# GN 757 Course Syllabus

## GN 757 – Quantitative Genetics Theory and Methods

**Section 001**

**FALL 2017**

**3 Credit Hours**

### Course Description

The essence of quantitative genetics is to study multiple genes and their relationship to phenotypes. How to study and interpret the relationship between phenotypes and whole genome genotypes in a cohesive framework is the focus of this course. We discuss how to use genomic tools to map quantitative trait loci, how to study epistasis, how to study genetic correlations and genotype-by-environment interactions. We put special emphasize in using genomic data to study and interpret general biological problems, such as adaptation and heterosis. The course is targeted for advanced graduate students interested in using genomic information to study a variety of problems in quantitative genetics.

### Learning Outcomes

Students will perform data analysis on QTL mapping, on epistasis and genotype-by-environment interaction and on genomic selection from publicly available genomic data using the theory and methods learnt from the course and publicly available genomic tools. Through lectures, assignments and project, students will learn how to use genomic tools to perform genetic analysis for interpreting genetic basis and structure of quantitative trait variation in a population.

### Course Structure

The course is primarily conducted through lectures. There are two assignments and a final project. The assignments are targeted to use genomic tools to perform genetic data analysis. The final project is targeted to produce and defend a cohesive interpretation on a specified genetic problem from a genomic dataset.

### Course Policies

Regular attendence in class is required. Extended absence in class and delays in assigment and project returns will result in a deduction of the final score.

### Instructors

**Zhao-Bang Zeng** (szeng) - *Instructor*  
**Email:** [szeng@ncsu.edu](mailto:szeng@ncsu.edu)   
**Phone:** 9196108764   
**Office Location:** 366 Ricks Hall   
**Office Hours:** 4:30-5:30 Tuesday and Thursday

### Course Meetings

#### Lecture

**Days:** Tuesday and Thursday   
**Time:** 3:00pm - 4:15pm   
**Campus:** Main   
**Location:** 321 Mann Hall   
*This meeting is required.*

### Course Materials

#### Textbooks

None.

#### Materials

Will be distributed in class.

### Requisites and Restrictions

#### Prerequisites

ST 511

### Safety & Risk Assumptions

None.

### Grading

#### Grade Components

| Component | Weight |  |
| --- | --- | --- |
| Assignments and final project | 60% assignments and 40% final project |  |

#### Letter Grades

**This Course uses Standard NCSU Letter Grading:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 97 | ≤ | **A+** | ≤ | 100 |
| 93 | ≤ | **A** | < | 97 |
| 90 | ≤ | **A-** | < | 93 |
| 87 | ≤ | **B+** | < | 90 |
| 83 | ≤ | **B** | < | 87 |
| 80 | ≤ | **B-** | < | 83 |
| 77 | ≤ | **C+** | < | 80 |
| 73 | ≤ | **C** | < | 77 |
| 70 | ≤ | **C-** | < | 73 |
| 67 | ≤ | **D+** | < | 70 |
| 63 | ≤ | **D** | < | 67 |
| 60 | ≤ | **D-** | < | 63 |
| 0 | ≤ | **F** | < | 60 |

#### Requirements for Credit-Only (S/U) Grading

Performance in research, seminar and independent study types of courses (6xx and 8xx) is evaluated as either "S" (Satisfactory) or "U" (Unsatisfactory), and these grades are not used in computing the grade point average. For credit only courses (S/U) the requirements necessary to obtain the grade of "S" must be clearly outlined.

#### Requirements for Auditors (AU)

Information about and requirements for auditing a course can be found at <http://policies.ncsu.edu/regulation/reg-02-20-04>.

#### Policies on Incomplete Grades

If an extended deadline is not authorized by the Graduate School, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) by the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at <http://policies.ncsu.edu/regulation/reg-02-50-03>. Additional information relative to incomplete grades for graduate students can be found in the Graduate Administrative Handbook in Section 3.18.F at <http://www.fis.ncsu.edu/grad_publicns/handbook/>

#### Late Assignments

Late assignment return will result in 10% deduction of the allocated score.

### Attendance Policy

For complete attendance and excused absence policies, please see <http://policies.ncsu.edu/regulation/reg-02-20-03>

#### Attendance Policy

Regular attendence in class is required.

#### Absences Policy

Occational absence in class with prior notification and full explanation is allowed.

#### Makeup Work Policy

Makeup assignments and project are allowed but with 10% deduction of the allocated sore.

#### Additional Excuses Policy

None.

### Academic Integrity

#### Academic Integrity

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at <http://policies.ncsu.edu/policy/pol-11-35-01>

#### Academic Honesty

See <http://policies.ncsu.edu/policy/pol-11-35-01> for a detailed explanation of academic honesty.

#### Honor Pledge

Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

### Electronically-Hosted Course Components

The coruse materials will be distributed through Wolfware (https://wolfware.ncsu.edu)

### Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, student must register with the Disability Services Office (<http://www.ncsu.edu/dso>), 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation at [http://policies.ncsu.edu/regulation/reg-02-20-01.](http://policies.ncsu.edu/regulation/reg-02-20-01)

### Non-Discrimination Policy

NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at <http://policies.ncsu.edu/policy/pol-04-25-05> or [http://www.ncsu.edu/equal\_op/.](http://www.ncsu.edu/equal_op/) Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

## Course Schedule

**NOTE:** The course schedule is subject to change.

### Lecture TH 3:00pm - 4:15pm — Untitled Week — 08/16/2017 - 12/01/2017

|  |
| --- |
| **Topic** |
| * **Theory and models of multiple genes and epistasis** |
| * **How to map quantitative trait loci (QTL) and infer QTL effect distribution** |
| * **How to estimate genomic epistasis consistently** |
| * **How to estimate genetic correlations and genotype-by-environment interaction consistently** |
| * **Theory and genomic study of adaptation** |
| * **Theory and genomic study of heterosis** * (Added) **Polyploid genetic, genomic and QTL analysis** |