Biology 3041:Plant Biology and Genetic Engineering
Spring 2015

The goal of this course is to convey a working knowledge of how plants grow, develop and reproduce, and how knowledge of plant genetics, development, cell biology, biochemistry, physiology and recombinant DNA techniques can be combined to produce plants with novel traits. Recent examples of genetically engineered crops and the current efforts of the biotechnology industry will be discussed. We will also spend some time discussing the environmental, social, economic and ethical issues related to genetic engineering of plants. Students should note that recombinant DNA techniques are useful tools to analyze genetic, physiological and cellular phenomena in most intensively studied organisms, not just in plants. Consequently, the experimental approaches and concepts presented will be applicable in other fields of biological research and parallels will be pointed out throughout the course.

Prerequisite: Bio 2970: Principles of Biology II (Mendelian and Molecular Genetics)
Credits: 4 units

Lecture	**Tu Th**	2:30 – 4:00 PM	Lab Sciences 201
Discussion	**F**	10:00-11:00 AM	Life Sciences 310
	F	2:00 – 3:00 PM	Life Sciences 310

Instructors
Please note that e-mail is the best way to reach us; give us 24 hours to respond.

Professors:	Dr. Elizabeth Haswell	ehaswell@wustl.edu Office: McDonnell Hall 221, 935-9223 Office Hours: Tuesdays 4 pm - 5 pm
TAs:	Angela Schlegel	angela.schlegel@wustl.edu Office Hours: Fridays 11 am – 12 pm McDonnell 205
Guest Lecturers:	Dr. Becky Bart	bbart@danforthcenter.org
	Dr. Ursula Goodenough	ursula@biology2.wustl.edu
	Dr. Joe Jez	jjez@biology2.wustl.edu
	Dr. Dmitri Nusinow	DNusinow@danforthcenter.org
	Dr. Maggie Wilson	mewilson@wustl.edu

Course Website
Blackboard https://bb.wustl.edu/

Lectures
A lecture outline and slide handout will be available before each lecture, along with assigned readings. These materials, including a PDF of the final Powerpoint slides, will be posted on Blackboard.

Discussion Sections

The Teaching Assistant (TA) will hold a weekly, one hour-long discussion section. This time will be used for reading the primary literature or other in-depth considerations of the lecture topics. You will be asked to fill out a short worksheet about the paper to be discussed that will be due at the beginning of each discussion section.

If you need extra one-on-one time, you are welcome to attend TA or Instructor office hours.

Textbooks and reading assignments

There is no single suitable textbook available that spans plant molecular genetics, development, biochemistry, physiology, and genetic engineering. Therefore, we will use a combination of assigned readings from several different textbooks as well as research articles and reviews from the primary literature.

We will rely most heavily on the following textbook:
Plant Physiology and Development, by Taiz, Zeiger, Moller & Murphy, 6th Ed. 2015

Casebound
ISBN: 978-1-60535-255-8
Looseleaf
ISBN: 978-1-60535-353-1
eBook
ISBN: 978-1-60535-255-8
http://www.coursesmart.com/9781605352558

We strongly encourage you to purchase your own copy of the Plant Physiology textbook. Additional reading assignments from other textbooks and from the primary literature will be posted on the course website.

Tests, Research Presentations and Grading

There will be three closed-book exams. The final exam will not be cumulative but will cover the material from the last third of the course.

	% of final grade
Exam 1	20
Exam 2	15
Exam 3	20
Problem Sets	15
Research Presentation	20
Participation	10
	100

Problem solving will be emphasized in tests and problem sets. For instance, you might be asked to design experiments towards accomplishing a hypothetical goal or to interpret data you've not seen before. Such questions will be based on what you've learned in class, but will not be

identical to what you have learned. There may be more than one correct answer. Partial credit will be given for all essay and short-answer problems.

There will be three take-home problem sets. The problem sets will consist of questions similar to those that will be on the exams, and are designed to help you study the material and practice answering questions. The problem sets will be graded, and answers will be made available after they are handed in during discussion section. For this reason, it is not possible to accept late problem sets.

There will also be a final research project and presentation that will count towards 20% of your grade. This assignment will allow you to research in detail, and then briefly present to the class, an example of genetic engineering that we did not get a chance to discuss in lecture.

Finally, your participation in the class will be worth 10% of your grade. Asking or answering questions in lecture and in discussion section will contribute to this score, as will the worksheets due at the beginning of the discussion section.

Students taking the class Pass/Fail (credit/no credit) will need the equivalent of a C- average to receive credit.

Make up exams

Unfortunately, experience dictates that our exam policy be rigid. No make-up exams will be given. Unless you have checked into the hospital or campus health center you are expected to be present at the exams. If you have a legitimate medical excuse, please obtain documentation - for instance, the health center can provide a note saying that you were admitted with a health problem serious enough to warrant your absence. However, they also have a note simply saying that you came to the health center, with no comment as to the seriousness of your condition. You need the first kind of note.

In the event of a family emergency (e.g. a death in the family) that requires you to miss an exam, please try to make other arrangements with the instructors in advance of leaving town. If this is not possible and you must leave town immediately, please be prepared to provide documentation (e.g. a copy of the obituary) within a reasonable period of time after your return to validate your absence. We increasingly need to be able to document all grading decisions and exceptions.

If you have a legitimate excuse for missing an exam, your final grade will be determined by calculating the mean of the other tests and problem sets. Unexcused, missed exams will be given a grade of zero and may necessitate withdrawal from the course.

Course evaluation

You are encouraged to fill out an evaluation form for this course online at evals.wustl.edu.

Academic Integrity and Etiquette

The Washington University Polices on Academic Integrity can be found at the following site:
https://acadinfo.wustl.edu/WUCRSLFrontMatter/WebWUCRSLInfo_AcadIntegrity.html

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. Finally, please strive to use proper email etiquette. 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.

Lecture/Exam Schedule 3041 2015

	Day	Date	Lecture Topic	Instructor
Lecture 1	Tu	13-Jan	Course Overview, Introduction to Plant Biology	Haswell
Lecture 2	Thu	15-Jan	Plant Cell Biology	Haswell
Lecture 3	Tu	20-Jan	Plant Life Cycle and Reproductive Strategies	Haswell
Lecture 4	Thu	22-Jan	Fertilization and Embryogenesis	Haswell
Lecture 5	Tu	27-Jan	Meristems and Plant Growth	Haswell
Lecture 6	Thu	29-Jan	Light Perception and Signal Transduction	Haswell
Lecture 7	Tu	3-Feb	Shoot Development and Flowering	Nusinow
Lecture 8	Thu	5-Feb	Root Development	Haswell
PROBLEM SET 1	Fri	6-Feb		
Lecture 9	Tu	10-Feb	Flower, Fruit and Seed Development	Haswell
EXAM 1	**Thu**	**12-Feb**		
Lecture 10	Tu	17-Feb	Plant Hormones and Tissue Culture	Haswell
Lecture 11	Thu	19-Feb	Agrobacterium-Mediated and Physical Transformation of Plants	Haswell
Lecture 12	Tu	24-Feb	Mutagenesis, Genetic Screens and Gene Tagging	Haswell
Lecture 13	Thu	26-Feb	Reverse Genetics and the World of Small RNAs	Wilson
PROBLEM SET 2	Fri	27-Feb		
Lecture 14	Tu	3-Mar	Recombinant Tools for Gene Identification	Haswell
EXAM 2	Thu	**5-Mar**		
SPRING BREAK	Tu	10-Mar		
	Thu	12-Mar		
Lecture 15	Tu	17-Mar	Big Picture: Impact of Agriculture on Society	Haswell
Lecture 16	Thu	19-Mar	Engineering Resistance to Herbicides	Haswell
Lecture 17	Tu	24-Mar	Plant Disease Resistance	Bart
Lecture 18	Thu	26-Mar	Engineering Resistance to Insects	Schlegel
Lecture 19	Tu	31-Mar	Pollination Control and Male Sterility	Haswell
Lecture 20	Thu	2-Apr	Ethylene and Control of Fruit Ripening	Haswell
Lecture 21	Tu	7-Apr	Algal Biofuels	Goodenough
Lecture 22	Thu	9-Apr	Synthesis of Biodegradable Plastics	Haswell
PROBLEM SET 3	Fri	10-Apr		
Lecture 23	Th	14-Apr	Regulatory Issues in Genetic Engineering	Jez
STUDENT PRESENTA-TIONS	Tu	**16-Apr**		
	Thu	**21-Apr**		
	Tu	**23-Apr**		
FINAL	Wed	**7-May**		