MCS New Course Proposal Form

Course Title: Genome Editing Biotechnology

Instructors: Aaron Mitchell

Course Number: 03428 and 03728  
Cross Listing: Click here to enter text.

Prerequisites/Corequisites: 03121, 03151, or 03709.

Semesters Offered:
- [ ] Fall
- [ ] Spring
- [ ] Summer-All
- [ ] Summer 1
- [ ] Summer 2

Semester Length:
- [ ] Mini 1
- [x] Mini 2
- [ ] Mini 3
- [ ] Mini 4
- [ ] Full Semester

Location
- [x] Pittsburgh
- [ ] Doha

Course Offering Frequency: Annually.

Suggested Days and Times: Tuesday and Thursday, 03:00PM-04:20PM

Learning Format
- [x] In Person
- [ ] Online
- [ ] Combination

Course Evaluation type:
- [x] Letter Grade
- [ ] Pass/Fail

Course Unit Justification: Total Units 4.5 (03428) and 6 (03728)

In Class Hours: 3  
Recitation Hours: 0

Lab Hours: 0  
Out of Class Hours: 1.5 (03428) and 3 (03728)

Target Population: MCS Juniors and Seniors; MS and PhD students in MCS and CIT

Anticipated Enrollment: 20

Rationale for Course (Background): Genome editing technology has exploded since the recent discovery of bacterial CRISPR systems. The goal of the course is to present the relevant material while new applications are emerging every day, and before a textbook is written! Cutting edge knowledge will enable our students to shape the future.

The courses were offered as pilots in Fall 2016. The two versions received overall course FCE’s of 4.78 and 4.58 with a response rate of 95%. The major student recommendation was to provide more homework assignments and more credit for homework, thus avoiding an unnecessarily stressful exam. That suggestion has
been accommodated in this proposal through an increase in homework value from
10 points to 30 points.

**Special Facilities Needed:** None

**Textbooks and/or Other Materials:** A set of primary research and review articles has
been chosen and will be updated each year.

**Assessment:**

**03428:** Grades will be based upon 100 total points.
30 points will be given for participation in class and homework assignments. 
70 points will be given for answers on an in-class exam.
Letter grades: A = ≥90; B = ≥80; C = ≥65; D = ≥50 points

**03728:** Grades will be based upon 125 total points.
30 points will be given for participation in class and homework assignments.
70 points will be given for answers on an in-class exam.
25 points will be given for an in-class presentation about a research paper.
Letter grades: A = ≥110; B = ≥90; C = ≥75; D = ≥65 points

**Topics Covered:**

- Introduction - the basic moving parts of CRISPR
- What happens at a DS break?
- Off target effects, Gene regulator CRISPRs
- Alternate technologies
- Ethics of modifying our genomes
- Applications - cell screening
- Applications - organism engineering
- Applications - anti-HIV, immunotherapy
- Gene therapy

**Course Catalog Description:**

(03428) How can we create genetically engineered cells, animals, plants, and even
humans? This course will focus on the technologies that enable genome
modification, with an emphasis on the recently developed CRISPR-Cas9 system.
Specific topics will include an introduction to CRISPR technology and its history;
DNA double strand break repair; Off target effects; Gene regulator CRISPRs;
Alternate technologies; Ethics of modifying our genomes; Applications - cell
screening; Applications - organism engineering; Applications - anti-HIV and
immunotherapy; Overview of Gene therapy.

(03728) How can we create genetically engineered cells, animals, plants, and even
humans? This course will focus on the technologies that enable genome
modification, with an emphasis on the recently developed CRISPR-Cas9 system.
Specific topics will include an introduction to CRISPR technology and its history;
DNA double strand break repair; Off target effects; Gene regulator CRISPRs;
Alternate technologies; Ethics of modifying our genomes; Applications - cell screening; Applications - organism engineering; Applications - anti-HIV and immunotherapy; Overview of Gene therapy. Student in-class presentations will cover late-breaking topics and specific areas of student interest.

**Learning Objectives:** Students who complete the course will be able to
1. describe the basic mechanisms that underlie genome editing technology.
2. describe major ways in which the technology has been applied.
3. apply genome editing principles to new biomedical problems.
4. present ethical considerations for and patient perspectives about genome modification.
5. (03728 only) identify significant recent research reported in peer-reviewed literature.

**Departmental Approval Date:** April 17, 2017

**CUA Recommendation Date:** May 5, 2017

**College Council Approval Date:**

**Date Sent to Enrollment Services:**

**Comments:**
Please attach a copy of the proposed syllabus – 2016 pilot course syllabi are attached with course modifications included.