HOS6295
METHODS IN PLANT BIOTECHNOLOGY
Summer A (3 credits)

INSTRUCTOR

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Office Hours:
Every Monday from 8:00am – 9:30am or by appointment. Please send me an e-mail.

MEETING DAYS, TIMES, AND LOCATION:

Monday – Friday: 2nd Period (9:30am – 10:45am).
Room: 2318 Fifield Hall
Summer A - May 15th – June 23th

COURSE DESCRIPTION

Plant biotechnology is a highly interdisciplinary field with new advances and techniques emerging at a fascinating speed. This graduate level course is designed as a comprehensive exploration to established and new methodologies used in the field of Plant Biotechnology.

COURSE LEARNING OBJECTIVES

The overall objective of this course is to provide an environment for students to develop critical thinking on 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.
- Evaluate several methods for stable and transient plant transformation.
- Design strategies for plant genetic manipulation against biotic and abiotic stressors.
- Hypothesize on strategies to increase important traits including yield and fruit/seed quality.

COURSE STRATEGY

- This course will focus on offering students the opportunity to learn biotechnological methods used in plant biotechnology. 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.
- Students will write a weekly 1-page critical essay where they would focus on the strengths and weaknesses of the paper discussed each week. Font: Arial 12pt; 1.5 spacing. This activity will be used to develop skills in critical reading and how to review scientific literature.

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.

RECOMMENDED PAPERS

I. Vasil IK (2008). A short history of plant biotechnology. Phytochemistry Reviews. 7:387-394

II. Tiang CL; He Y; Pawlowski WP (2012). Chromosome organization and dynamics during interphase, mitosis, and meiosis in plants. Plant Physiol. 158:26–34

III. Bao Z; Clancy MA; Carvalho RF; Elliott K; Folta KM (2017) Identification of novel growth regulators in plant populations expressing random peptides. Plant Physiol. 175: 619–627

IV. Kyndt, T. et al. (2015). The genome of cultivated sweet potato contains Agrobacterium T-DNAs with expressed genes: an example of a naturally transgenic food crop. Proc. Natl Acad. Sci. USA 112:201419685

V. Engler C; Gruetzner R; Kandzia R; Marillonnet S (2009). Golden gate shuffling: a one-pot DNA shuffling method based on type IIs restriction enzymes, PLoS One. 4: e5553

VI. Curtis MD; Grossniklaus U (2003) A gateway cloning vector set for high-throughput functional analysis of genes in planta. *Plant Physiol.* **133**, 462– 469.

VII. Cermak, T. et al. (2017) A Multipurpose Toolkit to Enable Advanced Genome Engineering in Plants. Plant Cell **29**, 1196–1217

VIII. Miao C, Xiao L, Hua K, Zou C, Zhao Y, et al. (2018) Mutations in a subfamily of abscisic acid receptor genes promote rice growth and productivity. PNAS 115: 6058–63

IX. Shimatani Z., Kashojiya S., Takayama M., Terada R., Arazoe T., Ishii H., et al. (2017). Targeted base editing in rice and tomato using a CRISPR-Cas9 cytidine deaminase fusion. Nat. Biotechnol. 35, 441–443.

X. Han, J. *et al.* (2020). TALEN-based editing of TFIIAy5 changes rice response to Xanthomonas oryzae pv. Oryzae. *Scientific Reports.* **10**, 2036.

XI. Bruggeman AJ; Kuehler D; Weeks DP (2014). Evaluation of three herbicide resistance genes for use in genetic transformations and for potential crop protection in algae production. Plant Biotechnol J. 12: 894-902

XII. Ye X; Al-Babili S; Kloti; Zhang J; Lucca P; Beyer P; Potrykus I. (2000) Engineering the provitamin A (β-carotene) biosynthetic pathway into (carotenoid-free) rice endosperm. Science 287,303–305.

GRADING

Course grades will be based on 1000 points. There will be two partial midterms and a final exam. Quizzes will be given each Wednesday 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
Midterm 2: 200 points
Writing essays: 200 points
Final Exam: 200 points
Weekly Quizzes: 68points each / 200 points total
The grading scale WILL NOT be adjusted or curved.

CRITICAL DATES

Midterm I Exam (May 26th)
Midterm II Exam (June 9th)
Final Exam (June 22nd)
Quizzes will be given each Friday

GRADE DISTRIBUTION

A	100.0 - 93.1%	A-	93.0 - 90.1%		
B+	90.0 - 86.1%	B	86.0 - 83.1%	B-	83.0 - 80.1%
C+	80.0 - 74.1%	C	74.0 - 72.1%	C-	72.0 - 70.1%
D+	70.0 - 64.1%	D	64.0 - 62.1%	D-	62.0 - 59.1%
E	59.0% or below				

PROGRAM AND TENTATIVE SCHEDULE

Date			Topics	Learning Modules
May	15	(M)	Introduction to the Class; History of Plant Biotechnology	Plant Genomes: The organization and expression of plant genes
May	16	(T)	DNA, Chromatin, Chromosome structure	
May	17	(W)	Regulation of Gene Expression and Fundamental skills in DNA sequence analysis - Hands on activity	
May	18	(R)	Plant Tissue Culture	Plant Tissue Culture and Techniques for Plant transformation
May	19	(F)	Paper discussion I	
May	22	(M)	Plant Growth regulators	
May	23	(T)	Primer Design - Hands-on Activity	Cloning and vectors for Plant Transformation
May	24	(W)	Agrobacterium Mediated gene transfer and biolistic	
May	25	(R)	Paper discussion II	
May	26	(F)	**Midterm I**	
May	29	(M)	**Holiday - No UF Classes**	
May	30	(T)	Principles of cloning, vectors, restriction enzymes	
May	31	(W)	Vector design - Hands on activity	Biotechnological strategies for plant improvement
June	1	(R)	Overexpression and Gene stacking	
June	2	(F)	Paper discussion III	
June	5	(M)	RNAi	
June	6	(T)	CRISPR	
June	7	(W)	TALEN	
June	8	(R)	Paper discussion IV	
June	9	(F)	**Midterm II**	
June	12	(M)	CRISPR design - Hands on activity	
June	13	(T)	Strategies for engineering herbicide tolerance	Biotechnological manipulation of important traits
June	14	(W)	GM strategies for insect resistance	
June	15	(R)	Paper discussion V	
June	16	(F)	VIGS - Virus Induced Gene Silencing	
June	19	(M)	Golden Rice	
June	20	(T)	Oral Presentations	
June	21	(W)	Review Session	
June	22	(R)	**Final Exam**	

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 stow their cell phones before entering the classroom.

ATTENDANCE 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/UGRD/academic-regulations/attendance-policies/.

ONLINE COURSE EVALUATION PROCESS

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. 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/.

ACADEMIC HONESTY

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following 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.” You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit 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." It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code.

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.

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. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation:

0001 Reid Hall, 352-392-8565, https://disability.ufl.edu/

CAMPUS HELPING RESOURCES

Students experiencing crises or personal problems that interfere with their general wellbeing 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
Counseling Services
Groups and Workshops
Outreach and Consultation
Self-Help Library
Wellness Coaching

• U Matter We Care, www.umatter.ufl.edu/

• Career Connections Center, First Floor JWRU, 392-1601, https://career.ufl.edu/.

Student Complaints:

• Residential Course: https://sccr.dso.ufl.edu/policies/student-honor-code-studentconduct-code/.

• Online Course: http://www.distance.ufl.edu/student-complaint-process