#### Purpose and Course Description

This half-semester (0.5 CU) course is organized in three modules. The first module “Technology and Its Impact on Work” starts by considering the types of technologies whose impact concerns us and probing “what’s so scary” about them. We’ll continue by considering past scares related to automation and evaluate the extent to which the “worst-case” scenarios about, for example, employment loss have or have not come to pass. Next we probe the “skill-biased technological change” hypothesis -- how economists see the impact that new technologies have on wages, jobs, and skills – in terms of the argument and the evidence, while also taking a close look at some affected occupations. A close look at the evolution of robots will provide further specificity and context. This module concludes by evaluating the claim that “this time it’s different”, i.e. because artificial intelligence (AI), via machine learning, can take over many more cognitive tasks performed by humans, with the potential for much higher displacement.

The second module “Technology and Managing People” examines how traditional practices of managing human and social capital are being transformed by new technologies that give managers new ways to enact control and new means to induce commitment. While having technology taking on a dominant role in the shaping and directing of work tasks is nothing new, the all-encompassing scope and pervasive influence of AI on customary “managing people” functions is also prompting “this time it’s different” discussions. The micro-monitoring of people as they work and fluid adjustment of work schedules based on customer demand are two other trends turbo-charged by new technological capabilities. Particularly in “gig economy” jobs, ranging from Uber/Lyft to TaskRabbit/Upwork, algorithms provide all functions once performed by managers and supervisors, from hiring and task/job allocation to performance appraisal and compensation. While the outsourcing of work, particularly technical labor, at both the high and low ends of the skill/talent dimension has accelerated over time, the people doing low-pay platform-based work are doing so partly in response to their precarious financial situation, even as gig work may increase that precarity.

In the third module “Technology and Policy” we will examine two “hot topics” about the consequences of new technologies for work and what to do about them. First we’ll consider proposals for a “universal basic income” premised on the idea that technological change will lead to an unprecedented amount of job displacement, exacerbating income inequality. Second we’ll consider the premise that “technology makes us dumber” by taking tasks away from humans that have helped us to maintain a certain level of competence at, for example, driving a car, reading a map, doing surgery, flying an airplane, remembering facts.
This course fits into the “Technology/Innovation/Analytics” category of Flex Fundamentals of the new undergraduate curriculum. The topics of this course are highly complementary to topics in other Wharton undergraduate courses in Legal Studies, Management, and OIDD but with little overlap. We hope to attract both students prioritizing the study of organizational/HR topics who want to know more about technology and operations strategies as well as those primarily studying technology and operations who want to understand more about work and employment practices, and the impact on economic and social outcomes for individuals, firms, and societies.

Because the issues related to technology and work are fast-changing and wide-ranging, I reserve the right to make changes in the content of this syllabus up to spring break, i.e., shortly before the course begins. We will stick with the syllabus that is set by the first day of the course (Monday, March 15th). Regardless of other changes, I will keep my plan to set a special topic for the final day of the course (Wednesday April 28th), selected via student suggestions and class discussion, with readings and discussion questions for that special topic set two weeks earlier (Wednesday April 14th.)

**Prerequisites:** We anticipate that students will have taken the first-year required Wharton 101 course before taking this elective. Taking the core MGMT 101 class, either before or together with this elective, will also be helpful in understanding how organizations function in their environment and the context within which firms make strategic decisions.

**Course Requirements**
Students will be evaluated on class participation (25%), a group assignment (25%), and two individual papers (25% each or 50% total). The group assignment is due, posted on Canvas, on Sunday April 4th at 11:59pm. Paper #1 is due, posted on Canvas, on Sunday April 18th at 11:59pm. Paper #2 is due, posted on Canvas, on Friday May 7th at 5:00pm.

**Class Participation (25% of your grade)**
This course requires a great deal of student involvement. It goes without saying that one cannot participate if not present in class. Regular, on-time attendance is the foundation of a strong participation grade. Each class period will include intense discussion of the topics and issues at hand that will require students to be in-class and prepared. Students will be graded on the quality of their comments in class, not the quantity. Quality is judged based on your ability to add substantively to class discussions and your ability to link to others’ comments in the class or to advance the discussion. I will occasionally call on students but will rely mostly on voluntary participation. Therefore, it is up to you to make sure your voice is heard. In addition, we will have in-class exercises and polls; these are also counted towards your participation grade.

**Group Assignment (15% of your grade)**
*In Hindsight* is a small-group assignment in which you research a past technology, report on the hopes and fears accompanying its introduction into the workplace or the economy more generally, and assess (with the benefit of 20/20 vision looking back) the extent to which those
hopes and fears were borne out – and, in addition, what unanticipated surprises occurred, for better or worse. You will be assigned in pairs, randomly, for this assignment.

Your report will take the form of a PechaKucha – a format developed to encourage new ways of sharing content and stimulating conversation. PechaKucha’s 20x20 presentation format consists of 20 chosen images, each shown for 20 seconds. In other words, you’ve got 400 seconds (6 minutes and 40 seconds) to tell your story, with visuals guiding the way. (PechaKucha means "chit chat” in Japanese.) I will provide further guidance on the assignment and the PechaKucha format, both in class and on Canvas. Technologically, a PechaKucha can be put together quite simply; think of a PowerPoint presentation with timed slide advances and pre-recorded voice-over narration. Ample online resources are available and we will have a Canvas discussion board on which tips can be shared. The PechaKucha is due at 11:59pm on Sunday April 4th, on Canvas.

Individual Papers (50% of your grade)
You will write two individual papers of 1250 words, one for each section of the course. Each is worth 25% of your final grade.

For the “Technology and Its Impact on Work” module, you will interview a relative, friend, or other person that you encounter frequently in your life at Penn, asking about a job that person has had (current or past) which has been significantly affected by technology of some kind (old or new; mechanical or digital; hardware or software; in the workplace or when working remotely). I will provide you with a general interview protocol, tips on how to select an interview subject, and training on how to approach the interview, which should last 45-60 minutes. I will also provide guidance on how to structure the paper in which you write up what you learn during this interview. I will urge you to draw upon the topics, themes, and concepts of this module in writing up your observations and reflections from this interview. This paper is due at 11:59pm on Sunday April 18th, posted on Canvas.

For the “Technology and Managing People” module, you will explore one particular facet of how technological change has affected the organizational function of managing human and social capital. Possibilities include: recruitment and selection (hiring); compensation (particularly variable or bonus comp); task/job allocation; monitoring the work effort, mental alertness, even emotions of people as they do their work; scheduling of work time and its consequences for an individual’s life outside of work; performance appraisal; documenting performance problems and worker dismissal; handling turnover/churn (back to hiring). The specific focus of your topic needs to be approved by the instructor. This paper is due at 5:00pm on Friday May 7th, posted on Canvas

Required Readings and Media
PENN COURSE RESERVE is the source for all readings in this course; there is no Study.Net coursepack. These readings include short articles from professional and academic journals, long-form journalism, and chapters from books.
We will use Canvas for courseware support. Many of the short articles, videos, and podcasts in the syllabus will be accessed directly from links provided within Canvas. You will also access the readings made available by Penn Course Reserve through Canvas. The syllabus, course slides, and detailed assignment descriptions will be posted there too. You will turn in most assignments (individual and team) by uploading your papers to Canvas, and I will return grades and comments to you electronically. Teams will be created randomly; you will find your team assignment on Canvas at the “People” tab. Finally, I will post relevant articles or web links that come to my attention during the course, and I encourage you to do the same.

Technology Policy
Given the substantive focus of this course, for me to unilaterally dictate a rigid set of rules regarding how you can and cannot use technology would deprive us all of a learning opportunity. As a result, I would like us to work together over the first two weeks of the course developing a technology-in-class policy. I have established a page on Canvas with a wiki on which we can all hash this out. In general, I would suggest you consider ways we can use technology effectively in-class to raise the level of intellectual discourse as well as ways that technology could undermine the quality and effectiveness of discussions and other in-class activities. We will iterate asynchronously as a group until Sunday March 28th, landing on a policy that we can all sign onto. I will mount the signed document on Canvas.

As you know, we will be meeting virtually for this course. You will access course sessions through Canvas – look carefully to pick the right time for your section.

Academic Integrity
Please read and familiarize yourself with Penn’s Code of Student Conduct and Code of Academic Integrity: https://catalog.upenn.edu/pennbook/. Regarding academic dishonesty, please note that plagiarism is not limited to copying an entire paper. Using quotes without properly citing them or using ideas without acknowledging their source also constitute plagiarism. Any form of cheating or plagiarism will result in disciplinary action.

Student Disabilities Services and Accommodations for Students with Disabilities
The University of Pennsylvania provides reasonable accommodations to students with disabilities who have self-identified and been approved by the office of Student Disabilities Services (SDS): https://www.vpul.upenn.edu/lrc/sds/. Please make an appointment to meet with me as soon as possible in order to discuss your needs and accommodations. If you have would like to request accommodations or have questions, you can make an appointment by calling (215) 573-9235. The office is located in the Weingarten Learning Resources Center at Stouffer Commons 3702 Spruce Street, Suite 300. All services are confidential.

Other Accommodations
Student athletes, parents and caregivers, and others whose commitments might affect their ability to attend class or complete assignments on time should also speak with me at the beginning of the semester about potential conflicts. You should also speak with me as soon as possible if
religious holidays that occur during the semester will require you to miss class. If you unexpectedly experience a life event that presents you with academic difficulties, I can refer you to CaseNet to ensure that you get the support you need: https://www.college.upenn.edu/casenet.

Academic Resources
Penn students are extremely fortunate to have access to an extensive network of academic resources. A majority of Penn students take advantage of one or more of these resources during their college careers, and I strongly encourage you to do so as well. The Office of Learning Resources provides professional consultation services in university relevant skills such as academic reading, writing, study strategies, and time management. PENNCAP supports the success of a diverse group of academically-talented students, many from low-income and first-generation backgrounds. The Tutoring Center offers Penn undergraduate students free, accessible, and convenient options to supplement their academic experience. For more information, visit https://www.upenn.edu/programs/acadsupport.

Additional Writing Resources
The Marks Family Writing Center operates under the assumption that all writers, regardless of their experience and abilities, benefit from informed, individualized, and personal feedback on their writing. The program’s professional staff and trained peer specialists work with writers engaged in any stage of the writing process—from brainstorming paper topics, to formulating and organizing arguments, to developing editing skills. Appointments and drop-in hours are available. For more information, visit http://writing.upenn.edu/critical/wc/. (You will find navigation options when you mouse over the “Marks Family Writing Center” heading on the menu bar at the top of the page.)

Well-Being, Stress Management, & Mental Health
If you (or someone you know) are experiencing personal, academic, or relationship problems and would like someone to talk to, reach out to Counseling and Psychological Services (CAPS) on campus. For more information about CAPS services, visit: https://www.vpul.upenn.edu/caps/about.php.

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MANAGEMENT 243: WORK AND TECHNOLOGY  
COURSE OUTLINE

MODULE 1: Technology and Its Impact on Work

Monday, March 15  
Session 1: Introduction  
“Applying science to the organization of work”: Taylorism, then and now; the mixed feelings spurred by new technologies. Course design, assignments, classroom norms, technology policy.

Readings and Media:

Wednesday, March 17  
Session 2: What Types of Technology Are We Considering? Why Fear Their Impact?  
Is the latest wave of automation and ubiquitous computing going to free individuals to be more creative at work and able to experience new and more fulfilling jobs? Or will these technologies make work worse – more routinized, less autonomous, less creative – whenever they aren’t actually putting people out of work by eliminating jobs?

TECH VIGNETTE: The Luddites

Was the Luddites’ fight idiotic, ill-informed, ill-advised? Or was it sensible? Would you have sided with them or with those against whom they were striking? Have you observed or sensed Luddite-like thoughts or actions “closer to home” in time and space?

Readings and Media:
1. “March of the Machines” as reported by Steve Kroft on CBS’s 60 Minutes. Includes interview with Erik Brynjolfsson and Andrew McAfee. January 13th, 2013. [14:44]
Monday, March 22
Session 3: Haven’t We Gone Through These Anxieties about Automation in the Past?
What makes the latest wave of technologies similar to or different from supposedly big technological breakthroughs of earlier eras? What are past patterns of technological change – and the diffusion of those changes – that could suggest how present-day new technologies might affect workers and the workplace?

Readings and Media:

Wednesday, March 24
Session 4: Technology, Skills, and Wages (Skill-Biased Technological Change)
A dominant hypothesis in recent decades on the different rates of earnings increase for individuals doing different types of work is skill-biased technological change, i.e. that jobs affected by automation that can replace workers are fewer in number and lower paid whereas jobs affected by automation that complements workers have grown in number and are higher paid. While there is certainly some evidence supporting this hypothesis, many other factors are affecting the relationship between technology, skills, and wages. We do a deep dive into the occupation of truck driver but also consider other settings, e.g. two types of job in a large bank.

**TECH VIGNETTE:** Trucking: Driverless, Automated, etc.
- Why is the automation of this one particular job—the truck driver—so momentous?
- Is the phenomenon of the automation of truck driving an example of skill-biased technological change? Why or why not?
- In the video, truck driver Scott Spendola comments, “Automation outside the terminal… I don’t believe would work. You need a human being to deal with some of the problems…”. To what extent do you agree with him?
- To the extent that some aspects of trucking remain difficult to automate, how has technological change influenced even these aspects of a truck driver’s job?

Readings:
Monday, March 29
Session 5: The Old(er) New Technology: The Evolution of Robots
Robots have commanded popular imagination for decades but their implementation as practical tools is much more recent. Check out these recent examples of robotics designed for the food services industry. Then skim the two excerpts from the Moravec chapter (written in 1988, when he was head of Carnegie-Mellon’s Robotics Lab) for a history of different approaches to conquering the challenges of robotics plus his predictions for the future. (What did he get right? Wrong?) Overall do you see the potential impact of robotics as large or small? If large, where will they have the greatest impact? If small, why? (given all the attention they are getting…)

TECH VIGNETTE: Reis & Irvy’s FroYo Franchising; Zume Pizza; and Flippy
- What would be the economic impact of a robot that eliminates the need for a person to dispense your frozen yogurt, assemble and top your pizza, or flip your burger?
- What are your reactions to the comments of Julia Collins, Zume co-creator and co-CEO? E.g. what seems prescient and far-sighted vs. naïve and/or wrong-headed?

Readings and Media:
3. “Robots have been about to take all the jobs for more than 200 years,” Timeline.com, May 16, 2016

Wednesday, March 31
Session 6:
“This Time It’s Different”: What Distinguishes Artificial Intelligence (AI) and Machine Learning (ML) and Their Potential Impact on Work from Past Technologies?

TECH VIGNETTE: Wordsmith: “explainer”; real estate; news stories; website
Based on what this technology does well, do you expect professional jobs will disappear, or do you expect they will evolve? If you expect them to evolve, consider precisely in what ways they might do so.
Readings and Media:

5. “How Will Machine Learning Affect Middle Class Jobs?” interview with James Bessen (Technology and Policy Research Initiative at Boston University’s School of Law), Brookings Institute podcast (start: 2:00 end: 22:00)

**Group Assignment (PechaKucha) Due at 11:59pm on Sunday April 4th on Canvas**

**MODULE 2: Technology and Managing People**

Monday, April 5

**Session 7: AI at Work**

Applying Artificial Intelligence (AI) to the fundamental tasks of managing people in organizations (recruitment and selection; on-boarding and training; performance appraisal – rewards, promotion, retention; benefits) is increasingly common yet questions abound. What’s different about extracting algorithms for decision-making from machine learning where the data are about employees, not product purchases or page views? How to handle concerns about fairness or demands for “explainability?” How does managers react to the promise and peril of applying AI at work?

Readings and Media:


Wednesday, April 7

**Session 8: Hiring: Online Job Search, Algorithmic Filtering and Background Checks**

How hiring works (search and matching); How technology alters this process e.g. LinkedIn. Best practices from research in screening applicants; pros and cons of black-box algorithms.
Readings and Media:

*** Paper #1 Due at 11:59pm on Sunday April 18th, posted on Canvas ***

Monday, April 12
Session 9: Flexible Schedules and Micro-Monitoring
New management methods affecting when and how hard we work: How “morning bias” and unpredictable changes undermine advantages of flex schedules. How schedule optimization software adds to the precarity of low-wage work. When “gamification” adds fun and challenge to the work day – and when it doesn’t. How tech-enabled keystroke monitoring and process control undermine the autonomy and outcome control premises of contract work. What it means when robots become part of the monitoring scene.

Readings and Media:

Wednesday, April 14
Session 10: Gig Economy and Algorithmic Management
How modern labor contracting modes are evolving in relation to changes in corporate governance. How trends towards “flexible labor” intersect with digital platforms to yield the “gig economy”. The importance and difficulty of the “independent contractor” vs. “employee” distinction. The social distancing impact of “gig” companies.

TECH VIGNETTE: Task Rabbit
- Under what circumstances would you choose to become a Tasker?
• Suppose one could develop a great reputation as a Tasker, enough so to reliably earn enough to eat, pay rent, etc. How would this bundle of tasks—performing dozens of different duties each week—differ from a conventional job?

Readings and Media:

Monday, April 19
Session 11: Gig Economy and Precarious Work
Resemblance between the new modes and pre-industrial arrangements, e.g. the “putting-out” system of piecework at home. Global outsourcing of “gig economy” tasks and the consequences for precarious work. What are the varied motivations of “gig economy” workers? How much is choice and how much is necessity? What does that matter?

Readings and Media:

MODULE 3: Technology and Policy

Wednesday, April 21
Session 12: Technology-Driven Inequality and Universal Basic Income (UBI)
The idea that technological change can drive mass unemployment and require governments to subsidize basic living expenses for many of its citizens is not new, arising in each era when automation scares arise. Proponents of such policies also see benefits in unlocking human creative potential when the necessities of life are met and people can pursue fuller self-
development when freed from having to do demotivating, low-skill, low-pay work. Presidential candidate Andrew Yang helped bring this issue onto the national stage in the last year.

We will hold a debate on UBI in class. The debate’s key feature is that students will be assigned to “pro” and “con” positions randomly and only after arriving in class. Further details will be forthcoming. The readings and media list will be finalized by April 15th.

Readings and Media:
1. Videos on UBI from Andrew Yang: Why UBI?; How to pay for UBI; Isn’t it socialism?
3. Excerpts from books and articles by these authors: Annie Lowrey, Andy Stern, Charles Murray, Philippe Van Parijs and Yannick Venderborghts, Chris Hughes, Rutger Bregman

Monday, April 26
Session 13: When Technology Makes Us Worse – How We Can Make Technology Better
Technology, when partially displacing human labor, can sometimes create the conditions under which the human skills that are still needed to complement the technology are worsening over time. How should we deal with situations where technology makes us worse? Our tech vignette concerns the automation for flying airplanes, known as “fly by wire”. Nicholas Carr develops a full thesis of how “automation makes us dumb” across a wide array of technological examples. The Bernstein report on Tesla’s overuse of automation shows another examples of how organizations fail on crucial performance dimensions through unwarranted faith in technology.

TECH VIGNETTE: Fly-by-Wire  Airbus 330  Boeing 737 Max

1. How is flight safety enhanced by this form of automation? In what ways does fly-by-wire hinder flight safety? Compare the first video, describing the “fly-by-wire” system for Airbus and the second video, probing the problems with Boeing 737 MAX at the interface of aircraft automation and pilot roles and responsibilities.
2. An hour and a half into your trans-Atlantic flight, the flight attendant comes on the loudspeaker with bad news. S/he can either announce 1.) “The fly-by-wire system is completely down and will be for the remainder of the flight.” or 2.) “Both the pilot and the co-pilot are unconscious and will be for the remainder of the flight.” As a passenger who enjoys living, which would you prefer? Is there any additional information you would want to know before answering the question?

Readings and Media:


**Wednesday, April 28**
**Session 14: Special Topic, to be determined via student suggestions and class discussion**

*** Paper #2 Due at 5:00pm on Friday May 7th, posted on Canvas ***