HOS6932
METHODS IN PLANT BIOTECHNOLOGY
(3 credits)

I. INSTRUCTOR

Course:	HOS6932
Instructor:	Dr. Kevin Begcy
	Environmental Horticulture Department
Office:	1535 Fifield Hall
	University of Florida, Gainesville, FL 32611
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Phone:	(352) 273 4528
Office Hours:	Every Monday from 9:00am – 10:00am or
	by appointment. Please send me an e-mail.

II. MEETING DAYS, TIMES AND LOCATION:

Tuesdays: 7th and 8th Periods (1:55pm – 3:50pm).
Thursday: 7th Period (1:55pm – 2:45pm).
Room: PSF4

III. 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.

IV. COURSE LEARNING OBJECTIVES

The overall objective of this course is to provide solid knowledge related to the utilization of biotechnological tools for plant improvement. Principles and applications of plant biotechnology from the cellular to whole-plant levels will be discussed.

Upon completion of this course students will be able to:

- Provide detailed point to point review of any manuscript of plant biotechnology and/or related areas.
- 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 aiming to develop resilient crops against biotic and abiotic stressors as well as with increased productivity.
- Hypothesize on strategies to increase important traits including yield and fruit/seed quality.

V. 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 review 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.

VI. TEXT AND MATERIALS

Textbook:

Plant Biotechnology: The Genetic Manipulation of Plants. Second Edition. By Adrian Slater, Nigel W. Scott, and Mark R. Fowler. Oxford and New York: Oxford University Press. 2008

- Class material and additional reading material will be posted on Canvas weekly.

VII. PAPER DISCUSSIONS

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.

VII. 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.
In the event of an illness or an emergency that does not allow for an arrangement prior to the test date, the student should make arrangement as soon as they can.

Total: 1000 points
Midterm 1: 200 points (September 21st)
Midterm 2: 200 points (October 26th)
Writing essays: 200 points
Final Exam: 300 points (December 7th)
Weekly Quizzes: 15 points each / 150 points total
Class participation and discussions: 50 points
Excellent Participation (50 points)
Consistently, actively supports, engages, listens, and responds to peers. Takes a leading role. Participates in a meaningful way in class discussions. Stays on task.

Good Participation (40 points)
Makes an effort to interact with peers every class but does not take a leading role. Some active participation in class discussions. Sometimes deviates from task.

Average Participation (30 points)
Some effort to interact with peers but does not take a leading role. Minimal participation in class discussions. Sometimes deviates from task.

Participation Below Average (20 points)

Limited interaction with peers and rarely participates in class discussions and/or does not stay on task.

Unacceptable Participation (5 points)
Virtually no interaction with peers and does not participate in class discussions

The grading scale WILL NOT be adjusted or curved.

IX. CRITICAL DATES

Midterm I Exam (September 21st)
Midterm II Exam (October 26th)
Final Exam (December 7th)
Quizzes will be given each Wednesday and require no more than 15 minutes to complete
Review reports are due every Wednesday at the beginning of the class.

X. 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				

XI. PROGRAM AND TENTATIVE SCHEDULE

Date			Topics	Learning Modules
Aug	24	(T)	Introduction to the Class; History of Plant Biotechnology	Plant Genomes: The organization and expression of plant genes
Aug	26	(R)	Paper discussion I:	
Aug	31	(T)	DNA, Chromatin, Chromosome structure and Regulation of Gene Expression	
Sep	2	(R)	Paper discussion II:	
Sep	7	(T)	Plant tissue culture and growth regulators	Plant Tissue Culture and Techniques for Plant transformation
Sep	9	(R)	Paper discussion III:	
Sep	14	(T)	Agrobacterium Mediated gene transfer and biolistic	
Sep	16	(R)	Paper discussion IV:	
Sep	21	(T)	Midterm I	Cloning and vectors for Plant Transformation
Sep	23	(R)	Paper discussion V:	
Sep	28	(T)	Principles of cloning, vectors, restriction enzymes	
Sep	30	(R)	Paper discussion VI:	

Oct	5	(T)	Gateway cloning and GoldenGate strategies	
Oct	7	(R)	Paper discussion VII:	
Oct	12	(T)	Overexpression and Gene stacking	
Oct	14	(R)	Paper discussion VIII:	Biotechnological strategies for plant improvement
Oct	19	(T)	RNAi and CRISPR	
Oct	21	(R)	Paper discussion IX:	
Oct	26	(T)	Midterm II	
Oct	28	(R)	Paper discussion X:	
Nov	2	(T)	No UF Classes – Veterans Day	
Nov	4	(R)	Paper discussion XI:	
Nov	9	(T)	TALEN and VIGS	
Nov	11	(R)	Paper discussion XII:	Biotechnological manipulation of important traits
Nov	15	(T)	Strategies for engineering herbicide and disease resistance	
Nov	18	(R)	Paper discussion XIII:	
Nov	23	(T)	Golden Rice	
Nov	25	(R)	No UF Classes - Thanksgiving	
Nov	30	(T)	Molecular Farming	
Dec	2	(R)	Paper discussion XIV:	

XII. 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.

XII. 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/.

XIV. 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/.

XV. 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.

XVI. 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.

XVII. 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/

XIV. IN-CLASS RECORDING

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures

without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student

XV. 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.

Health and Wellness

U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.
University Police Department: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road, Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

GatorWell Health Promotion Services: For prevention services focused on optimal wellbeing, including Wellness Coaching for Academic Success, visit the GatorWell website or call 352-273-4450.

Academic Resources

E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352-392-6420. General study skills and tutoring.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: Visit the Student Honor Code and Student Conduct Code webpage for more information.

On-Line Students Complaints: View the Distance Learning Student Complaint Process.