ZOO 4926
Special Topics: Genomics and Biotechnology

Instructor
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Schedule
CLASS LECTURES: Tu & Th Periods 6 & 7.
Location: CARR 521,

LABS (see course outline for specific Lab Dates) Th Periods 6-9 labs will be held in Bartram Hall room 617 – note that there are no lectures on lab days

Credit Hours
04

Pre-requisites and Co-requisites
BSC2010, PCB3063 (or equivalent), and at least one University level chemistry lab.

Course website
UF e-learning

Course Description
Big data and genomics are prominent in the medical and agricultural life-sciences. Students will be introduced to modern next-generation sequence based molecular biology through a combination of lectures and hands-on wet-lab exercises. This course will introduce students to the theory behind basic molecular biology techniques (i.e. nucleic aid biochemistry and isolations, cloning, PCR, DNA/RNA hybridization, traditional and NGS sequencing), basic analysis (basic UNIX and command line familiarity, annotation, sequence alignment, data file formats, variant detection, expression analysis), and supplement these with wet-labs where students will perform RNA and DNA isolations, sample QC, NGS library construction; and, dry-lab sessions where students will learn to perform basic assembly, alignment and expression detection analysis using the NSF CYVERSE platform.

Course Objectives:
Upon completion og this class students will have amassed core knowledge in basic recombinant DNA techniques and theory, DNA sequencing and its modern high through-put variants, an understanding of genome sequencing and annotation projects, and several sequence based analyses. Students will be able to use this core knowledge to read and understanf scientific literature focused on genomics. In addition, basic tool based bioinformatics techniques will be introduced and used for sequence analysis projects.

Textbook: None required

Readings will comprise a selected set of papers from peer-reviewed journals, popular science writing, vetted web sites with a science education focus, and science journalism, and will be provided on the course website as necessary. Note that peer-reviewed scientific literature is the means that practicing scientists use to communicate their findings. Reading the peer-reviewed literature can be difficult because the text can be very technical and use a large amount of novel vocabulary. However, it is important to learn how scientists communicate, and reading this literature is a skill you should acquire. Generally these reading materials will be assigned as supplements to material in the Theory lectures that will be discussed the following week. So, for example, I may assign a reading on week 2 that you should read in preparation to discussion during week 3. We will assign readings for student presentation / discussion leading to supplement lectures throughout the semester.

Email Policy:
All email correspondence must be from your ufl.edu account, have your full name in the body of the email, and contain your course and section number in the subject line. Emails not meeting these requirements may not be recognized by my email filters, and thus may not be answered.

Conduct in Class

- Participate in discussions and ask questions. Be prepared to discuss readings; most readings are assigned the week before they will be covered. Please be courteous to other students during the class, but make sure you engage with both the other students and the instructor.

- Tardiness is disruptive to your peers – please be on time.

- Only approved electronic devices may be used in class. Approved electronic devices are laptop computers (when used to participate in classroom activities) and voice recording devices. Unapproved electronic devices include cell phones, video recorders, digital cameras and MP3 players.

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.

Notice regarding Syllabus lecture and exam schedule

This syllabus is subject to change. While it is very likely that the procedures, lecture, posted exam and presentation dates will be adhered to, these may be subject to change as the semester progresses and should be considered tentative ONLY!!

Grading:

30% Active/Leading discussion
30% Lab write-ups and analysis
40% Assignments (take home quizzes 20%; 1 final analysis (20%)

• **No make-up assignemnts will be given without prior permission or documentation of illness**. In case of illness, a letter from your primary care provider is required. A personal matter requires a note from the Dean of Students (P202 Peabody Hall).

• Attendance in class and lab is mandatory

• Grading will be on a percent scale.

93 – 100%	A
90 – 92.9%	A-
87 - 89.9%	B+
83 – 86.9%	B
80 – 82.9%	B-
77 – 79.9%	C+
73 – 76.9%	C
70 – 72.9%	C-
67 – 69.9%	D+
63 – 66.9%	D
60 – 62.9%	D-
<60	E

Academic Honesty:
All students registered at the University of Florida have agreed to comply with the following statement:

> *"I understand that the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that my failure to comply with this commitment may result in disciplinary action up to and including expulsion from the University."*

In addition, on all work submitted for credit the following pledge is either required or implied:

> *"On my honor I have neither given nor received unauthorized aid in doing this assignment."*

If you witness any instances of academic dishonesty in this class, please notify the instructor or contact the Student Honor Court (392-1631) or Cheating Hotline (392-6999). For additional information on Academic Honesty, please refer to the University of Florida Academic Honesty Guidelines at:
http://www.dso.ufl.edu/judicial/procedures/academicguide.html.

Accommodations for Students with Disabilities:
Students with disabilities who require accommodations should first seek assistance at the Dean of Students Office of Disability Resources, in Peabody 202 (phone: 352-392-1261). The Dean of Students Office of Disability Resources will work with the instructor to accommodate the student. Please see the University of Florida Disability Resources website for more information at: http://www.dso.ufl.edu/drp/services/.

Counseling Center:
Many students experience test anxiety and other stress related problems. "A Self Help Guide for Students" is available through the Counseling Center (301 Peabody Hall, 392-1575) and at their website: http://www.counsel.ufl.edu/

Other Information:
Please do not request individual special treatment at the end of the semester; we do not adjust grades for individuals for any reason. Plan to do well on all assignments from the beginning of the semester.

Covid-19 Statement:
In response to COVID-19, the following practices are in place to maintain your learning environment, to enhance the safety of our in-classroom interactions, and to further the health and safety of ourselves, our neighbors, and our loved ones.

- If you are not vaccinated, get vaccinated. Vaccines are readily available and have been demonstrated to be safe and effective against the COVID-19 virus. Visit one.uf for screening / testing and vaccination opportunities

- As with any excused absence, you will be given a reasonable amount of time to make up missed work.

- Continue to regularly visit coronavirus.UFHealth.org and coronavirus.ufl.edu for up-to-date information about COVID-19 and vaccination.

In-Class Recording:
Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor. A "class lecture" is an educational presentation intended to inform or teach

enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session. Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

Syllabus is subject to change. While it is very likely that the posted exam and poster session dates will be adhered to, these should be considered tentative ONLY!! Date changes will be announced well in advance.

Course Outline (topics covered by week – subject to revision throughout the course)

Week	Topic
1 08/24	**Lecture –** Fundamentals (Nucleic Acids, structure, chromosomes and plasmids, Review of replication/transcription and Translation properties that influence isolation, purification, quantification and detection (hybridization)).
2 08/22, 08/24	**Lecture** – Introduction to cloning: Vectors and their properties, Restriction Enzymes and fragment manipulation, Gel electrophoresis and fragment sizing DNA library construction, cDNA library construction, library screening (hybridization), PCR. **Take home Assignment – DNA isolation**
3 08/29, 08/31	**Lecture** – DNA Sequencing – Sanger **PCR primer design** **LAB 1** – **Crude DNA Prep**
4 09/5 09/7	**Lecture** – Genomics and Transcriptomics – Genome Mapping strategies, clone sequencing, assembly **LAB 2** – gDNA isolation and QC, Set up PCR Rxns **Take Home Assignment – cloning, libraries**
5 09/12, 09/14	**Lecture** - Genomics and Transcriptomics – Genome Mapping strategies, clone sequencing, assembly **LAB 3 – Clean fragments and Clone,transformation**

6 09/19, 09/21	**LAB 4a (Tues) - Pick colonies and grow overnight innoculations** **Lecture** – What is a gene, Annotation techniques, BLAST, Gene finders Genome annotation, Annotation files and Public genomics resources **Lab 4b (Thurs) – mini prep, QC, digest**
7 09/26, 09/28	**Lecture -** What is a gene, Annotation techniques, BLAST, Gene finders Genome annotation, Annotation files and Public genomics resources **LAB 5 – Run plasmid Gels, check insert, send clones for Sanger sequencing. Set up gDNA digest**
8 10/3, 10/5	**Lecture/Discussion -** Introduction to sequencing projects **Lecture:** Blotting – how and why **Lecture** - Intro to NGS Sequencing technology: Methods, assembly issues vs. resequencing **Take home assignment – Sequence alignment and annotation**
9 10/10, 10/12	**Lecture** – Intro to NGS Transcriptome Sequencing and Expression analysis **Lecture** – Intro to NGS - Transcriptome Sequencing, Assembly
10 10/17, 10/19	**Lecture/Discussion –** Long reads vs. Short reads (depth vs. solving the mapping problem) **Lab 6a – Run digested DNA on gel, set up southern transfer, make probe**
11 10/24, 10/26	**Lab 6b (Tues) – set up hybridization** **Lecture** – NGS analysis techniques: exome sequencing and Variant detection **LAB6c – Washes and Detection**
12 10/31 11/2	**Lecture** – isoform detection/epigenetics; Monoclonal Antibodies and their NGS applications (DNA/RNA binding protein motif detection). **Lecture –** HiC, Single Cell transcriptomics
13 11/7, 11/9	**Lecture** – NGS Data analysis: Intro to Cyverse (or HiPerGator/Galaxy) **Lab 7 – RNA extraction and QC**
14	

11/14, 11/16	**Lecture** – NGS Data analysis: Expression **LAB 8a – cDNA libraries and QC** **Take home assignment: epigenetics and IP**
15 11/21 11/23	**Lab 8b – Nanopore cDNA sequencing** – **NGS Data analysis**: Expression **THANKSGIVING**
16 11/28 11/30	**Data analysis** – cDNA expression /Nanopore analysis **Data analysis** - cDNA expression /Nanopore analysis
17 12/5	**Data analysis** - cDNA expression /Nanopore analysis