NJIT BIOLOGY

Course Syllabus

SPRING 2016

BIOLOGY 698-002: BIO-INSPIRED ROBOTICS

INSTRUCTOR:	Dr. Brooke Flammang	**EMAIL:**	flammang@njit.edu
OFFICE:	Central King Bldg.	**OFFICE HOURS:**	R: 1:00pm –2:00pm or by appointment
COURSE SCHEDULE:	T, R: 2:30PM – 3:55PM ▪ CKB 207	**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. Experience with coding is beneficial but not required.

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%
Midterm Exam	20%
Presentation/Discussion Leader	20%
Robot Project	20%
Final Paper	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 and be actively involved in discussions on their content. Each student will have to present the papers on a particular day's topic 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 7-10 page paper (TNR 12 pt, double spaced, 1" margins; not including references and figures) about the biological phenomenon of interest and the design features that could be applied to a new technology. In addition to the paper, students must include a physical model of how they think it would work.

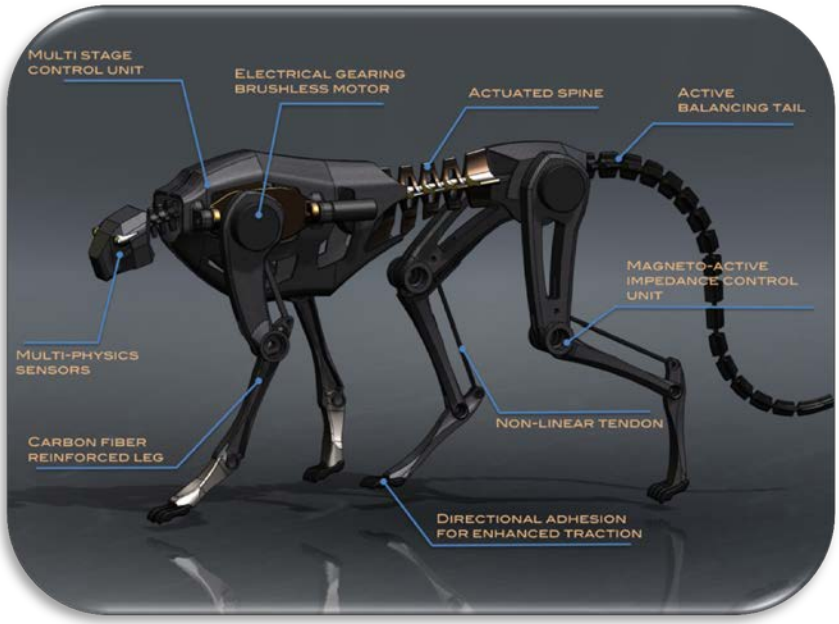
At the end of this course students should have the necessary skills to:

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 19 Jan	What is a bioinspired robot?	
R 21 Jan	Principles of Biomechanics	
T 26 Jan	Quadrupeds: Big dog, Cheetah	Raibert et al. 2008, Lewis et al. 2011
R 28 Jan	Granular media: Sidewinder	Jayne 1988, Marvi et al. 2014
T 2 Feb	Stability: Cockroach	Ting et al. 1994, Saranli et al. 2001
R 4 Feb	Adhesion: Geckos	Autumn et al. 2002, Bartlett et al. 2012
T 9 Feb	Flight 1: Bats	Ting et al. 1994
R 11 Feb	Flight 2: Flies	Ristroph et al. 2010, Ma et al. 2013
T 16 Feb	Amphibious: Salamander	Frolich and Biewener 1992, Karakasilotis et al. 2013
R 18 Feb	Swimming 1: Frogs	Richards and Biewener 2007, Richards and Clemente 2012
T 23 Feb	Swimming 2: Mantas	Rosenberger 2001, Moored et al 2011, 2011b
R 25 Feb	Swimming 3: Fishes	Esposito et al 2012, Tangorra et al 2011, Curet et al. 2011
T 1 Mar	**MIDTERM EXAM**	
R 3 Mar	Student Short Presentations	**Project Plan DUE**
T 8 Mar	Project Workshop	Arduino tutorials
R 10 Mar	Project Workshop	Arduino tutorials
3/15&17	**SPRING BREAK – MARCH 13-20, 2015- NO CLASSES**	
T 22 Mar	Project Workshop	
R 24 Mar	Project Workshop	
T 29 Mar	Project Workshop	
R 31 Mar	Project Workshop	
T 5 Apr	Independent Writing	
R 7 Apr	Independent Writing	**Draft of Final Paper DUE**
T 12 Apr	Project Workshop	
R 14 Apr	Project Workshop	
T 19 Apr	Project Workshop	
R 21 Apr	Project Workshop	
T 26 Apr	Project Workshop	
R 28 Apr	Project Workshop	
T 3 May	TBD	
6-12 May	Finals Week	**Bioinspired Design Project Due**
FINALS	**FINAL EXAM WEEK: MAY 6-12, 2015**	