SYLLABUS
ORH4932/HOS6932:
METHODS IN PLANT BIOTECHNOLOGY: PRINCIPLES AND APPLICATIONS
(3 credits)

INSTRUCTOR

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PREREQUISITES: PLS3004C, AGR3303

DESCRIPTION

This upper level undergraduate/graduate level course is designed as an introduction to the field of Plant Biotechnology. Plant biotechnology has promptly developed into one of the most prolific, expanding and influential areas of the plant sciences. Applications of modern biotechnological tools have resulted in great advances for agriculture and society. Plant biotechnology is highly interdisciplinary and involves numerous plant sciences specialties, including cell biology, genetics, physiology, bioinformatics, biochemistry and tissue biology.

The overall objective of this course is to provide an environment for students to develop critical thinking on plant biotechnological tools for plant improvement. Principles and applications of plant biotechnology from the cellular to whole-plant levels will be covered. Upon completion of this course students will be able to:

- Describe regulation of gene expression and implications for plant transformation.
- Distinguish plant culture techniques and culture types.
- Describe several methods for stable and transient plant transformation.
- Design strategies for plant genetic manipulation against biotic and abiotic stressors.
- Hypothesize on strategies to increase plant yield and fruit/seed quality.

COURSE STRATEGY

- This course will focus on offering students the opportunity to learn biotechnological tools for plant improvement. A strong emphasis will be given to

develop critical thinking ability to design experiments using biotechnological tools for plant improvement.

- Teaching lessons will include discussions of state of the art literature on plant biotechnology, "hands-on" activities and problem sets.
- Active student participation in the class (questions and discussions) is highly encouraged and rewarded.

TEXT AND MATERIALS

Textbook: Plant Biotechnology: The genetic manipulation of plants (Second Edition) by A. Slater, N Scott and M, Fowler.
Class material and additional reading material will be posted on Canvas weekly.

STUDENTS WITH DISABILITIES

Students with disabilities are encouraged to contact Dr. Begcy for a confidential discussion of individual needs for academic accommodation. I will make every attempt to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in the course activities or meet course requirements. Students requesting classroom accommodation should also register with the Dean of Students Office.

ACADEMIC HONESTY

Students should value honesty and personal integrity.
The University of Florida requires all members of its community to be honest in all endeavors. Cheating, plagiarism, and any other form of academic dishonesty will not be tolerated. Students in violation of this policy will earn a zero for the assignment, be subject to disciplinary action, and may receive a failing grade for the course.
When students enroll at UF they commit themselves to honesty and integrity. As a result of completing the registration form at the University of Florida, every student has signed the following statement:
"I understand the University of Florida expects its students to be honest in all their academic work. I agree to adhere to this commitment to academic honesty and understand that failure to comply with this commitment may result in disciplinary action up to and including expulsion from the university."
Furthermore on work submitted for credit by UF students, 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 to be assumed that 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.

GRADING

Course grades will be based on 1000 points. There will be two partial midterms and a final exam. Quizzes will be given at the end of each week, and require no more than 15 minutes to complete.

Missed exams/quizzes will count as a zero unless an arrangement to take a make-up is made **PRIOR** to the test date.

Total: 1000 points
Midterm 1: 200 points (September 27th)
Midterm 2: 200 points (November 1st)
Final Exam: 350 points
Weekly Quizzes: 15 points each / 150 points total
Homework: 50 points
Class participation and discussions: 50 points
The grading scale WILL NOT be adjusted or curved.

GRADE DISTRIBUTION

A	93-100%	A-	92-90%		
B+	86-89%	B	83-85%	B-	82-80%
C+	76-79%	C	73-75%	C-	72-70%
D+	66-69%	D	63-65%	D-	62-60%
F	59% or below				

PROGRAM

Modules	Learning Topic
1	Plant genomes: the organization and expression of plant genes
2	Plant tissue culture
3	Techniques for plant transformation
4	Vectors for plant transformation
5	Strategies for plant improvement (CRISPR, RNAi, TALEN, OX)
6	Genetic manipulation of herbicide tolerance
7	Genetic manipulation of pest resistance
8	Plant disease resistance
9	Reducing the effect of viral disease
10	Strategies for engineering stress tolerance
11	Improvement of crop yield and quality
12	Molecular farming
13	Science and society

EXPECTATIONS

Students are expected to spend 2-3 hours on the course material for EVERY hour spent in the classroom. The reading assignment list will be posted during the first

week of the class. It is subject to change as the course progresses. Students are expected to be courteous and respectful to their fellow students and not interfere with their learning. You are expected to be on time. Students are asked to switch off their cell phones before entering the classroom.

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/.

ADDITIONAL RESOURCES

Required software tools will be provided through the course e-Learning system (Canvas). There you will be able to access notes and lecture slides, view the course calendar, take quizzes, view exam scores, access study questions, read course announcements, and find information concerning assignments.

TENTATIVE SCHEDULE

Date			Topics	Learning Modules
Aug.	21	(W)	Introduction to the Class	
Aug.	23	(F)	History of Plant Biotechnology	
Aug.	26	(M)	DNA, Chromatin and Chromosome structure	Plant Genomes: The organization and expression of plant genes
Aug.	28	(W)	Regulation of Gene Expression	
Aug.	30	(F)	Fundamental skills in DNA sequence analysis – Hands-on activity	
Sept.	2	(M)	Holiday - No UF Classes	
Sept.	4	(W)	Plant Tissue Culture	
Sept.	6	(F)	Plant Growth regulators	Plant Tissue Culture
Sept.	9	(M)	Plant Regeneration	
Sept.	11	(W)	Primer Design – Hands-on Activity	Techniques for Plant

Sept.	13	(F)	Agrobacterium-mediated gene transfer	Transformation
Sept.	16	(M)	Direct gene-transfer methods	
Sept.	18	(W)	Selectable markers and markers for screening	
Sept.	20	(F)	Principles of cloning, vectors, restriction enzymes	Vectors for Plant Transformation
Sept.	23	(M)	Gateway and GoldenGate strategies	
Sept.	25	(W)	Vector design – Hands-on activity	
Sept.	27	(F)	**Midterm I**	
Sept.	30	(M)	Overexpression	Strategies for Plant Improvement
Oct.	2	(W)	Gene stacking	
Oct.	4	(F)	Homecoming - No UF Classes	
Oct.	7	(M)	RNAi	
Oct.	9	(W)	CRISPR	
Oct.	11	(F)	CRISPR design – Hands-on activity	
Oct.	14	(M)	TALEN	
Oct.	16	(W)	Strategies for engineering herbicide tolerance: Glyphosate	The Genetic Manipulation of Herbicide Tolerance
Oct.	18	(F)	Strategies for engineering herbicide tolerance: Imidazoline	
Oct.	21	(M)	GM strategies for insect resistance	Plant Disease Resistance
Oct.	23	(W)	Natural disease resistance pathway	
Oct.	25	(F)	Biotechnological approaches to disease resistance	
Oct.	28	(M)	VIGS - Virus Induced Gene Silencing	Reducing the Effect of Viral Disease
Oct.	30	(W)	Type of plant viruses	
Nov.	1	(F)	**Midterm II**	
Nov.	4	(M)	The nature of abiotic stresses	Strategies for Engineering Stress Tolerance
Nov.	6	(W)	Stresses during reproductive development	
Nov.	8	(F)	Targeted approaches to manipulating tolerance to stresses	

Nov.	11	(M)	Veterans Day - No UF Classes	
Nov.	13	(W)	Fruit ripening	The Improvement of Crop Yield and Quality
Nov.	15	(F)	Golden rice	
Nov.	18	(M)	Improvement of Carbohydrates and lipids	Molecular Farming
Nov.	20	(W)	Molecular farming of proteins	
Nov.	22	(F)	Edible vaccines	
Nov.	25	(M)	Public concerns and GMO regulation	Science and Society
Nov.	27	(W)	Thanksgiving - No UF Classes	
Nov.	29	(F)	Thanksgiving - No UF Classes	
Dec.	2	(M)	Review and Final Activities	
Dec.	4	(W)	Review and Final Activities	