

PLANT MOLECULAR BIOLOGY AND GENOMICS
(Formerly Plant Molecular and Cellular Biology)
PCB 5530 Section 4205, 3 Credits
FALL 2012

MEETING TIME and PLACE

MWF; 3rd Period (9:35-10:25 a.m.), Plant Sciences Facility (PSF) 05

INSTRUCTORS

Fredy Altpeter

Agronomy Department
2191 McCarty Hall
University of Florida
altpeter@ufl.edu
392-1823 x204 or x218
Office hours TBA

Andrew Hanson

Horticultural Sciences Department
2143 Fifield Hall
University of Florida
adha@ufl.edu
392-1928 x334
Office hours TBA

John Davis

School of Forest Resources &
Conservation
365 Newins-Ziegler Hall (morning)
320 UF Genetics Institute (afternoon)
University of Florida
jmdavis@ufl.edu
846-0879
Office hours TBA

Gary Peter, Course Coordinator

School of Forest Resources & Conservation
326 Newins-Ziegler Hall (morning)
320 UF Genetics Institute (afternoon)
University of Florida
gfpeter@ufl.edu
846-0896
Office hours TBA

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 genomics technologies, data and analyses with the goal of stimulating students to think critically and creatively about current research questions.

COURSE LEARNING OBJECTIVES/OUTCOMES

Upon completion of this course, students will:

1. Understand the current status of knowledge in plant genome structure and the molecular mechanisms of gene function including
 - a. DNA replication & repair
 - b. Cell cycle
 - c. Transcription, Splicing & translation

- d. Regulation of gene expression
 - e. Metabolic control
2. Dissect genomes, transcriptomes, proteomes and metabolome data using
 - a. Web based tools for analysis
 - b. Case studies from the primary literature
 3. Proficiently access and interpret web based 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

LEC	DATE	TOPIC	INSTR	HMWK/READINGS
		DNA REPLICATION & REPAIR		
1	M 8/22	Course Overview & Introduction to Molecular and Cellular Analyses	Peter	
2	W 8/24	Chromosome Structure, Chromatin, DNA Packaging, Nucleosomes	Peter	Hwk.1 – due
3	F 8/26	DNA replication I. Fidelity	Peter	Hwk.2 – due
4	M 8/29	DNA replication II. DNA Repair	Peter	Johnson & O'Donnell 2005 Ann Rev. Biochem. 74:283-315 Hwk.3 – due
5	W 8/31	DNA replication III. DNA Polymerases	Peter	Hwk.4 – due
6	F 9/2	DNA replication IV. DNA Replication	Peter	Plant Physiol. 207 144: 1697-714 Hwk.5 – due
	M 9/5	NO CLASS- LABOR DAY	Peter	
7	W 9/7	DNA replication V. DNA Replication	Peter	Hwk.6 – due
8	F 9/9	Chromatin Dynamics	Peter	Hwk.7 – due
9	M 9/12	DNA replication VI. Origins/regulation	Peter	Hwk.8 – due
10	W 9/14	Cell Cycle I. S	Peter	Inze & De Veylder 2006 Ann Rev. Genet. 40:77-105 Berckmans & De Veylder 2009 12: 599-605 Hwk.9 – due
11	F 9/16	Cell Cycle II. G ₀ -G ₁	Peter	Hwk.10 – due
12	M 9/19	Cell Cycle III. Plant Cell Cycle	Peter	De Veylder et al. 2007 Nat. Rev. Mol Cell Bio. 8 655-665:
	TBD	OUT OF CLASS EXAM	Peter	Take Home Due 9/24
		GENE EXPRESSION		
13	W 9/21	Prokaryotic Transcription I	Altpeter	MCB- Chap 6, 299-309
14	F 9/23	Prokaryotic Transcription II	Altpeter	MCB- Chap 7, 395-400 Cell 98: 1-4
15	M 9/26	Transcription of the Eukaryotic Nuclear Genome	Altpeter	MCB- Chap 6, 309-313
16	W 9/28	Regulation of Transcription of the Eukaryotic Nuclear Genome	Altpeter	MCB- Chap 7, 400-408 Curr. Opin. Struc. Biol. 9: 48-55 Plant Phys. 118: 1111-1120 Cell 108: 475-487 Eur. J. Biochem. 262: 247-257
17	F 9/30	Processing of Transcripts of the	Altpeter	MBC page 315-329

		Eukaryotic Nuclear Genome		Curr. Opin. Plant Biol. 5: 452-459 Cell 108: 439-451 Genes and Dev. 14: 1415-1429
18	M 10/3	Eukaryotic Translation	Altpeter	Homework #1 Due MBC page 335-351 TIBS 28: 182-187 Curr. Opin. Plant Biol. 5: 460-465
19	W 10/5	Analysis of Protein-Protein and Protein-Nucleotide Interaction, Engineering Transcription Factors	Altpeter	Molecular and Cellular Biochemistry 172: 67-79 RNA 11:227-233. Methods in Enzymology 328: 333-358 J Mol Biol 354: 507-519. Trends Plant Sci. 15: 308-321
20	F 10/7	Transgene Expression in Plants I	Altpeter	Microbiol. Mol. Biol. Rev. 67: 16-37
21	M 10/10	Transgene Expression in Plants II	Altpeter	Trends Biotechn. 21: 20-28 Curr. Opin. Biotechn. 13: 136-141 Trends Plant Sci. 7: 84-91 Mol. Breeding 15: 305-327
22	W 10/12	Biology of Gene Silencing	Altpeter	Homework #2 due Cell 108: 489-500 Science292: 2277-2280 Science 297: 2215-2218 Genes Dev. 17: 49-63
23	F 10/14	Gene Silencing II	Altpeter	http://www.nature.com/focus/mai/animations/animation/animation.htm
	TBD	OUT OF CLASS EXAM	Altpeter	
		PHYLOGENOMICS & METABOLOMICS		
24	M 10/17	Web Resources for Metabolism	Hanson	
25	W 10/19	Web Resources for Metabolism	Hanson	
26	F 10/21	Principles of Comparative Genomics	Hanson	
27	M 10/24	Principles of Comparative Genomics	Hanson	
28	W 10/26	Comparative Genomics & Metabolism	Hanson	
29	F 10/28	Comparative Genomics & Metabolism	Hanson	
30	M 10/31	Comparative Genomics & Metabolism	Hanson	
31	W 11/2	Metabolomics	Hanson	
	F 11/4	NO CLASS- HOMECOMING		
32	M 11/7	Metabolic control analysis	Hanson	
	TBD	OUT OF CLASS EXAM	Hanson	
		FUNCTIONAL GENOMICS		
33	W 11/9	Genome I. Assembly and Annotation	Davis	
	F 11/11	NO CLASS- VETERANS DAY		
34	M 11/14	Genome II. Structure and Evolution	Davis	
35	W 11/16	Transcriptome I. Promoter Case Study	Davis	Detail Paper
36	F 11/18	Transcriptome II. Scaling Up Analysis	Davis	
37	M 11/21	Transcriptome III. Networks Case Study	Davis	Detail Paper
38	W 11/23	Proteomics and Interactions	Davis	
	F 11/25	NO CLASS - THANKSGIVING		
39	M 11/28	Reverse Genetics I. Approaches	Davis	
40	W 11/30	Reverse Genetics II. Case Study	Davis	Detail Paper
41	F 12/2	Forward Genetics I. Approaches	Davis	
42	M 12/5	Forward Genetics II. Case Study	Davis	Detail Paper
43	W 12/7	Systems Biology	Davis	
	TBD	OUT OF CLASS EXAM	Davis	

ADDITIONAL READING MATERIALS

Biochemistry and Molecular Biology of Plants, (Buchanan, Grissem, Jones, ed. 2000)

Molecular Biology of the Cell (Alberts et al., 4th Edition, 2002) **ISBN:** 0815332181

Molecular Biology of the Cell: A Problems Approach

Genes IX (Lewin, 2008)

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

Papers from the primary literature will be assigned

COURSE MATERIALS ON WEB (SkyDrive)**URL:**

<http://login.live.com/login.srf?wa=wsignin1.0&rpsnv=11&ct=1282133747&rver=5.5.4177.0&wp=MBI&wreply=https://cid-9a4942eaed89da77.office.live.com/richupload.aspx/Syllabus&lc=1033&id=250206&cbcxt=doc>

User name: pcb5530@live.com

Password: ufpmcb

GRADING

The four sections of this course will be graded independently and non-cumulatively. The final grade will be determined by performance on homework and the exam for each section. In general, each section will be worth 100 points, but this value will be normalized based on the number of class periods in each section. The final grade is assigned based on the cumulative percentage attained over all 4 sections as shown in the table below. Class attendance and participation will be considered in assigning grades that are close to a cut-off.

Letter Grade*	Grade Points**	Percentage
A	4.0	80-100
B+	3.33	70-79
B	3.0	60-69
C+	2.33	55-59
C	2.0	40-54
E	0	<39

* Letter grades below C are not considered passing grades at the graduate level, therefore not included. Letter grades A- and B- do not reflect a statistically different performance at the graduate level and also not included.

** 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 be take home exams.

CLASS POLICIES

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>.

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.

PROFESSIONALISM STATEMENT

Scientists are professionals guided by specific values and behaviors. These values and behaviors include respect, cooperation, active participation, 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 help others learn. If you are ill or an emergency occurs, contact your instructor PRIOR TO the scheduled class time; otherwise your attendance and participation are firm expectations.

ACADEMIC HONESTY, SOFTWARE USE, UF COUNSELING SERVICES, SERVICES FOR STUDENTS WITH DISABILITIES

ACADEMIC HONESTY

In 1995 the UF student body enacted an honor code and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to the standard drafted and enacted by students.

The Honor 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.

On all work submitted for credit by students at the university, the following pledge is either required or implied: **"On my honor, I have neither given nor received unauthorized aid in doing this assignment."**

Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean, Student Honor Council, or Student Conduct and Conflict Resolution in the Dean of Students Office. *(Source: 2011-2012 Undergraduate Catalog)*

It is assumed all work will be completed independently unless the assignment is defined as a group project, in writing by the instructor.

This policy will be vigorously upheld at all times in this course.

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
 - Training Programs
 - Community Provider Database
- **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.

0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc