NJIT BIOLOGY

Course Syllabus

SPRING 2015

BIOLOGY 698-002: BIO-INSPIRED ROBOTICS

INSTRUCTOR:	Dr. Brooke Flammang	**EMAIL:**	flammang@njit.edu
OFFICE:	Central King Bldg.	**OFFICE HOURS:**	T: 10:30am –11:30am
COURSE SCHEDULE:	T, R: 11:30AM – 1255PM ▪ CKB 313	**COURSE WEBSITE:**	http://moodle.njit.edu/

COURSE DESCRIPTION:

This course emphasizes interdisciplinary design collaboration and incorporates studying primary biological literature, videoconferencing with scientists building bioinspired robotics, and design and construction of a device based on biological and physical principles. This exposes the students to the precise experimental methods and detailed recording-keeping practices that are needed to produce high-quality scientific data.

COURSE PREREQUISITES: Hum 102, R120:201/202, and BIOL 205/206

CLASS POLICIES:

Cell Phones: The use of cell phones during class or exam times is prohibited.

Makeup Exam Policy: There will be no makeup exams, except in rare situations where the student has a legitimate reason for missing an exam, including illness, death in the family, accident, requirement to appear in court, etc. The student must notify the Biological Sciences office and the Instructor that he/she will miss an exam. In all cases, the student must present proof for missing the exam TO THE DEAN OF STUDENTS OFFICE, e.g., a doctor's note, police report, or court notice, etc., clearly stating the date and times.

Academic Integrity: Students are reminded of the Honor Code each one has agreed to abide by (at Rutgers or NJIT). Violations of Academic Integrity will be dealt with according to the guidelines indicated in the NJIT Academic Honor Code (http://www.njit.edu/education/pdf/academic-integrity-code.pdf). Please re-read Article III of the Honor Code (page 4), which describes conducts that are considered unacceptable (cheating, violating the US Copyright law, etc). Rutgers has similar rules (http://www.ncas.rutgers.edu/oas/ai).

GRADING POLICY:

COMPONENT	PERCENT
Participation	20%
Quizzes	20%
Presentation/Discussion Leader	20%
Project	20%
Final Exam	20%
TOTAL	**100%**

GRADING SCALE	
A	88-100
B+	81-87
B	74-80
C+	67-73
C	60-66
F	0-59

BIOLOGY 698-002: BIO-INSPIRED ROBOTICS

LEARNING EXPECTATIONS AND ASSESSMENT:

This course is designed to introduce students to understanding the physical mechanisms that biological organisms have evolved to interact with their environment. Bioinspired robotic models are becoming increasingly useful in both experimental biology and applied technologies when engineered to take advantage of the biological phenomenon found in nature. Students will be expected to read the assigned primary literature each week. A short five minute quiz will be given at the beginning of each class meeting to assess reading comprehension. Tuesday class meetings will be focused on discussion of the biological mechanism being investigated. Thursday class meetings will discuss the bioinspired application and in many cases will include a skype conference with the scientist who developed the technology. Students are expected to complete all assigned reading in advance of the class meeting and participate in all discussions. Each student will have to present one of the biological papers (Tuesday) and lead the discussion for that day.

By the end of the course students are expected to have selected a biological mechanism and produce a 5-7 page paper (TNR 12 pt, double spaced, 1" margins) about the mechanism and the design features that could be applied to a new technology. In addition to the text pages, students must include either a detailed blueprint for their design or a physical model of how they think it would work.

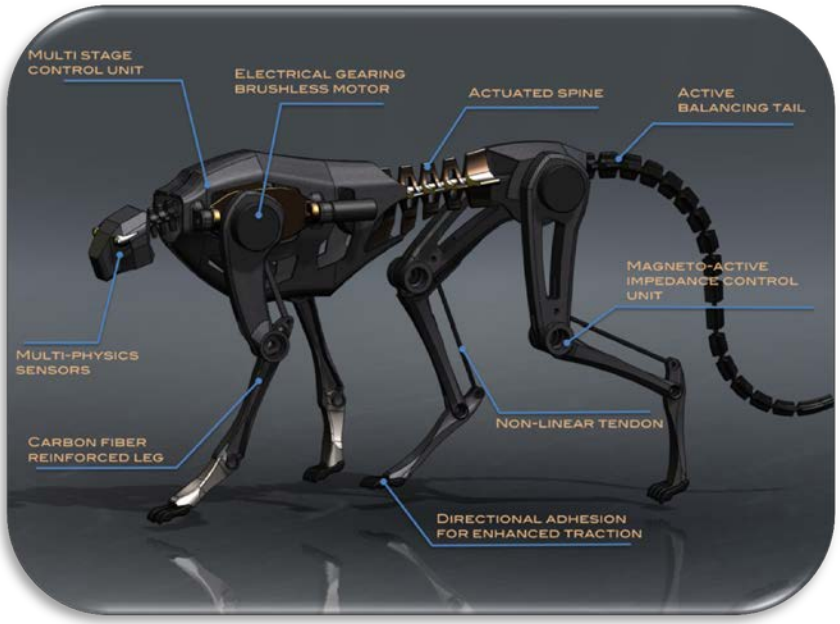
At the end of this course students should have the necessary skills to:

1.) analyze and interpret scientific data.

2.) give an effective scientific presentation.

3.) communicate biology through writing.

4.) find and evaluate scientific literature relevant to their interests.



BIOLOGY 698-002: BIO-INSPIRED ROBOTICS

COURSE OUTLINE:

DATES	LECTURE TOPICS	ASSIGNMENT DUE (PAPER PDFs ON MOODLE)
T 20 Jan	What is a bioinspired robot?	
R 22 Jan	Principles of Biomechanics	
T 27 Jan	All Terrain: Big dog	Raibert et al. 2008
R 29 Jan	Need for Speed: Cheetah robot	Lewis et al. 2011
T 3 Feb	sidewinder	Jayne 1988
R 5 Feb	Sidewinder-inspired robot	Marvi et al. 2014
T 10 Feb	Cockroach stability	Ting et al. 1994
R 12 Feb	RHex: cockroach-inspired robot (Chen Li?)	Saranli et al.
T 17 Feb	Gecko adhesion	Autumn et al. 2002
T 17 Feb	**Dr. Tonia Hseih (Temple) 1pm**	**Biology Colloquium Speaker**
R 19 Feb	Gecko inspirations: Dr. Duncan Irschick	TBD
T 24 Feb	Bat aerodynamics	Hubel et al. 2012
R 26 Feb	Ro-bat	Bahlman et al. 2013
T 3 Mar	How flies fly	Ristroph et al. 2010
R 5 Mar	Teeny fly robots	Ma et al. 2013
T 10 Mar	Salamander	TBD
R 12 Mar	Salamander	TBD
»	**SPRING BREAK – MARCH 16-20, 2015**	
T 24 Mar	Frogs	TBD
R 26 Mar	Frogenstein: Dr. Chris Richards	Richards and Clemente 2012
T 31 Mar	Virtual class	Biorobotic Forum
R 2 Apr	Student Short Presentations	Project Plan Due
T 7 Apr	Manta ray swimming	Rosenberger 2001
R 9 Apr	Manta-bot	Moored et al 2011
T 14 Apr	Evolving Robots	TBD
R 16 Apr	Evolving Robots: Dr. John Long	Roberts et al 2014
T 21 Apr	Knifefish	Youngerman et al 2014
R 23 Apr	Knifefish robot	TBD
T 28 Apr	Virtual Class	Biorobotic Forum/Project Updates
R 30 Apr	Bluegill sunfish	Flammang and Lauder 2009
T 5 May	Bluegill AUV (Tangorra)	Esposito et al 2012,Tangorra et al 2011
8-14 May	Finals Week	**Bioinspired Design Project Due**
FINALS	**FINAL EXAM WEEK: MAY 8-14, 2015**	