

**AGR5321C Genetic Improvement of Plants
Spring 2018
Section 159F**

Instructor: Dr. M A Babar

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Office Hours: 10:30 am to 12:30 pm (Tuesday). Students are welcomed to visit instructor's office at other time as well but it is wise to schedule an appointment (e-mail) to make sure the instructor is available.

Instructor: Dr. F. Altpeter

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TA: Marco D. Goyzueta Altamirano

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Office Hours: 2:30 pm to 4:30 pm (Friday). Office or room to be determined, students can also schedule appointments in advance.

Class Meeting Time and location: T and R; T 12:50-1:40 MCCA 1142; R 12:50 - 2:45 MCCA 1142.

Prerequisites:

AGR 3303 (Genetics) or PCB 3063 (Genetics).

Text: Breeding Field Crops Fifth Edition by Sleper and Poehlman. An outline of lecture notes will be available on the web site prior to the beginning of each major topic.

Course Learning Objectives/Outcomes:

Upon completion of this course, student will

1. Apply the basic principles of genetics and plant breeding for genetic improvement of plants
2. Describe how total phenotypic variations are partitioned into different component and how the genetic portion is manipulated.
3. Discuss how to use selection parameter, heritability, and genetic gain concept for plant improvement
4. Describe how mode of pollination, fertilization, and reproduction impacts the ability to manipulate genetic variation.
5. Discuss how special breeding techniques like double haploid, fertility gene manipulation, etc and how to use those for genetic improvement of plants.

6. Describe various selection techniques and methods that can be used in genetic improvement of self and cross pollinated crops.
7. Describe various molecular breeding techniques and methods those could be used for genetic improvement of crops

Grading:

There will be three major progress exams. Three exams will be given in class during the regular class time. The fourth exam (final) will be at 12:30 to 2:30 pm on April 28. The final exam is non-comprehensive. **Each of these exams will count 100 points = 400 points. Exam-1, 2 and 3 will be proctored by Dr. Babar and exam-4 by Dr. Altpeter.** Students will submit three lab assignments with total points of **210 points (each assignment counts 70 points).** Lab assignment-1 will be based on monogenic inheritance; lab assignment-2 will be based on polygenic inheritance; lab assignment-3 will be based on breeding field trips. The grade for each lab assignment will be determined from a formal written report. **A review paper on a "recent plant breeding technique" is required to submit by April 10 and is worth of 90 points. A total course point is 700.**

Makeup Exam- All the exams will be given in class with closed notes and books. A zero will be given if you miss it. **Only missing mid-term exam with a legitimate excuse (medical, family emergency, official university and religious holiday) will be accepted.** Excuses for missed exams must be documented and approved by the instructor at least 24 hours before the exam.

Bonus Points: Bonus quizzes worth **1 point** each are given randomly during classes. These quizzes are unannounced and are presented on the screen at any moment during class. **Students will be given 5 minutes to answer the question and turn in the answers on a piece of paper with their name and UFID.** There is no make-up quiz. It is your responsibility to make sure your answer sheet is handed in for grading.

Bonus discussion points can be awarded either posting discussion topics or participating in the posted discussion topics in Canvas. The discussion topics have to be related to genetic improvement of plants, and students have to write at least **200 words long summary** on the findings and significance of the topics, and will send that to instructor for review and approve before posting to canvas. A student can get **1 point** by posting one topic and can't post more than **2 topics**. So, a student can get **a total of 2 points** by posting interesting topics on genetic improvement of plants in canvas. Students can get 1 point by participating in the discussion also. If a student participates in discussion on the posting of other students, the participating student can get **1 point**. However, participating student can't just write "I like discussion topics" or "I don't like". Participating students must have to write at least **100 words** on the posting topics why that topic is important. A student can participate in the discussion of maximum of **2 topics** and can get a maximum of **2 points**. **A student can get a maximum of 4 discussion bonus points either by 2 postings, or 2 participations or combination of both.**

Grades will be assigned according to the following scale:

<u>% of available marks</u>	<u>Grade</u>
>90%	A
85% to 89.99%	B+
80% to 84.99%	B
75% to 79.99%	C+
70% to 74.99%	C
65% to 69.99%	D+
60% to 64.99%	D
< 60%	E

Grades and Grade Points Effective May 11, 2009 - Summer A

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Passing Grade	A	B+	B	C+	C	D+	D	S
Grade Points	4.0	3.3	3.0	2.3	2.0	1.3	1	0

Attendance and Participation:

Students are expected to attend all classes. Students are required to e-mail the course instructor if they need to be excused from any lecture or laboratory.

Course website:

E-Learning system, Canvas to <http://elearning.ufl.edu> is the online source for majority of the learning resources. All lecture handouts will be uploaded in the “Files” section of Canvas under “Exam” folder. Lab assignments will also be uploaded in the “Files” section of Canvas under “Lab assignment” folder. Announcements regarding general course information will be posted in Canvas throughout the semester. Students need to login with GatorLink username and password for access. If you do not have a GatorLink ID go to <http://gatorlink.ufl.edu> or to the Help Desk: 392-HELP for assistance.

Exam objectives:

Exam 1: Basic genetic and breeding principles; contribution of plant breeding; importance of international plant breeding institutions; different reproduction methods and their importance in plant breeding; genetic recombination; monogenic and polygenic traits; continuous and discontinuous variations; Chromosome numbers and manipulation; different fertility mechanisms (self-incompatibility, genetic male sterility and cytoplasmic male sterility) and their manipulation in plant breeding.

Exam 2: Concepts of breeding environment, characterize breeding goals and selection objectives; concepts of direct and indirect selection, genetic gain, heritability and use those in

plant breeding; concept of genetic, environment and genotype-environment interaction effect; concept of genetic gain, heritability and their application in breeding; Hardy-Weinberg law of equilibrium and relationship to plant breeding.

Exam 3: Methods for self and cross pollinating crop breeding and their comparison, factors affecting selection process (such as environment, selection pressure, pedigree information, trait expression, etc); Double haploid breeding technique, using double breeding cycles for crop improvement, development of hybrid varieties, breeding methods for major agronomic self and cross-pollinating crops, cultivar release, maintenance, and seed increase of agronomic crops; breeding of horticultural crops (peach, blueberry and strawberry).

Exam 4: Introduction to Biotech crops, gene technologies for crop improvement, molecular markers, marker assisted breeding, transgenic approach of plant improvement.

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Schedule of Lecture Topics and Exams

Lecture	Date	Topic
1	01/09 (Tue)	Plant breeders and their work (Ch. 1); Review of meiosis, Mendel's law of inheritance (Dr. Babar)
2	01/11 (Thr)	Reproduction in crop plants (Ch. 2); Gene recombination in plant breeding (Ch. 3) (Dr. Babar)
3	01/16 (Thu)	Discontinuous variation and plant breeding (Dr. Babar)
4	01/18 (Thr)	Lab-1: Probability, monogenic inheritance and test of hypothesis (Dr. Babar)
5	01/23 (Thu)	Variations in chromosome number and plant breeding (Ch.5) (Dr. Babar)
6	01/25 (Thr)	Quantitative inheritance in plant breeding (Ch.4) (Dr. Babar)
7	01/30 (Thu)	Selection parameters, heritability, genetic gain, indirect selection, selection efficiency (Dr. Babar)
8	02/01 (Thr)	Fertility-regulating mechanisms and their manipulation (Ch. 7) (Dr. Babar)
9	02/06 (Tue)	Lab-2: Quantitative traits, heritability, genetic gain, and application in plant breeding (Dr. Babar)
10	02/08 (Thr)	Exam 1 (Dr. Babar)
11	02/13 (Tue)	Breeding methods for self-pollinating crops including double haploid (Ch. 9, 10 & 12) (Dr. Babar)
12	02/15 (Thr)	Breeding methods for self-pollinating crops including double haploid (Ch. 9, 10 & 12) (Dr. Babar)
13	02/20 (Thu)	Breeding methods for cross-pollinating crops (Dr. Babar)
14	02/22 (Thr)	Lab-3: Prunus Breeding in Gainesville (Tentative; Dr. Babar)
15	02/27 (Tue)	Breeding methods for cross-pollinating crops (Dr. Babar)
16	03/01 (Thr)	Exam 2 (Dr. Babar)
17	03/13 (Tue)	Breeding methods suitable for hybrid cultivars (Ch. 11) (Dr. Babar)
18	03/15 (Thr)	Breeding methods suitable for hybrid cultivars (Ch. 11) (Dr. Babar)
19	03/20 (Tue)	Breeding methods of corn & soybean (Ch 17; 20; 21) (Dr. Babar)
20	03/22 (Thr)	Breeding methods of corn & soybean (Ch 17; 20; 21) (Dr. Babar)
21	03/27 (Tue)	Introduction to Biotech crops I (Dr. Altpeter)
22	03/29 (Thr)	Lab-4: Wheat Breeding in PSREU (Tentative; Dr. Babar)
23	04/03 (Tue)	Introduction into Biotech Crops II (Dr. Altpeter)
24	04/05 (Thr)	Lab-5: Blueberry Breeding at PSREU (Tentative; Dr. Babar)
25	04/10 (Tue)	Gene technologies for crop improvement I (Dr. Altpeter) (Exam-3, 5-7 pm; Dr. Babar*)
26	04/12 (Thr)	Gene technologies for crop improvement II (Dr. Altpeter)
27	04/17 (Tue)	Molecular characterization of (transgenic) plants (Dr. Altpeter)
28	04/19 (Thr)	Molecular markers and Marker assisted breeding (Dr. Altpeter)
29	04/24 (Tue)	Exam 4 (Dr. Altpeter)

Note: We will attempt to maintain the exam schedule; however, material may be altered for any given exam depending on time and coverage of lectures.

***Exam-3 will cover only Dr. Babar's course content covered after exam-2 and breeding field trips.**

General Class Demeanor:

- 1) Students arrive to class on time
- 2) Students convey superior work ethic and perform to high standards
- 3) Students share questions and ideas in and out of the class
- 4) Students keep an open mind
- 5) Students respect one another
- 6) Students turn off cell phones during class time
- 7) Computer and iPad are allowed for note taking purposes during class time

Academic Honesty

In 1995 the UF student body enacted an [honor code](#) and voluntarily committed itself to the highest standards of honesty and integrity. When students enroll at the university, they commit themselves to the standard drafted and enacted by students. **The Honor 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.** On all work submitted for credit by students at the university, the following pledge is either required or implied: **"On my honor, I have neither given nor received unauthorized aid in doing this assignment."** Students should report any condition that facilitates dishonesty to the instructor, department chair, college dean, Student Honor Council, or Student Conduct and Conflict Resolution in the Dean of Students Office. *(Source: 2012-2013 Undergraduate Catalog)*. It is assumed 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.

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.

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well-being 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.

1. *University Counseling & Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/*
 - Counseling Services
 - Groups and Workshops Outreach and Consultation Self-Help Library
 - Training Programs
 - Community Provider Database
2. *Career Resource Center, First Floor JWRU, 392-1601, www.crc.ufl.edu/*

Services for Students with Disabilities

Services for Students with Disabilities

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodations. Students with disabilities should follow this procedure as early as possible in the semester

NOTE: The instructors reserve the right to change any information contained in this and other handouts in this course.