EEBL/POSC 689
SPECIAL TOPICS IN GENOMICS & BIOINFORMATICS
Department of Poultry Science
Instructor: Giri Athrey, PhD
Meeting Time: MW; 10:20AM -11:10 AM Lecture MW, 11:10AM – 12:50 PM Lab
Location: KLCT 200
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COURSE OBJECTIVES

The technological advances in the generation of large scale genomic data has transformed biological research. Despite the widespread application of genomic and bioinformatic tools in biology, the graduate students in the *agricultural and life sciences* do not have sufficient opportunity and preparation to utilize these approaches. This course is designed as a primer to genomics and bioinformatics for the students conducting research in all areas relevant to agricultural genomics - animal/poultry health and breeding, plant genomics, or vector and pest biology.

LEARNING OUTCOMES

At the end of the course, the students will be able to:
1. Demonstrate knowledge of foundational information in the application of genomics in biological studies.
2. Design experiments and analyze data using genomic and bioinformatics approaches
3. Evaluate the considerations for generating genomic data for a non-model agricultural species.
4. Reflect on the pitfalls, limitations, and strengths of data genomic data and contemporary bioinformatics tools.

COURSE DESCRIPTION

This course is aimed towards graduate students in the agricultural and life sciences who have a lot to gain from the application of genomics. This course focuses on the practical application of genomics and bioinformatics relevant to the fields of agriculture, production, molecular ecology, and evolutionary genetics.

COURSE PROGRESSION

The first weeks will introduce concepts, terminologies and technical considerations of genomics and bioinformatics. After an introductory set of sessions, the course will be subdivided into three sections, each of approximately three to four week duration. The final two weeks will be used to cover emerging topics, challenges and review of selected case studies from the contemporary literature. The three modules will be as follows:

Section 1: Whole-genome enabled studies. Topics: Variant discovery, variant effect prediction, sequence comparison and analyses

Section 2: Analysis of functional data. Topics: RNAseq, microbial genomics, metagenomics

Section 3: Working without a genome. Topics: Overview of genome assembly and genome annotation, and emerging technologies and applications

WEEK #	WEEK OF	TOPICS	NOTES
	JAN 14	INTRO	
	JAN 21	Overview of concepts	
	JAN 28	Overview of NGS data	
	FEB 4	Alignments	Section 1
	FEB 11	Variant discovery & Effect prediction	Section 1
	FEB 18	Sequence analyses	Section 1
	FEB 25	Functional Genomics	Section 2, Assignment Due
	MAR 4	Gene expression analyses	Section 2
	MAR 11	SPRING BREAK	
	MAR 18	Microbial Genomics	Section 2
	MAR 25	Metagenomics	Section 2
	APR 1	Genome Assembly	Section 3, Assignment Due
	APR 8	Genome Annotation	Section 3
	APR 15	Emerging Technologies	Section 3
	APR 22	Case Studies	
	APR 29	REVIEW	
	MAY 1	FINALS	

MEETING TIMES
Lecture MW; 10:20AM -11:10 AM. Lab MW 11:11AM -12:50 PM.
This course is a very hands-on, intensive practical course. While there will be a few lectures without computer based activities, most of the lecture and lab sessions will require working on a computer while you follow along with the steps of particular genomics analyses

COURSE COMMUNICATION
A dedicated Slack channel (a communications app) hosted on slack.tamu.edu will be used to ask questions and carry out group discussion. Details about joining the channel and using it will be provided during the first week of class.

ATTENDANCE
Attendance at lectures and lab sessions is mandatory. Attendance will be tracked using a sign-in sheet. Please remember that 15% of your grade comes from full attendance and participation. Please refer to University Rules on attendance regarding excused absences at http://student- rules.tamu.edu/rule07.

Absences During Lab Sessions and Exams:
Except for verifiable and extenuating circumstances, you must get approval for an absence prior to lab sessions and examinations from the instructor. The student is expected to provide evidence to substantiate the reason for absence. Example of excusable and verifiable reasons for absences include a) participation in activity authorized by university and major advisor, b) major illness or death in family c) confinement because of illness d) required participation in military duties. For a complete list of reasons for absences considered excused by the university and exam make-up policy for excused absences see sections 7.1-7.7 of the Student Rules: http://student-rules.tamu.edu/rule07 In case of unexpected emergencies that fall into one of the above categories, the student will need to inform the instructor within 48 hours of missing class or exam. Students who are requesting an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code; See Rule 24 of the Texas A&M University Student
Rules: http://student-rules.tamu.edu/.

Non-approved absence during an examination will result in a "0" score for that exam.

Make-up Policy for excused absences:
For excused absences, a make-up exam will be given which may include an oral exam at the discretion of the instructor. Lab sessions can normally not be made up, and will result in 2% reduction of from the 15% attendance and participation grade for each missed lab session. Make up exams are not allowed for unexcused absences.

EVALUATION AND GRADING

Assignments will be open book and emphasizes the ability to understand and solve problems common in bioinformatics. This includes finding and using appropriate internet resources. Assignments will be take home and will not take more than 12 hours, including time for research, and use of online tools or databases. There will be a take home assignment at the end of each module, each of which will constitute 15% of the final grade.

Grading and Classifications:

Attendance & Participation	15%
Problem Sets	35%
Module 1 Assignment	15%
Module 2 Assignment	15%
Module 3 Assignment	15%
Final Presentation	5%

90 and above	A
80-89.9	B
70-79.9	C
65-70	D
64 and below	F

Prerequisites: Undergraduate genetics (GENE 412, POSC 414) or similar.

EQUIPMENT
Students in this course **will need to bring a laptop (or comparable) computing device that has the ability to log into a remote terminal. Unix based systems (eg. Mac and Linux) and Windows systems can both be used for this class.** Windows systems will require installation of third-party programs to enable terminal access. Installation help will be provided in class.

TEXTBOOKS
We will use freely available Internet sources and journal articles as required. Recommended (not required): Practical Computing for Biologists (Dunn & Haddock).

RULES
1. ABSOLUTELY NO texting allowed during class. You may use your tablet computer if and only if you are using it to take notes or to view copies of lecture slides.
2. All University rules apply in this class.

3. The Americans with Disabilities Act (ADA) Policy Statement – is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

4. Academic Integrity Statement and Policy – As commonly defined, plagiarism consists of passing off as one's own the ideas, words, writing, etc., which belong to another. In accordance with this definition, you are committing plagiarism if you copy the work of another person and turn it in as your own, even if you should have the permission of that person. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues without which research cannot be safely communicated. If you have any questions regarding plagiarism, please consult the latest issues of the Texas A&M University Student Rules, under the section "Scholastic Dishonesty," or visit the academic integrity web site. The Aggie Honor Code and the Honor Council Rules and Procedures can be found on the web at: http://aggiehonor.tamu.edu. "An Aggie does not lie, cheat or steal, or tolerate those who do."

5. Copyright – Please note that all handouts and supplements used in this course are copyrighted. This includes all materials generated for this class, including but not limited to syllabi, exams, in- class materials, review sheets, and lecture outlines. Materials may be downloaded or photocopied for personal use only, and may not be given or sold to other individuals.