ZOO 4926
Special Topics: Genomics and Biotechnology

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 iPlant CYVERSE platform.

Instructor
Dr. W. Brad Barbazuk, Department of Biology and the UF Genetics Institute
CGRC room 407 2033 Mowry rd. or by appointment (273-8624)
bbarbazuk@ufl.edu

Course website
UF e-learning

Text
Dale, Schantz and Plant. 2012 From Genes to Genomes, 3rd ed. Pearson, New York.

Additional 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.
Reading/presentation schedule will be determined during the first week.

Schedule
CLASS LECTURES: Tu & Th Periods 7 & 8,
Location: CGRC 351

LABS (see course outline for specific Lab Dates) Th Periods 7-10 ICBR teaching Lab – 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.

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:

25% Active participation, 30% Lab write-ups and analysis, 30% Assignments, 15% Discussion leading.

- **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.

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

Week	Topic
1 1/7,1/9	**Intro to Cyverse – get accounts** **Lecture –** Fundamentals (Nucleic Acids, structure, chromosomes and plasmids, Review of replication/transcription and Translation properties that influence isolation, purification, quantification and detection (hybridization)).
2 1/14, 1/16	**Lecture** – Introduction to cloning: Vectors and their properties, Restriction Enzymes and fragment manipulation, Gel electrophoresis and fragment sizing. **LAB 1 - DNA isolation/quantification**
3 1/21,1/23	**Lecture** – DNA library construction, cDNA library construction, library screening (hybridization), PCR. **LAB 2 - DNA isolation (plasmid & genomic) quantification, gel electrophoresis,**
4 1/28,1/30	**Lecture** – Genomics and Transcriptomics – Legacy to NGS (Genome Mapping strategies, DNA Sequencing, clone sequencing, assembly **LAB 3 – RNA Isolation / quantification**
5 2/4, 2/6	**Lecture** - Genomics and Transcriptomics – Legacy to NGS (Genome Mapping strategies, DNA Sequencing, clone sequencing, assembly **LAB 4 – RNA-Isolation/quantification cont.**
6 2/11, 2/13	**Lecture** – What is a gene, BLAST, Annotation techniques, Gene finders **LAB 5 – Nanopore RNA Sequencing**
7 2/18, 2/20	**Lecture** - What is a gene, BLAST, Annotation techniques, Gene finders (cont.) Genome annotation, Annotation files and Public genomics resources

	Genome Browsers **Take Home Assignment I – sequence alignment and annotation**
8 2/25, 2/27	**Lecture (Guest)** – Intro to NGS Sequencing technology - Genomic sequencing, assembly issues and Resequencing
9 3/3, 3/5	**SPRING BREAK**
10 3/10, 3/12	**Lecture** – Recap NGS sequencing **-** Intro to NGS Sequencing technology – Transcriptome Sequencing; Transcriptome Assembly **Guest Lecture** – 3/12 TBD **Take Home Assignment II - Gene finding and Annotation**
11 3/17, 3/19	**Guest Lecture** 3/17 TBD **Lecture** – NGS analysis techniques: exome sequencing and Variant detection **Lecture** – RNA-Seq; transcript characterization/isoform detection/epigenetics
12 3/24 3/26	**Lecture** – NGS Data analysis: Intro to Cyverse **-** NGS data analysis: sequence assessment, and alignment,
13 3/31, 4/2	**Lecture** - NGS data analysis techniques: RNA sequencing and transcript assembly; Gene expression analysis.
14 4/7, 4/9	**Lecture** - NGS data analysis techniques: RNA sequencing and Gene expression analysis, Alternative Splice Isoform Discovery
15 4/14, 4/16	**Lecture** – NanoPore data analysis; NGS data analysis: Variant detection, Genome Browsers
16 4/21	Data analysis continued**.** **ANALYSIS projects due 4/27**