SOCR 430, Applications of Plant Biotechnology
Fall 2018

Instructor: Stephen Pearce
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    Phone: (970) 491-1427
    Office hours: Every day after class. If you need to see me outside of office hours feel free to stop by my office or make an appointment and I will do my best to make myself available.

Time/Place: Monday, Wednesday, Friday, 2-2:50 pm, Clark C363.

Prerequisite: SOCR 330 (Principles of Genetics), BZ 350 (Molecular and General Genetics), or equivalent.

Text: None required. Reading materials will be placed on Canvas.

Objectives: Students who take this course will achieve the following:

1. Gain an understanding of applications of plant biotechnology in agriculture, including gene mapping and characterization, marker-assisted selection and genetic engineering.
2. Learn how changes in 'omics technologies have altered plant breeding, gene identification and our understanding of the genes that control qualitative and quantitative traits.
3. Understand how and why foreign genes are inserted into crop plants.
4. Understand the technical and societal issues concerning transgenic crops, and functional genomics.
5. Gain experience in written and oral communication concerning plant biotechnology.

Required activities: Students in this course are expected to:
- Attend and participate in class.
- Read the assigned materials.
- Complete short written and oral homework assignments.
- Complete two in-class exams and a final take-home exam.
- Write a term paper (~10 pages, double spaced) on some aspect of plant biotechnology.
- Give an oral presentation on a societal issue concerning plant biotechnology.

Encouraged activities. The following will help you learn more:
- Ask questions during lectures.
- Ask questions outside of lectures. Talk to the instructor after class or make an appointment.
- Attend seminars on campus in the area of plant biotechnology.
- Read beyond the assigned readings.
- Spend time exploring online resources related to biotechnology and genomics.

Grading:

In-class exam 1	10%
In class exam 2	10%
Final take-home exam	20%
Homework assignments	20%
Oral presentation	10%
Term paper	15%
Class participation	15%

Schedule of topics

Week	Date	Topic	Who
1	Aug. 20	Lecture 1: Introductions and expectations; What is plant biotechnology and why should we study it?	SP
	Aug. 22	Lecture 2: Crop improvement during history, crop domestication.	SP
	Aug. 24	Lecture 3: Crop improvement during history, the Green Revolution.	SP
2	Aug. 27	Lecture 4: Plant genomes.	SP
	Aug. 29	Lecture 5: Genomic variation.	SP
	Aug. 31	Lecture 6: DNA markers to identify natural variation.	SP
3	Sep. 3	**Labor Day**	
	Sep. 5	Lecture 7: Running a DNA marker.	Yucong Xie, Plant Sciences W212
	Sep. 7	Lecture 8: Marker results analysis, gene mapping.	SP
4	Sep. 10	Lecture 9: Gene mapping and genome wide association mapping	SP
	Sep. 12	Lecture 10: Gene mapping and genome wide association mapping	SP
	Sep. 14	Lecture 11: Identifying candidate genes	SP
5	Sep. 17	Lecture 12: Characterizing genes and transcriptomics	SP
	Sep. 19	Lecture 13: Induced variation in breeding – chemical and radiation mutagenesis	SP
	Sep. 21	Lecture 14: Applications of mutagenesis 1	SP
6	Sep. 24	Lecture 15: Applications of mutagenesis 2	SP
	Sep. 26	Lecture 16: Introduction to transgenics.	SP
	Sep. 28	Lecture 17: Herbicide tolerant crops	Todd Gaines
7	Oct. 1	**Exam 1**	
	Oct. 3	Lecture 18: How to make a transgenic plant	SP
	Oct. 5	Lecture 19: Transgenic plants 2	SP
8	Oct. 8	Lecture 20: Transgenic plants 3	SP
	Oct. 10	**Topics for term papers due** Lecture 21: Gene gun lab visit.	Andrew Katz, Biology 428
	Oct. 12	Lecture 22: Tissue culture and transformation.	SP

9	Oct. 15	Lecture 23: Agrobacterium transformation.	SP
	Oct. 17	Lecture 24: Applications of transgenics 1.	SP
	Oct. 19	Lecture 25: Applications of transgenics 2.	SP
10	Oct. 22	Lecture 26: Applications of transgenics 3.	SP
	Oct. 24	Lecture 27: RNAi and gene knockdowns.	SP
	Oct. 26	Lecture 28: Introduction to genome editing	SP
11	Oct. 29	Lecture 29: Editing the rice genome.	Dr. Federico Martin (Leach lab)
	Oct. 31	**Exam 2**	SP
	Nov. 2	**Outline for term paper due** Lecture 30: Applications of genome editing	SP
12	Nov. 5	Lecture 31: Applications of genome editing	SP
	Nov. 7	Lecture 32: Benefits and risks of GMOs/genome editing **Homework 3 golden rice due**	SP
	Nov. 9	Lecture 33: Benefits and risks of GMOs/genome editing	SP
13	Nov. 12	Lecture 34: Public perceptions	SP
	Nov. 14	Lecture 35: Public perceptions	SP
	Nov. 16	Lecture 36: Communication strategies	SP
	Nov. 19-23	**Thanksgiving week**	
14	Nov. 26	Lecture 37: Communication strategies	SP
	Nov. 28	Lecture 38: In-class case study example	SP
	Nov. 30	Oral presentations	Students
	Dec. 3	Oral presentations **Take-home final exam distributed**	Students
15	Dec. 5	Lecture 39: Genome editing practical	SP – W102 Plant Sciences
	Dec. 7	**Term papers due** Lecture 40: Final points, wrap-up, evaluation	SP
	Dec. 12	**Take-home final exam due midnight**	

Agricultural biotechnology web sites. Please sign up to receive the news reports from these two sites:

Information Systems for Biotechnology: http://www.nbiap.vt.edu/ Click on "News", then on "Subscribe to the ISB News Report". Select "Please sign me up to receive the ISB News Report electronically". Fill in the contact info, then click "Submit".

Crop Biotech Update, http://www.isaaa.org/kc/cropbiotechupdate/. To subscribe to the weekly update email, submit email address on the pop-up window.

Other sites that may be of interest

Educational Portal: http://education-portal.com/academy/course/introduction-to-biology.html. Freely accessible lessons on a variety of biology topics.

Union of Concerned Scientists: http://www.ucsusa.org/food_and_agriculture/. Advocates for a more sustainable food and agriculture system.

The Center for Food Safety: http://www.centerforfoodsafety.org/ Advocacy group that is strongly opposed to genetically engineered crops.

Plant and Soil Sciences eLibrary: http://passel.unl.edu/pages/ This site from the University of Nebraska-Lincoln provides information on many aspects of agricultural biotechnology, organized in lesson format.

SciDev.Net: http://www.scidev.net News, views, and information about science, technology, and the developing world. Has sections on Agriculture and Environment.

Principles of Community

In this course we strive to follow and extend Colorado State's University's Principles of Community, and welcome spirited discussion, lively debate and pursuit of knowledge in a manner that respects each of us as individuals.

The Principles of Community support the Colorado State University mission and vision of access, research, teaching, service and engagement. A collaborative and vibrant community is a foundation for learning, critical inquiry, and discovery. Therefore, each member of the CSU community has a responsibility to uphold these principles when engaging with one another and acting on behalf of the University.

Inclusion: We create and nurture inclusive environments and welcome, value and affirm all members of our community, including their various identities, skills, ideas, talents and contributions.

Integrity: We are accountable for our actions and will act ethically and honestly in all our interactions.

Respect: We honor the inherent dignity of all people within an environment where we are committed to freedom of expression, critical discourse, and the advancement of knowledge.

Service: We are responsible, individually and collectively, to give of our time, talents, and resources to promote the well-being of each other and the development of our local, regional, and global communities.

Social Justice: We have the right to be treated and the responsibility to treat others with fairness and equity, the duty to challenge prejudice, and to uphold the laws, policies and procedures that promote justice in all respects.

Need Help? Rams Take Care of Rams

Reach out and ask for help if you or someone you know is having a difficult time. Always feel free to come and talk to me; I will always make myself available to help connect you with any resources you need. CSU is a community that cares for you. If you are struggling with drugs or alcohol and/or experiencing depression, anxiety, overwhelming stress or thoughts of hurting yourself or others please know there is help available. Counseling Services has trained professionals who can help. Contact 970-491-6053 or go to http://health.colostate.edu. If you are concerned about a friend or peer, tell someone by calling 970-491-1350 (or visit http://safety.colostate.edu/tell-someone.aspx) to discuss your concerns with a professional who can discreetly connect the distressed individual with the proper resources. Rams take care of Rams.

This course will adhere to the Academic Integrity Policy {Section 1.6} of the Colorado State University General Catalog, the Student Conduct Code, and University Principles of Community.

Please refer to The University Principles of Community found on page 9 of this syllabus.

Please refer to our cheating and plagiarism policy found on the Canvas homepage and page __ of this syllabus.

Student Conduct Code: http://www.conflictresolution.colostate.edu/conduct-code.aspx#conduct

Colorado State University General Catalog: http://www.catalog.colostate.edu/

Classroom Etiquette

No animals are allowed in the classroom except those defined in the CSU policy regarding SERVICE animals (see pages _____ of this syllabus). No emotional support animals are allowed in class.

Please silence your phone and other electronic devices during class.

Please be quiet while in class. It can be difficult to hear in a large classroom and even quiet talking can be very disruptive to other students who are trying to listen.

Please do not read newspapers, text, play games, or listen to music during class. It may not impact your learning experience, but it is distracting to others in the room.

Exam and Assignment Policy

Everyone will receive access to exams and Assignments on the same day. I encourage you to make your best effort to submit all assignments and exams on time, but I understand that sometimes circumstances arise that are beyond your control. Students that miss an exam due to illness, family emergencies, or other University approved excuses will be able to make up exams by special arrangement.

Please note that assignments submitted late without prior approval will not be eligible for full credit. Exceptions are EXTREMELY limited.

For athletes and others with schedule conflicts; prior arrangements must be made.

Students who use alternative testing at RDS can contact me prior to the exam to make arrangements and sign applicable paperwork.

Please contact me ASAP if you miss an exam (preferably the day of the exam)

Library Help:
Renae Watson is the librarian supporting this course. Contact her for assistance at renae.watson@colostate.edu / ph. 970-491-5338. See her research guide at libguides.colostate.edu/agriculture. Additionally, the CSU Libraries Help Desk provides both research (ph. 970-491-1841) and technical (ph. 970-491-7276) support. These services are free for all CSU students and can be extremely helpful as you prepare your final project.

Title IX: Sexual Assault, Sexual Violence, Sexual Harassment:
CSU's Discrimination, Harassment, Sexual Harassment, Sexual Misconduct, Domestic Violence, Dating Violence, Stalking, and Retaliation policy designates faculty and employees of the University as "Responsible Employees." This designation is consistent with federal law and guidance, and requires faculty to report information regarding students who may have experienced any form of sexual harassment, sexual misconduct, relationship violence, stalking or retaliation. This includes information shared with faculty in person, electronic communications or in class assignments. As "Responsible Employees," faculty may refer students to campus resources (see below), together with informing the Office of Support and Safety Assessment to help ensure student safety and welfare. Information regarding sexual harassment, sexual misconduct, relationship violence, stalking and retaliation is treated with the greatest degree of confidentiality possible while also ensuring student and campus safety.

 Any student who may be the victim of sexual harassment, sexual misconduct, relationship violence, stalking or retaliation is encouraged to report to CSU through one or more of the following resources:
-Emergency Response 911
        -Deputy Title IX Coordinator/Office of Support and Safety Assessment (970) 491-1350
        -Colorado State University Police Department (non-emergency) (970) 491-6425

Please Visit: http://oeo.colostate.edu/title-ix-sexual-assault for more information.

Service Animals in the Classroom
This course will follow all of the policies regarding service animal access to the classroom. The full university policy may be found here: http://policylibrary.colostate.edu/policy.aspx?id=747 .

POLICY STATEMENT

The University will not discriminate against individuals with disabilities who use service dogs, nor, subject to the terms of this Policy, deny those persons access to programs, services and facilities of the University. In addition, only under certain limited conditions as stated in this policy, the University may permit an individual with a documented disability to have an Emotional Support Animal in a University residential facility. Pets are not permitted in any University building, including residence halls, except for the Veterinary Teaching Hospital and other veterinary facilities in accordance with their rules and policies, or when otherwise specially allowed with advance approval from Environmental Health Services for bona fide academic or University business purposes.

Service Dogs
Subject to some limitations, a service dog may accompany an individual with a disability throughout campus, such as in classrooms, recreational facilities and campus residences. It is strongly encouraged, but not required, that a service dog be identifiable to others through a visible signifier (e.g., vest or harness). Individuals with a disability who require a service dog in the classroom should contact Resources for Disabled Students (RDS) for assistance with accommodations.

Emotional Support Animals
An emotional support animal (ESA) is one that alleviates one or more identified symptoms or effects of a person's disability. ESAs are not permitted in university buildings, except in the rare situation where use of an ESA in University housing is approved in advance by the University upon the submission of appropriate documentation, as set forth in this policy.

ESAs are not permitted in non-residential buildings such as classrooms, laboratories, business offices, recreational facilities, dining halls, or the Lory Student Center; they are limited to the disabled individual's residence in a University residence hall, apartment, or other housing unit, and permitted only with prior approval.

Plagiarism and Academic Integrity
We take the issue of academic integrity very seriously in this course. You are expected to do your own work and to not access notes or the web during an exam, copy from someone else's exam or to provide exam answers to another student during an exam. We reserve the right to proctor all exams and will take actions to ensure that all students are following this policy.

Plagiarism
"Plagiarism includes the copying of language, structure, ideas, or thoughts of another, and representing them as one's own without proper acknowledgment. Examples include a submission of purchased research papers as one's own work; paraphrasing and/or quoting material without properly documenting the source" (CSU Policies and Guiding Principles, 2017-2018).

Our motivation for rigorously enforcing a no-plagiarism policy is twofold: First, plagiarism is a form of theft. Taking someone else's words or ideas without attribution is stealing someone else's

work. Second, copying someone else's work does not fulfill the purpose of the assignment, which is for you to develop critical thinking and analysis skills. You demonstrate this by presenting your own, new, synthesis and analysis in your writing. Simply copying or paraphrasing from source materials does not demonstrate this, however insightful the source(s) may be. Good writing generates new knowledge. This should be your goal in this class, in other courses at CSU and in your career after you leave here.

In this course all written work will be spot checked for plagiarism issues by both instructors and originality checking software such as VeriCite. If you are caught plagiarizing materials you will receive a 0 for the assignment/exam/project, and depending upon the severity of the offense, an F in the course. All examples of plagiarism or academic dishonesty and will be reported to the Office of Conflict Resolution and Student Conduct Services for additional disciplinary action as outlined in the student handbook under the heading "academic integrity/Misconduct" (http://catalog.colostate.edu/general-catalog/policies/students-responsibilities/).

Canvas Email System Utilization
Using the University's systems or networks for personal gain; for example, by selling access to your eID or to university systems or networks, or by performing work for profit with university resources (e.g. selling your notes or promoting a personal agenda) in a manner not authorized by the University is strictly forbidden within the CSU Code of Conduct and also CSU's policy for Acceptable Use for Computing and Networking Resources. All cases of this type of code violation will be reported to the Office of Conflict Resolution and Case Management and dealt with following CSU legal counsel guidance.