HUMAN FACTORS ENGINEERING: FALL 2025

Course Objectives

This course provides students with the knowledge and skills to analyze, design, and evaluate human-centered systems. Students will learn the principles of human factors engineering and ergonomics, including task analysis, cognitive walkthroughs, sensory and perceptual system design, decision-making, skill acquisition, workload assessment, and selected topics in physical ergonomics including anthropometry, strength, work physiology, manual work design, and time study. The course emphasizes both theoretical and experimental design, measurement, and evaluation of human performance. By the end of the course, students will be able to apply human factors methods to design safer, more effective, and satisfying human-system interactions across diverse domains such as healthcare, manufacturing, transportation, and workplace design.

Instructor

Dr. Arunkumar Pennathur, apennathur@utep.edu. My office hours are Tuesdays 1 to 230 and by appointment. I am also available after our class if that time is more convenient for you to meet. My office is located in A240 Engineering Annex.

Course Meeting Details

This course is hybrid. Most of the class meetings after the first few classes will be online via Zoom (Zoom link on BB). Class activities will be via Teams (Teams Portal will be formed). There will be 2 scheduled laboratory sessions in October which will be held in person in the Physical, Information and Cognitive Human Factors Engineering Research Laboratory located in E226J.

Course Recommended Readings

Two good texts recommended for this course include:

Lee, J.D., Wickens, C.D., Liu, Y., Boyle, L.N. (2017). *Designing For People: Intro To Human Factors Engineering, 3rd Edition*.

and

Human Factors in Simple and Complex Systems by R.W. Proctor and T.V. Zandt, 3rd Edition, CRC Press.

I will also supply audio-annotated PowerPoint notes for all class lecture slides, and other readings and handouts from time to time. These will be posted on BB.

Course Topics

Introduction to Human Factors Engineering and Human Factors Definitions

Experimental methods in human factors
Design and evaluation methods in human factors
Visual sensory systems
Auditory, tactile and vestibular systems
Cognition
Decision Making
Display design
Control design
Manual Work Design
Stress and Workload
Workplace design
Time Study

Course Grading Components

Online questions/quizzes (Individual):	10%
Design journal (Individual):	20%
4 Mini-project reports (Team):	30%
In-class activities (Team):	10%
Emerging Topics (Team):	15%
2 Written article summaries (Individual):	15%

Online questions and quizzes (Individual)
Each topic will have online quizzes which are meant to be low-stakes quizzes to keep you up with the topics. These quizzes can be taken up to 3 times. There will also be an interaction with an AI persona either based on Socratic questioning or based on role-playing. Aim for more than 5 interactions with the AI persona for every topic. Your input must be thoughtful and reflective and will be graded on this basis.

Design journal (Individual)
Throughout the semester, you (individually) will keep a journal on human factors design problems and successes. You can use a word processing software to keep this journal (up to 3 pages per design problem, no more). Depending on the course topic, you will identify a product, service, system design feature in your home or work environment and comment on it. For example, when we cover cognition, you might take a picture of a pill box and comment on the pros and cons of its design with respect to human factors implications. Over the semester, you will journal for at least 10 different products or features, with at least one product or feature for each of the topics below:

Topics:
Auditory Systems
Visual Systems
Cognition

Decision Making
Displays
Controls

Typically, each design note should contain the following elements:

If the design is an example of a good design:

1. Describe the design feature in the product, service or system.
2. If it is an example of a good design, describe why so. What features make it a good design?
3. What are implications for human factors because of the good design?
4. If you were to further improve it, what design suggestions would you have? What constraints in design and use you might have to consider?

If the design is an example of a poor design:

1. Describe the design feature in the product, service or system.
2. If it is an example of a poor design, describe why so. What features make it a poor design?
3. What are implications for human factors because of the poor design?
4. If you were to improve it, what design suggestions would you have? What constraints in design and use you might have to consider?

Please use photos or sketches of products – your descriptions need not be all text. If you can use video or other media to journal this, that is acceptable too.

This design journaling assignment will be graded based on (1) your effort in analyzing the design (2) rationale for your response on human factors implications (3) rationale for your design suggestions. Note that the entire design journal is due end of the semester to make timelines flexible for you, but I encourage you to work on this after we complete each topic in class so that you make significant progress as we progress in the topics.

Mini-projects (Team-based)

There will be 4 team-based mini-projects – one on interface/website usability, one on evaluating anthropometry, muscle strength and dexterity (this will be an in-person laboratory mini-project), one on eye tracking/face reader, and one on time study. Please see mini-projects section on BB for details on what these projects reports should contain.

In-class activities (Team-based)

We will use MS Teams Channels for all in-class activities – I will post relevant Word documents so teams can jointly work on the activities in class and report out via zoom or in person (when classes are in person).

Human Factors Engineering in Emerging Societal Problems presentations (Team-based)

Human factors engineering plays a major role in any system that has people interacting with other people, technology or tasks. Contemporary work settings and emerging topics are not an exception. For example, remote work has become an important topic in the past year which has major human factors implications. Similarly, several emerging issues in the design and distribution of personal protective equipment has risen due to the pandemic. What do we know about the role of human factors engineering in such systems? What are some of the unique issues in such systems? Some of these emerging topics are significant grand challenges in Engineering according to the National Academy of Engineering (NAE).

In this emerging topics team assignment, **your team can choose an emerging topic/problem that has implications for human factors engineering**. A suggested list of topics is provided below. Once you decide on a topic, you can consult with me discuss your topic during our office hours or through email to ensure relevance to human factors.

Your team will prepare a short presentation on your topic of interest (plan for 30 minutes presentation and questions) and present it as a team during the finals week. Please remember that you are to present a synthesis of what you understood about the topic from research publications and other external sources, and not a slide-by-slide review of each paper/webpage. They are due at the times indicated in the schedules. **There is no written report for the emerging research topics assignment.**

<u>Emerging Research Topics</u>

- Biohazards and Infectious diseases
- Artificial Intelligence and Work
- Remote Work
- Driving in the age of smartphones
- Brain computer interfaces
- Older workforce
- Use of robotics and artificial intelligence in medicine
- Automated or self-driving cars
- Health Informatics
- Space

In your assigned topic, prepare a short presentation on the following suggested aspects:

- In your assigned topic, what is the broader problem or challenge you have identified? (e.g., Information age, and the explosion of data and converting it into meaningful information; managing information; health information records; remote work difficulties) What have the researchers discussed as the primary problem they are trying to address?

- What settings does the emerging topic play a role in? (e.g., healthcare, health information records)
- What specific human factors engineering problems have you identified? (e.g., usability issues in health information records leads to errors and decrease in performance)
- Identify ethical and professional responsibilities in such engineering situations with consideration of the impact of engineering solutions in global, economic, environmental, and societal contexts.
- Discuss current solution approaches for this problem from the literature/research review.
- What are the limitations of the current solutions? What has not been solved yet?
- What would be your suggestions/recommendations as a human factors engineer for solving this problem? What other settings might have an impact due to the broader issue? How would your suggestions address the broader challenges?

Written article summaries (Individual)

The topics we learn in class are relevant research topics in human factors engineering. To provide you a perspective of the type of research problems that human factors researchers focus on, you (individually) will read and analyze a research article from the list of articles provided on BB. Pick two articles from the ones posted, (or pick your own research article with my approval).

Article Summary Structure

Use this structure to write your analysis comments of the article you read. You will need to write a synthesis of your understanding in your own words/paraphrased and not directly quote the text from the article in response to these sections/questions unless otherwise stated below. Your summary should be no more than 5 pages, Times Roman, 12 point font, single spaced, for each article.

Purpose of the article – State, as accurately as possible, the author's purpose for writing the document. What was the author trying to accomplish?

Key question(s) that the author is addressing – Your goal is to figure out the key question that was in the mind of the author when she/he wrote the article.

Most important information in the article – Identify the key information the author used, or presupposed, in the article to support his/her main arguments. Here you are looking for facts, experiences, and/or data the author is using to support his/her conclusions, as well as its sources.

Main inferences/conclusions – Identify the most important conclusions that the author reaches and presents in the article.

Key concepts/what they mean – To identify these concepts, ask yourself, what are the most important ideas or theories you would have to understand in order to understand the author's line of reasoning? Then briefly elaborate what the author means by these ideas.

Main assumptions – Ask yourself, what is the author taking for granted [that might be questioned]? The assumptions are generalizations that the author does not think require defense in this context, and they are usually unstated. This is where the author's thinking logically begins.

Implications – What consequences are likely to follow based on the author's line of reasoning? Here you are to follow out the logical implications of the author's position. You should include the implications the author states but also include those the author does not state. Consider both negative and positive implications of technical, social, environmental, financial and ethical aspects.

Points of view – The main question you are trying to answer here is what is the author looking at, and how are they seeing it?

TECHNOLOGY REQUIREMENTS

Course content is delivered via the Internet through the Blackboard learning management system. Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

You will need to have access to a computer/laptop, a webcam, and a microphone and internet connection to attend synchronous zoom sessions throughout the semester. You may need to download or update the following software: Microsoft Office, Adobe Acrobat Reader, Windows Media Player, QuickTime, and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course.

If you do not have a word-processing software, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal. Click the following link for more information about Microsoft Office 365 and follow the instructions.

IMPORTANT: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the UTEP Help Desk as they are trained specifically in assisting with technological needs of students.

NETIQUETTE

As we know, sometimes communication online can be challenging. It's possible to miscommunicate what we mean or to misunderstand what our classmates mean given

the lack of body language and immediate feedback. Therefore, please keep these netiquette (network etiquette) guidelines in mind.

- Always consider audience. This is a college-level course; therefore, all communication should reflect polite consideration of other's ideas.
- Respect and courtesy must be provided to classmates and to the instructor at all times. No harassment or inappropriate postings will be tolerated.
- When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.
- Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space.

ATTENDANCE AND PARTICIPATION

Your participation in the course is important not only for your learning and success but also to create a community of learners. Participation is determined by completion of the following activities:

- Reading/Viewing all course materials to ensure understanding of assignment requirements
- Participating in engaging discussion with your peers on the discussion boards
- Participating in scheduled zoom sessions for speakers and presentations
- Asking questions of the speakers and engaging in conversations
- Other activities as indicated in the modules

Because these activities are designed to contribute to your learning each week, they cannot be made up after their due date has passed.

ZOOM SESSIONS

This class requires participation in scheduled Zoom sessions. The purpose of these sessions are for you to listen to lectures and participate in class activities throughout the semester, engage in discussions with the speakers, do presentations and engage in discussion with your peers.

Students are expected to, at least occasionally, participate in these sessions with a webcam and microphone. Students should not record the sessions and post them to any sites outside of Blackboard.

If you are unable to attend a Zoom session, please let me know as soon as possible so that accommodations can be made when appropriate.

MAKE-UP WORK

Make-up work will be given *only* in the case of a *documented* emergency. Note that make-up work may be in a different format than the original work, may require more intensive preparation, and may be graded with penalty points. It is therefore important to reach out to me—in advance if possible—and explain with proper documentation

why you missed a given course requirement. Once a deadline has been established for make-up work, no further extensions or exceptions will be granted.

ALTERNATIVE MEANS OF SUBMITTING WORK IN CASE OF TECHNICAL ISSUES

I strongly suggest that you submit your work with plenty of time to spare if you have a technical issue with the course website, network, and/or your computer. I also suggest you save all your work (answers to discussion points and essays) in a separate Word document as a back-up. This way, you will have evidence that you completed the work and will not lose credit. If you are experiencing difficulties submitting your work through the course website, please contact the UTEP Help Desk. You can email me your back-up document as a last resort.

INCOMPLETE GRADE POLICY

Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

ACCOMMODATIONS POLICY

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, or email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

SCHOLASTIC INTEGRITY

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct

and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more, please visit HOOP: Student Conduct and Discipline.

CLASS RECORDINGS

The use of recordings will enable you to have access to class lectures, group discussions, and so on in the event you miss a synchronous or in-person class meeting due to illness or other extenuating circumstance. Our use of such technology is governed by the Federal Educational Rights and Privacy Act (FERPA) and UTEP's acceptable-use policy. A recording of class sessions will be kept and stored by UTEP, in accordance with FERPA and UTEP policies. Your instructor will not share the recordings of your class activities outside of course participants, which include your fellow students, teaching assistants, or graduate assistants, and any guest faculty or community-based learning partners with whom we may engage during a class session. **You may not share recordings outside of this course.** Doing so may result in disciplinary action.

PLAGIARISM DETECTING SOFTWARE

Some of your course work and assessments may submitted to SafeAssign, a plagiarism detecting software. SafeAssign is used review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.

COPYRIGHT STATEMENT FOR COURSE MATERIALS

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

COURSE RESOURCES

UTEP provides a variety of student services and support:

Technology Resources

- Help Desk: Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.

Academic Resources

- UTEP Library: Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- University Writing Center (UWC): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- Math Tutoring Center (MaRCS): Ask a tutor for help and explore other available math resources.
- History Tutoring Center (HTC): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- RefWorks: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

Individual Resources

- Military Student Success Center: Assists personnel in any branch of service to reach their educational goals.
- Center for Accommodations and Support Services: Assists students with ADA-related accommodations for coursework, housing, and internships.
- Counseling and Psychological Services: Provides a variety of counseling services including individual, couples, and group sessions as well as career and disability assessments.