Great Issues Courses for Fall 2013

**CHM 49000  History & Philosophy of Science**  (offered fall only)  [uncertain if it will be offered Fall 2013]
CHM 490 was created to provide juniors and seniors in the College of Science with a course that focuses on the synergies among the physical and life sciences, the humanities, the social sciences, and education. CHM 490 is neither a prerequisite for later courses nor a review of basic principles of science and mathematics out of a textbook. It was prepared for inclusion among the College of Science “Great Issues in Science” courses that address the impact of science on society and the ramifications of scientific advances because it tries to look at science from the perspective of work in the humanities (e.g., history and philosophy), the social sciences (with particular emphasis on cognitive science), and education (with a focus on what is known about the teaching and learning of science).

**EAPS 30100  Oil!**  (offered fall only)
Petroleum is a common thread that interweaves Geoscience with the Political-Economic history of the 20th century. Its dominance in current society has major repercussions on our current and future society and environment. The unequal distribution of petroleum and natural gas, coupled with innovative geologists and engineers, has set the stage for the modern geo-political world. This course is a unique survey into the multitude of aspects of petroleum -- from its formation to "resource wars".

**EAPS 32700  Climate, Science, and Society**  (offered both fall and spring)
This interdisciplinary course examines our current understanding of climate science, its role in the political and social debates about the climate problem today, and the policy alternatives to reduce our carbon footprint.

**EAPS 37500  Great Issues:  Fossil Fuels, Energy & Society**  (offered both fall and spring)
Prosperity of the 20th century was based on abundant and cheap energy; during the 21st century we will be faced with difficult challenges. Our society will face higher energy prices, decline of petroleum based fuels supplies, increased environmental effects of fossil fuels usage, and the challenge of solving the technological problems of developing alternative fuels. This course will review the structure, economics, and geopolitical issues faced by fossil fuel industries and the mitigation strategies that will be needed to change to low fossil fuel use society based on low polluting renewable energy sources.

**MA 27900  Modern Mathematics in Science and Society**  (offered fall)—(as of 3/7/13 course is MA 390 – Great Issues)
Course Learning Outcomes:  The students will gain knowledge, overview, and understanding in several fundamental mathematical disciplines which fall into four basic categories: voting and apportionment; growth; management of networks; data analysis. Some of these theories had their beginnings in the middle ages, but most have been developed in the 20th century and touch the frontier of current research – particularly in the interactions with high capacity computing. Students will assimilate these mathematical ideas while applying them to practical everyday questions, and in turn gain an understanding how real life problems gave rise to the development of mathematical theories. Historical backgrounds and examples as well as current developments in society will document a framework of living mathematical sciences.

Great Issues:  The student will have to logically and creatively apply basic, but non-trivial mathematical concepts to understand very practical problems that appear in real life, such as the case of the Alabama Paradox, optimization methods (shortest paths), interpreting samplings and surveys, and network control. The goals of the course are manifold: via appropriate cases, the students will become acquainted with abstract reasoning as it leads to theorems; the course will document the historical impact of society on the development of mathematics, and in turn explain how mathematical endeavors shape and enable numerous aspects of our lives today; the students will get a broad introduction to mathematical ideas that are highly integrated into the human sciences and management and which reflect intellectual responses of society to its needs.

**SCI 36000  Great Issues in Science and Society**  (offered both fall and spring)
The focus of the course is on the integration of different perspectives and the need for interdisciplinary approaches to solve the challenges facing students’ local, national, and global communities. The course format is discussion intensive,
team-oriented, and stresses the need to continually ingest and integrate new information, as the technologies and social proposed action that can contribute to the solution of a Great issue.

**Spring-only Courses**

**BIOL 39500 Great Issues: Genomics & Society**  (offered spring only)
The course will revolve around genomics, the science and technology involved in determining the sequence of the entire DNA complement in an organism. Almost everyone has heard of the human genome project, but fewer are aware of the spectacular technical progress in this field and the fact that over 1,000 different organisms have had their genome sequenced. Until recently, most of these have been microorganisms, but technological and computational progress has made it progressively easier and cheaper to sequence the genomes of higher organisms. This field may have more of an impact on your future lives than almost any other field of the life sciences-mostly because it touches on all areas of study.

The course will focus on the impact that genomics will have in selected areas. It will begin with a basic understanding of the science and technology that gave rise to our current capabilities in sequencing and the fact that technology continues to provide greater capacity and cheaper prices. You will soon see that every field in the College of Science is well represented in the science and technology. We will then go on to see how genomics influences many topics that affect our daily lives and can possibly provide answers to some critical questions (or at least pose better questions):

- What is the basis of personalized medicine?
- What does genomics tell us about the genealogy of mankind?
- What impact will genomics have on our future food supply and our ability to feed a population of 9 Billion people?
- What is the human microbiome and what does that mean to me? Similarly, what is the gut microbiome, the mouth microbiome, etc?
- What impact will genomics have on the development of alternative energy sources, especially biofuels?

In every area, we will discuss the scientific challenges, but also the ethical and societal implications. In most cases, there is no one right answer, but a series of choices that can be guided by ethical considerations.

**BIOL 48300 Environmental & Conservation Biology**  (offered spring only)
Intended for mid-level undergraduate biology majors, this course will provide an introduction to the application of ecological principles to environmental issues. It will introduce fundamental ecological theory and empiricism, and demonstrate their application to practical issues concerning effects of environmental change, at each level of organization from the individual to the ecosystem. Whole-biosphere issues, such as global warming and global patterns of productivity, will form the umbrella issues for more focused integrations of ecological knowledge centered at the population level to understand the viability of small and threatened populations. The global extinction crisis and the geography of biodiversity will be covered, and the course will focus on particular case studies of threatened ecosystems and analyses of the genetic and demographic stability of populations. The history and prognosis for the coexistence of human civilizations with the rest of natural ecosystems form the background for applying ecology to policy.

**CHM 49000 Great Issues in Drug Design**  (offered Spring only)  [uncertain if it will be offered Spring 2014]
Since the millennium began, the pharmaceutical industry has been stressed by (1) the rise of a global generics industry in response to patent expiries, (2) the complex biology of unmet medical needs, (3) economic challenges with respect to both revenue and cost, and (4) a tougher regulatory climate. The nature of this dilemma will be explored through historical advances in chemistry and clinical research in parallel with the development of the global regulatory environment for clinical trials and pharmaceutical manufacturing. The challenges of drug development that relate the availability of therapies to patients to cost, safety, efficacy, and the relative funding of R/D by government, foundations and industry will be described. Safe, effective and economic; pick two. It is expected that aspirants for careers in medicine or medical research will benefit from understanding the many ambiguities that define this topic. On completion of the course students will have had exposure to the history of pharmacology, life science ethics, regulatory challenges nationally and globally, and the expectations of investors from government, foundations and private sources.