

**PLANT MOLECULAR BIOLOGY AND GENOMICS**  
**PCB 5530 Section 4205, 3 Credits**  
**FALL 2022**

**MEETING TIME & LOCATION**  
M, W, F – 3<sup>rd</sup> Period 9:35-10:25AM  
PSF#4– In class & Online sections

**INSTRUCTORS**

**Kelly Balmant**

School of Forest Resources &  
Conservation  
320 CGRC  
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**Gary Peter, Course Coordinator**

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**PREREQUISITES**

Undergraduate molecular and cellular biology or biochemistry

**OVERVIEW OF COURSE**

The course has four modules. The first two modules focus on building student understanding of basic principles and foundational knowledge of molecular mechanisms controlling plant growth, development and adaptation. The second two modules introduce students to current genomic technologies, data and analyses with the goal of stimulating students to think critically and creatively about current research questions.

**MODE OF DELIVERY**

This course will be delivered in person and synchronously online via videoconferencing. Students attending online will need internet access and are expected to log in prior to scheduled class times.

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Course is organized through Canvas

### **Online access - Zoom Meeting**

<https://ufl.zoom.us/j/94381722740>

## **COURSE LEARNING OBJECTIVES/OUTCOMES**

*Upon completion of this course, students will be able to:*

1. Explain the current status of knowledge in plant genome structure and the molecular mechanisms of
  - a. DNA replication & repair
  - b. Cell cycle
  - c. Transcription, splicing & translation
  - d. Regulation of gene expression
  - e. Genome structure
  - f. Metabolic control
2. Dissect genomes, transcriptomes, proteomes and metabolomes data using
  - a. Web based tools for analysis
  - b. Case studies from the primary literature
3. Proficiently access and interpret web-based information, data sets and apply web-based tools to their interpretation
  - a. Apply tools in a research context to solve current problems
4. Integrate web-based information and primary literature to generate hypotheses
5. Demonstrate proficiency in on-line learning and professionalism in on-line interactions.

LEC	DATE	TOPIC	INSTR	HMWK/READINGS
		<b>DNA REPLICATION &amp; REPAIR</b>		
1	W 8/24	Course introduction & meet and greet	All	
2	F 8/26	Fidelity of DNA Replication	Peter	
3	M 8/29	DNA Replication I. DNA Polymerases	Peter	
4	W 8/31	DNA Replication II. Replisome	Peter	<b>HMWK 1 DUE</b> Plant Physiol. 207 144: 1697-714
5	F 9/2	DNA replication III. Origins/regulation	Peter	
6	M 9/5	<b>NO CLASS- LABOR DAY</b>	Peter	
7	W 9/7	Plant DNA replication	Peter	<b>HMWK 2 DUE</b>
8	F 9/9	Chromatin Assembly/Replication	Peter	Slide set on Nucleosome structure
9	M 9/12	Cell Cycle I. Cell Cycle Overview	Peter	
10	W 9/14	Cell Cycle II. Checkpoints	Peter	<b>HMWK 3 DUE</b>
11	F 9/16	Cell Cycle III. Plant Cell Cycle	Peter	<a href="https://doi.org/10.1016/j.pbi.2014.09.012">https://doi.org/10.1016/j.pbi.2014.09.012</a>
12	M 9/19	DNA Repair	Peter	Singh et al. BMC Genomics 2010, 11:443
	<b>TBD</b>	<b>OUT OF CLASS EXAM</b>	Peter	
		<b>GENE EXPRESSION</b>		
13	W 9/21	Introduction/Prokaryotic Transcription I	Kim	Paper list and grading policy for section 2-posted on Canvas (week 5)
14	F 9/23	Prokaryotic Transcription regulation	Kim	HW-post on Canvas
15	M 9/26	Transcription of the Eukaryotic Nuclear Genome	Kim	
16	W 9/28	Processing of Transcription of the Eukaryotic Nuclear Genome	Kim	Team/Paper selection due
17	F 9/30	Regulation of Eukaryotic Transcription	Kim	Quiz 1
18	M 10/3	Eukaryotic Translation	Kim	HW-Due
19	W 10/5	Analysis of Protein-Protein interaction	Kim	
20	F 10/7	Analysis of Protein-Nucleotide Interaction	Kim	Quiz 2 Review A-Due
21	M 10/10	Genome Editing and Gene Silencing	Kim	Exam post

22	W 10/12	Team Presentation I	Kim	Review B-Due
23	F 10/14	Team Presentation II	Kim	
	<b>TBD</b>	<b>OUT OF CLASS EXAM</b>	Kim	Final exam Due Oct 18
		<b>COMPARATIVE GENOMICS &amp; METABOLOMICS</b>		
24	M 10/17	Principles of Comparative Genomics	Hanson	
25	W 10/19	Web Resources for Metabolism	Hanson	
26	F 10/21	Web Resources for Metabolism	Hanson	
27	M 10/24	Comparative Genomics & Metabolism	Hanson	
28	W 10/26	Comparative Genomics & Metabolism	Hanson	
29	F 10/28	Comparative Genomics & Metabolism	Hanson	
30	M 10/31	Metabolic Control Analysis	Hanson	
31	W 11/2	Metabolomics	Hanson	
32	F 11/4	Metabolomics	Hanson	
		<b>OUT OF CLASS EXAM</b>	<b>Hanson</b>	
		<b>FUNCTIONAL GENOMICS</b>		
33	M 11/7	Genome I. Assembly and Annotation	Balmant	
34	W 11/9	Genome II. Structure and Evolution	Balmant	
	F 11/11	<b>NO CLASS – LABOR DAY</b>		
35	M 11/14	Transcriptome I. Promoter Case Study	Balmant	
36	W 11/16	Transcriptome II. Scaling Up Analysis	Balmant	
37	F 11/18	Transcriptome III. Network Case Study	Balmant	
38	M 11/21	Proteome. Network Case Study	Balmant	Detailed Paper
	W 11/23	<b>NO CLASS - THANKSGIVING</b>		
	F 11/25	<b>NO CLASS - THANKSGIVING</b>		
39	M 11/28	Reverse Genetics I. Approaches	Balmant	Detailed Paper
40	W 11/30	Reverse Genetics II. Case Study	Balmant	
41	F 12/2		Balmant	
42	M 12/5		Balmant	
43	W 12/7		Balmant	
	<b>TBD</b>	<b>OUT OF CLASS EXAM</b>	<b>Balmant</b>	

### **Additional Reading Materials**

*Biochemistry and Molecular Biology of Plants*, (Buchanan, Gruissem, Jones, 2<sup>nd</sup> edition, 2015)

*Molecular Biology of the Cell* (Alberts et al., 6<sup>th</sup> Edition, 2014)

*Genes IX* (Lewin, 2008)

*Methods in Enzymology Guide to Molecular Cloning Techniques* (Berger, Kimmel, ed. 1987)

Papers from the primary literature will be assigned

### **GRADING**

The four sections of this course will be graded independently. The final grade will be determined by performance on homework and the exams. Each section will be worth 100 points. The final grade is assigned based on the cumulative percentage attained over all 4 sections. Class attendance and participation will be considered in assigning grades.

Information on current UF general grades and grading policies can be found at <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> and the Graduate Catalog at <http://gradcatalog.ufl.edu/content.php?catoid=2&navoid=762#grades>

**Note:** EXAMS will be scheduled in the evenings outside of normal class hours or they will take home exams.

### **Course Materials on Canvas**

### **PROFESSIONALISM STATEMENT**

Scientists are professionals guided by specific values and behaviors. These values and behaviors include respect, cooperation, active participation, ethics, intellectual inquiry, integrity, timeliness, and attendance. In addition to your performance on the graded materials, you will be evaluated on your growth as a professional. Professional characteristics include punctuality, attendance, participation, collegial attitude, and willingness to learn from and help others learn. Your attendance at all classes is a firm expectation, but if you are ill or an emergency occurs, contact your instructor PRIOR TO the scheduled class time.

### **CLASS POLICIES**

**LATE ASSIGNMENTS-** A penalty of 33% per day will be taken off for each late assignment. Reasonable explanations for late assignments will be taken under consideration, particularly if communicated ahead of the deadline.

**MAKEUP EXAMS-** Make-up exams or course work will be accepted only by special permission of the course instructors. Permission to make up work will be granted on a case by case basis and not all requests will be approved.

### **Grades and Grade Points**

For information on current UF policies for assigning grade points, see <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

### **Absences and Make-Up Work**

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>.

### **Students Requiring Accommodations**

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### **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.

### **Course Evaluation**

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/>.

### **University Honesty Policy**

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students 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." The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with an instructor in this class.

### **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.

### **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>

### **Campus Resources:**

#### **Health and Wellness**

U Matter, We Care: If you or someone you know is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu), 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need or visit the Student Health Care Center website.

University Police Department: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

GatorWell Health Promotion Services: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the GatorWell website or call 352-273-4450.

### **Academic Resources**

E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at [helpdesk@ufl.edu](mailto:helpdesk@ufl.edu).

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services. Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: Visit the Student Honor Code and Student Conduct Code webpage for more information.

### **University of Florida Complaints Policy**

The University of Florida believes strongly in the ability of students to express concerns regarding their experiences at the University. The University encourages its students who wish to file a written complaint to submit that complaint directly to the department that manages that policy.

A student who is unsure as to the official responsible for handling his or her particular complaint may contact the Ombuds office or the Dean of Students Office. For complaints that are not satisfactorily resolved at the department level or which seem to



be broader than one department, students are encouraged to submit those complaints to one of the following locations: Ombuds: <http://www.ombuds.ufl.edu/>  
31 Tigert Hall, 352-392-1308

The purpose of the Ombuds office is to assist students in resolving problems and conflicts that arise in the course of interacting with the University of Florida. By considering problems in an unbiased way, the Ombuds works to achieve a fair resolution and works to protect the rights of all parties involved.

Dean of Students Office: <http://www.dso.ufl.edu/>  
202 Peabody Hall, 352-392-1261

The Dean of Students Office works with students, faculty, and families to address a broad range of complaints either through directly assisting the student involved to resolve the issue, working with the student to contact the appropriate personnel, or referring the student to resources or offices that can directly address the issue. Follow up is provided to the student until the situation is resolved. Additionally, the University of Florida regulations provide a procedure for filing a formal grievance in Regulation 4.012: <http://regulations.ufl.edu/regulations/uf-4-student-affairs>