**Syllabus, BISC 583, Spring 2018**

**Evolution & Adaptation of Marine Organisms**

***Draft version, 12/5/17***

Course overview

BISC 583 is a 4-unit course covering fundamentals of evolutionary patterns and processes in the marine environment, with emphasis on rates of adaptation to a changing ocean. It is primarily intended for first-year students in the Marine Biology and Biological Oceanography (MBBO) Graduate Program. Prerequisites are admission to the MBBO program or permission from the instructors.

Course objectives

This is a core course for first year students in the MBBO program. Students will gain background in the essentials of evolution and adaptation in marine microbes and metazoans, including quantitative approaches. In addition, they will gain experience in critiquing the current literature through discussions and written presentations.

Faculty

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Format

The course will meet in VKC 105 from 9:30 to 10:50 am on Tuesdays and Thursdays, with Tuesdays largely devoted to faculty lectures and Thursdays largely devoted to student-led discussions of primary literature. Course content will be posted on Blackboard (https://blackboard.usc.edu/).

Textbooks

Futuyma and Kirkpatrick (F&K), 2017. Evolution. Sinauer. ISBN 978-1605356051

Grading

Letter grades will be based on student-led discussions (10%), three writing assignments (10% each), assigned exercises (10%), three midterms (15% each) and overall participation (5%).

*Student-led discussions:* Students will alternate leading discussions of journal papers throughout the semester. All students should come to class prepared to lead, and the leader will be chosen in class. For each article students should be prepared to (1) state the central question or hypothesis of the article, (2) explain the tables and figures, (3) explain the main conclusion(s), (4) review key evidence supporting the conclusion(s), and (5) provide specific questions for general group discussion.

*Writing assignments:* Each student will write three reviews of journal articles presented in class, as if the articles were manuscripts being submitted for publication. Reviews should be brief (1-2 pages, single spaced) and should follow guidelines discussed in class. The three papers are due on Feb 13, Mar 27 and May 1. No late papers will be accepted.

*Assigned exercises.* Quantitative problems from the textbook(s) and other sources will be assigned each week.Exercises associated with each chapter in Futuyma & Kirkpatrick's Evolution are found at the textbook website (https://evolution4e.sinauer.com). Answers (either hardcopy or electronic copy) are due each week. Complete answers will get full credit, whether correct or incorrect. These exercises are representative of a subset of questions to be included on the midterms.

*Midterms*: Each of the three midterms will include a combination of short answer questions, calculations and essay questions. There will not be a final exam.

*Overall participation*: Participation scores are determined by the frequency and quality of contributions to class discussions.

**Statement for Students with Disabilities**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the instructor(s) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

**Statement on Academic Integrity**

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one’s own academic work from misuse by others as well as to avoid using another’s work as one’s own. All students are expected to understand and abide by these principles. Scampus, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: http://www.usc.edu/dept/publications/SCAMPUS/gov/. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.

Schedule

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| --- | --- | --- | --- | --- |
| **Date** | **Topic** | **Instructor** | **Reading** | **Assigned exercises** |
| *Evolutionary Processes* | | | | |
| T Jan 9 | Intro to Evolution/Adaptation | Edmands | F&K ch 1 | Ex 1.1 Q 1-10 (due 1/11) |
| Th Jan 11 | Journal club | Edmands | Dobzhansky 1973, Lynch 2007 |  |
| T Jan 16 | Natural Selection & Adaptation | Edmands | F&K ch 3 | Ex 3.1 Q1-5 (due 1/18) |
| Th Jan 18 | Journal club | Edmands | Dines et al. 2014, Waldbusser et al. 2016 |  |
| T Jan 23 | Quantitative Genetics | Edmands | F&K ch 6 | Ex 6.1 Q1-8 (due 1/ 25) |
| Th Jan 25 | Journal club | Edmands | Sunday et al. 2011, Gagnaire & Gaggiotti 2016 |  |
| T Jan 30 | Genetic Drift | Edmands | F&K ch 7 | Ex 7.2 Q1-3 (due 2/1) |
| Th Feb 1 | Speciation | Edmands | F&K ch 9 | Ex 9.1 Q1-3 (due 2/6) |
| T Feb 6 | Journal club | Edmands | Plough 2016, Meyer et al. 2016 |  |
| Th Feb 8 | **Midterm I** | Edmands |  |  |
| *Evolutionary Patterns* | | | | |
| T Feb 13 | Origin of Life | Heidelberg |  |  |
| Th Feb 15 | Journal club | Heidelberg |  |  |
| T Feb 20 | Tree of Life | Heidelberg |  |  |
| Th Feb 22 | Journal club | Heidelberg |  |  |
| T Feb 27 | Bacteria/Archaea | Heidelberg |  |  |
| Th Mar 1 | Journal club | Heidelberg |  |  |
| T Mar 6 | Eukaryotes/Multicellularity | Gracey |  |  |
| Th Mar 8 | Journal club | Gracey |  |  |
| USC Spring Break March 11-18 | | | | |
| T Mar 20 | Evo/Devo | Gracey |  |  |
| Th Mar 22 | **Midterm 2** | Gracey/Heidelberg |  |  |
| *Selective Agents* | | | | |
| T Mar 27 | Temperature & Pressure | Gracey/Heidelberg |  |  |
| Th Mar 29 | Journal club | Gracey/Heidelberg |  |  |
| T Apr 3 | Temperature & Pressure | Gracey/Heidelberg |  |  |
| Th Apr 5 | Journal club | Gracey/Heidelberg |  |  |
| T Apr 10 | Homeostasis | Gracey/Heidelberg |  |  |
| Th Apr 12 | Journal club | Gracey/Heidelberg |  |  |
| T Apr 17 | Water & Nutrients | Gracey/Heidelberg |  |  |
| Th Apr 19 | Journal club | Gracey/Heidelberg |  |  |
| T Apr 24 | Atmospheric Gases | Gracey/Heidelberg |  |  |
| Th Apr 26 | **Midterm 3** | Gracey/Heidelberg |  |  |

Journal club papers

Dines JP, E O-Castillo, P Ralph, J Alas, T Daley, AD Smith, MD Dean. 2014. Sexual selection targets cetacean pelvic bones. Evolution 68:3296-3306.

Dobzhansky Th. 1973. Nothing in biology makes sense except in the light of evolution. The American Biology Teacher 35(3): 125-129.

Gagnaire P-A, OE Gaggiotti. 2016. Detecting polygenic selection in marine populations by combining population genomics and quantitative genetics approaches. Curr. Zool. 62:603-616.

Lynch M. 2007. The frailty of adaptive hypotheses for the origins of organismal complexity. Proc. Nat. Acad. Sci. USA 104:8597-8604.

Meyer JR, DT Dobias, SJ Medina, L Servilio, A Gupta, RE Lenski. 2016. Ecological speciation of bacteriophage lambda in allopatry and sympatry. Science: DOI: 10.1126/science.aai8446

Plough LV. 2016. Genetic load in marine animals: a review. Current Zoology 62(6): 567-579.

Sunday, JM, RN Crim, CDG Harley, MW Hart. 2011. [Quantifying rates of evolutionary adaptation in response to ocean acidification.](http://www.plosone.org/article/info:doi/10.1371/journal.pone.0022881) PLoS ONE6(8): e22881.

Waldbusser GG, MW Gray, B Hales, CJ Langdon, BA Haley, I Giminez, SR Smith, EL Brunner, G Hutchinson. 2016. Slow shell building, a possible trait for resistance to the effects of acute ocean acidification. Limnol. Oceanogr. doi:10.1002/imo.10348