**TPSS 453 Plant Breeding and Genetics**

**Fall 2016** **3 credits**

**Instructor:** Richard Manshardt

**Office:** St. John Lab of Plant Science 109A

**Office hours:**

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**Instructor:** Michael Kantar

**Office:** 204B St. John lab of Plant science

**Office hours:** Tuesday 10:00-12:00 or by appointment

**Email:** mbkantar@hawaii.edu

**Tuesday and Thursday: 12:00-12:50 STJHN 10A**

**Thursday lab: 1:00-3:30 Moore 103 unless otherwise directed**

**Web resources:** <https://laulima.hawaii.edu>

**Textbook:**  Bernardo R (2014) Essentials of plant breeding. Stemma Press Woodbury, Woodbury

Hardbound, 260 pages, 30 tables, 71 figures ISBN 978-0-9720724-2-7

**Course Purpose:** The purpose of this course is gain an understanding of the basic principles of genetics, the basic features of plant reproduction, and procedures used by plant breeders to use this information to improve plant populations for human use. To this end, students will learn terminology related to genetics, botany, evolution, pathology, biotechnology, and environmental science. Lectures will be supplemented with problem solving activities, field trips, and laboratory experiments.

**Course Audience:** This course is designed for upper division undergraduates or first year Master of Science students who have limited genetics background who anticipated to be used of plant breeding products rather than professional plant breeders.

**Attendance:** Attendance is essential for successful completion of the course. Please notify the instructors by email should you be unable to attend class. **Grading**

|  |  |
| --- | --- |
| Activities | Percent of total grade |
| Mid-term I | 20 |
| Mid-term II | 20 |
| Final exam | 20 |
| Vocabulary and Lab Quizzes | 10 |
| Problem Sets | 20 |
| In Class Assignments | 10 |

**Letter Grade**

|  |  |
| --- | --- |
| A | 92% |
| A- | 89-91% |
| B+ | 86-88% |
| B | 83-85% |
| B- | 80-82% |
| C+ | 77-79% |
| C | 74-76% |
| C- | 71-73% |
| D+ | 68-70% |
| D- | 60-67% |
| Credit | 71-100% |
| No-credit | Less than 71% |

\*All students regardless of grading system chosen, are expected to complete all work assigned, a grade of incomplete will be given if assigned work has not completed by the end of the semester.

\*All assignments are expected to be completed and turned in on the assigned date. Late assignments will be graded but will decrease but the grade will decrease 10% for each day the assignment is late.

**Course Objectives / Outcomes**

1. Be able to discuss the principles of Mendelian Genetics.
2. Be able to describe the essential features of plant reproduction.
3. Be able to understand the terminology of used by plant breeders and plant geneticist.
4. Be able to describe the features of a breeding program and breeding methods used.
5. Be able to describe the relationship of genetics to crop evolution and plant breeding.
6. Be able to describe the relationship between genotype and environment**.**

**Academic dishonesty and scholastic misconduct**

Academic dishonesty will not be tolerated for full definitions see UH Manoa policies.

**(**[**http://www.catalog.hawaii.edu/about-uh/campus-policies1.htm**](http://www.catalog.hawaii.edu/about-uh/campus-policies1.htm)**)**

**Disabilities**

Students with disabilities that impact their ability to participate in the course completely are encouraged to bring this to attention of instructors so accommodations can be arranged.

**Policy on makeup examination for legitimate absences**

Students should not be penalized for absence due to unavoidable or legitimate circumstances. It is the responsibility of the student to notify instructors as soon as possible of such circumstances so arrangements can be made.

**Projected Course Schedule**

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Topic** | **Current Lecture** | **Reading** |
| Aug 23 | Introduction to Course | 1 |  |
| Aug 25 | Introduction to Genetics-DNA structure, chromosomes, replication | 9 |  |
|  |  |  |  |
| Aug 30 | Genetics: transcription and translation, mutation  | 4 |  |
| Sep 1 | Genetics continued: mitosis, meiosis: Quiz 1 | 5 |  |
|  |  |  |  |
| Sep 6 | Mendelian genetics: Introduction | 3 |  |
| Sep 8 | Mendelian genetics: Gene action and epistasis  | 3 |  |
|  |  |  |  |
| Sep 13 | Mendelian Genetics: Phenotypic ratios and genetic models | 18 |  |
| Sep 15 | Mendelian Genetics: tests of probability: Quiz 2, Problem set 1 | 3 |  |
|  |  |  |  |
| Sep 20 | Plant mating systems | 2 |  |
| Sep 22 | Plant mating systems: Mid-term 1 | 2 |  |
|  |  |  |  |
| Sep 27 | Self-incompatibility | 2 |  |
| Sep 29 | Extra-nuclear inheritance | 2 |  |
|  |  |  |  |
| Oct 4 | Linkage mapping and marker assisted selection | 3,4,15 |  |
| Oct 6 | Linkage mapping and marker assisted selection: Quiz 3 | 3,4,15 |  |
|  |  |  |  |
| Oct 11 | Linkage mapping and marker assisted selection | 3,4,15 |  |
| Oct 13 | Linkage mapping and marker assisted selection | 3,4,15 |  |
|  |  |  |  |
| Oct 18 | Population Genetics- population structure | 8 |  |
| Oct 20 | Population Genetics- outlier tests: Quiz 4, Problem Set 2 | 8 |  |
|  |  |  |  |
| Oct 25 | Quantitative Genetics – trait distributions | 7 |  |
| Oct 27 | Quantitative Genetics – heritability | 7 |  |
|  |  |  |  |
| Nov 1 | Quantitative Genetics  | 7 |  |
| Nov 3 | Quantitative Genetics: Quiz 5 | 7 |  |
|  |  |  |  |
| Nov 8 | Genomics: Whole genome sequence | 15 |  |
| Nov 10 | Genomics: Genome wide selection | 15 |  |
|  |  |  |  |
| Nov 15 | Breeding objectives-general | 10 |  |
| Nov 17 | Breeding objectives-self-pollinated crops: Quiz 6: Problem set 3 | 11 |  |
|  |  |  |  |
| Nov 22 | Breeding objectives-cross pollinated crops | 12,13 |  |
| Nov 24 | Breeding objectives-asexual propagated crops: Mid-term 2 | 14 |  |
|  |  |  |  |
| Nov 29 | Breeding methods-recurrent selection | 11,12 |  |
| Dec 1 | Breeding methods-backcross breeding | 11 |  |
|  |  |  |  |
| Dec 6 | Breeding methods-hybrid breeding | 13 |  |
| Dec 8 | Breeding methods-clonal breeding | 14 |  |
|  |  |  |  |
| Dec 12 | Genetic Resources | 16,17 |  |
| Dec 14 | Genetic Resources | 16,17 |  |
|  |  |  |  |
| **Dec XXX** | **Final Exam** |  |  |