PROPOSAL FOR NON MAJORS UNDERGRADUATE COURSE:
INTRODUCTION TO CANCER BIOLOGY

Justification (How does course fit into our curriculum? Why is it valuable? Who will teach it?):
Cancer is the second leading cause of death both in United States and globally. This lecture course will empower students with the knowledge and tools to better understand and make informed choices in dealing with cancer. This course is an introduction to the basic biology of cancer including the cellular and genetic changes that characterize the development and progression of cancer, as well as a review of the major therapies currently being pursued to treat cancer. Topics that are emphasized in this course include the fundamental causes of cancers, the socioeconomic implications of cancer incidence, and basic preventative measures. The genetic mutations associated with the development and spread of cancer, and current technologies used to understand the mechanisms of cancer development and effective cancer therapeutics and diagnostics will also be explored. This course is designed for non-biology students and does not satisfy a lower-division requirement for any biology major. In addition, the course may be useful for all majors, as well. Michael Burg will develop the class.

Title and Description (for the catalog, length limit for description is 500 characters including spaces):
Introduction to Cancer Biology (4 U). Cancer is the second leading cause of death both in United States and globally. This course is an introduction to the basic biology of cancer including the cellular and genetic changes that characterize the development and progression of cancer, as well as a review of the major therapies currently being pursued to treat cancer. Topics that are emphasized in this course include the fundamental causes of cancers, the socioeconomic implications of cancer incidence, and basic preventative measures. This course is designed for non-biology students and does not satisfy a lower-division requirement for any biology.

Prerequisites: NONE

Logistics (Comments on how the course will be taught? Any infrastructure requirements or unusual features? Will there be a textbook and if so what is it? What kind of assignments/tests will there be and how will grades be determined?):
This course will be an undergraduate biology course designed for non biology majors, but has information that can be useful to biology majors, as well. Topics will emphasize basic biological principles with particular emphasis on the scientific method and experimental design to educate students on proper interpretation of information that is presented to them. The standard lecture format will be used (3 hours lecture, 1 hour discussion with 8 hours outside prep/homework per week). At present there are no plans to require a textbook; excerpts from selected texts and readings from science news and primary literature will be occasionally assigned. In addition, numerous videos will be used to expand upon class topics. Class time will consist of lectures interspersed with active learning to develop skills (e.g. group design of a proposed epidemiological study; group analysis of current news). Homework will consist of reading/video assignments, problem sets on interpreting common forms of published genomic data (these will also incorporate group-work in discussion section), and other at-home assignments. Grades will be based on the following approximate distribution: 10% participation in lecture, 30% assignments (at home and in-class assignments during discussion section), 20% midterm, 30% final exam. The course will require the same resources as other biology electives (classroom with standard projection or screen technology, equipped for podcasting/videocasting, and Instructional Assistants).

Course scope and syllabus: This course will be roughly divided into three parts. The first unit will be a brief introduction/overview of cancer and the impact upon them and society. Basic cancer statistics of cancer types, incidence, and death will be presented along with discussion of the unequal burden placed upon people of lower socioeconomic status. A brief description of
how normal cells become cancer cells is presented with a strong emphasis on the individual diversity found in all cancers. Students will then learn the basic nomenclature of cancer types and characteristics that will enable them to basically interpret a biopsy. The unit will conclude with analysis of what are the major causes and carcinogens associated with most cancers. Preventative measures including smoking habits, obesity, diet, and HPV vaccines will be explored. The second unit will delve into the basic cellular, molecular, and physiological effects associated with cancer progression. Understanding of basic biological principles including control of cellular activity, cellular communication, and homeostasis will be emphasized. The third unit will enable students to apply their gained knowledge of cancer to a greater understanding of current screening, diagnostic, and therapeutics. The ability to properly critique current standards and understand the rationale behind the future technological improvements in these areas will be a main emphasis in this section of the course. The goal of the course is to educate the students on the biology of cancer and empower students to be prepared to deal with this disease in an informed manner.

Part 1: Introduction to Cancer (~3 week)
- Cancer statistics (Emphasis on socioeconomic impact)
- Basic characteristics associated with the conversion of normal cellular function to cancer cell abnormalities and cancer progression
- Naming, grading, staging of cancer (basic interpretation of a pathology report)
- Basic causes/prevention of cancer (includes how to properly design and interpret epidemiological and laboratory studies)

Part 2: The Hallmarks of Cancer (~ 4 weeks)
A. Comparison between normal vs. Cancer cells
- Comparison of cellular functions (e.g. control of proliferation, cell death, cellular differentiation) between normal and cancer cells. Includes differences in:
  - Cell cycle and control of proliferation
  - Cellular communication
  - Cell signaling

B. Major classes of mutations associated with cancer progression
- Oncogenes
- Tumor suppressor genes
- Unlimited replication
- Loss of Apoptosis
- Angiogenesis
- Metastasis

Part 3. Cancer screening, diagnostics, and therapeutics (~ 4 weeks)
- Current cancer screening/diagnostics (e.g. mammogram’s): effectiveness and limitations (% false positives; % false negatives)
- Improved cancer screening/diagnostics in development and clinical trials
- Basic approaches to cancer therapeutics: Past, present, and future. Includes:
  - Surgery: History and improvements in precision
  - Radiation therapy: External beam, brachytherapy, and proton therapy
  - Chemotherapy: Traditional and tumor targeted
  - Immunotherapy: Development of patient-specific therapeutics

Please comment on any overlap with existing courses: Nothing substantial.