Instructors:

	Dr. Cameron Thrash	Dr. Carly Kenkel
Office Hrs:	On Request	On Request
Location:	AHF TBD	AHF 231A
Email:	thrash@usc.edu	ckenkel@usc.edu

Meeting times & Location: Fri 1:00-3:00pm, room TBD

Recommended Textbooks: *Practical Computing for Biologists*, Haddock & Dunn
Phylogenomics, DeSalle & Rosenfeld

Websites: https://blackboard.usc.edu

Course Description

Contemporary research in the biological sciences has capitalized on recent advances in computational methodologies to address novel questions relating to the ecology and evolution of life on this planet. To effectively contribute to this growing field, the next generation of biologists must have a solid foundation in both classical biology and bioinformatics. This hands-on course will introduce biologists with minimal to no prior command line experience to basic bioinformatics skills, software, and analysis pipelines.

Prerequisites: Admission to the MBBO or Ocean Sciences graduate programs or permission from the instructors.

Specific learning objectives. By the end of this course, students will be able to:
1) Submit batch jobs to an HPC system.
2) Execute a wide variety of command line operations.
3) Complete data transfer between multiple types of computing resources.
4) Create basic bash scripts.
5) Use several common bioinformatics programs.
6) Troubleshoot utilization of a novel software/analysis pipeline.

Schedule of lecture topics. *Note that the schedule is subject change*. Any schedule changes will be discussed in class and posted on Blackboard.

Week of	Topic	Instructor	Readings	Assignment
Aug 26	Intro to HPC/command line		Software carpentry tutorials	
Sep 2	Editing text files, customizing your work environment, file transfers		Haddock and Dunn Chps 4,5,20	
Sep 9	Linux one-liners		Software carpentry tutorials	
Sep 16	Shell scripting basics		Haddock and Dunn Chp 6	
Sep 23	Downloading and viewing FASTQ files		TBD	
Sep 30	Quality filtering FASTQ files		TBD	
Oct 7	Assembling a reference		TBD	
Oct 14	BLAST		DeSalle & Rosenfeld, Chp 5	

Oct 21	Annotating an assembly		DeSalle & Rosenfeld, Chp 7	
Oct 28	Mapping reads to a reference		TBD	
Nov 4	Calling & Filtering genotypes*		TBD	
Nov 11	Quantifying differential expression*		TBD	
Nov 18	Phylogenetics*		De Salle & Rosenfeld Chps 6,8	
Nov 25	Final Project Consultations		TBD	
Dec 2	Final Project Presentations		TBD	

*Indicates optional special topics lectures subject to change. A student survey will be conducted earlier in the semester to determine what topics will be most useful for the majority of the group.

HPC Resources & Software

Students must have a personal computer and an account on the USC HPC system to participate in this class. Accounts are free and your supervisor may already have an allocation – if so, request that they add you as a user. If you do not already have access to an allocation, please apply for one here:
https://hpcc.usc.edu/support/accounts/applying-for-a-hpcc-account/

Students working on a PC will also need to install an SSH client – we recommend PuTTY:
https://www.putty.org/

All students should also have a text editor installed. Those working on a PC can use Notepad. Text Wrangler is recommended for Mac users: https://www.barebones.com/products/textwrangler/

Students should also download and install R version NNNN.

Course Policies

COMMUNICATION: Email is the preferred form of communication with the instructors outside of class. Responses can be expected within 24-48 hours, though there may be an additional delay over weekends/holidays. If an in-person meeting is desired, please email a request to set up a meeting time.

GRADES: Any document associated with grading may be photocopied by the instructional staff.
The final letter grade will be determined by the total number of points as follows.

	Points possible	Percent
Weekly Assignments (10 points ea.)	130	42%
In-class Contributions (5 points ea.)	75	25%
Final Project Report + Presentation	100	33%
TOTAL	305	100%

WEEKLY ASSIGNMENTS: Exercises to help you develop your skills will be conducted during each class period. Some of these may involve additional work outside of class.

IN-CLASS CONTRIBUTIONS: Good attendance is necessary but not sufficient to earn full marks for this component of the course grade. Students who earn top scores will participate in class exercises and discussions actively, thus helping lead their peers to think critically and analytically. This requires students to chime in, asking questions, and making relevant comments in response to the questions of others. It also necessitates full participation and completion of in in-class exercises and problem sets.

FINAL PROJECT: You will be responsible for utilizing some combination of the tools and skills learned in the course to complete real-world analyses. This can include analyses of data connected to your dissertation research, or if no such data is available, that from a publically available repository.

PLANNED ABSENCES: Requests for absences should be made by email to the Instructors at least 2 weeks in advance and preferably as early in the semester as possible. If the absence is approved a reasonable accommodation will be provided, which may include coordinating remote participation or a make-up assignment.

Statement on Academic Conduct and Support Systems

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call
engemannshc.usc.edu/counseling
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org
Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call
engemannshc.usc.edu/rsvp
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086
equity.usc.edu, titleix.usc.edu
Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421
studentaffairs.usc.edu/bias-assessment-response-support
Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu
Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710
studentaffairs.usc.edu/ssa
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101
diversity.usc.edu
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
dps.usc.edu, emergency.usc.edu
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call
dps.usc.edu
Non-emergency assistance or information.