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Global Science, Technology, & Society Spring 2012

Fulfills Non-Lab Science Requirement

Only Required Course for GSTS Minor

SCOPE & CONTENT

This course will address, in a global context, insights emerging from the physical and natural sciences, humanities, and social sciences. It will explore the societal and historical forces that shape, and are shaped by, science and technology. Attention will be given to issues surrounding ethical and policy questions derived from multicultural and international approaches to how science is practiced and technology implemented. Inquiry will be directed toward how science and technology advance, decline, and reappear as cultures encounter and influence each other. Ideas will be illustrated using specific historical and contemporary examples. Readings and lectures will also address theories of technology, philosophies of science, the dynamics of knowledge development, and interactions of literature with technology and science.

We will structure our exploration of these issues around three transformative periods in human history. In Unit I we will look at the transformation and reassessment of the human condition that was wrought by the industrialization of warfare in World War I. We witness here the collision of two contradictory sentiments that in fact knew no national boundaries. On the one hand the rapid industrialization and concomitant advances in science at the end of the 19th century had led to a faith in the power of technology to better society. But these same advances also led to a widespread sense of malaise over the manner in which traditional values appeared to be threatened by technology. Paradoxically, many of those who felt this threat also believed that values could be restored and society renewed by employing the martial technology of the society that they criticized.

In Unit II we will trace some of the historical roots of this combination of faith in the power of science and foreboding over its societal consequences. It is obvious that WWI could not have exploded without gunpowder. It's introduction into Europe led directly to another transformative period in human history. It is but one aspect of an in large part

commercially-based dialogue with Asia and the Middle East. This link not only brought to the West crucial Chinese inventions like gunpowder and the compass, but also led to the recovery of an ancient Western technical knowledge that had experienced significant enhancements in the Islamic world. This Renaissance culminated in the natural sciences in the figure of Galileo Galilei, the first modern experimental scientist. But it was Isaac Newton who truly ushered in the age of science. It was a world subject to rational laws. And a society that mastered these laws could employ them to advantage. The ideas of this Enlightenment permeated society. We witness in this era the birth of social sciences inspired by the Newtonian model, especially modern economics and formal political theory. But there were of course some cautionary voices. Both the promise and the threat of the Enlightenment vision were realized in the conflagration of World War I.

In Unit III we wonder about what the human race learned from World War I. We think it useful to investigate this question from the perspective of the information and genetic technology revolution in which we now find ourselves. We are clearly once again experiencing a global technology-based societal change. It has brought dividends that we could hardly have imagined at the end of the twentieth century. But it also brings substantial threats. What is the relation of these changes to religion and to our understanding of the environment? The same technologies and underlying science that promotes global understanding and well-being can be used for ill purposes by aggressive militaries and repressive police. And just as in the past the danger exists that society will organize and define itself on the basis of this new scientific model. Are we really globally linked computer processing units – in spite of the fact that most scientists would be hard pressed to explain what such a unit really is!

The three of us will bring a perspective to these discussions that is born in part in our respective academic disciplines. Specifically **Professor Nuckols'** 1st unit lectures will address how industrial growth, technology, international trade and commerce factored into WWI. He will also delve into the expressed angst over the uncertainty that emanated from, prior to WWI, psychoanalysis, art, and literature. Professor Nuckols ends his unit one contribution by looking into differing post WWI reflections over how the war led to pessimism towards the human condition. His 2nd unit initiates a conversation on topics covering advances in industry and technology in the 18th & 19th centuries. He will also ascertain the impact of how science and technology affected economic and political thought. He ends unit two by sampling and addressing reactions from literature to the so-called Industrial "Revolution". Unit III will have Professor Nuckols discuss the philosophy of technology, religion and ecology—their intersection with science and technology—and finally, the symbiotic relation between Art, Science, Technology & Culture.

Professor Daeley will address three topics. The first topic is the role of technology in the World War One experience of shell shock, and the attempt to address this problem through the Freudian "talking cure." The second topic is the international transmission of weapons technology in the medieval early modern periods, with special attention to gunpowder and terrorism in the Guy Fawkes plot. The third topic is centered on the nature and history of scientific collaboration, with special attention to detection and

science both in the literary world and the world of police work. All three topics will give as much attention as possible to the cultural contexts of science and technology, to the common elements of science in whatever culture it appears, and to the complex interactions of different cultures as they pursue scientific and technological goals.

Professor Salisbury will focus in the three units mainly on the underlying physical science, the societal context in which it emerged, and the interrelationship between technological and scientific developments. In unit 1 he will examine the relationship between the chemical and electro-technical industries in Germany at the end of the 19th century and discoveries in molecular chemistry, electricity, and magnetism. Large-scale government and private collaborations in these areas eventually led to applications in WWI. In unit 2 he will look at the way in which gunpowder altered the conduct of war during the Renaissance, and the effect that this change had on the emergence of experimental science. In unit three he will describe in simple terms some of the physics underlying today's information technology revolution. He will end the semester with some remarks on the nature of scientific models and their lamentably unavoidable societal misuse.

All course lectures will be held from 11:00 to 11:50 MWF in Room 201 in the Administration Building. **The student is expected to bring to class the readings for that day; and all reading assignments should be completed for the class for which they are assigned.**

TEXTS. You must have the listed ISBN of these books.

Civilization and Its Discontents by Sigmund Freud
ISBN 0-393-05995-2
W.W. Norton Press

Technology and the Future, 11th edition, ed. by Albert H. Teich
ISBN 978-1-4051-4901-3
Wiley-Blackwell

OTHER READINGS. Students will be expected to access some readings in various electronic versions. Hard copies of other readings may occasionally be distributed in class—material that the professor unexpectedly uncovers and feels appropriate for the course. Matters related to this course frequently show up in the news, for example.

EXAMS and GRADING POLICY:

The exams will include questions of varying format: short answer, identification, and brief discussion. Most of the focus of the exams will be on a student's ability to understand the material, rather than solely his or her ability to memorize information, though important facts must be mastered to do well on the exams. In an effort to prepare

the student for course exams and discussion periods, the professors will provide, as class handouts and/or posted material, some topics to be considered in order to better understand lectures and assigned readings.

Student Roundtable Discussions:

Some class periods will be used for the purpose of having a relatively small percentage of students discuss and debate, on a rotating basis, prior lecture material. These class dates are listed on the syllabus. All students will be expected to participate in three or more of these small discussions, with those audience members not directing participating in the roundtable providing commentary and questions as well.

Grading:

Grades will be dependent upon *Participation* (25%) and three *Exams* (25% each). The Participation grade will be based upon class attendance and active involvement in class and roundtable discussions. There will be three scheduled exams during the semester. In addition, there will be an **optional** *Cumulative Final Exam* administered during final exam week. Every student must take all three semester exams, but each student also has the option of taking the *Cumulative Final Exam* for purposes of replacing a prior exam score, or for taking the place of an exam that the student missed. This last option assumes that the student has missed an exam for an acceptable reason, a reason determined to be legitimate by the professors. If the professors rule that the student has missed an exam for a legitimate reason, then the missed exam will count as the dropped score and the student will be permitted to take the *Comprehensive Final* in order to replace the zero. **However, if the student misses an exam for an unacceptable reason, an automatic grade of zero will be recorded for that exam, with no opportunity to take the *Comprehensive Final Exam* to replace the zero.** Barring a missed exam without an acceptable reason, this leaves the student with three scored exams, weighted 25% each. **The student should note that there are NO Make-Up Exams administered in this course for ANY REASON!** Examples of acceptable reasons for missing an exam and earning the right to replace it with the comprehensive final exam include absence for college-approved activities (choir tour, athletic events, MUN), documented contagious or serious illness, or documented legal obligations. **Unless an emergency makes it impossible, the student MUST notify the professors ahead of the exam that he or she is unable to take it as scheduled.**

In summary:

Class Participation:	25%
Three Recorded Exam Scores @ 25% each =	<u>75%</u>
	100%

The dates for the exams are on the course syllabus. The grades will be computed by using your three highest test grades along with your Participation grade.

Use of the 11:00-11:50 Class Period. Careful reading of the “Topics & Reading Assignments” portion of the syllabus will make it clear that approximately two-thirds of the classes will be lectures (with some discussion/Q&A). All lectures will be held in

Administration 201. The remaining classes will be used for small group roundtable discussions.

ATTENDANCE. Regular attendance is expected at all scheduled class meetings (both lecture and discussions) and will be recorded at the beginning of each meeting. It is your responsibility to ensure that your attendance is accurately recorded. If you miss class, or know you are going to miss a future class, do not offer the instructors an explanation or excuse; we trust you have a good reason. However, if you must be away from class for an extended period (more than three consecutive classes), please inform us well in advance.

1-5 Missed Classes: No Penalty

After five absences, five points will be deducted from the student's Final Grade for **EACH** missed class.

Note: The first five absences are in a sense “free,” i.e. there is no grade reduction for them, though they may cause you to do less well on an exam. “Spend” your “free” absences however you need to, e.g., school field trips, school team trips, job interviews, funerals, recovering from an illness, etc. Course rules do not distinguish between “excused” and “unexcused” absences except in determining whether you can take the comprehensive final in place of a missed exam. In that particular case, your reason for missing the exam must be “acceptable.” For other absences above five, the reason does not matter; the number does. If you miss five classes in the first five weeks of the term because you would rather do something else than come to class, and then you become ill, you are in the penalty zone not for being ill but for already having “spent” your penalty-free absences. Please note that you are not required to spend five absences just because you have them. It is in your best interest not to miss any classes, though that is not always possible. You may inquire about your number of recorded absences at any time during the course. There will be no alteration of our attendance records at the end of the course.

TAPE RECORDINGS OF LECTURES. Tape recordings of lectures will not be provided, nor are students permitted to tape lectures.

ACADEMIC INTEGRITY POLICY. This course will adhere to the Austin College Academic Integrity Policies. Group studying is accepted and even encouraged. But all students are required to do their own work on exams and other assignments. By enrolling in this course, each student has agreed to abide by the Academic Integrity principles found in the most recent version of ENVIRONMENT or in other official college publications. All sources in the preparation of papers must be appropriately acknowledged. **(See attached for Academic Integrity General Definitions, Procedures, Penalties, and Faculty Responsibility.)**

STUDENTS WITH DISABILITIES. Austin College seeks to provide reasonable accommodations for all individuals with disabilities. Austin College will comply with all applicable federal, state, and local laws, regulations and guidelines, specifically Section

504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA), with respect to providing appropriate academic adjustments to afford equal educational opportunity. **It is the responsibility of the student to register with and provide verification of academic accommodation needs to the Director of Academic Skills Center as soon as possible. This verification/documentation must be handed to the student's professors. The student also must contact the faculty member in a timely manner (at least one week before exam date) for reasonable academic accommodations. For further information regarding learning disability issues or to register for assistance, please contact the office at 903-813-2454 or visit the Academic Skills Center.**

CLASS ETIQUETTE & CONDUCT

- A. Do not bring tape recorders to class. Keep cell phones turned off and out of sight during class. Do not "text" during class. If you have an emergency situation, speak with one of the professors ahead of class for permission to keep your cell phone visible.
- B. Come to class on time: that is, be in your seat ready to start class no later than 11:00. Persistent lateness might affect your Participation grade. If, however, you on some occasion are going to be late, come to class anyway (and come in quietly). It is better to be in class for 30 minutes than not at all.
- C. Do not leave the classroom during lectures/discussions.
- D. Complete reading assignments before their discussion in class.
- E. Respect the rights of others by refraining from talking (unless recognized by the instructors) while class is in session. Do not read during class any material not under discussion in that class session.
- F. Get permission from one of the professors before bringing visitors to class.
- G. Do not eat during class. Beverages are permitted.
- H. Sit near the classroom door and be as quiet as possible in leaving, if it is necessary on some occasion for you to leave class early.

TOPICS & READING ASSIGNMENTS **(Assorted Readings will be in the form of In-Class Handouts or placed on Moodle)**

UNIT I **World War I and the Human Condition**

Jan. 30 Monday

Preliminaries

Introductory Presentations: Professors of Physics, English, and Economics briefly discuss their role, discipline, and practice as it pertains to the course.

Professor Nuckols: “Industrial Growth and the Technology of War: Relevant factors before World War I”

Feb. 1 Wednesday

Professor Salisbury: “Foundations of 20th century science and technology: Chemistry, physics and industry in the 19th century”

Reading: [Pages 15-29](#) from *Prometheans in the Lab* by Sharon Bertsch McGrayne
[Pages 373-392](#) from *Audacious Enterprise* by Lewis Pyenson

Feb. 3 Friday

Professor Salisbury: “The dawn of big science: the Kaiser Wilhelm Society and chemists at war”

Reading: [Emil Fischer and the Kaiser Wilhelm Society](#) by G. B. Kauffman and P. M. Priebe
[The Kaiser's chemists](#) by Jeffrey Allan Johnson

Feb. 6 Monday

Professor Salisbury: “Scientific and technical transformation of the World War I battlefield.”

Reading: To be announced

Feb. 8 Wednesday

STUDENT ROUNDTABLE

Feb. 10 Friday

Professor Daeley: “‘Dulce et Decorum Est’: the technology of World War I”

Reading: Poems posted on Moodle

Feb. 13 Monday

Professor Daeley: Freud and the Talking Cure: Mechanized warfare and shellshock

Reading: Selections from novels posted on Moodle

Feb. 15 Wednesday

Professor Daeley: ‘*Square Rounds*’: Fritz Haber and the moral dilemma of poison gas

Reading: Selection from the play posted on Moodle

Feb. 17 Friday

STUDENT ROUNDTABLE

Feb. 20 Monday

Professor Nuckols: “Pre WWI Thought: The Age of Uncertainty”

Reading: *Civilizations and its Discontents* by Sigmund Freud

Feb. 22 Wednesday

Professor Nuckols: “WWI Aftermath: Reflections on the Human”
Condition?

Reading: *Civilizations and its Discontents* (cont.)

Feb. 24 Friday

STUDENT ROUNDTABLE

Feb. 27 Monday

EXAM I

UNIT II

Gunpowder and the Emergence of the Modern World

Feb. 29 Wednesday

Professor Daeley: Ironies of History: the transmission of weapons technology among the Chinese, Islamic, and European worlds

Reading: To be announced

March 2 Friday

Professor Salisbury: "Renaissance warfare, science, and mathematics"

Reading: To be announced

March 5 Monday

Professor Salisbury: "Cannonball trajectories and systems of the world"

Reading: To be announced

March 7 Wednesday

Professor Salisbury: "The Galileo Affair"

Reading: Galileo Galilei and Stilman Drake, "Letter to the Grand Duchess Christina" in *Discoveries and Opinions of Galileo*, [pp. 145-216](#)

[David Marshall Miller, "The Thirty years war and the Galileo affair"](#)

March 9 Friday

STUDENT ROUNDTABLE

SPRING BREAK BEGINS MARCH 9 AT NOON

March 19 Monday

Professor Daeley: “Guy Fawkes: Gunpowder, Terrorism, and Popular Culture”
Reading: To be announced

March 21 Wednesday

Professor Daeley: “The Macartney Expedition: Technology and Trade”
Reading: To be announced

March 23 Friday

Professor Nuckols: “Advances in Industry & Technology in the 18th & 19th Centuries”
Reading: To be announced

March 26 Monday

STUDENT ROUNDTABLE

March 28 Wednesday

Professor Nuckols: “Impact of Science & Technology on Economic & Political Thought”
Reading: To be announced

March 30 Friday

NO CLASS MEETING

April 2 Monday

Professor Nuckols: “Reactions from Literature to the Industrial ‘Revolution’”
Reading: To be announced

April 4 Wednesday

STUDENT ROUNDTABLE

April 6 Friday

EXAM II

UNIT III

The Information Technology Revolution and Terror

April 9 Monday

Professor Salisbury: “Quantum origins of nanotechnology and the global media revolution”

Reading: To be announced

April 11 Wednesday

Professor Salisbury: “Information technology, surveillance, and warfare”

Reading: To be announced

April 13 Friday

STUDENT ROUNDTABLE

April 16 Monday

Professor Daeley: “Detection and Science: The 19th Century”

Reading: To be announced

April 18 Wednesday

Professor Daeley: “Detection and Science: The 20th/21st Centuries”

Reading: To be announced

April 20 Friday

Professor Daeley: “Crowd Science: the history and nature of scientific collaboration”

Reading: To be announced

April 23 Monday

STUDENT ROUNDTABLE

April 25 Wednesday

Professor Nuckols: “Philosophy of Technology”

Reading: *Technology and the Future* ed. by Albert Teich

(assorted chapters to be assigned)

April 27 Friday

Professor Nuckols: “Religion & Ecology: Conversations with Science & Technology”

Reading: *Technology and the Future* (cont.)

April 30 Monday

Professor Nuckols: “Art, Science & Technology”

Reading: *Technology and the Future* (cont.)

May 2 Wednesday

STUDENT ROUNDTABLE

May 4 Friday

Professor Salisbury: “The dark side of modeling: The fallacy of misplaced concreteness”

Reading: To be announced

May 7 Monday

REVIEW

May 8 Tuesday 9:00-11:00am

FINAL EXAM (Exam III)

Optional Make-up Exam (Time & Date to be determined)