

 <b>FLORIDA ATLANTIC UNIVERSITY</b>	<b>NEW COURSE PROPOSAL</b> <b>Graduate Programs</b>		UGPC Approval _____ UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner _____ Catalog _____	
	<b>Department Biological Sciences</b> <b>College Science</b> (To obtain a course number, contact <a href="mailto:erudolph@fau.edu">erudolph@fau.edu</a> )			
<b>Prefix</b> ZOO <b>Number</b> 6377	(L = Lab Course; C = Combined Lecture/Lab; add if appropriate) <b>Lab Code</b>	<b>Type of Course</b> lecture	<b>Course Title</b> Advanced Animal Locomotion	
<b>Credits</b> (Review <a href="#">Provost Memorandum</a> ) <b>3</b>	<b>Grading</b> (Select One Option)  <b>Regular: X</b>  <b>Sat/UnSat</b>	<b>Course Description</b> (Syllabus must be attached; see <a href="#">Guidelines</a> ) This course explores animal movement over a range of species and environments. Graduate students will explore modes of locomotion by examining anatomy and mechanics of both skeletal and muscular systems, and the media through which an animal moves. Topics will be presented through lecture material, and readings from the primary literature and text. Students show mastery of topics through presentations utilizing active learning techniques and written papers.		
<b>Effective Date</b> (TERM & YEAR) <b>Fall 2020</b>	<b>Prerequisites</b>  <b>Academic Service Learning (ASL) course</b> Academic Service Learning statement must be indicated in syllabus and approval attached to this form.			
<b>Prerequisites, Corequisites and          Registration Controls are enforced for all          sections of course.</b>		<b>Corequisites</b> none	<b>Registration Controls</b> (For example, Major, College, Level)	
<b>Minimum qualifications needed to teach          course:</b> Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)		<b>List textbook information in syllabus or here</b> see syllabus		
<b>Faculty Contact/Email/Phone</b> Porter / mporte26@fau.edu / 7-1288		<b>List/Attach comments from departments affected by new course</b> chairs contact in Biological Sciences and Ocean Engineering		

<b>Approved by</b> Department Chair <u>          Sarah L. Nathan          </u> College Curriculum Chair <u>          Christopher Beetle          </u> 2020.08.24 14:00:18 -04'00' College Dean <u>          William David Kalie          </u> UGPC Chair _____ UGC Chair _____ Graduate College Dean _____ UFS President _____ Provost _____	<b>Date</b> <u>          4-22-2020          </u>  <u>          08/24/2020          </u>  _____ _____ _____ _____
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Email this form and syllabus to [UGPC@fau.edu](mailto:UGPC@fau.edu) 10 days before the UGPC meeting.

## Advanced Animal Locomotion

**Course:** ZOO 6377 (3 credits)

**Semester:** Fall 2020

**Instructor:** Dr. Marianne Porter

**Email:** me.porter@fau.edu

**Office:** Sanson 211;

**Phone:** 561-297-1288

**Hours:** Monday and Wednesday, 2:00-3:30 pm

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### Course schedule:

**Time:** Monday and Wednesday; 4:00 – 5:20 pm

**Location:** PS 113

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**Prerequisites:** BS degree

### Course description:

This course explores animal movement over a range of species and environments. Graduate students will explore modes of locomotion by examining anatomy and mechanics of both skeletal and muscular systems, and the media through which an animal moves. Topics will be presented through lecture material, and readings from the primary literature and text. Students show mastery of topics through presentations utilizing active learning techniques and written papers.

**Textbook:** "Animal Locomotion, 2<sup>nd</sup> edition" by A.A. Biewener and S.N. Patek (2018). Oxford University Press

### Course objectives:

This course will expose students to the fundamentals of animal locomotion. How do animals move? How do different aspects of an animal's environment affect their movement? What techniques can we use to study locomotion? Students will learn about the physics of locomotion and motion analysis, and knowledge will be culminated in an end of the semester symposium presentation. Students will be expected to demonstrate their understanding for major concepts by answering questions in weekly discussions.

### Content:

This course is designed to have a significant student presentation / peer engagement component. Class discussions will focus on contemporary issues in animal locomotion through presentations and discussions of assigned readings. The course is comprised of the following assignments:

Each week we will cover a different chapter from the required text and papers from the primary literature. For each session, a graduate student will **present a book chapter** and **lead a class discussion** on the assigned readings, chosen in conjunction with the instructor (see attached schedule). Throughout the semester, graduate students will **develop an active learning, Teachable Tidbit**. This tidbit will be used in class, revised, presented at FAU High School, and based on the feedback from FAU HS, graduate students will prepare papers on the active learning lesson and the science behind the lesson, which will then upload to an educational database (courcesource.org; a peer-reviewed open access journal). Additional details can be found in a separate document.

Please remember, it is the duty of discussion team leaders to only answer technical questions about the papers and to keep the discussion moving along. **It is the responsibility of each student in the class to critically review each paper and raise their questions to the group.** For example, has the author formally stated a hypothesis or question? Is the methodology correct or appropriate? Are the data adequate and have the appropriate statistical analyses been performed? Do the data justify the author's conclusions? *A significant portion of your grade will be based upon your class participation in these discussions for the duration of the course.*

**Participation:**

The level of participation exhibited by each student during class discussions and activities determines part of the final grade.

**Peer review:**

Students will be required to provide a written peer-review of the chapter presentations, teachable tidbits, and symposium presentations. Your thoughtful review will be used to derive a grade for your colleagues. Part of your grade is determined by the constructive feedback you provide to your peers.

<b>Graduate evaluation:</b>		<b>Course grading scale:</b>	
Teachable Tidbits	30	A	90-100
Participation	20	B	80-89
Paper	30	C	70-79
Chapter / paper discussion	20	D	60-69
Total	100	E	<60

**Attendance policy:** Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance.

*Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University- approved activities.* Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student’s responsibility to give the instructor at least two-weeks notice prior to any anticipated absences and as soon as practical after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student’s final course grade as a direct result of such absence.

**Make up policy:** Students will not be penalized for absences due to participation in University-approved activities, including athletic or scholastics teams, musical and theatrical performances, and debate activities. ***Students must inform the instructor at least two weeks in advance of any absence for a University-approved activity.*** In the event of unscheduled absences or missed work, please email Dr. Porter as soon as practical and come to her next available office hours to discuss

late work. Grades of Incomplete (“I”) are reserved for students who are passing a course but have not completed all the required work because of exceptional circumstances.

**Religious accommodation:** Reasonable accommodation will be made for students participating in a religious observance. These requests should be made well in advance of a missed class.

**Disability Policy Statement:** In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU’s campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at [www.fau.edu/sas/](http://www.fau.edu/sas/).

**Academic Integrity Policy:** Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see [University Regulation 4.001](https://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf). [https://www.fau.edu/ctl/4.001\\_Code\\_of\\_Academic\\_Integrity.pdf](https://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf)

**Counseling and Psychological Services (CAPS) Center:** Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU’s Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>

**Credit Hour Policy:** **Excess Hours Surcharge**<sup>SEP</sup> Florida Statute 1009.286 defines “excess hours” as credit hours that exceed the completion requirements for a baccalaureate degree program at state universities. For students enrolling in a state university or a Florida State College System institution for the first time in or after the fall 2009 semester, a tuition rate surcharge will be applied for excess hours. The surcharge is assessed only on the tuition portion of the semester hour cost, not on the fees. The amount of the surcharge and the allowable “excess hours” are determined by the initial term of entry as indicated in the catalog. For the complete Policy see <http://www.fau.edu/academic/registrar/FAUcatalog/academics.php#excess>.

Don’t waste your time and money! Use the below tips to get and stay on track for a timely graduation.

- 1) Learn how to navigate the “MY FAU” web portal. Familiarize yourself with features available through “FAU Self-Service” located within the “Home” tab as well as the features available in the “Students”, “Money Matters!” and “Success Network” tabs.

- 2) Use the **flight plans** available on the FAU website to build your own academic plan. The flight plans are suggested four-year course schedules leading to completion of the **Biology B.A.** or the **Biology B.S.** (blueprints for graduation within four years!). For Biology majors who wish to apply to a medical or professional program upon graduation, a suggested **Pre- Health** version of the Biology B.S. flight plan is also available.
- 3) Use the “**Departmental Schedule**” (not the “Searchable Schedule”) to see **all** courses available (by department) within a given semester when working to schedule your classes.
- 4) Use the **Degree Audit Reporting System (DARS)** to keep track of which requirements you still need to fulfill in order to graduate. When running your degree audit, you may audit your progress against the catalog year in which you first entered FAU (provided that you have maintained continuous enrollment) OR the current catalog year. You may also select alternate degree options to see if you are closer to completing one degree than another compare the Biology B.S. with the Biology B.A.).

**\*\*\*Please note the above excess credit hour policy. It is your responsibility to work with your academic advisor to minimize additional costs to you associated with the completion of excess credits.**

Reading assignments – the instructor reserves the right to reassign the order of the lectures. TBA: Primary literature associated with the chapters will be posted on Canvas.

Date	Topic
24, 26 August	Go over syllabus Scientific reading Teachable tidbit example Ch 1, Physical and Biological Properties and Principles
31, 2 August/ September	Finish Ch 1 Ch 2, Muscles and skeletons: the building blocks of animal movement
7, 9 September	<b>NO Classes on September 7</b> Ch 2 literature: – Body condition impacts blood and muscle oxygen storage capacity of free-living beluga whales ( <i>Delphinapterus leucas</i> ) <a href="https://jeb.biologists.org/content/222/11/jeb191916">https://jeb.biologists.org/content/222/11/jeb191916</a> – Muscle fibers bear a larger fraction of passive muscle tension in frogs compared with mice <a href="https://jeb.biologists.org/content/221/22/jeb182089">https://jeb.biologists.org/content/221/22/jeb182089</a>
14, 16 September	Ch 3, Energetics of locomotion Literature: – Fish swimming in schools save energy regardless of their spatial position <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4293471/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4293471/</a> – Energetic costs of locomotion in bears: is plantigrade locomotion energetically economical? <a href="https://jeb.biologists.org/content/221/12/jeb175372">https://jeb.biologists.org/content/221/12/jeb175372</a>
21, 23 September	Ch 4, Movement on Land Literature: – Comparative locomotor costs of domestic dogs reveal energetic economy of wolf-like breeds <a href="https://jeb.biologists.org/content/220/2/312">https://jeb.biologists.org/content/220/2/312</a> – Compliant legs enable lizards to maintain high running speeds on complex terrains <a href="https://jeb.biologists.org/content/222/6/jeb195511">https://jeb.biologists.org/content/222/6/jeb195511</a>
28, 30 September	Ch 5, Movement on Water Literature: – Function of the heterocercal tail in sharks: quantitative wake dynamics during steady horizontal swimming and vertical maneuvering <a href="https://jeb.biologists.org/content/205/16/2365">https://jeb.biologists.org/content/205/16/2365</a> – Pectoral fin kinematics and motor patterns are shaped by fin ray mechanosensation during steady swimming in <i>Scarus quoyi</i> <a href="https://jeb.biologists.org/content/223/2/jeb211466">https://jeb.biologists.org/content/223/2/jeb211466</a>

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5, 7 October	<p>Ch 6, Movement in Air</p> <p>Literature:</p> <ul style="list-style-type: none"> <li>– Gliding for a free lunch: biomechanics of foraging flight in common swifts (<i>Apus apus</i>) <a href="https://jeb.biologists.org/content/221/22/jeb186270.abstract">https://jeb.biologists.org/content/221/22/jeb186270.abstract</a></li> <li>– Nathusius' bats optimize long-distance migration by flying at maximum range speed <a href="https://jeb.biologists.org/content/222/4/jeb176396.abstract">https://jeb.biologists.org/content/222/4/jeb176396.abstract</a></li> </ul> <p>– <b>tidbit topic determined</b></p>
12, 14 October	<p>Ch 7, Jumping, climbing, and suspensory locomotion</p> <p>Literature:</p> <ul style="list-style-type: none"> <li>– Comparison of spatiotemporal gait characteristics between vertical climbing and horizontal walking in primates <a href="https://jeb.biologists.org/content/222/2/jeb185702">https://jeb.biologists.org/content/222/2/jeb185702</a></li> <li>– The biomechanics of leaping in gibbons <a href="https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.21329">https://onlinelibrary.wiley.com/doi/full/10.1002/ajpa.21329</a></li> </ul> <p>– <b>tidbit outline discussed</b></p>
19, 21 October	<p>Ch 8, Neuromuscular control of movement</p> <p>– <b>tidbit progress check in</b></p>
26, 28 October	<p>Ch 8 Literature:</p> <ul style="list-style-type: none"> <li>– Neuromuscular control of hovering wingbeat kinematics in response to distinct flight challenges in the ruby-throated hummingbird, <i>Archilochus colubris</i> <a href="https://jeb.biologists.org/content/216/22/4161.full">https://jeb.biologists.org/content/216/22/4161.full</a></li> <li>– Neuromuscular control of locomotion is altered by tail autotomy in geckos <a href="https://jeb.biologists.org/content/221/18/jeb179564.full">https://jeb.biologists.org/content/221/18/jeb179564.full</a></li> </ul> <p>– <b>grad student teachable tidbits in class, tidbit revisions</b></p>
2, 4 November	<p>Ch 9, Evolution of Locomotion</p> <p>Literature:</p> <ul style="list-style-type: none"> <li>– Locomotor Patterns in the Evolution of Actinopterygian Fishes <a href="https://academic.oup.com/icb/article/22/2/329/2015957">https://academic.oup.com/icb/article/22/2/329/2015957</a></li> <li>– Fossils, feet and the evolution of human bipedal locomotion <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1571304/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1571304/</a></li> </ul> <p>– <b>give tidbits at FAU HS</b></p>

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9, 11 November	Literature <b>NO Classes; Veteran's Day (Nov 11)</b> – assign paper topics: lesson or science behind the lesson
16, 18 November	Literature
23, 25 November	Literature (Monday) – <b>Work day for papers; draft due (Wednesday)</b>
30, 2 November /December	Last day of classes is December 2; – <b>paper progress check-in</b>
9 December	4:00-6:30; <b>papers are due</b>

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**From:** Pak-Cheung An pan@fau.edu  
**Subject:** RE: new Animal Locomotion course  
**Date:** February 6, 2020 at 2:16 PM  
**To:** Manhar Dhanak dhanak@fau.edu, Marianne Porter mporte26@fau.edu



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There is no conflict re your new courses. Good luck. Edgar

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**From:** Manhar Dhanak  
**Sent:** Thursday, February 6, 2020 7:37 AM  
**To:** Marianne Porter <mporte26@fau.edu>  
**Cc:** Pak-Cheung An <pan@fau.edu>  
**Subject:** Re: new Animal Locomotion course

Dear Marianne,

Thank you for reaching out. There does not appear to be any conflict between your new courses and our EOC 6663. However, I am copying this to Edgar An who teaches EOC 6663 for confirmation.

Regards,

Manhar Dhanak

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**From:** Marianne Porter <mporte26@fau.edu>  
**Date:** Tuesday, February 4, 2020 at 9:02 PM  
**To:** 'Manhar Dhanak' <dhanak@fau.edu>  
**Subject:** new Animal Locomotion course

Dear Dr. Dhanak,

I am an assistant professor in the Department of Biological Sciences and I am submitting paperwork to get my undergraduate and graduate Animal Locomotion courses added to the catalog. I am attaching the paperwork here for you.

I have searched the graduate and undergraduate course offerings in the College of Engineering to ensure these proposal are not redundant with other courses in your department or college. The only course that even mentions locomotion is Intelligent Underwater Vehicles (EOC 6663), which includes this description:

'Engineering principles for intelligent, unmanned, untethered, underwater vehicles (IU3 vehicles). Topics include vehicle kinematics; and tasks, behavior, locomotion, power sources and sensors.'

My proposed courses does not have an underwater vehicle focus, and my courses go in to more depth of the locomotion literature compared to EOC 6663, which only mentions locomotion as one topic of many to be covered.

Please let me know if I have missed any other course offerings or should take anything else into consideration. I have had a few OME undergrads working in my lab before and currently, and I

would really enjoy seeing other engineering students in this course in future semesters.

Thank you for your time.

Marianne

Marianne E. Porter  
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(The FAB Lab)  
Biological Sciences  
Florida Atlantic University  
Boca Raton, FL 33434  
[www.porterbiomechanics.wordpress.com](http://www.porterbiomechanics.wordpress.com)