School of Systems Biology

**Creativity and Innovation - 13747 - Spring 2018**

**BIOL 691 – 002**

**Instructors**

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**Textbook: There is no textbook required for this class**

**Credit hours:** 3.000 Credits

**Meeting days and times:** Wednesday 4:30 pm - 7:10 pm

**Building and room:** Bull Run Hall 246

**Course description**

Creativity and innovative thinking is the most important requirement for success in any field. Creative thinking drives all progress in the arts, the sciences, and the commercial sector. Under this philosophy, graduate students should be immersed in a culture of creativity surrounded by mentors and advisors who explain and demonstrate the creative process. Graduate students should be shown that every team member in a modern academic lab – ranging from summer scientists to tenured professors – can be the originator (and inventor) of a seminal idea that opens a whole new field.

To succeed in the current highly competitive funding climate, a scientist must submit a grant proposal that is highly daring and risky, or they will fail to gain the attention of the study section. Moreover, if the idea isn’t totally new then it cannot be patented, and it will not have a significant impact in the commercial sector. Consequently, maximizing creativity is of primary importance to maintain a competitive edge in biomedical science. We strive to ensure that our students fundamentally understand that they gain future job security in science by taking a risk in the lab. Instead of following the current scientific vogue, we want our trainees to launch the next viral idea. We aspire to graduate scientists that create new technology, propose radical hypotheses, or select radical experimental systems, not just because it is cool, and may increase the probability of winning a grant application, but because it can be used to ask, and answer, questions in biology and medicine that have never been possible before.

In the first four weeks of this class students will explore the origin and value of creativity and will be presented with examples of successful disruptive ideas and ideas that failed. In weeks five through eight the students will receive a complete tutorial on patents and intellectual property for scientists. In weeks nine through twelve the students will exercise their creative abilities to solve real world timely scientific problems posed in the class.

**Course Grading**

Grades will be based on 1) mid-term take home exam, 2) project presentation and 3) class participation (35%, 35%, 30%, respectively).

*Mid-term take home exam* (due March 14th): using the principles of the class, students will propose a solution to a given challenge. Professors will give the students challenges. Solutions can encompass a phone app, a new treatment, a new medical device, etc. This assignment will be carried out individually.

*Final presentation*: in groups of four, students will propose a solution to a given challenge using the principles of the class. Students will prepare a power point presentation and deliver it to the class during the final four classes of the semester.

**Course Learning Outcomes:**

 Demonstrate applications of acquired information

 Formulate an original research topic

 Demonstrate proficiency and excellence in the core concepts

**Definition of Grades for Graduate Courses**

|  |  |  |
| --- | --- | --- |
| Grade | Quality Points | Graduate Courses |
| A+ | 4.00 | Satisfactory/Passing |
| A | 4.00 | Satisfactory/Passing |
| A- | 3.67 | Satisfactory/Passing |
| B+ | 3.33 | Satisfactory/Passing |
| B | 3.00 | Satisfactory/Passing |
| B- | 2.67 | Satisfactory\*/Passing |
| C | 2.00 | Unsatisfactory/Passing |
| F | 0.00 | Unsatisfactory/Failing |

\* Although a B- is a satisfactory grade for a course, students must maintain a 3.00 average in their degree program and present a 3.00 GPA for the courses listed on the graduation application.

Information about additional grade notations that apply to graduate students including “IN” Incomplete and “IP” In Progress as well as grading for undergraduate students may be found in the Academic Policies section of the catalog under [Grading System](http://catalog.gmu.edu/content.php?catoid=19&navoid=4065#grading). Graduate students are not required to take midterm exams.

**Weekly schedule**

|  |  |
| --- | --- |
| **Date** | **Topic** |
| Jan 24 | Introduction to Creativity |
| Jan 31 | Emerging research breakthroughs in medicine |
| Feb 7 | Brainstorming and marketing of ideas |
| Feb 14 | Creativity applied to medical diagnosis and treatment |
| Feb 21 | Introduction to cancer |
| Feb 28 | Introduction to infectious diseases |
| Mar 7 | Introduction to neurodegenerative diseases |
| Mar 21 | Ethics in human research and clinical trials |
| Mar 28 | Intellectual property, patents and trademarks |
| Apr 4 | IP management: licenses and agreements |
| Apr 11 | Practicing Creativity: student presentations |
| Apr 18 | Practicing Creativity: student presentations |
| Apr 25 | Practicing Creativity: student presentations |
| May 2 | Practicing Creativity: student presentations |

The course will be divided into three parts.

**Part 1 Introduction to Creativity**

What is Creativity? What is the difference between creativity and innovation? How does the creative process work? Does art versus science require a separate type of creativity? How can creativity be encouraged? How is creativity suppressed or discouraged? Examples of disruptive technologies. Examples of creativity based on addressing a need. Brainstorming. Creativity by trying to predict the future. How to know when to give up on one approach and move to another. Why is creativity and risk taking the most important skill for success in science? Marketing your idea. Creativity applied to medical diagnosis and treatment. Examples of the hottest trends is science today, and the impact of “fads” in science.

**Part 2 Inventions and Patents: A practical tutorial for scientists**

Introduction: origin and value of patents. Common misconceptions about patents. Types of Patents. Meaning of Novel, Non Obvious and Useful in Patent Terms. Utility versus composition of matter. Design Patents. Plant Patents. What is not patentable based on recent Supreme Court Decisions? Co-Inventors: Who is an inventor? Provisional Patent Application. Preparing a patent application. Design and language of Claims. Examiner office actions. Patent fees and issuance. Types of Licenses. Non Disclosure Agreements. Notebook records. Prior Art Searches. What constitutes a prior art disclosure? Examples of successful and flawed patents.

**Part 3 Practicing Creativity**

Students will participate in a group brainstorming session that is coached by the Professors who pose a specific challenge. The students will compare different approaches to generating unexpected creative lead ideas. Students will be posed 4 different practical health related scientific challenges that are within their realm of expertise. Each challenge is a problem that could lead to a patentable invention, a grant application, or a high impact publication if a creative approach can be found. The students will be divided into four groups and each group will be assigned one of the 4 challenges. The groups will work on their own to develop an approach to the challenge. Each group will then present their solutions to the whole class orally, or by powerpoint or even prototype mock up. One of the projects will be selected to be developed further as a grant application or a provisional patent application.

**Plagiarism:**

Plagiarism is the presentation of someone else’s ideas or work as one’s own. Students must give credit for any information that is not either the result of original research or common knowledge. If a student borrows ideas or information from another author, he/she must acknowledge the author in the body of the text and on the reference page. Students found plagiarizing are subject to the penalties outlined in the Policies and Procedures section of the University Catalog, which include a hearing by the Honor Code Committee and may include a failing grade for the work in question or for the entire course. The following website provides helpful information concerning plagiarism for both students and faculty: <http://oai.gmu.edu/the-mason-honor-code-2/plagiarism/>

**Honor Code:**

* George Mason University has an Honor Code, which requires all members of this community to maintain the highest standards of academic honesty and integrity. Cheating, plagiarism, lying, and stealing are all prohibited
* All violations of the Honor Code will be reported to the Honor Committee.
* See <http://oai.gmu.edu/the-mason-honor-code-2/> for more detailed information.

**Enrollment:**

* Students are responsible for verifying their enrollment in this class.
* Schedule adjustments should be made by the deadline published on the Registrar’s website.
* Note the add/drop dates in the Academic Calendar published on the Registrar’s website.
* After the last day to drop a class, withdrawing from this class requires the approval of the dean and is only allowed for nonacademic reasons.
* Undergraduate students may choose to exercise a selective withdrawal.
* See <http://registrar.gmu.edu> for selective withdrawal procedures.

**Ethics:**  
Ethical behavior in the classroom is required of every student. The course will identify ethical policies and practices relevant to course topics.

**Technology:**

Students are expected to be competent in using current technology appropriate for this discipline. Such technology may include presentation software. Students are required to become familiar with Mason’s Responsible Use of Computing Policy #1301 <http://copyright.gmu.edu/?page_id=301>

**Diversity:**

Learning to work with and value diversity is essential in every class. Students are expected to exhibit an appreciation for multinational and gender diversity in the classroom.

**Civility:**

As a diverse community of learners, students must strive to work together in a setting of civility, tolerance, and respect for each other and for the instructor. Rules of classroom behavior (which apply to online as well as onsite courses) include but are not limited to the following:

* Conflicting opinions among members of a class are to be respected and responded to in a professional manner.
* Side conversations or other distracting behaviors including cell phone use or non-class online access are not to be engaged in during lectures, class discussions or presentations
* There are to be no offensive comments, language or gestures

Students not complying will be asked to cease immediately or leave the class session. **Students with Disabilities:**

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Resources at 703.993.2474.  All academic accommodations must be arranged through that office.