

**AGR5321C Genetic Improvement of Plants**  
**Spring 2020**  
**Section 07HE, 159F**

**Instructor: Dr. M A Babar**

Office: Room 2081 McCarty Hall B

Phone: 352-273-2213

E-Mail: [mababar@ufl.edu](mailto:mababar@ufl.edu)

**Review session, 5:00 pm to 7:00 pm (Thursday)**. A review session, question and answers, etc through zoom link. On campus 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**

Office: 3085 McCarty

Office phone: (352) 273-3418

E-Mail: [altpeter@ufl.edu](mailto:altpeter@ufl.edu)

**TA: Dipendra Shahi**

Office: TBD

Phone: 352-317-8283

E-Mail: [dshahi@ufl.edu](mailto:dshahi@ufl.edu)

**Office Hours: 2:30 pm to 4:30 pm (Friday)**: through zoom link.

**Class schedule:** Online

**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 should be able to

1. Define basic plant breeding terms
2. Apply the basic principles of plant breeding for genetic improvement of plants
3. Describe how total phenotypic variations are partitioned into different components and how the genetic portion is manipulated.
5. Describe how mode of pollination, fertilization, reproduction, and fertility gene manipulation impact the ability to manipulate genetic variation.
6. Understand selection parameters, heritability, and genetic gain concept, and how they are applied for plant improvement.
6. Describe various breeding techniques (including pedigree, bulk, recurrent, double haploid, back cross, shuttle breeding) 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 four major exams. **Each of these exams will count 100 points = 400 points.** Exam-1, 2 and 3 will be administered by Dr. Babar and exam-4 by Dr. Altpeter. The exams are not cumulative. All the exams will be proctored through **canvas and ProctorU except for exam-1 for international students. International students will be required to take exam 1 on campus.** Students will submit three lab reports assigned by Dr. Babar with total points of **210 points (each assignment counts 70 points).** Lab assignment-1 will include solving of various problems related to qualitative inheritance and writing a review on qualitative inheritance; lab assignment-2 will include solving various problems related to quantitative inheritance and writing a review on quantitative inheritance; lab assignment-3 will be based on plant breeding programs of different crops in different public and private industries. The grade for each lab assignment will be determined from a formal written report. **A review paper (assigned by Dr. Babar) on a "recent plant breeding technique" is required to submit by March 20 and is worth 90 points. The topics for review paper will be provided in "introduction" class presentation and students have to select a topic by January 31. A formal review paper has to be submitted by March 20. A total course point is 700.**

		Points
Exam	Four	400 (each worth 100 points)
Assignment	Three	210 (each worth 70 points)
Review paper	one	90
Quiz and discussion		12-16 points (Bonus)
Bonus breeding field tour		10 points (Bonus)
<b>Total</b>		<b>700</b>

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

**Exam feedback:** 5 questions with highest wrong answers will be provided to students after each exam. However, students can meet with instructor and TA to get exam feedback as well.

**Assignment feedback:** Assignment feedback will be provided through canvas.

**Bonus Points:** Bonus quizzes worth **1 point** each and will be given randomly throughout the semester. These quizzes will be conducted through canvas. **Students will be given 5 minutes to answer the questions.** The instructor will send an email through canvas (24 hours before) when the bonus quiz will be posted. There is no make-up quiz.

**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 maximum 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 a maximum of two discussion topics and can get a maximum of **2 points. A student can get a maximum total of 2 discussion bonus points by 2 postings or 2 participation.**

**Bonus breeding field tour:** A bonus breeding field trip will be organized to visit UF small grain breeding or Blueberry breeding program between March 16 to March 20. Date and time of field trip will be decided after discussion with students. The bonus field trip will worth of 10 bonus points. The grade for bonus breeding tour will be determined from a formal written report.

**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

**Participation:**

Students are expected to complete each presentation in time.

**Course website:**

E-Learning system, Canvas to <http://elearning.ufl.edu> is the online source for majority of the course modules. All modules will be uploaded in the "module" section of Canvas. Lab assignments

will also be uploaded in the “module” 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; concept of genetic gain, heritability and their application in breeding; Hardy-Weinberg law of equilibrium and relationship to plant breeding.

**Exam 2:** Different fertility mechanisms (self-incompatibility, genetic male sterility and cytoplasmic male sterility) and their manipulation in plant breeding. Concepts of breeding environments, 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; Methods for self-pollinating crop breeding.

**Exam 3:** Methods of cross pollinating crop breeding and their comparison with self-pollinating crop breeding method, 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, concept of heterosis or hybrid vigor, breeding methods for major agronomic self and cross-pollinating crops, cultivar release, maintenance, and seed increase of agronomic crops; breeding of horticultural crops (peach and blueberry).

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

**AGR 5321 - Genetic Improvement of Plants  
Spring 2020**

**Schedule of Lecture Topics and Exams**

Lecture	Date	Topic
Week 1	01/06 to 1/11	Introduction; Plant breeders and their work; Contribution of ICAR; Review of Meiosis; Mendel's law of inheritance ( <b>Dr. Babar</b> )
Week 2	01/13 to 01/17	Reproduction in crop plants Heritable variation: gene recombination in plant breeding; variation of chromosome number ( <b>Dr. Babar</b> )
Week 3	01/20 to 01/24	Discontinuous variation and plant breeding; Continuous variation, polygenic inheritance; heritability, genetic gain, ( <b>Dr. Babar</b> )
	01/24	<b>Lab-1 assignment:</b> Probability, discontinuous variation, qualitative inheritance and test of hypothesis ( <b>Dr. Babar</b> )
Week 4	01/27 to 01/31	Selection objectives; Indirect select in plant breeding; selection efficiency ( <b>Dr. Babar</b> )
	01/31	<b>Exam 1; 90 mins scheduled time; from 5 pm of 01/30 to 5 pm of 01/31 (Dr. Babar)</b>
Week 5	02/03 to 02/07	Fertility-regulating mechanisms and their manipulation ( <b>Dr. Babar</b> )
	02/7	<b>Lab-2 assignment:</b> Quantitative traits, heritability, genetic gain, and application in plant breeding ( <b>Dr. Babar</b> )
Week 6	02/11 to 02/14	Breeding methods for self-pollinating crops ( <b>Dr. Babar</b> )
Week 7	02/18 to 02/21	Breeding methods for cross-pollinating crops ( <b>Dr. Babar</b> )
Week 8	02/24 to 02/28	Breeding methods suitable for hybrid cultivars ( <b>Dr. Babar</b> )
	02/26	<b>Lab-3 assignment:</b> Breeding procedure of a specific crop practiced by different public and private industries ( <b>Dr. Babar</b> )
	02/28	<b>Exam 2; 90 mins scheduled time; from 5 pm of 02/28 to 5 pm of 03/01 (Dr. Babar)</b>
Week 9		<b>Spring break</b>
Week 10	03/09 to 03/13	Breeding methods of corn and peanut ( <b>Dr. Babar</b> )
Week 11	03/16 to 03/20	Bonus breeding field trip to small grain breeding program/blueberry breeding program or both
	03/20	<b>Exam 3; 90 mins scheduled time; from 5 pm of 03/20 to 5 pm of 03/21 (Dr. Babar)</b>
Week 12	03/23 to 03/27	Introduction to Biotech crops I-IV ( <b>Dr. Altpeter</b> )
Week 13	03/30 to 04/03	Introduction to Biotech crops V-VI; Molecular characterization of (transgenic) plants I-II ( <b>Dr. Altpeter</b> )
Week 14	04/06 to 04/10	Molecular markers and Marker-assisted breeding I-III ( <b>Dr. Altpeter</b> )
Week 15	04/17	Review session for exam 4 ( <b>Dr. Altpeter</b> ) live in 2108 McCarty B or via zoom link , 3:30 pm-5pm
Week 16	04/20-04/22	<b>Exam 4 (Dr. Altpeter) (date and time will be decided later)</b>

**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.**

### **Online Course Evaluation Process**

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### **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/](http://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/](http://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/](http://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.**