

Syllabus of ANS6905 - Animal Epigenetics (3 credits) - Fall 2024

Instructor:

Dr. Carl Jiang, Associate Professor

Department of Animal Sciences

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Office hours: You are welcome to send me an e-mail to set up an appointment or stop by my office.

Course Information

Description: Welcome to Animal Epigenetics. By the beginning of this century, it had become clear that the extraordinary complexity of genetic regulation relies in part on changes in gene expression, without alterations in the DNA sequence itself, that is, on epigenetics. Understanding livestock epigenetics towards a more sustainable animal production systems. This course provides graduate students with a state-of-the-art perspective on animal epigenetics. Epigenetic mechanisms (DNA methylation, histone modifications, chromatin remodeling, and non-coding RNAs) will be thoroughly examined as well as the epigenome profiling methods used to assess them. We will discuss the role of epigenetics in male and female reproduction, early embryonic/fetal development, pluripotency and nuclear reprogramming, and disease and productive traits in the context of large animal settings, as well as epigenetic editing technologies and the application of epigenetics in livestock research and production. Lastly, we will develop your critical thinking skills and exposure to cutting-edge research by reading, analyzing, discussing primary scientific articles in the field of animal epigenetics.

Course Objectives: Upon successful completion of the course, it is expected that students will have a good understanding of the fundamentals of epigenetics and on the context of livestock species, more specifically:

- Know the epigenetic mechanisms and how they regulate gene expression.
- Understand in detail through several routinely used methods that analyze epigenetic modifications and mechanisms.
- Understand how epigenetic modifications are established and reprogrammed during development. You will also appreciate the ability to reprogram the epigenome by nuclear transfer and somatic cell reprogramming.
- Appreciate the far-reaching effects of lifestyle on epigenetic profiles and how this can manifest in disease, and how to edit epigenome.
- Have a broad knowledge of how epigenetics may apply to livestock research and production.
- Develop your critical thinking skills and exposure to cutting-edge epigenetic research by reading, analyzing, and discussing primary scientific articles in groups and as a class.

Credits: The course will be offered in every Fall semester. This is a 3 credits course, which means that we will be meeting 3 hours per week in class, and you are recommended to study 6 hours per week outside the classroom.

Prerequisites: Undergraduate level molecular biology, cell and developmental biology, and genetics would be helpful.

Meeting Days, Time, and Location:

Tuesdays – Period 4 (10:40am – 11:30am)

Thursdays – Period 4 and 5 (9:35am – 10:25am, and 10:40 – 11:30am).

Class will meet in room 102 Bldg459 (Animal Sciences Building).

Student taking the course online can access the zoom link in the Canvas page (Canvas >>zoom conferences).

Recommended Textbooks: There is no required textbook. Various readings will be handed out during the semester or made available by email.

Lecture Topics

August 27	Introduction to Animal epigenetics - Review of basic genetics
August 29	Introduction to animal epigenetics - cell type specific gene expression
August 29	Livestock genome to phenome
September 3	DNA methylation
September 5	Laboratory molecular methodologies to analyze DNA methylation
September 5	DNA modification and early development (discussion)
September 10	Histone modification
September 12	Laboratory molecular methodologies to analyze histone modification
September 12	Histone modification and early development (discussion)
September 17	Chromatin remodeling
September 19	Laboratory molecular methodologies to analyze chromatin dynamics
September 19	Chromatin remodeling and early development (discussion)
September 24	Small RNAs
September 26	Laboratory molecular methodologies to analyze small RNAs
September 26	Small RNAs and early development (discussion)
October 1	Histone variants
October 3	Exam I
October 8	Epigenetics in male reproduction: sperm
October 10	Epigenetics in female reproduction: oocyte
October 10	Epigenetic reprogramming during gametogenesis (discussion)
October 15	Epigenetic reprogramming in early development: embryo
October 17	Epigenetic reprogramming in early development: fetal programming
October 17	Epigenetic regulation in early development (discussion)
October 22	Epigenetics of pluripotency and differentiation
October 24	Epigenetics of pluripotency and differentiation

October 24	Epigenetics of pluripotency and differentiation (discussion)
October 29	Genomic imprinting in mammals
October 31	X chromosome inactivation
October 31	Gene imprinting/XCI (discussion)
November 5	Nuclear reprogramming - Epigenetics in animal cloning
November 7	CRISPR and epigenetic editing
November 7	CRISPR and epigenetic editing (discussion)
November 12	Epigenetics and diseases/productive traits
November 14	Environmental stress and epigenetic transgenerational inheritance
November 14	Epigenetic inheritance (discussion)
November 19	Applications of epigenetics in livestock research
November 21	Applications of epigenetics in livestock production
November 21	Livestock epigenetics (discussion)
November 25-27	Thanksgiving, No Class
December 4	Exam II

Grading

The final grade will be based on performance in the exams, discussion as well as in course participation. The breakdown is as follows:

Exam 1 - 30%, Exam 2 - 30%, Discussion - 30%, Participation - 10%

Exams will primarily be essay, problem solving, and short answer questions. Exams will focus on material that is new since the last exam although it is expected that students will be familiar with concepts from the entire course. For each exam, the student will be able to select a specific number of questions to answer from a wider range of questions.

For information on current UF policies for assigning grade points, see

[https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/Links to an external site.](https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/Links%20to%20an%20external%20site)

Grade scheme: The grading scale is A, 90-100%; B+, 86-89; B 80-85 etc., as shown.

Grade	Range	Points
A	90.0 – 100%	90 - 100
B+	85.0 - 89.9%	85 - 89
B	80.0 - 84.9%	80 - 84
C+	75.0 - 79.9%	75 - 79
C	70 - 74.9%	70 - 74
D+	65 - 69.9%	65 - 69
D	60 - 64.9%	60 - 64
E	< 59.9%	< 59

Course policies

Communication about the Class: Email will be used as the major method for communicating when not in class. Therefore, provide Dr. Jiang with your email address, if

one is available. Dr. Jiang's email is z.jiang1@ufl.edu

Attendance and Make-Up policy: Requirements for class attendance, assignments and other work are consistent with university policies that can be found at: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>.

Online Course Evaluation Process: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at gatorevals.aa.ufl.edu/public-results/.

Students Requiring Accommodations: Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Academic Honesty: As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*" You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "*On my honor, I have neither given nor received unauthorized aid in doing this assignment.*" It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: <http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code>Links to an external site.

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. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy: There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see:

<http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

Services for Students with Disabilities: The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation 0001 Reid Hall, 352-392-8565, <https://disability.ufl.edu> Links to an external site.

UF Resources

Health and Wellness:

- **U Matter, We Care:** If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student.
- Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 352-392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.
- **Sexual Assault Recovery Services (SARS):** Student Health Care Center, 352-392-1161.
- **University Police Department:** 352-392-1111 or 911 for emergencies or <http://www.police.ufl.edu/>

Academic Resources:

- **E-Learning Technical Support:** 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>
- **Career Resource Center:** Reitz Union, 352-392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>
- Library Support: <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.
- **Teaching Center:** Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.
- **Writing Studio:** 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>
- **Student Complaints Campus:**
https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf