PLS 4105
Genome Editing and Plant Biotechnology
(3 credits)

I. COURSE AND INSTRUCTOR INFORMATION

Course:	PLS 4105
Instructor:	Dr. Kevin Begcy
	Environmental Horticulture Department
Office:	1535 Fifield Hall
	University of Florida, Gainesville, FL 32611
Email:	kbegcy.padilla@ufl.edu
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:

M-W-F, 8th Period (3:00pm – 3:50pm). **Room:** 2318 Fifield Hall

III. PREREQUISITES: PLS3004C & AGR3303

IV. COURSE DESCRIPTION

Plant biotechnology is one of the most prolific and influential areas of the plant sciences. This upper-level undergraduate course will be focused on modern biotechnological tools and applications that have resulted in great advances for agriculture and society.

V. COURSE LEARNING OBJECTIVES

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.
- 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 plant yield and fruit/seed quality.

VI. 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.

VII. 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.

VIII. 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. Phone number: 352-294-2273; email: DSOCares@dso.ufl.edu

IX. 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.

X. 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: 250 points **(October 1st)**
Midterm 2: 250 points **(November 5th)**
Final Exam: 250 points **(December 8th – 1:30pm to 4:30pm)**
Weekly Quizzes (every Friday): 15 points each / 150 points total
Homework: 50 points
Class participation (active interaction in class) and discussions: 50 points
The grading scale WILL NOT be adjusted or curved.

XI. 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				

XII. 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	Plant disease resistance
8	Reducing the effect of viral disease
9	Strategies for engineering stress tolerance
10	Improvement of crop yield and quality
11	Molecular farming
12	Science and society

XIII. SCHEDULE

Date			Topics	Learning Modules
Aug	23	(M)	Introduction to the Class	Plant Genomes: The organization and expression of plant genes
Aug	25	(W)	History of Plant Biotechnology	
Aug	27	(F)	DNA, Chromatin and Chromosome structure	
Aug	30	(M)	Regulation of Gene Expression	
Sept.	1	(W)	Plant Tissue Culture	Plant Tissue Culture
Sept.	3	(F)	Fundamental skills in DNA sequence analysis - Hands on activity	
Sept.	6	(M)	Holiday - No UF Classes	
Sept.	8	(W)	Plant Growth regulators	
Sept.	10	(F)	Fundamental skills in Protein sequence analysis - Hands on activity	
Sept.	13	(M)	Plant regeneration	
Sept.	15	(W)	Primer Design - Hands-on Activity	Techniques for Plant transformation
Sept.	17	(F)	Agrobacterium-mediated gene transfer	
Sept.	20	(M)	Direct gene-transfer methods	
Sept.	22	(W)	Selectable markers and markers for screening	Vectors for Plant Transformation
Sept.	24	(F)	Principles of cloning, vectors, restriction enzymes	
Sept.	27	(M)	Gateway and GoldenGate strategies	
Sept.	29	(W)	Vector design - Hands on activity	
Oct.	1	(F)	Midterm I	Strategies for plant improvement
Oct.	4	(M)	Overexpression	
Oct.	6	(W)	Gene stacking	
Oct.	8	(F)	RNAi	
Oct.	11	(M)	Homecoming - No UF Classes	
Oct.	13	(W)	CRISPR I	
Oct.	15	(F)	CRISPR II	
Oct.	18	(M)	CRISPR design - Hands on activity	
Oct.	20	(W)	TALEN	
Oct.	22	(F)	Strategies for engineering herbicide tolerance: Glyphosate	The genetic Manipulation of Herbicide tolerance
Oct.	25	(M)	GM strategies for insect resistance	Plant Disease Resistance
Oct.	27	(W)	natural disease resistance pathway	
Oct.	29	(F)	Biotechnological approaches to disease resistance	
Nov.	1	(M)	VIGS - Virus Induced Gene Silencing	Reducing the effect of Viral disease
Nov.	3	(W)	Type of plant viruses	
Nov.	5	(F)	Midterm II	Strategies for Engineering stress tolerance
Nov.	8	(M)	Stresses during reproductive development	
Nov.	10	(W)	Targeted approaches to manipulating tolerance to stresses	

Nov.	12	(F)	Fruit ripening	The improvement of crop yield and quality
Nov.	15	(M)	Golden rice	
Nov.	17	(W)	Molecular farming of proteins	Molecular Farming
Nov.	19	(F)	Edible vaccines	
Nov.	22	(M)	Carbohydrates and lipids	
Nov.	24	(W)	Thanksgiving - No UF Classes	
Nov.	26	(F)	Thanksgiving - No UF Classes	
Nov.	29	(M)	Public concerns and GMO regulation	
Dec	1	(W)	Oral presentations	Final Remarks
Dec	3	(F)	Review and Final Activities	

XIV. 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.

XV. 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/.

XVI. 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/.

XVII. 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.

XVIII.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.

XIX. 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/

XX. 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

XXI. 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.