

AGR 6305 - Plant Chromosomes and Genomes
Spring 2022, Section GNV1 (30124)
(3 credits)

Instructors:

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Meeting Periods and Rooms

Tuesday, periods 7 (1:55-2:45 pm); Thursday, period 7 (1:55-2:45 pm) and Period 8 (3:00 pm - 3:50 pm) at McCarty B 3108 or at Zoom 932 7776 7129 (password: plant)

Prerequisites

General Genetics course

Course Description

This course is designed to introduce students to plant chromosome structures, inheritance, plant genome composition, and basic genomic tools to analyze plant genomes. The main topics include DNA organization in chromosomes, cytogenetics, genomic DNA structure and function, DNA sequencing technologies, transcriptome, basic bioinformatic tools, high throughput DNA marker development, and genomic database exploring.

Course Objectives

By the end of this course students will be able to:

1. Describe chromosome structure and organization

2. Illustrate epigenetics in terms of chromosome structure variations and their impacts on gene expression and plant development
3. Explain how chromosome number and structure variations are associated with abnormal inheritance patterns and disorders.
4. Identify appropriate cytogenetic techniques to address cytogenetic questions.
5. Picture general plant genome composition
6. Describe current DNA sequencing technologies and how to obtain genomic data
7. Apply next generation sequencing (NGS) technologies for marker development and genotyping
8. Explain the principles and applications of genome editing tools
9. Annotate the plant genome and analyze genomic sequences using basic bioinformatics.
10. Mine GenBank to solve related biological and genetic problems.
11. Evaluate current literature in plant genetics and genomics
12. Design projects to solve a biological problem utilizing NGS technologies and bioinformatics skills

Course Format

The course includes assigned readings, lectures, individual paper presentations, group discussions, exams, and pop quizzes.

Course Website

Lectures handouts, reading assignments, course announcements, grades and other related information and materials are available through E-Learning (Canvas)

<https://ufl.instructure.com/courses/324474>. Students must login with their GatorLink user name and password for access.

Text Book and Recommended Reading

No textbook is required; instead various reading materials primarily a collection of recently published articles in scientific journals will be assigned according to each topic. Assigned reading will be posted on the course website. Students are expected to read the assignments for improved understanding and class participation.

Grading

A total of 280 points are given throughout the course including 125 points for five homework assignments (5 x 25 points/homework = 125 points), 90 points for two exams (2 x 45 points/exam = 90 points), 10 points for a paper presentation, 20 points for class participations, and 35 points for an end-term project. The total grade is given according to the total points that students earn by the end of the term.

A	90% (\geq 252 points)
B+	85% to 89.99% (238 – 251 points)
B	80% to 84.99% (224 – 237 points)
C+	75% to 79.99% (210 – 223 points)
C	70% to 74.99% (196 – 209 points)
D+	65% to 69.99% (182 – 195 points)
D	60% to 64.99% (168 – 181 points)
E	< 60% (\leq 167 points)

Note: no minus grades will be given

For more information on grades and grading policies, please visit:
<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Homework assignments

Five individual homework assignments will be given through the semester. Each assignment is worth 25 points. All assignments with due dates and point allocations will be posted on the Canvas website under the assignment tab. Students are expected to finish the homework independently. The assignment must be submitted in Canvas electronically by the due time. One point will be deducted for late submission past the due time within 24 hours. An additional point will be deducted for every 24-hour of further delay in homework submission. Students are encouraged to make a copy of the homework assignment before submission. Feedback for homework will be provided individually to each student through Canvas within one week after submission.

Exam

Two 45-point mid-term exams will be given during the semester. An optional comprehensive 45-point exam will be given during the final week. If you miss one of the two mid-term exams due to any reason or would like to replace the lowest score of any mid-term exam, you can take the final comprehensive exam as a makeup. Exam feedback will be provided to each student within one week in class or through Canvas. Students are welcome to stop by the instructors' office to discuss their exam questions.

Class participation (details are in a separate file at Canvas)

- 1) Lecture summary and in-class interaction (5 points). Feedback will be provided after each class
- 2) Pop quizzes (5 points). Feedback will be provided to students immediately after the quiz.
- 3) Group topic discussion (10 points). Feedback will be provided to students within one week after the discussion.

Paper presentation

We have a few periods at the end of semester for students to present peer reviewed literature and to participate in the associated discussions, which are worth 10 points (a scoring sheet will be given online). The presented paper will be selected from a list provided by the instructors. Presentations are 8 minutes and students will be assigned their date and time later in the semester. The presentation should include a 6-min PowerPoint slide show followed by a 2-min question and discussion from the students and instructors. Feedback will be provided to each individual student in the instructor's office by appointment.

End-term project

A few relevant topics with outlines of subtitles and detailed expectations will be given in early February. Students choose a topic and prepare a mini literature review manuscript according to the outline given. Student can invite a few undergraduate students in the class to contribute to the topic. But the graduate student plays the leadership role to assign the responsibility, check progress, control the content quality, and determine the

final submitted version. Undergraduate participant can earn 2~5 bonus points according to the evaluation of the leading graduate student. The mini review manuscript will be possibly published if its' quality meets the standards of certain peer-reviewed journals.

Attendance Policy

Students are expected to attend every class and be on time. There will be five bonus pop quizzes. Each quiz will be worth 1 point and given randomly in class throughout the semester. You must attend class to have the opportunity to take the bonus quizzes. If you are absent or late for class, you will not be able to make up a quiz or get extra time to complete the quiz. If you miss a class it is YOUR RESPONSIBILITY to speak with another student to discuss what was covered in class.

Make-Up Policy

Late assignments are accepted but points will be deducted. Missed pop quizzes cannot be made up at a later date. The two mid-term exams cannot be taken after their scheduled dates. However, if due to any reason (serious illness, bereavement or activities that fall under the Twelve –Day Rule), you are not able to take one of the mid-term exams, you can take the optional final comprehensive exam as a replacement exam.

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

General Class Demeanor

- Students arrive to class on time
- Students convey superior work ethic and perform to high standards
- Students share questions and ideas in and out of the class
- Students keep an open mind
- Students respect one another
- Students silent cell phones
- Computers are allowed only for note-taking and accessing the class activities. Abuse of this policy will result in not allowing in-class computer use for that particular student

Course Schedule/Topics

Date	Lectures	Topics
Jan. 6	Lecture 1	Course introduction and basic concepts review
Jan. 6	Lecture 2	Chromosome structure
Jan. 11	Lecture 3	Epigenetics I
Jan. 13	Lecture 4	Epigenetics II
Jan. 13	Lecture 5	Epigenetics III
Jan. 18	Lecture 6*	Meiosis analysis for chromosome abnormalities
Jan. 20	Lecture 7*	Polyploid and speciation
Jan. 20	Lecture 8*	2n gametes and autopolyploid genetics
Jan. 25	Lecture 9*	Interspecific cross compatibility and allopolyploid genetics (HW1 due)

Jan. 27	Lecture 10*	Apomixis
Jan. 27	Lecture 11*	Cytogenetic techniques: flow cytometry
Feb. 1	Mini lab I*	Flow Cytometry mini lab
Feb. 3	Lecture 12*	Cytogenetic techniques: GISH and FISH
Feb. 3	Mini lab II*	Chromosome observation mini lab (in class)
Feb. 8	Lecture 13	Genomes: an introduction (HW2 due)
Feb. 10	Exam I	Exam I (In class close note exam)
Feb. 15	Lecture 14	DNA sequencing technologies I
Feb. 17	Lecture 15	DNA sequencing technologies II
Feb. 17	Tour	NGS instruments and their features (ICBR)
Feb. 22	Lecture 16	DNA sequencing technologies III
Feb. 24	Lecture 17	Sequence assembly I
Feb. 24	Lecture 18	Sequence assembly II
Mar. 1	Lecture 19	Using UF HiPerGator (HPC) system for sequence assembly (Demo)
Mar. 3	Lecture 20	Transcriptome and RNAseq (HW3 due)
Mar. 3	Lecture 21	Identify DEGs from RNAseq data (Demo)
Mar. 7-11	Spring Break	No class
Mar. 15	Lecture 22	Gene structure and gene prediction I (Demo)
Mar. 17	Lecture 23	Gene structure and gene prediction II (Demo)
Mar. 17	Lecture 24**	Gene promoter prediction (Guest lecture)
Mar. 22	Lecture 25	GenBank and BLAST I (Demo)
Mar. 24	Lecture 26	GenBank and BLAST II (Demo)
Mar. 24	Lecture 27	Browse plant genomes I (Demo) (HW4 due)
Mar. 29	Lecture 28	Browse plant genomes II (Demo)
Mar. 31	Lecture 29	Plant genome features
Mar. 31	Lecture 30	Genome editing
Apr. 5	Lecture 31	Genetic markers
Apr. 7	Lecture 32	Developing SSR and SNP markers from genome sequences (Demo) I
Apr. 7	Lecture 33	Genotyping by sequencing
Apr. 12	Presentation	<i>Student paper presentations</i> (HW5 due)
Apr. 14	Presentation	<i>Student paper presentations</i>
Apr. 14	Presentation	<i>Student paper presentations</i>
Apr. 19	Presentation	<i>Student paper presentations</i> Exam II (take home)
Final week	Final exam	Optional Final Exam (take home)

*To be given by Dr. Rios.

** Guest lecture.

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 <https://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 <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

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>.

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.

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university’s counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/*
 - Counseling Services
 - Groups and Workshops
 - Outreach and Consultation
 - Self-Help Library
 - Wellness Coaching
- U Matter We Care, www.umatter.ufl.edu/

- Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/

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, www.dso.ufl.edu/drc/

The instructors reserves the right to make changes in the assignments and syllabus as needed. Notification will be via E-Learning, e-mail or class announcements.