the ADAPTS Office of Disability Services (<http://www.adapts.gatech.edu>) to discuss the appropriate procedures.

Academic integrity

You are expected to be familiar with the Georgia Tech Honor Agreement and Code (<http://honor.gatech.edu/content/2/the-honor-code>) and are bound by it at all times in this course. If you are not familiar with the concept of plagiarism, you are responsible for familiarizing yourself with that as well (you can suffer consequences for plagiarizing, even if you're famous: <http://www.politico.com/gallery/2014/07/10-high-profile-plagiarism-cases/001951-027783.html>)

Tentative course schedule

| Unit | Date | Class content | Quiz | HW due | Admin |
|------|------|---------------|--|--------|----------------------|
| 0 | Mon | 21-Aug | Syllabus | | |
| | Wed | 23-Aug | Intro to engineering psychology | | |
| 1 | Fri | 25-Aug | Unit 1 reading, survey design | | Registration |
| | Mon | 28-Aug | Hierarchical task analyses 1 | | |
| | Wed | 30-Aug | Hierarchical task analyses 2 | | |
| | Fri | 1-Sep | Quiz 1, Unit 2 preview | Q1 | HW 1 |
| | Mon | 4-Sep | NO CLASS – LABOR DAY | | |
| 2 | Wed | 6-Sep | Psychology of card magic | | |
| | Fri | 8-Sep | Unit 2 reading, optical illusions | | Verify participation |
| | Mon | 11-Sep | Math of signal detection theory | | |
| | Wed | 13-Sep | Guest lecture: Brittany Noah | | HW 2 |
| | Fri | 15-Sep | Research in aging populations (Rachel) | | |
| | Mon | 18-Sep | Psychophysical, HW 2 review | | |
| | Wed | 20-Sep | Quiz 2, Unit 3 preview | Q2 | |
| | Fri | 22-Sep | NO CLASS – PERSONAL | | |
| | Mon | 25-Sep | NO CLASS – PERSONAL | | |
| 3 | Wed | 27-Sep | Pie charts, 3D graphs, tables | | |
| | Fri | 29-Sep | More data viz examples | | Progress reports |
| | Mon | 2-Oct | Gestalt, hypervariate data | | |
| | Wed | 4-Oct | Correcting terrible graphs | | |
| | Fri | 6-Oct | Quiz 3, Unit 4 preview | Q3 | HW 3 |
| | Mon | 9-Oct | NO CLASS – FALL BREAK | | |
| | Wed | 11-Oct | NO CLASS – CONFERENCE | | |
| | Fri | 13-Oct | NO CLASS – CONFERENCE | | |
| 4 | Mon | 16-Oct | Unit 4 reading | | |
| | Wed | 18-Oct | Bad websites, HW 4 intro | | |
| | Fri | 20-Oct | HW 4 working period | | |
| | Mon | 23-Oct | Data collection for HW 4 | | |
| | Wed | 25-Oct | Data collection for HW 4 | | |
| | Fri | 27-Oct | Data collection for HW 4 | | |
| | Mon | 30-Oct | Guest lecture: Vincent Martin | | |
| | Wed | 1-Nov | Robots and usability (Rachel) | | |
| | Fri | 3-Nov | Quiz 4, Unit 5 preview | Q4 | HW 4 |
| 5 | Mon | 6-Nov | Unit 5 reading, change blindness | | |
| | Wed | 8-Nov | Automation and SA, errors, disasters | | |
| | Fri | 10-Nov | Unit 5 quiz, Unit 6 preview | Q5 | |
| 6 | Mon | 13-Nov | Unit 6 reading, Kahneman, candle ex. | | HW 5 |
| | Wed | 15-Nov | Guest lecture: David Illingworth | | |
| | Fri | 17-Nov | Choices, Kahneman review | | |
| | Mon | 20-Nov | Unit 6 quiz | Q6 | |
| | Wed | 22-Nov | NO CLASS – THANKSGIVING | | |
| | Fri | 24-Nov | NO CLASS – THANKSGIVING | | |
| | Mon | 27-Nov | NO CLASS – THANKSGIVING | | |
| | Wed | 29-Nov | Training and learning | | |
| | Fri | 1-Dec | Last day of class: Course wrap-up | | |
| | Mon | 4-Dec | | | Letter |