SYLLABUS
Bio 4028 From Seed to Senescence:
Genetics, Development, and Cell Biology of Plants

Class Details:
FL2012: Monday, Wednesday, and Friday from 9 – 10 am, Life Sciences 118
3 units

Course Master:
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Please email, call, or set up an appointment if you have any questions or need help with any aspect of the course! I will try to respond within 24 hours.

Instructors:
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Prerequisites:
Fundamentals of Biology II: Genetics (Bio 2970) or permission of the instructor.

Course Website:
The course website can be found on Blackboard, which you access through WebSTAC. This is where you will find the course materials, including readings, links, and Powerpoint presentations. In addition, you can monitor your grade and communicate with other students and instructors under the Discussion tab.

Course description:
This course is designed to introduce you to the many unique features of plant cells, genomes, and plant development (i.e., how plants grow, from seed to senescence!) and contemporary approaches and paradigms in the field. The focus will be on those areas where plants differ from animals, and on topics of current excitement and investigation in the research community. The course will include lectures, discussions of the primary literature, hands-on exploration of genomic and phylogenetic tools, oral presentations, and workshops. In addition, each of you will work on an individual project that will be developed over the semester, and summarized at end of the course in a research proposal.

Course Goals:
1. Provide an overview of plant cell biology, development, and genetics.
2. Illustrate how modern approaches are used to answer questions in plant biology.
3. Give students experience in the design and application of these approaches.
4. Provide training in critical evaluation of the literature and the oral and written presentations of research proposals.

Required Reading:
Readings will be primarily classic and contemporary scientific papers. Both background/overview and research papers from the literature will be assigned. Lecture slides, resource materials, and readings will be available on the course website.

Recommended Textbook:
Phylogenetic Trees Made Easy, 4th edition, by Barry Hall.
http://www.sinauer.com/detail.php?id=6069.
http://www.amazon.com/Phylogenetic-Trees-Made-Easy-Edition/dp/0878936068.
One copy on reserve at Olin Library.

Classroom Internet:
Some workshops and courses will require you to have a laptop and to be connected to the internet. In LS 188, either sign in with your WUSTL key or use WUSTL guest access. Please let Dr. Haswell know if you do not have access to a laptop.

Required Software:
Internet browser such as Firefox or Safari.
ClustalX available for free download from http://www.clustal.org/clustal2/#Download.
Mega 5.05 (or latest build) available for free at http://www.megasoftware.net/.

Assignments and Exams:
Each of the 5 modules will have an assignment, either oral or written, worth 12 % of your grade, as shown below in the table. In addition, the final research proposal will be worth 30 % of your grade and class participation will be worth 10% of your grade.

	Type of evaluation	% of grade
Module 1	Student presentations	12
Module 2	Mini-proposal	12
Module 3	Student presentations	12
Module 4	Genetic screen design	12
Module 5	Student presentations	12
Research Proposal		30
Participation		10
TOTAL		100

The Research Proposal:
The activities in this course are designed to build upon one another, and at the end of the course you will use the work you've done throughout the course to write a well-considered research proposal, similar to those used in graduate and postdoctoral fellowship applications. The planning and development of your research proposal will be undertaken one step at a time:

Module 1: Identify a research question.
Module 2: Design an imaging-based approach to addressing this same question.
Module 3: Design a high-throughput 'omics approach to addressing your question.
Module 4: Design a forward genetic screen in Arabidopsis to address your question and plan future experiments for 2 genes "identified" in your screen (these will be assigned by the instructor) using contemporary web-based tools for reverse genetics.
Module 5: Conduct a phylogenetic analysis with the genes "identified" in your screen.

You will then use this work to build an NSF-style research proposal, most likely with three aims corresponding to the three approaches identified in Modules 2, 3, and 4. More information about each module and about the research proposal will be forthcoming.

Academic Integrity and Etiquette:
You are expected to abide by the Washington University Polices on Academic Integrity:
Undergraduates: http://www.wustl.edu/policies/undergraduate-academic-integrity.html
Graduate Students: http://graduateschool.wustl.edu/files/graduate/AcademicIntegrity.pdf

Please also observe standard classroom etiquette: turn off your cell phone, no email or texting during class, and listen to other students' ideas with respect and without interruption.

We will do our best to respond to any email within 24 hours, provided that it is up to professional standards. For example, do not start out with "Hey" or similarly informal openings, do not use textspeak or emoticons, use clear subject lines, and make sure to sign off with your full name. Other tips can be found at http://www.wellesley.edu/SocialComputing/Netiquette/netiquetteprofessor.html.

Topics Schedule (subject to change during the semester)

Wed	8/29		Haswell	Lecture: Course overview, intro to plant biology research
Fri	8/31	Module 1	Kunkel/Pandey	Lecture & Discussion: Overview of signal perception and transduction in plants
Mon	9/3			LABOR DAY
Wed	9/5	Module 1	Kunkel/Pandey	Discussion: Methods and approaches used to study signal transduction in plants
Fri	9/7	Module 1	Kunkel/Pandey	Workshop I: Hormone receptor discovery
Mon	9/10	Module 1	Kunkel/Pandey	Journal Club: Signaling topic TBA
Wed	9/12	Module 1	Kunkel/Pandey	**Student Presentations**
Fri	9/14	Module 1	Kunkel/Pandey	**Student Presentations**
Mon	9/17	Module 1	Kunkel/Pandey	**Student Presentations**
Wed	9/19	Module 1	Kunkel/Pandey	**Short Presentations** on individual research topics
Fri	9/21	Module 2	Dixit	Lecture: Imaging the plant cell-- basic intro to light microscopy and live-cell microscopy
Mon	9/24	Module 2	Dixit	Lecture: Role of the cytoskeleton during plant cell morphogenesis and cell division
Wed	9/26	Module 2	Dixit	Lecture: Organelle movement in plants
Fri	9/28	Module 2	Dixit	Lecture: Cell wall biology
Mon	10/1	Module 2	Ganguly	Lecture: Membrane trafficking in plant cells
Wed	10/3	Module 2	Dixit	**Short Research Paper**
Fri	10/5	Module 3	Mockler	Lecture: High-throughput technologies
Mon	10/8	Module 3	Mockler	Lecture: Plant genome sequencing, assembly, analysis; paper 1
Wed	10/10	Module 3	Mockler	Lecture: Plant transcriptome analysis; paper 2
Fri	10/12	Module 3	Mockler	Lecture: Plant polymorphism discovery and analysis; paper 3
Mon	10/15	Module 3	Mockler	Workshop I: hands on tutorial/computer lab - genome assembly
Wed	10/17	Module 3	Mockler	Workshop II: hands on tutorial/computer lab -RNA-seq analysis
Fri	10/19			FALL BREAK
Mon	10/22	Module 3	Mockler	Workshop III: hands on tutorial/computer lab - variant discovery
Wed	10/24	Module 3	Mockler	Paper 4 Report and In Class Discussion
Fri	10/26	Module 3	Mockler	**Student Presentations**
Mon	10/29	Module 4	Haswell	Lecture: Forward genetics in Arabidopsis I: overview, chemical
Wed	10/31	Module 4	Haswell	Lecture: Forward genetics in Arabidopsis II: transposon mutagenesis; designing genetic screens, dealing with redundancy
Fri	11/2		Haswell	Workshop I: how to design a genetic screen
Mon	11/5	Module 4	Haswell	Lecture: Forward genetics in Arabidopsis III: processing and analyzing mutants
Wed	11/7	Module 4	Haswell	Lecture: Forward genetics in Arabidopsis III: processing and analyzing mutants
Fri	11/9	Module 4	Haswell	Lecture: Reverse genetics in Arabidopsis: T-DNA and transposons, TILLING, RNAi
Mon	11/12	Module 4	Haswell	Workshop II: web-based tools for reverse genetics
Wed	11/14	Module 4	Baxter	Lecture: Natural variation and QTL analysis
Fri	11/16	Module 5	Umen	Lecture: Phylogenetics
Mon	11/19	Module 5	Umen	Workshop III: ClustalX and Mega for phylogenetics
Wed	11/21			THANKSGIVING BREAK
Fri	11/23			THANKSGIVING BREAK

Mon	11/26	Module 5	Umen	Workshop III: ClustalX and Mega for phylogenetics
Wed	11/28	Module 4/5	Haswell/Umen	**Student Presentations**
Fri	11/30	Module 4/5	Haswell/Umen	**Student Presentations**
Mon	12/3	Module 4/5	Haswell/Umen	**Student Presentations**
Wed	12/5	All	All	**Panel discussion of Research Proposal Summaries**
Fri	12/7	All	All	**Panel discussion of Research Proposal Summaries**
Mon	12/10			READING WEEK
Wed	12/12			READING WEEK
Fri	12/14	All	All	**Final Research Proposal Due**