

PS 8330 - Molecular Breeding - Fall Semester 2012

Course Description:

This course will cover the development of molecular plant breeding, evolution of transgenic crops, genetic mapping and DNA marker technology, application of marker-assisted selection (MAS) to crop improvement, and emerging transgenic and genomic technologies.

Instructor: Henry T. Nguyen, Ph.D.
Missouri Soybean Merchandising Council Professor of Genetics and Biotechnology

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Office hours: By appointment

Time/Location: Tue, Thu 11:00 to 12:30 pm; 28 Agriculture Bldg.

Prerequisites: PS 3225 or equivalent

Text: There is no required text for this course. Reading assignments will be book chapters. Journal articles will be given for each lecture topic.

Grade: Final grade will be determined based on two mid-term exams, a final exam, and a research paper as follows:

EXAM I	15%
EXAM II	15%
FINAL EXAM (comprehensive)	40%
RESEARCH PAPER	20%
CLASS ATTENDANCE	10%

Grading Scale:

90 – 100%	A
80 – 89%	B
70 – 79%	C
<70%	F

Research paper: The research paper is expected to be a review article (about 15 pages) or research proposal (USDA format, about 15 pages) on a selected topic. Topic will be selected with instructor's consent.

Attendance Policies: Daily class attendance is expected and counted towards the final grade. Exam make-up and late submission of the research paper must be approved by the instructor in advance.

Americans with Disabilities Act:

If you need accommodations because of a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please inform me immediately. Please see me privately after class or in my office.

Office location: 24 Agriculture Building, Office hours: By appointment.

To request academic accommodations (for example, a notetaker), students must also register with the [Office of Disability Services](http://disabilityservices.missouri.edu), (<http://disabilityservices.missouri.edu>), S5 Memorial Union, 882-4696. It is the campus office responsible for reviewing documentation provided by students requesting academic accommodations, and for accommodations planning in cooperation with students and instructors, as needed and consistent with course requirements. For other MU resources for students with disabilities, click on "Disability Resources" on the MU homepage.

Academic Dishonesty Statement:

Academic integrity is fundamental to the activities and principles of a university. All members of the academic community must be confident that each person's work has been responsibly and honorably acquired, developed, and presented. Any effort to gain an advantage not given to all students is dishonest whether or not the effort is successful. The academic community regards breaches of the academic integrity rules as extremely serious matters. Sanctions for such a breach may include academic sanctions from the instructor, including failing the course for any violation, to disciplinary sanctions ranging from probation to expulsion. When in doubt about plagiarism, paraphrasing, quoting, collaboration, or any other form of cheating, consult the course instructor.

Sample Statement for Intellectual Pluralism:

The University community welcomes intellectual diversity and respects student rights. Students who have questions concerning the quality of instruction in this class may address concerns to either the Departmental Chair or Divisional leader or Director or the Director of the [Office of Students Rights and Responsibilities](http://osrr.missouri.edu) (<http://osrr.missouri.edu>). All students will have the opportunity to submit an anonymous evaluation of the instructor(s) at the end of the course.

Recording Statement:

University of Missouri System Executive Order No. 38 lays out principles regarding the sanctity of classroom discussions at the university. The policy is described fully in Section 200.015 of the Collected Rules and Regulations. In this class, students may not make audio or video recordings of course activity, except students permitted to record as an accommodation under Section 240.040 of the Collected Rules. All other students who record and/or distribute audio or video recordings of class activity are subject to discipline in accordance with provisions of Section 200.020 of the Collected Rules and Regulations of the University of Missouri pertaining to student conduct matters.

Those students who are permitted to record are not permitted to redistribute audio or video recordings of statements or comments from the course to individuals who are not students in the course without the express permission of the faculty member and of any students who are recorded. Students found to have violated this policy are subject to discipline in accordance with provisions of Section 200.020 of the Collected Rules and Regulations of the University of Missouri pertaining to student conduct matters.

Class Syllabus:

Aug 21	Plant breeding – past successes and future directions
Aug 23	Genetic variation – where does it come from and how do we use it?
Aug 28	Fundamental breeding methodologies for pure line cultivar development
Aug 30	Fundamental breeding methodologies for hybrid cultivar development
Sept 4	Development of molecular plant breeding - transgenic technology, marker-assisted selection, and genomics-assisted breeding
Sept 6	Transgenic approach to crop improvement and gene transfer methods; Development and commercialization of transgenic crops
Sept 11	Lab demonstration – tour Plant Transformation Core Facility
Sept 13	Introduction to marker-assisted selection and tools (markers and molecular maps)
Sept 18	Heritability and selection theory
Sept 20	Evolution of different DNA marker types (RFLP, AFLP, SSR, SNP)
Sept 25	Genetic mapping basics – Mendelian genetics (qualitative inheritance)
Sept 27	Genetic mapping basics – Quantitative inheritance (QTL); Molecular dissection of complex traits
Oct 2	Marker-assisted gene introgression and gene pyramiding
Oct 4	Selection for quantitative traits; Marker-assisted hybrid prediction
Oct 9	Genomics-assisted mutation breeding
Oct 11	Synthesis and review
Oct 16	EXAM I
Oct 18	Genotyping methods for MAS - Simple Sequence Repeats (SSR) markers
Oct 23	Genotyping methods for MAS - Single Nucleotide Polymorphism (SNP) markers
Oct 25	Bottlenecks in application of marker-assisted selection
Oct 30	MAS Laboratory Tour and Demonstration
Nov 1	New molecular breeding tools: omics and arrays; next generation sequencing
Nov 6	Functional SNP Marker Development
Nov 8	High throughput SNP Genotyping Technology
Nov 13	Synthesis and review
Nov 15	Exam II
Nov 19-23	Thanksgiving Break
Nov 27	Molecular breeding for yield, crop protection (biotic stress), and abiotic stress tolerance
Nov 29	Molecular breeding for crop quality traits

Dec 4 Emerging Transgenic Technologies
Dec 6 Emerging Genotyping Technologies; Research Paper due
Dec 10 Finals week