Course title: Introduction to Social, Ethical, and Political Issues Associated with Biotechnology

Prerequisites: BIOL 171 or TPSS 200 or NREM 210

Contact hours: Two 75-minute lectures/discussion per week.

Cross-listed Courses: None.

Catalog Description:
Concepts of biotechnology, fundamental issues associated with use of this technology, with special emphasis on agricultural biotechnology. Rise of agricultural biotechnology. Consequences of biotechnology applications to the lives of humans and other animals, plants, and to the environment. Issues and ethics concerning the future of biotechnology and our society.

Modification:
New course.

Justification:
Science and technology interface with society in many ways and under the umbrellas of various topics. In turn, society affects the course of science and its applications. Genetically engineered organisms (GEOs) have received much national and international attention in recent years, interfacing with society in ways that few would have imagined a decade ago. As the scientific capabilities to engineer plants, animals, and microorganisms for applications that could pose great benefits to society grow rapidly, so do the number of potential challenges and concerns. Many issues associated with genetic engineering (GE) pervade other areas of scientific pursuit, and there seem to be more commonalities than differences. In light of this, the course will give students opportunity to look at some of these issues. The goal of the course is to enable each student to develop an understanding of conflicting opinions regarding science, medicine, technology, and culture and to define and refine their own ethical code of conduct based on evaluation of the arguments from differing viewpoints. This course will also fulfill a requirement for the Ethics Focus designation to satisfy the UHM General Education Focus core requirement.

Student Learning Outcomes
Students will be exposed to alternative views on this controversial subject and encouraged to understand various sides of the arguments. However, students should not only gain perspectives on the particular issues associated with genetic engineering, but also be able to translate the broader policy themes to other emerging areas of science and technology.
Sample syllabus:

**Weeks 1-2 Setting the Stage**
A review the syllabus and discussion on expectations of the course. Informal conversation about policy issues surrounding GEOs and issues of most interest to students. General overview of the science behind genetic engineering.

**Weeks 3 An Overview of Past, Present, and Potential Future Applications of Genetically Engineered Organisms**
History of the development and applications of GEOs as they relate to setting policy in this area. Main categories of current and potential uses for GEOs, and the general concerns and benefits associated with each product category. Collectively develop ways to categorize the uses, benefits, concerns, and issues, setting the tone for future discussions.

**Weeks 4-5 Decision making and Scientific Uncertainty: A regulatory look**
In this session, we’ll discuss the current regulatory system for GEOs in the United States. General overview, followed by questions concerning the subject of the regulatory process (e.g. “product” versus “process” debates), appropriate level of oversight for ensuring safety (e.g. what is “acceptable risk”), and the interplay of science and society in the regulatory process (e.g. societal input, etc.). Regulation of laboratory GEOs and GEOs in the environment—these cases will be used to discuss the issue of risk-benefit “balancing” and how it affects public debates.

**Weeks 6-7 International Policy Issues**
The tensions between the European Union and US over the labeling, regulation, and trade of genetically engineered organisms and foods have been growing. This session will be used to examine the current state of GEOs in the EU and the differences between the EU and US systems. The World Trade Organization negotiations over GEOs will be reviewed and discussed. Possible roots of EU and US differences, as well as policy options for moving forward.

**Weeks 8-9 Public-Private Interfaces—National and International Issues**
Public-private partnerships are essential for moving ideas to market. Current industry-academic relationships as they relate to R&D on GEOs will be addressed. Factors that promote or discourage such relationships. Issues surrounding conflict of interest in safety assessments and other scientific studies. Policy options for assessing/avoiding conflict of interest and ways to ensure that independent investigations take place.

**Weeks 10 Access to Genetic Resources, Patenting and Intellectual Property**
Advances in the life sciences from the point of discovery to application require years of costly research and development. Intellectual property (IP) protection is a way for developers to recoup their financial investments. Capacities in and impacts on the developing world will be focal points for discussion.

**Week 11-13 Science and Public Interfaces**
Most consumers of GE foods and products receive their information from mainstream media, yet detailed and qualified scientific information does not make for very exciting news. We will discuss this dilemma in this session. Examples of GEO news coverage will be provided, and we will critique the coverage together in discussion. International examples will be included. We will explore ways to improve coverage and assess source reliability. We will also discuss how to best provide information to consumers about GEOs (e.g., food labeling, fact sheets, etc.).

**Weeks 14-17. Ethical Dimensions of biotechnology—Ethical & Religious dimensions of GEOs in agriculture. The conflict between science technology and culture**

We will consider a set of questions: what is science, what is technology, how are they related to each other, and what is their relationship to the domain of ethics and local CULTURE? Our focus is the moral problems which arise in the day-to-day practice of science, technology, medicine and their overlap with cultural beliefs. Drawing on guest speakers, the class will have the opportunity to consider these issues from a variety of cultural perspectives, including Hawaiian, Tonga, Samoan, Pilipino, Haole and other locally significant perspectives. Among the ethical issues to be examined are: ethics of working on and patenting of indigenous plants, benefits/potential risks of genetic engineering to farmers and consumers, the clash of this technology and impact of this technology on cultural beliefs.

**CTAHR Course Proposal: Description and Justification**

1. **What is the course modification?**
   The course proposal is to add TPSS 416, *Introduction to Social, Ethical and Political issues associated with Biotechnology*, as an undergraduate lecture/discussion combination.

2. **Why is this course being requested or modified?**
   Hawaii is the state with the highest number of experimental permits for biotech food development; as well as a state with the first developed and adopted GE fruit tree (papaya). GE varieties of other crops (corn, soy) are being grown or are in development (banana, ornamental taro). At the same time, Hawaii has become a target of campaigns to discredit GE food development. These campaigns often depend on propagation of misinformation, fear-mongering, and the notion that GE foods are designed by large agro-business multi-nationals only to maximise profits and control global food production.

   Dr. Ania Wieczorek taught the majority of topics covered in this course as a graduate seminar in TPSS and MBBE and the material was well received by students. Dr Wieczorek has presented 14 guest lectures annually addressing these topics which show high level of interest in these topics by students and faculty.

3. **How will the course be organized?**
   There will be two (75 min) lectures per week. A course outline is attached.
4. What other courses at UHM closely parallel the proposed course, and in what way will the latter make a distinct contribution?

There is currently no other course at UHM that closely parallels the proposed course. This course will examine the development of genetic engineering (GE) technologies that provide powerful methods for intervening in the genetic constitution of living things. The principal goal of the course is to develop a broad historical perspective on the emergence and development of a new field of scientific achievement, the contexts in which the field is evolving, the terms of development, and the social and ethical issues associated with the development and application. Use of agricultural biotechnology and the issues associated with this technology here in Hawaii will be use as a case study. The course will focus on four issues that have produced extensive debate both locally and globally: safety of GE foods for human consumption; the release of genetically engineered organisms into the environment; globalization; and coexistence of different forms of agriculture.

5. Where or how does the proposed course fit into the current and future curriculum?

The Department of Tropical Plant and Soil Sciences aims to understand plant and soil issues important to Hawaii and other tropical areas of the world. Classes offered by the department focus on an understanding of the interactions among plants, soil, water and air in different setting. An appreciation of these interactions requires an integration of fundamental biological, chemical, and physical processes and activities, so as to understand and responsibly manage land, water, and crops.

The department is involved in the adaptation and application of biotechnology and production technologies to enhance and sustain food production, assure a safe food supply and develop environmentally sound production and soil restoration systems.

The B.S. degree in Tropical Plant and Soil Sciences is offered, with options in Plant Sciences and Genetics, Plant Production and Management (Horticulture), and, Environmental Soil Sciences. The proposed course provides an important component of this curriculum, offering an overview of biotechnology and ethical issues associated with the technology. This course also meets UHM Gen Education focus requirements.

6. Why is the number of credits and level justified? Explain the prerequisites and absence thereof

This is a three-credit course. The credits proposed are required to adequately cover background material as well as the major topics associated with biotechnology and its impact on societies. Students will be required to participate in group discussions and analyses of case studies, and complete reading assignments which will augment the material covered in lectures.
Prerequisites should be at least one biology course (BIOL 171 or TPSS 200 or NREM 210). Many issues associated with genetic engineering (GE) overlap with other areas of scientific pursuit and basic understanding of science is required for the student to actively participate in this course. This course will start with an introduction to the state of genetic engineering, its current applications, and its potential risks and benefits. This course will provide critical knowledge to students who are interested in topics of biotechnology and its impact on society. This course will fulfill a requirement for the Ethics Focus designation to satisfy the UHM General Education Focus core requirement. The course will include synthesis of materials and discussion sessions as well as conventional lectures, and is thus listed at the 400-level.

7. How will the course assist students to achieve the critical skills and competencies expected of CTAHR graduates?
Students will be required to undertake assignments in addition to lectures, which together will train them in the skills and competencies expected of CTAHR graduates. Specifics are listed below:

- Written communication - Presentation; preparation of discussion sessions; examinations.
- Oral communication - Students will also be afforded the opportunity to enhance their critical capacity and communication skills, in that the course will be presented in such a way that students are encouraged to participate actively in classes. They will be required to complete reading assignments and provide critical opinions of the material covered during discussions in classes. Discussions will be led in such a way that any students who may feel uncomfortable with voicing their opinions are encouraged to express their thoughts. Students will be grouped according to their level of confidence with discussing issues, so that each gets a chance to voice her/his opinion among peers. Students from each group will be asked to provide feedback on their conclusions, both written and orally
- Problem solving and critical thinking - Presentation/ Debate; group discussions of topical issues.
- Real world experience and global perspective - Many case studies will be presented; student presentation will require interaction (by phone or e-mail) with people outside UH and Hawaii; occasional guest lecturers.

8. How will student be evaluated?
Two mid-term exams and a final exam; each student will give an oral presentation - Presentation evaluations and analysis.

9. What are the minimum qualifications for teaching this course? Is a qualified instructor available?
Ph.D. (or M.S.) in biological sciences, preferably with a specialization in biotechnology, agriculture and excellent knowledge of all the issues associated with this technology (including local issues in Hawaii) A.M Wieczorek (Ph.D.) will teach this course.

10. How will the course be financed, assuming no further cutback?
There is no laboratory in this course, and no significant costs are anticipated.

11. Has the course been offered before? Is there a demand for it?
This course has not been offered previously. Dr. Ania Wieczorek has taught the majority of these topics as a graduate seminar in TPSS and MBBE and was well received by students. Dr. Wieczorek also has presented 14 guest lectures annually addressing these topics which show high level of interest in these topics by students and faculty.

12. Is the course cross-listed with another Department
Not currently.