Syllabus for SPSS 3245 Plant Breeding and Biotechnology (2019)

Catalog Book Course Description:
Three credits. Principles and applications, economic, social and environmental impacts, advantages, potentials and limitations of major traditional and modern plant breeding technologies including crossing/hybridization, mutagenesis, polyploidy induction, genetic engineering and genome editing.

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Rationale and Objectives: This course will cover the principles, current and future applications, advantages and limitations, economic, social and environmental impacts of crossing/hybridization, mutation breeding, transgenic, and genome editing biotechnologies. The course content will present a broad range of applicable information pertaining to genetic improvement of a wide range of crops, with a particular emphasis on horticultural crop species. Specific objectives include: A) To understand the overall science of plant breeding and biotechnology. B) To become familiar with prominent methods for modern and classical plant breeding. C) To assist the development of critical thinking, and to improve skills in written and oral presentations of specific topics related to crop plant breeding. D) To lay a foundation for advanced studies on plant breeding and biotechnology.

Credit hours: Three credits.

Prerequisites: One of BIOL 1108, BIOL 1102, BIOL 1110, MCB 2410, SPSS 3210, SPSS 3230, SPSS 4210, or instructor consent.

Class meetings: Tuesday and Thursday, 1:30 - 2:45. Spring semesters, even years from 2018.

Textbook: None but lecture PPT notes, selected journal articles and book chapters

Assessments

--Mid-term exam	100 pts
--Final exam	150 pts
--Classical and Modern Plant Breeding Position Paper	150 pts
--Oral Presentation	50 pts
--Class participation	50 pts
--Total	**500 pts**

--Grading: A: 93-100%; A-: 90-92%; B+: 87-89%; B: 83-86%; B-: 80-82%; C+: 77-79%; C: 73-76%; C-: 70-72%; D+: 67-69%; D: 63-66%; D-: 60-62%; F: below 60%.

Exams: The mid-term examination will cover classical genetics and traditional breeding techniques and the final examination will cover recombinant DNA, transgenics and genome editing technologies. “Make-ups” must be rescheduled before time of the regular exam. Either a pre-approved absence or evidence of illness/emergency (requires document with physician’s signature) will be required.

Classical and modern breeding position paper: The student will be requested to describe principles of major classical and modern plant methods, critically evaluate the benefits and detriments, and future applications of major classical and modern plant breeding technologies including crossing/hybridization, mutagenesis, transgenics, and genome-editing. The papers must be student’s own work, at least 8-10 pages. The paper will be double-spaced not including title page; 12 pt. character font. The majority of the cite references should be peer reviewed journal articles. For late submission, 20 points will be deduced.

Oral presentation: students will select a scientific research publication provided by the instructor and conduct an oral presentation based on the publication selected. Students need to have a thoroughly understanding of the publication and provide a 20 min power-point slide presentation to the class. The instructor will provide the help to prepare the presentation on a one to one basis when needed.

Code of Conduct:
--1) Please read The Student Code of Conduct from the UConn provost's website: http://community.uconn.edu/wp-content/uploads/sites/523/2016/06/1617-The-Student-Code.pdf
--2) Plagiarism is not allowed. Please read: http://lib.uconn.edu/about/get-help/writing/plagiarism-resources/
--3) Policies from the University Senate, the Office of Institutional Equity, the Office of the Provost, and Community Standards that apply to this course can be found at: http://provost.uconn.edu/syllabi-references Information can be found at this location regarding a) Absences from Final Examinations, b) Class Attendance, c) Credit Hours, d) People with Disabilities Policy Statement, and e) Policy Against Discrimination, Harassment and Related Interpersonal Violence.

Contents of Lectures

A. Basic concepts important for modern and traditional breeding.
--DNA, genes, gene expression and regulation
--Gene identification, DNA cloning and plasmid construct design
--Mendelian genetics
--Polyploidy
--Biology of plant reproductive systems
--Crop evolution and domestication

B. Major classical breeding techniques
--Crossing/hybridization
--Mutagenesis
--Plant tissue culture
--Polyploidy induction
--Traits of interest for horticultural crop plants
--Screening and selection methods
--Products, impacts, potentials, and limitations of classical plant breeding

B. Major plant biotechnology (transgenic plant) technique, and samples of transgenic plants
--Gene identification, DNA cloning and fusion gene construction
--Plant transformation methods
    --Tissue culture/regeneration based tehcniques
        --Agrobacterium
        --Gene gun and direct DNA uptake
    --*In Planta* methods
--Samples of transgenic plants
    --Flavr Savr tomato
    --Roundup-Ready soybeans
    --Insect cotton and corn
    --Virus-resistant papaya
    --Nonbrowning Arctic® apple
    --Trends and future direction
    --Economic and social impact, concerns/issues, future opportunities and challenges of GMO

D. Genome editing technologies

--Zinc finger nuclease, TALEN and CRISPR technologies
--Methods to produce transgene-free gene-edited plants
--Potentials, limitations and regulations of genome editing technologies

E. Comparison of major plant breeding technologies (roundtable discussion led by students)
--Similarities and differences
--Applications and potentials
--Limitations and challenges
--Future trends