Future of Work

Fall 2023

Instructor: Dr. Priyadarshini Pennathur
Office Address: A 241 Engineering Building
Telephone: 915-747-7956
Office Hours: Mondays 3 pm – 5 PM or by appointment. My email is prpennathur2@utep.edu. I usually respond to emails within a day when I am in town, and during weekdays. It may take a bit longer when I am traveling, and during weekends.

Course Website: Blackboard

Meeting Times: Mondays from 6:00 PM – 8:50 PM
Location: Bell Hall 130A

Course Description

This graduate course examines future of work systems, workers and work design with a human factors lens. Future work systems might integrate significant technology and automation including Artificial Intelligence, Robotic Process Automation, and both soft and physical bots. Additionally, the nature and structure of work itself is changing with remote work becoming more mainstream. The course will include current research readings, in-class discussions on future of work systems and its implications, and case studies.

Course Goals

By the end of this course, you will learn about:

- A broad set of topics on future of work systems, workers and work design examined from a human factors standpoint
- Approaches for addressing human factors design challenges in future work systems

Course Topics

- Introduction to Future of Work
- Information technology and its impact on work
- Organizational Design
- Worker Characteristics
- Communication, Coordination and Teamwork
- Physical and Cognitive Implications and Ergonomics of Future of Work Systems
- Health and Well-Being
- Industry sectors and applications

Course Expectations

- Read and understand peer-reviewed research publications critically and reflectively.
- Participate and contribute to class discussions, by including your thoughtful ideas and opinions, with due respect for your peers' ideas.
- Bring additional insights and opinions by sharing other resources, articles or ideas that you are aware of.
- Be open to other ideas, reflect on them, and challenge them constructively.
- Be punctual and courteous in attending the class sessions, and in submitting assignments on time.

Course Grade Assignments

- Reading Assignments and Participation in Class Discussions (35%)
- Online discussion (10%)
- Case Presentations (15%)
- Debates (15%)
- Final paper and presentation (25%)

Description of Assignments

Reading Assignments and Participation in Class Discussions (35%)

The majority of class time will be spent in discussing peer-reviewed research publications/case articles. Class discussions will help bring out varied perspectives on the research issues, as well as provide a forum for critically and thoughtfully thinking about the future of work implications.

There will be 2 components to every discussion:

1. Leading discussions for 3 publications in class and 1 online discussion.
2. Every student will read and prepare for discussion every class.

I will post discussion questions for every publications on Blackboard couple of days prior to the assigned date for discussion.

There will be a discussion lead for each publication. Each student is required to choose and lead 3 in-class discussions and 1 online discussion over the course of the semester. There will be a sign-up sheet provided to you for choosing the publication.

The discussion lead should be prepared to summarize the article, and facilitate discussion based on the questions I post in Blackboard. The discussion lead is expected to be ready with well-thought-out responses for the discussion questions, any additional sources about the topic and facilitate peers to discuss the questions. Written response to the questions I post is not required. I will provide a discussion rubric first week of classes. This rubric will be used to grade your engagement in discussions.

For each publication we will discuss in class that day, each student should complete and bring to class a written document (limit: one page) containing the following elements:

1. 2 to 3 sentence summary of each publication (can be a bulleted list).
2. 2 interesting questions or thoughts that came to you while reading the publication (can be a bulleted list).

This written sheet should be provided to me or uploaded on blackboard prior to beginning of class. The intent of this exercise is for you to read each publication and prepare for discussion. You will be using this written sheet to guide your discussion.

We will spend approximately 30 minutes per publication during class. You are encouraged to consult other external sources/readings as relevant to help steer the discussions.

The written document, generation of discussion questions and participation in discussions will all count towards your reading assignment and participation grade. A breakdown of grades for each category is shown below.

- Written document/summary = 5 pts per class session * 10 in-class sessions = 50 pts
- Leading discussions = 3 articles * 15 pts = 45 points
- Participation in discussion = 5 pts per class session * 10 in-class sessions = 50 points

Online Discussion (10%)

Each student will lead and moderate an online discussion of 1 reading assignment. Details will be provided closer to the assigned date.

Case Presentations (15%)

Case analyses: There will be 2 case assignments/team on future of work topics. Teams will analyze, present, and facilitate discussion for a case [teams will be formed on the first day of class]. Guiding questions for the case discussions will be posted online on Blackboard. You can add additional questions that emerge during your reading and analysis of the case during the discussion. The case list is as follows:

Case analyses should include the following: (1) a brief presentation [you can use any medium including PPT, MS Word, Text Files etc.] outlining the case and any background information; (2) key questions and topics addressed in the case; (3) a brief analysis of case information [can be qualitative or quantitative or a combination of the two]; (4) key insights and takeaways from the case. Please upload your case presentation and notes on Blackboard for the respective case assignment before the presentation.

Your contribution to the case analyses presentation will be evaluated based on the following criteria: 1. Clarification/bringing out central ideas in case [5 points] 2. new insights, new questions raised [5 points] and 3. Key takeaways [5 points].

Debates (15%)

In this assignment, your team will be assigned a future of work relevant topic and a side (for or against) to debate. A debate is a structured argument supported by evidence. The debate will be structured in this format:

Round one: The for and against teams present their arguments.

Discussion Period: The teams prepare their responses based on the opposing teams' arguments in the first round.

Round two: The teams respond with their arguments based on round 1.

There will be 2 debates per team this semester. A rubric will be used to assess debate performance. Other external judges might be invited to assess the debates. Debate topics and logistics will be announced shortly. There are no submissions for this assignment.

Project and Presentation (25%)

We all have a role to play in designing the future of work systems either by creating entirely new ways to do work or by improving the current work activities we do. In the final project, you will assume the role of a "work system designer" and pitch an idea to do work differently or improve the current work activities. You can select any industry sector or work activity you like – healthcare, manufacturing, service sector etc. Think about the worker doing typical work activities in that sector and see how you can improve their work. For example, how can technology better help the Starbucks barista we interact with? How will their future of work be? Your pitch (both in the final paper and in the presentation) should contain the following elements (1) The problem/need you are addressing (2) the technology or process or product innovation and how it addresses the problem (3) how does your innovation impact the human who currently does the work or is expected to do the work in the future? how did you integrate human-centered design aspects in your innovation? (4) cost, benefit and value (5) challenges you anticipate and positive impacts you expect over time – include discussion of ethics, economics, well-being, labor issues etc.

Final paper (15%)

Final paper should not exceed 15 pages. It is due by **Dec 4th, 2023**. No exceptions will be allowed.

Final Presentation (10%)

Final presentation will be held on Dec 4th, 2023. Please plan a presentation for approximately 30 minutes, with 10 minutes for questions.

Attendance

Regular attendance is expected. As the nature and format of the course requires interactive discussion, students are expected to attend all classes. Classes will begin on time. If there is a genuine need for absence, please contact Dr. Pennathur well in advance, and please inform your team of your absence.

Grading Scale

A: 91-100
B: 81-90
C: 71-80
D: 61-70
F: ≤ 60

Week	Date	Topic	Assignment (due dates)
1	Aug 28th	Course Introduction Form teams Finalize discussion assignments/case picks Identify and download reading discussion articles from UTEP library	
2	Sep 4th	Labor Day holiday	
3	Sep 11th	Overview of Developments and Challenges in Future of Work	
4	Sep 18th	Information technology and its impact on work	
5	Sep 25th	Information technology and its impact on work Online-discussion Guest Lecture	Case 1 presentations
6	Oct 2nd	Information technology and its impact on work	
7	Oct 9th	Organizational Design	Debate 1
8	Oct 16th	Organizational Design	
9	Oct 23rd	Worker Characteristics	
10	Oct 30th	Communication, Coordination and Teamwork Online-discussion	Case 2 presentations
11	Nov 6th	Physical and Cognitive Implications and Ergonomics of Future of Work Systems	

12	Nov 13th	Physical and Cognitive Implications and Ergonomics of Future of Work Systems	Debate 2
13	Nov 20th	Health and Well-Being Online and In-Class Discussion	
14	Nov 27th	Industry sectors and applications	
15	Dec 4th	Final Presentations	Final pitch presentation and report due

Case Study List
All the case studies can be found in this link: https://hbsp.harvard.edu/educator

McCormick & Co.: Deploying Artificial Intelligence in New Product Development
By: Darren Meister, R. Chandrasekhar
- **Product #:** W25509-PDF-ENG

Dessa: Growing a Diverse and Inclusive Artificial Intelligence Company
By: Cheryl Gladu, Raymond Paquin
- **Product #:** W20880-PDF-ENG

Catalant's Operating System for the Future of Work
By: Christopher Stanton, William R. Kerr, James Palano, Kendall Smith
- **Product #:** 820093-PDF-ENG

Evie.ai: The Rise of Artificial Intelligence, and the Future of Work
By: Damien Joseph, Wee-Kiat Lim, Chong Tack Chun
- **Product #: NTU226-PDF-ENG**

Telenor: Revolutionizing Retail Banking in Serbia: Digital Transformation of the Customer Experience
By: Joerg Niessing, Hilke Plassmann
- **Product #: IN1328-PDF-ENG**

GitLab and the Future of All-Remote Work (A)
By: Prithwiraj Choudhury, Emma Salomon
- **Product #: 620066-PDF-ENG**

Unilever's Response to the Future of Work
By: William R. Kerr, Emilie Billaud, Mette Fuglsang Hjortshoej
- **Product #: 820104-PDF-ENG**

Upwork: Reimagining the Future of Work
By: Feng Zhu, Rory McDonald, Marco Iansiti, Aaron Smith
- **Product #: 616027-PDF-ENG**

Reading Assignments

Sept 11th

Introduction to Future of Work

Wang, W., & Siau, K. (2019). Artificial intelligence, machine learning, automation, robotics, future of work and future of humanity: A review and research agenda. *Journal of Database Management (JDM)*, *30*(1), 61-79.

Frank, M. R., Autor, D., Bessen, J. E., Brynjolfsson, E., Cebrian, M., Deming, D. J., ... & Rahwan, I. (2019). Toward understanding the impact of artificial intelligence on labor. *Proceedings of the National Academy of Sciences*, *116*(14), 6531-6539.

Spencer, D. A. (2018). Fear and hope in an age of mass automation: debating the future of work. *New Technology, Work and Employment*, *33*(1), 1-12.

Sept 18th

Information technology and its impact on work

Howard, J. (2019). Artificial intelligence: Implications for the future of work. *American journal of industrial medicine*, *62*(11), 917-926.

Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. *Business horizons*, *61*(4), 577-586.

Madakam, S., Holmukhe, R. M., & Jaiswal, D. K. (2019). The future digital work force: robotic process automation (RPA). *JISTEM-Journal of Information Systems and Technology Management*, *16*.

Sept 25th (Online Discussion)

Information technology and its impact on work

Jędrzejka, D. (2019). Robotic process automation and its impact on accounting. *Zeszyty Teoretyczne Rachunkowości*, (105), 137-166.

Paikari, E., & Van Der Hoek, A. (2018, May). A framework for understanding chatbots and their future. In *Proceedings of the 11th international workshop on cooperative and human aspects of software engineering* (pp. 13-16).

Almansor, E. H., & Hussain, F. K. (2020). Survey on intelligent chatbots: State-of-the-art and future research directions. In *Complex, Intelligent, and Software Intensive Systems: Proceedings*

of the 13th International Conference on Complex, Intelligent, and Software Intensive Systems (CISIS-2019) (pp. 534-543). Springer International Publishing.

Oct 2nd

Information technology and its impact on work

Nawaz, N., & Gomes, A. M. (2019). Artificial intelligence chatbots are new recruiters. *IJACSA) International Journal of Advanced Computer Science and Applications*, *10*(9).

Chohan, U. W. (2023). Generative AI, ChatGPT, and the Future of Jobs. *Available at SSRN*.

Berg, J., & Gmyrek, P. (2023, April). Automation Hits the Knowledge Worker: ChatGPT and the Future of Work. In *UN Multi-Stakeholder Forum on Science, Technology and Innovation for the SDGs (STI Forum)*.

Oct 9th

Organizational Design

Kittur, A., Nickerson, J. V., Bernstein, M., Gerber, E., Shaw, A., Zimmerman, J., ... & Horton, J. (2013, February). The future of crowd work. In *Proceedings of the 2013 conference on Computer supported cooperative work* (pp. 1301-1318).

Addati, L., Cattaneo, U., Esquivel, V., & Valarino, I. (2018). *Care work and care jobs for the future of decent work*. International Labour Organisation (ILO).

Stoian, C. A., Caraiani, C., Anica-Popa, I. F., Dascălu, C., & Lungu, C. I. (2022). Telework Systematic Model Design for the Future of Work. *Sustainability*, *14*(12), 7146.
Leadership

Oct 16th

Organizational Design

Angelici, M., & Profeta, P. (2023). Smart working: work flexibility without constraints. *Management Science*.

Lund, S., Madgavkar, A., Manyika, J., & Smit, S. (2020). What's next for remote work: An analysis of 2,000 tasks, 800 jobs, and nine countries. *McKinsey Global Institute*, 1-13.

Sng, M., Khor, W. J., Oide, T., Suchar, S. C., & Tan, B. C. K. (2021). Effectiveness of a Four-days/Eight Hour Work Week.

Chakraborty, D., Bhatnagar, S. B., Biswas, W., & Dash, G. (2022). The Subtle Art of Effecting a Four-day Workweek to Drive Performance. *Management and Labour Studies*, *47*(3), 275-297.

Oct 23rd

Worker Characteristics

Bughin, J., Hazan, E., Lund, S., Dahlström, P., Wiesinger, A., & Subramaniam, A. (2018). Skill shift: Automation and the future of the workforce. *McKinsey Global Institute*, *1*, 3-84. https://www.mckinsey.com/featured-insights/future-of-work/skill-shift-automation-and-the-future-of-the-workforce

Vickerstaff, S., & Van der Horst, M. (2022). Embodied ageism:"I don't know if you do get to an age where you're too old to learn". *Journal of Aging Studies*, *62*, 101054.

Moghaddam, M., Wilson, N. C., Modestino, A. S., Jona, K., & Marsella, S. C. (2021). Exploring augmented reality for worker assistance versus training. *Advanced Engineering Informatics*, *50*, 101410.

Oct 30th (Online Discussion)

Communication, Coordination and Teamwork

Van Laar, E., Van Deursen, A. J., Van Dijk, J. A., & de Haan, J. (2020). Determinants of 21st-century skills and 21st-century digital skills for workers: A systematic literature review. *Sage Open*, *10*(1), 2158244019900176.

Kaasinen, E., Anttila, A. H., & Heikkilä, P. (2022). New Industrial Work: Personalised Job Roles, Smooth Human-Machine Teamwork and Support for Well-Being at Work. In *Human-Technology Interaction: Shaping the Future of Industrial User Interfaces* (pp. 271-301). Cham: Springer International Publishing.

Wang, B., Liu, Y., Qian, J., & Parker, S. K. (2021). Achieving effective remote working during the COVID-19 pandemic: A work design perspective. *Applied psychology*, *70*(1), 16-59.

Severinson-Eklundh, K., Green, A., & Hüttenrauch, H. (2003). Social and collaborative aspects of interaction with a service robot. *Robotics and Autonomous systems*, *42*(3-4), 223-234.

Moore, C. (2016). The future of work: What Google shows us about the present and future of online collaboration. *TechTrends*, *60*(3), 233-244.

O'Neill, T., McNeese, N., Barron, A., & Schelble, B. (2022). Human–autonomy teaming: A review and analysis of the empirical literature. *Human factors*, *64*(5), 904-938.

Nov 6th

Physical and Cognitive Implications and Ergonomics of Future of Work Systems

Bentley, T., Green, N., Tappin, D., & Haslam, R. (2021). State of science: the future of work–ergonomics and human factors contributions to the field. *Ergonomics*, *64*(4), 427-439.

Drury, C. G. (2008). The future of ergonomics/the future of work: 45 years after Bartlett (1962). *Ergonomics*, *51*(1), 14-20.

Woods, D. D. (2019, April). Steering the reverberations of technology change on fields of practice: Laws that govern cognitive work. In *Proceedings of the twenty-fourth annual conference of the cognitive science society* (pp. 14-16). Routledge.

Argyle, E. M., Marinescu, A., Wilson, M. L., Lawson, G., & Sharples, S. (2021). Physiological indicators of task demand, fatigue, and cognition in future digital manufacturing environments. *International Journal of Human-Computer Studies*, *145*, 102522.

Nov 13th

Physical and Cognitive Implications and Ergonomics of Future of Work Systems

Sowa, K., Przegalinska, A., & Ciechanowski, L. (2021). Cobots in knowledge work: Human–AI collaboration in managerial professions. *Journal of Business Research*, *125*, 135-142.

Kadir, B. A., Broberg, O., & da Conceicao, C. S. (2019). Current research and future perspectives on human factors and ergonomics in Industry 4.0. *Computers & Industrial Engineering*, *137*, 106004.

Parker, S. K., & Grote, G. (2022). Automation, algorithms, and beyond: Why work design matters more than ever in a digital world. *Applied Psychology*, *71*(4), 1171-1204.

Nov 20th

Online Discussion
Health and Well-Being

Moore, P. V. (2019). OSH and the future of work: benefits and risks of artificial intelligence tools in workplaces. In *Digital Human Modeling and Applications in Health, Safety, Ergonomics and Risk Management. Human Body and Motion: 10th International Conference, DHM 2019, Held as Part of the 21st HCI International Conference, HCII 2019, Orlando, FL, USA, July 26–31, 2019, Proceedings, Part I 21* (pp. 292-315). Springer International Publishing.

Yu, J., Ariza-Montes, A., Hernández-Perlines, F., Vega-Muñoz, A., & Han, H. (2020). Hotels' eco-friendly physical environment as nature-based solutions for decreasing burnout and increasing job satisfaction and performance. *International Journal of Environmental Research and Public Health*, *17*(17), 6357.

In-Class

Health and Well-Being

Tamers, S. L., Streit, J., Pana-Cryan, R., Ray, T., Syron, L., Flynn, M. A., ... & Howard, J. (2020). Envisioning the future of work to safeguard the safety, health, and well-being of the workforce: A perspective from the CDC's National Institute for Occupational Safety and Health. *American journal of industrial medicine*, *63*(12), 1065-1084.

Fukumura, Y. E., Gray, J. M., Lucas, G. M., Becerik-Gerber, B., & Roll, S. C. (2021). Worker perspectives on incorporating artificial intelligence into office workspaces: Implications for the future of office work. *International Journal of Environmental Research and Public Health*, *18*(4), 1690.

Cummings, M. L., Gao, F., & Thornburg, K. M. (2016). Boredom in the workplace: A new look at an old problem. *Human factors*, *58*(2), 279-300.

Nov 27th

Industry sectors and applications

Grischke, J., Johannsmeier, L., Eich, L., Griga, L., & Haddadin, S. (2020). Dentronics: Towards robotics and artificial intelligence in dentistry. *Dental Materials*, *36*(6), 765-778.

Romao, M., Costa, J., & Costa, C. J. (2019, June). Robotic process automation: A case study in the banking industry. In *2019 14th Iberian Conference on information systems and technologies (CISTI)* (pp. 1-6). IEEE.

Murray, S. G., Wachter, R. M., & Cucina, R. J. (2020). Discrimination by artificial intelligence in a commercial electronic health record—a case study. *Health Affairs Forefront*.

Ferràs, X., Hitchen, E. L., Tarrats-Pons, E., & Arimany-Serrat, N. (2020). Smart tourism empowered by artificial intelligence: The case of Lanzarote. *Journal of Cases on Information Technology (JCIT)*, *22*(1), 1-13.

Arinez, J. F., Chang, Q., Gao, R. X., Xu, C., & Zhang, J. (2020). Artificial intelligence in advanced manufacturing: Current status and future outlook. *Journal of Manufacturing Science and Engineering*, *142*(11), 110804.

De Clercq, M., Vats, A., & Biel, A. (2018). Agriculture 4.0: The future of farming technology. *Proceedings of the world government summit, Dubai, UAE*, 11-13.

Administrative Drops:
At the discretion of the instructor, a student may be dropped from a course because of excessive absences, neglect or lack of effort. A grade of "W" will be assigned before the course drop deadline and a grade of "F" after the course drop deadline. A grade of "F" received due to disciplinary action imposed by the University overrides a grade of "W" received through a student-initiated or faculty drop.

Class Attendance:
The student is expected to attend all class sessions. It is the responsibility of the student to inform each instructor of extended absences. When, in the judgment of the instructor, a student has been absent to such a degree as to impair his or her status relative to credit for the course, a drop for not attending will count toward the State Allowed Six Drop Limit. If you are failing the class at the time of the drop you may also be given a WF designation. Be advised that a drop could adversely impact visa status, financial aid and other programs. As per UTEP rules, you may be asked to show a UTEP ID at any time during class.

Excused Absences for University-Recognized Activities:
Students who will be absent while representing the University in officially recognized University activities (sports, band, professional conferences, etc.) **must notify the Dean of Students not less than ten (10) days prior to the absence**. The Dean of Students will provide the student with a letter of excuse for the professors. It is the student's responsibility to give the letter to the professors prior to the official recognized activity. Students following these procedures will be permitted to make up both assignments and examinations in consultation with faculty.

Students With Disabilities:
If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at https://www.utep.edu/student-affairs/cass/.

Academic Integrity:
The University of Texas at El Paso prides itself on its standards of academic excellence. In all matters of intellectual pursuit, UTEP faculty and students must strive to achieve excellence based on the quality of work produced by the individual. In the classroom and in all other academic activities, students are expected to uphold the highest standards of academic integrity. Any form of academic dishonesty is an affront to the pursuit of knowledge and jeopardizes the quality of the degree awarded to all graduates of UTEP.

Any student who commits an act of academic dishonesty is subject to discipline. Academic dishonesty includes, and is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, and any act designed to give unfair advantage to a student or the attempt to commit such acts. Proven violations of the detailed regulations, as printed in the *Handbook of Operating Procedures (HOP)*, and available in the Office of Student Life and on the homepage of the Office of Student Life at www.utep.edu/dos, can result in sanctions

ranging from disciplinary probation, to a failing grade on the work in question, to a failing grade in the course, to suspension or dismissal, among others.

Engineers are educated professionals, and every engineer is expected to subscribe to a professional canon of ethics. Paramount among these is the canon that engineers shall not affix their signatures to documents that are not their own work. This is also expected of engineering students, whether or not the work is being graded individually or as a group! **If academic dishonesty is suspected or observed, please report it to the instructor -- this will be kept in the strictest confidence.**

- If you are suspected of scholastic dishonesty you may not be directly confronted about your conduct by the instructor or proctor. You will however, be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) and your exam will not be admissible. Your grade in the class may not be available until OSCCR makes a final ruling, this may adversely impact your ability to enroll in other classes or graduation.

- If you miss more than one exam, the instructor may choose to administratively drop you from the class. This may adversely impact a visa and financial aid.

- Scholastic dishonesty on homework, lab assignments and all other class assignments will be held to the same standards and requirements of academic honesty as quizzes and exams.

References

https://www.niu.edu/citl/resources/guides/instructional-guide/classroom-debates.shtml