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MEC-E9120 Perspective on Industrial and Technological Change L (3-6 ECTS)

Spring 2017/18

Teacher-in-charge: Prof. Mats Fridlund (MF)

Time: Mondays 12-14 (K1-213a) Tuesdays 16-18 (R002-R1)
Teaching Period: IV
Level of the Course: P, All levels
Status of the Course: Mechanical Engineering, Advanced Studies
Language of instruction: English
Scope & form: Lectures, assignments & seminars
Evaluation: Participation & evaluation of exercises/reports
Grading scale: Pass/Fail
Prerequisites: None

Workload	The course can be taken for 3, 5 or 6 credits with difference in the amount of independent work Lectures/contact hours 24 h (2 x 2 h/week) Preparing for lectures 11 h Independent work: 46, 100 or 127 h for 3, 5 or 6 cr respectively (short written assignments to be submitted before weekly lectures)

LEARNING OUTCOMES:
The course outline central elements of industrial and technological change in a historical perspective and provides an introduction to conceptual models used to understand this development. A student who has met the objectives of the course will be able to:

- outline key turning points in the history of industrial and technological change.
- describe central elements and events of past industrial and technological revolutions
- assess the relative strengths and weaknesses of various concepts and models to explain historical examples of industrial and technological change
- use conceptual models of technological and industrial change to provide interpretations of historical and contemporary events

GENERAL COURSE OBJECTIVES:
The aim of the course is to establish an understanding of the mutual shaping of societal change and technological & industrial change and the various social, cultural and political factors that has influenced industry and technology as professional activities and societal phenomena.

The importance of various factors will be illustrated by the study and analysis of historical examples across a range of fields of technology and industry innovation giving the student a greater understanding and critical appreciation of technological and industrial change as societal processes.

CONTENT:
The course combines a historical survey of the industrial and technological revolutions from ancient times until the present with an explanation of central concepts used by historians to explain industrial and technological change such as industrial revolutions, path-dependence, technological determinism, technological momentum, technological paradigm, technopolitical regimes, invention vs innovation, linear model of industrial change, development blocks, social construction of technology, consumption junctions, large technical systems, sociotechnical systems, actor-network theory, national systems of innovation, sociotechnical affordances and sociotechnical transition pathways. It have a global coverage with a focus on the Western world.

TEACHING METHOD:
Two 90 min lecture/discussions/group work sessions per week consisting of 7 lectures and 6 lab-sessions. Lecture attendance and accepted written weekly assignments. Regular attendance on Mondays required. Absences may be made up by completing assignments consisting of summarizing each of the three readings for the lab session in **380 ±50 words for each text**, i.e three summaries in total of about 1.000 words.

EVALUATION:
The course is graded **Pass/Fail**. To pass the course the student has to submit written assignments and attend lab-sessions. A missed lab-session or late question set can be compensated for with compensation assignments.

For 3 ECTS:
Submitt 5 lab-question sets of three questions each (a,b,c) and attend 5 lab-sessions

For 5 ECTS:
Submitt 5 lecture-question sets of two questions each (A,B).
Submitt 5 lab-question sets of three questions each (a,b,c) and attend 5 lab-sessions.

For 6 ECTS:
Submitt 6 lecture-question sets of two questions each (A,B).
Submitt 6 lab-question sets of three questions each (a,b,c) and attend 5 lab-sessions.
Submitt an essay (10.000 characters) on a topic agreed upon with the teacher

QUESTIONS:
To facilitate active class participation the students are before each lecture (A+B) or lab-session (a+b+c) required to answer and submit question-sets on the topics assigned for that class. The question sets are posted after the class immediately before the lecture/lab. Questions must be posted in the Discussion Board on the course page on MyCourses the days of class before 10am (6 hours before the class meets) except during the second course week when they can be emailed to the teacher at mats.fridlund@aalto.fi
The lab-sessions consist of work using the answers to the lab-questions and discussions of the answers. Attendance at the first lecture on Monday 19.2 counts as one question set for LEC1 (1A+1B) and for LAB1 (1a+1b+1c). In addition the course include the following question sets:

2A+2B
2a+2b+2c

3A+3B
3a+3b+3c

4A+4B
4a+4b+4c

5A+5B
5a+5b+5c

6A+6B
6a+6b+6c

7A+7B

ESSAY TOPICS
The essay should 10.000 keystrokes (±20%) – including blanks – in English or Swedish. Chose one of the two different essay formats below. **If you want to discuss your essay, email me to book an appointment.**

A. – Book/movie report
The topic will be to write a report on the movie *Who Killed the Electric Car?* (92 mins, 2006) or another literary movie or book treating industriual or technological change as agreed upon with MF. Advice on how to write the report can be found at the end of these coursenotes.

B. – Your own choice of essay topic
Topic using one of the theories and models discussed in the course to analyze an area or process in the history of technology or industrialization as agreed upon with MF.

CLASS SCHEDULE

Date	*Week*	*Room*	*Class*
Mo19.2	1/8	R008/213a	LEC1 + LAB1: ***Introduction: What is industry and technology?***
Tu20.2		R002/R1	2A+2B lecture-question sets before Tuesday 10am LEC2: ***Transformation***
26.2	2/9	R008/213a	2a+2b+2c lab-question sets before Monday at 8am LAB2: ***Transformations***
27.2		R002/R1	3A+3B lecture-question sets submitted before Tuesday 10am LEC3: ***Changemakers***
5.3	3/10	R008/213a	3a+3b+3c lab-question sets submitted before Monday at 8am LAB3: ***Changemakers***
6.3		R002/R1	4A+4B lecture-question sets submitted before Tuesday 10am LEC4: ***Use***
12.3	4/11	R008/213a	4a+4b+4c LAB4: ***Use***
13.3		R002/R1	5A+5B lecture-question sets submitted before Tuesday 10am LEC5: ***Systems***
19.3	5/12	R008/213a	5a+5b+5c LAB5: ***Systems***
20.3		R002/R1	6A+6B lecture-question sets submitted before Tuesday 10am LEC6: ***Networks***
26.3	6/13	R008/216	6a+6b+6c LAB6: ***Networks***
27.3		R002/R1	7A+7B lecture-question sets submitted before Tuesday 10am LEC7: ***Forecasting & backcasting***
Tu 3.4	7/14	R002/216	**Conclusion:** *Feedback & summing-up*

CLASS SCHEDULE WITH READINGS

Week 1: 19.2 **Introduction**: What is technology and industry?

No required readings

Week 2: 26.2 **Transformation**: Change in technology and industry

1.1 Thomas P Hughes, “Foreword”, in: idem, *American Genesis: A Century of Invention and Technological Enthusiasm 1870-1970* (2004; Penguin, 1989), ix-xxvii.
1.2 Svante Lindqvist. “Changes in the Technological Landscape: The Temporal Dimension in the Growth ands Decline of Large Technological Systems”, in: idem, *Changes in the Technological Landscape: Essays in the History of Science and Technology* (Science History Publications, 2011), 3-24.
1.3 Thomas Kaiserfeld, ”Resistance to Change”, in: idem, *Beyond Innovation: Technology, Institution and Change as Categories for Social Analysis* (Palgrave Macmillan, 2015), 77-87.

Week 3: 5.3 **Changemakers**: Agents of technological and industrial change

Readings To be Decided

Week 4: 12.3 **Use**: Role of technological use, consumption and users

Readings To be Decided

Week 5: 19.3 **Systems**: Technology as a Sociotechnical Systems

Readings To be Decided

Week 6: 26.3 **Networks**: Hybridity and Actor Network Theory

Readings To be Decided

Week 7: 3.4 **Conclusion**: Backcasting & Forecasting

No required readings

Advice on How to Write an Essay

For a good introduction
https://en.wikibooks.org/w/index.php?title=How_to_Write_a_Research_Paper_in_History&stable=1

Establish the topic for your essay.
Your topic has to be chosen from the list above or as agreed with MF. If you are uncertain whether the topic is acceptable please contact MF. What topic you chose could marginally influence your evaluation, i.e. if you chose a difficult but innovative topic but don't manage to find many sources you might get credit for imagination and creativity, and likewise if you chose a standard, unimaginative, broadly specified and/or not very thought-through topic, like "The history of the computer" you have no excuses if you do not write a very good essay. Try to find a topic that is fun and that interests you and that is not too difficult. In general, a good advice is to begin with a narrow topic, i.e. "The history of computer use among civil engineering researchers at University of Helsinki, 1980-1985", and then expand it if it is too narrow rather than the other way around.

Finding your sources.
In general the safest way to improve your essay is to take a trip to an actual library where you can browse the shelves to look for books on your topic. If you find a useful book, check its bibliography for other books or articles on that topic. Also check indexes of periodicals and newspapers. Check with a librarian if you need help finding sources. Keep a list of all the sources that you use. Include the title of the source, the author, publisher, and place and date of publication. The search engines Google Scholar (schoolar.google.com) and Google Books (books.google.com) are two of the best ways of finding scholarly articles and books on your topics. You can most of the time download the articles directly as pdf and search for your keywords inside and read several pages in the books. You can also borrow books at the various libraries of Aalto University or University of Helsinki or visit the Helsinki city library.

Reliable sources.
The arguments of your essay has to be supported by evidence and arguments from credible sources. It is not supposed to be a collection of your unsubstantiated thoughts and opinions. All arguments have to be backed up by trustworthy sources. You are allowed to use all kind of sources for your essay as long as you can motivate that they are credible, i.e. that we can trust them. *Your essay will be severly penalized if you use untrustworty or unverifiable sources or if you include unsubstantiated arguments and facts*. For guidelines follow what wikipedia states about verifiability of sources at http://en.wikipedia.org/wiki/Wikipedia:Verifiability – although many of the wikipedia articles do not follow these guidelines. That is also why in general, wikipedia can not be trusted as a source but it might include references to articles and/or websites that can be attributed and referenced. What kind of sources to use vary depending on your topic but in general a diversity of different kind of sources – books, articles, websites, newspapers - will get you a higher grade.

Your essay should be supported with details and examples i.e., it should be a well-written analytical essay. The review will be graded both on content and on form. Content means the originality and interest of the questions and issues you address, the nature of the methodology used to investigate the question, the plausibility of your interpretations. Form means the organization, clarity and quality of the writing, and the correct use of scholarly conventions such as citations and footnotes. Your essay should include citations indicating the sources you used. A high quality essay finds an interesting theme, makes use of primary and secondary sources to illuminate this, and adds interesting and original interpretations of your own. It is well-organized and clearly and professionally written.

Advice on How to Write the Film/Book Report

1. **Pick out a film/novel and view/read it**. I am interested in what image the film/book gives of technologists and engineers and engineering and technology, how it address the motivations, ethics and cultural importance and impact of technologists and engineers. Especially interesting is what role the technologists' and engineers' practice and impact play in the movie, what values and ideologies do the technologists' and engineers' ideas and instruments symbolize/represent? Write down comments while watching/reading and afterwards write a rough list of items or scenes that you remember you dis/liked, you found convincing or provocative and another list of items/scenes that seemed in/accurate. These lists can include anything from details of props, speech, a particular scene, or even a general sense of the characters, setting, or plot.

2. **Do some research on some of the items you made note of above**. If the movie/book is based on a historic event you might address how it correspond to what we know about it from historical research. Remember that it is a work of art (regardless of whether you find it good or bad art) and do therefore unlike scholarly works or news articles do not have an obligation to be true to what really happened.

3. **Find and read a minimum of three reviews of the film/book** of which at least one should be published by a professional journalist, film critic, or academic scholar. Since your report should address how the movie/book shape our perception of technology as a cultural phenomenon try to find reviews that particularly address that. A good place for movie reviews is "Rotten tomatoes" http://www.rottentomatoes.com/movies/

4. **After checking details, consider re-watching/reading the film/book**. Note elements you dis/like, etc.

5. **Now write the report**. You can write it in either English, Danish, Norwegian, Finnish or Swedish.

DO NOT write a summary of the film/book, you can take for granted that I know the overall story, DO include a short description of scene(s) you found especially interesting and/or illuminating. I am mainly not interested in if you found the movie/book to be 'good' or 'bad' but rather your analysis of its message about technologists and engineers and engineering and technology. I am mainly interested in YOUR analysis of the film's content and its major themes in relation to the topics of the course. Does the film have a "thesis" or a message on the motivations of technologists and engineers, and the cultural and social importance and consequences of technology and engineering? What is it? Do you find it convincing? Why or why not? Ultimately, in what ways do it influence our understanding/perception of technologists and engineers and engineering and technology as a cultural and social phenomenon and in what ways does it distort it? Try to answer the following questions:

What aspects of the film were most convincing?
What aspects were the least convincing?
Which accuracies and inaccuracies were particularly striking?
As a work of art, what are the film's strengths and weaknesses?

Two main aspects of the film should be covered:

(a) its "internal" message about technologists and engineers and engineering and technology,
(b) its "external" reception, what message did the viewer bring with them, preferably through reviews or contemporary discussion, and through your own feelings watching/reading the movie/book. Remember that the message you got might be different from what the director intended or the movie critics saw, but that does not make it wrong.

Your report and your analysis should be supported with details and examples i.e., it should be a well-written analytical essay. The report will be evaluated on both content and form. Content means the originality and interest of the questions and issues you address, the nature of the methodology used to investigate the question, the plausibility of your interpretations. Form means the organization, clarity and quality of the writing, and the correct scholarly use of conventions such as citations and footnotes. Your report should include citations indicating the sources you used in analyzing the film. Furthermore you should include copies of the reviews. A high quality report finds an interesting theme in the movie/book that address engineering or technology as a cultural and social phenomenon, makes use of primary and secondary sources to illuminate this, and adds interesting and original interpretations of your own. It is well-organized and clearly and professionally written.

Finally, be creative, surprise me & tell me something I did not know before.