IDH3931 Section 3902 Class Number: 23168

Course on Arts, Science and Education (CASE): "Leonardo's mechanical dragonfly and the evolution of flight in insects"

SPRING 2020

2 credits, no prerequisites

Location: Hume

Meeting time: Thursdays: 8th and 9th periods (3pm to 4:55pm)

Humankind has been fascinated by the idea of flight since the dawn of recorded history. One of the oldest known references to human flight is found in Greek mythology, where Daedalus, a craftsman and artist, made wings from bird feathers, strings and wax for his son Icarus and himself. However, it wasn't until the 1480s, that Leonardo da Vinci (1452 – 1519) started to write about his view of the science behind flight through his observations of birds and insects. In this course, we will merge the science and art behind Leonardo's vision from the perspectives of current biology, physics, engineering and art. In this interdisciplinary course, students will learn how to use current technology such as 3D printing to print insects, as well as other art techniques used by Leonardo, the physics and mechanics of dragonfly flight, and the evolution of insect flight. With the gained knowledge, the students will co-create and conduct hands-on educational activities with K-12 students at local schools or another public audience (service learning component). As this course does not required any previous experience in art, science and education, basic concepts will be introduced but not particularly derived in the course, however students are encouraged to deepen in the topics of their interest as the course unfold and instructors will be here to guide them based on the instructors expertise. The overarching goal of the course are two-fold, one is to empower UF and K-12 students to be inventors, as well as for them to appreciate, respect, and protect the very thing that inspired Leonardo, our natural world. The emphasis of this course is on team work, co-creation, science communication, and mostly to think without limits.

Teaching team Spring 2020

Dr. Marina Ascunce, Co-Instructor and course coordinator, ascunce@ufl.edu

I am an evolutionary biologist with broad interests on host-parasite and environment interactions, biological invasions and climate change. My courses reflect my interdisciplinary research and are focus on hands-on learning activities, scientific literature discussion through team-work and peer-instruction, and science communication. In this course, I will introduce students to concepts of evolution, impact of insects in our societies, conservation, and connect the science of Leonardo's work to our current knowledge in biology.

Dr. Brett Aiello, Co-Instructor, brett.aiello@physics.gatech.edu

I am an evolutionary biologist with a broad interest in the neural and mechanical mechanisms of animal locomotion. My current research focuses on the evolution of insect flight stability and maneuverability. In this course I well students explore the physics of flight, the relationship

between wing size, shape, and aerodynamics from an engineering perspective, and the evolution of insect flight.

Mrs. Maria De Vecchi, Co-Instructor, mariadevecchimx@gmail.com
I am a graphic designer, entrepreneur. I will lead the topics on Leonardo's art techniques and concepts such at the Aurea proportions as it related to arts and science.

Dr. Edward L. Stanley, Co-Instructor, elstanley@ufl.edu
webpage: www.edwardstanley.org
www.floridamuseum.ufl.edu/digital-lab/

Dr. Mayra L. Cordero, Co-instructor, mcordero@pky.ufl.edu
I have been teaching Science in K-12 grades for more than 10 years. I will guide UF students in the development of the K-12 educational materials and advise them in their classroom implementation. I will also supervise the pre and post assessments to evaluate the impact of such program on K-12 student engagement and learning.

Ms. Patricia Perez, Undergraduate Teaching Assistant, p.perez@ufl.edu
I am a UF Emerging Scholar undergraduate student with major in Environmental Sciences. I have more than 5 years of experience conducting outreach activities through institutions such as Zoo Miami and Fairchild Botanical Gardens and UF. I will bring my experience and knowledge on insects and on outreach to the course to guide students in the K-12 activities.

Bernard Mingo, Undergraduate Teaching Assistant, enzomingo@ufl.edu
I am an undergraduate student with major in Digital Arts & Sciences. I have more than 4 years of experience in 3D modeling and 3D printing. I will be teaching those concepts through the course and guide students in their 3D printing projects.

Guest lectures: The course will have a series of wonderful guest lectures that are going to be indicated in the schedule below.

Course Description: This is an interdisciplinary Course on Arts, Science and Education (CASE) where theme is "*Leonardo's mechanical dragonfly and the evolution of flight in insects*". For this CASE 2020, we will create 3D models of actual dragonflies and will replicate Leonardo da Vinci's mechanical dragonfly machine using models produced by Elenco company. Comparisons of these two types of models will be used to understand the physics and mechanics of the dragonfly flight. Dragonflies is a group of insects that belong to the order Odonata, Suborder Anisoptera with more than 3,000 described species. They are related to the griffenflies (Meganisoptera), an extinct a group of large to gigantic predatory flying insects, with wingspans of 12 to 75 cm, and fossil remains from the Carboniferous Period (~359.2 to 299 million years ago). Current dragonflies display wingspans ranging from 20 mm to 90 millimeters, and due to their long evolutionary history, Odonata can be found on every continent except Antarctica. Dragonflies have also been present in human culture since the origin of humankind, in pottery, rock paintings, jewelry, traditional medicine, food, and are a source of inspiration to writers, poets and artists in general. In recent years, dragonflies have also been study based on

biologically-inspired principles to develop Micro Air Vehicles, this miniature class of unmanned aerial vehicles (UAVs) have been subject of extensive investigation with potential uses in hazardous environments and for remote observations or surveillance.
Because dragonflies are bioinspiration models, this course will provide the students the opportunity to think broadly and foster in them an unlimited way of approach scientific questions such as insect flight. As one of the University of Florida statements says: "We see things not as they are, but as they could be."

Course Format: This CASE course is limited to 15 students and combines hands-on work, article discussions, project presentations and a final outreach educational project. We will meet once a week for about 2 hours. Students will be forming team of 2 to 3 students. There will be two field trips on campus during our time to the Harn Art museum and to the Florida Museum of Natural History, both on campus. Additional trips to the University garden which is walking distance from Hume will be conducted for different activities.
It is expected that the students meet outside the class time to prepare paper discussions and project presentations at least once a week.
Students should come to class having done any required reading or preparation, and ready to engage on active learning activities.

Course goals:
Lesson Learning Goals:
Students will:

- Gain appreciation of intellectual diversity by learning about insect fly from multiple disciplines
- Develop skills in communicate knowledge through arts
- Increase confidence to take intellectual risks
- Practice '*academic consciousness*' through engage in inclusive, respectful, and honest dialogs

Lesson Learning Objectives:
The successful student will complete this course with a variety of new knowledge and skills. By the end of the course, students will be able to:

- Understand basic concept of the insect flight and Leonardo's machine
- Learn some of Leonardo's drawing and painting techniques, and 3D printing
- Understand the importance of insect for our society and the earth
- Gain the ability to assess the current and potential use of biological design in our society and earth
- Be able to work together in a team in a respectful way

Prerequisites: As this course does not required any previous experience in art, science and education, basic concepts will be introduced but not particularly derived in the course, however students are encouraged to deepen in the topics of their interest as the course unfold and instructors will be here to guide them based on the instructors expertise.

Readings: Reading materials and media will be available on E-learning or freely available on the internet.

Grading (out of 100 pts):
30 Participation and team-work
10 Quizzes (2 pts each, there will be short quizzes)
20 Leading Paper Discussions: Students will research and present to the class on a topic covered in the course
10 Co-creative classroom guided projects
10 Team Project Proposal Presentation
20 K-12 or general audience activity

Grade and associated percent ranges %
A 93-100; A- 90-92; B+ 88-89; B 83-87; B- 80-82; C+ 78-79; C 73-77; C- 70-72; D+ 68-69; D 63-67; D- 60-62; E <60

For information on current UF policies for assigning grade points, see https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Participation: Participation points are earned by: 1) your presence at each class meeting (laboratories, discussions and presentations), 2) your engagement in small group discussions during class. Class attendance is required and included in your grade as participation. To receive full credit, you will need to come to class on time and well prepared (having done any required reading or assignment), actively participate throughout the discussion/activity, and follow any instructions specific to the activity.

Presentations: Presentations are an opportunity for students to deeply explore a particular topic and present the material to the class, gaining public speaking skills. Students will work in pairs.

Each participant will lead or co-lead a journal article discussion for the group.

Extra credit (no more than 5%)
You can discuss extra credit opportunities with your assigned member of our teaching team.
Extra Credit Opportunities will be available throughout the semester and may include:
There are four extra credit opportunities that we encourage all of the students to participate. These activities are:
1) Attending and presenting* at the UF Undergraduate Research Symposium.
2) Collaborate in the developing of outreach material to use during "*The ImportANTS of Ants*" educational program. Students will meet with the team to develop and construct the educational material to be used during school visits.
3) Short (3 minutes) elevator speech type presentation via video (e.g. youtube). Each student will create an end of the course-Take home message about this course, what they would tell to their friends and family about the course. More TBD.

Course outline (*as of December 16, 2019) this is an outline and it is subject to change*; changes will be posted on the course Canvas site.

Weeks	Dates	**Thursdays**: Class meeting, field trips, presentations
1	January 9	Introduction to CASE and research projects General concepts of evolution and insects in our society – Building the Mechanical Dragonfly Machine K-5 outreach science experience from Dr. Lopez Torres, Florida Museum of Natural History
2	January 16	Dragonfly diversity and visit to the University Gardens Guest lecture by Dr. Franklin "Buck" Snelson, Florida Museum of Natural History
3	January 23	The physics and evolution of insect flight
4	January 30	Visit to the Florida Museum of Natural History Butterfly Exhibition and active learning activity about flight in insects and other organisms
5	February 6	Leonardo da Vinci his art and machines / Biological design
6	February 13	*Aurea Proportion* in arts and Science
7	February 20	Proportion in Leonardo practice
8	February 27	Sfumato / Use of the Harn studio
9	March 5	**SPRING BREAK**
10	March 12	Student lead articles/ Visit the Harn Museum
11	March 19	3D Printing in Science
12	March 26	3D Printing in Science
13	April 2	How to communicate science through art / Student lead articles Guest lecture from the SciArt program, Florida Museum of Natural History
14	April 9	Project Proposal Presentations
15	April 16	Project Proposal Practices
16	After April 22 to May 1	Conduct Educational Activity K-12 or general audience

Attendance and Make-Up Work
Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at: **https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.**

Cell Phones
Students are expected to turn off - or put on silent - and put away all cell phones during class sessions.

Online Course Evaluation Process
Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of

instruction in this course using a standard set of university and college criteria. These evaluations are conducted online at https://evaluations.ufl.edu. We also will ask students to please complete pre-course and post-course surveys.

Academic Honesty
As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code.

Accommodations for Students with Disabilities
The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students should first register with the Disability Resource Center at 0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/ and provide appropriate documentation.

UF Policy on Software Use
All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Campus helping resources: U Matter, We Care
At UF Every Gator Counts. U Matter, We Care serves as UF's umbrella program for UF's caring culture and provides students in distress with support and coordination of the wide variety of appropriate resources. Families, faculty, and students can contact umatter@ufl.edu seven days a week for assistance for students in distress.

The university's counseling resources are available for students experiencing personal problems that interfere with their general well-being and/or academic performance. The Counseling & Wellness Center provides confidential counseling services at no cost for students that are currently enrolled with the university.

- University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/
    - Counseling Services
    - Groups and Workshops
    - Outreach and Consultation
    - Self-Help Library
    - Training Programs
    - Community Provider Database
- Career Resource Center, First Floor JWRU, 352-392-1601, www.crc.ufl.edu/

Student complaints

If there is an issue in the course, please bring it to the instructor's attention. UF policies about more serious complaints are described in these documents.

- Residential Course: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf
- Online Course: http://www.distance.ufl.edu/student-complaint-process

UF Diversity Statement

The University of Florida is committed to creating a community that reflects the rich racial, cultural, and ethnic diversity of the state and nation. No challenge that exists in higher education has greater importance than the challenge of enrolling students and hiring faculty and staff who are members of our country's diverse groups. This pluralism enriches the university community, offers robust academic dialogues, and contributes to better teaching and research. The University benefits from the richness of a multicultural student body, faculty, and staff who can learn from and support one another. Diversity and inclusion empower and inspire respect and understanding among us. Importantly, the University does not tolerate the actions of anyone who violates the rights of another person.

Through policy and practice, the university strives to embody a diverse and inclusive community, creating a university that truly reflects the greatness of our state and nation.

"Together we can accomplish academic excellence within our community, reflective of the rich culture and diversity of our state and nation." President Fuchs