Objectives:
This course is intended to provide a basic introduction to plant genetics, cytogenetics, and genomics and to relate current techniques and research discoveries to plant breeding methods, including DNA marker-assisted selection. Beginning from this base, the course then covers the theory and principles of plant breeding methodology including population improvement, selection procedures, genotypic evaluation, cultivar development and breeding strategies.

Instructors: T. G. Isleib, Professor; J.B. Holland, Associate Professor

Dr. Holland will teach approximately the first five weeks of the course and Dr. Isleib will teach the remaining lectures.

Office Hours:
Dr. Isleib’s regular office hours will be 10:00 to 12:00 Tuesday and Thursday in Rm 210 at 840 Method Rd., Unit 3. If you need to schedule an appointment with Dr. Isleib at some other time, his telephone number is 515-3281. You also can contact him by e-mail at tom_isleib@ncsu.edu.

Dr. Holland will meet with students as arranged by appointment. His phone number is 513-4198 and his email address is: james_holland@ncsu.edu.

Grading System:
Half of the course grade will be given by Dr. Holland, and half by Dr. Isleib. The two grades will be averaged to obtain the final grade. Dr. Holland’s grades will be based on six homework assignments. Final grades will not be posted by student number. Students may obtain their final grades by contacting the instructor or over the Internet. Grades will not be disclosed to any other student.

Prerequisites:
Formally, CS (GN, HS) 741 (Plant Breeding Methods) and ST 512 are the prerequisites for CS 413. For CS 746, students are expected to be familiar with basic concepts and principles of eukaryotic genetics including Mendelian inheritance, linkage and mapping, chromosomal mutation and variation, population genetics and evolution, DNA structure and function, mutation, and gene regulation. These topics will be reviewed briefly when introduced in the context of plant breeding methods.

Attendance Policy:
In accordance with University policy as set forth in the Handbook for Teachers, 3rd Ed., regular attendance at classes and examinations is expected of all students. Attendance at examinations is mandatory. Excuses for anticipated or emergency absences from examinations may be accepted at my discretion. Examples of anticipated absences are:
(1) University duties or university trips as certified by an appropriate member of the faculty or staff, (2) required court attendance as certified by the Clerk of Court, and (3) religious observances as certified by the Department of Student Development. Students seeking an excuse for an anticipated absence must notify me in writing with the appropriate certification at least one week prior to the absence. Examples of emergency absences are: (1) illness or injury when certified by an attending physician and (2) death or serious illness in the family when certified appropriately. Excuses for emergency absences must be reported to me not more than one week after the return to class. Students absent from an examination without excuse will receive no credit for the examination.

**Academic Integrity:**

Students should be aware of the University policy on academic integrity found in the Code of Student Conduct. The Code is available on the Internet under the Academic Policies heading on the NCSU home page. Students are expected to perform their work independently. Groups of students enrolled in CS 746 may collaborate in homework assignments, but each student must turn in each assignment independently. By placing his or her signature on an assignment or test, the student is implicitly affirming the NCSU students' Honor Pledge, i.e., “I have neither given nor received unauthorized aid on this test or assignment.” Violation of this pledge constitutes academic dishonesty with the consequences described in the Code of Student Conduct.

**Text:**

There is no assigned text. Lecture notes for some classes are available at Jim Holland’s website: [http://www4.ncsu.edu/~jholland/Teaching.html](http://www4.ncsu.edu/~jholland/Teaching.html). Assigned readings will be journal articles. The assigned readings are required and will be covered on homeworks. Journal articles will be available on the internet as PDF files at Jim Holland’s website or via the NCSU library website.

**Syllabus (Part 1, entirely subject to change!):**

**Monday, Feb. 13:** Review of plant cytogenetics
- Centromeres and telomeres
- Basic terminology
- Meiosis – diploid, disomic polyploid, polysomic polyploid

**Wednesday, Feb. 15:** Review of plant cytogenetics
- Polyploid segregation ratios
- Centromere mapping

**Friday, Feb. 18:** Chromosome pairing in allopolyploids
- Control of pairing – Ph1
- Rapid genome evolution in allopolyploids

*Homework 1 out: basic genetics*
Monday, Feb. 20: Crossing-over and recombination

Wednesday, Feb. 22: Crossing-over and recombination

Friday, Feb. 24: Transposable Elements
(guest lecture by Dr. Peter A. Peterson)

Homework 1 due
Homework 2 out: crossing-over

Monday, Feb. 27: Mapping genes with aneuploids
Physical mapping

Wednesday, Mar. 1: Recombination and linkage mapping (Jines)

Friday, Mar. 3: Recombination and linkage mapping (Jines)

Homework 2 due
Homework 3 out: linkage mapping

Mar. 6 – Mar. 10 Spring break, no classes!

Monday, Mar. 13: Physical mapping/Genome organization

Wednesday, Mar. 15: Jim travels to Cornell

QTL mapping I (Jines)

Friday, Mar. 17: QTL mapping II

Homework 3 due
Homework 4 out: genome organization, QTL mapping

Monday, Mar. 20: QTL mapping III

Wednesday, Mar. 22: QTL mapping IV

Friday, Mar. 24: Linkage disequilibrium and association mapping

Homework 4 due
Homework 5 out: QTL mapping

Monday, Mar. 27: Marker-assisted backcrossing

Wednesday, Mar. 29: Marker-assisted selection

Friday, Mar. 31: Marker-assisted selection

Homework 5 due
Homework 6 out: QTL mapping/MAS

Monday, April 3: Dr. Isleib begins.