

Genome Wide Association Studies
CROPS 512 Topics
1 credit hour- Fall 2015

Professor: Zhiwu Zhang
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Course Objective: To understand the statistical concept and principals in gene mapping for modern breeding programs.

Lecture: Johnson Hall 116. Tue/Thu 4:15-5:05, August 24 to October 9, 2015

Office hours: By appointment

Attendance: Participation in each class is expected. Asking questions and contribution to discussions are part of lecturing theme in addition to homework and exams.

Course Description: With the wide available genetic markers covering entire genomes, Genome Wide Association Studies (GWAS) have become the most effective approaches to identify genes controlling human diseases and agriculturally important traits. This course illustrates the fundamental concepts in GWAS and their applications by using advanced methods developed in recent years. The outcomes include deep understanding on false discovery rates, mechanism of GWAS, and experimental design through power analyses in aspects of marker density, population structure, and relatedness. Advanced statistical methods and computing tools are covered to perform GWAS with different efficiency and statistical power.

Required Text Book: There is no required textbook. Each lecture will be accompanied by a handout that covers all of the in class material and more in-depth material that is beyond this course. For students who would like to have a general reference book, I recommend: Genome-Wide Association Studies and Genomic Prediction (Methods in Molecular Biology)

Prerequisites: Introductory statistics and genetics courses are recommended. Experience with R programming helps, but not required.

Course Evaluation: Grading of examinations, homework, asking questions and discussions will focus on demonstration of knowledge of concepts, not ability to memorize, derive, and/or calculate detailed formulas.

Grades will be based on:

Present (10%)
Participation (20%)
Homework (45%)
Final exam (25%)

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Campus Resources

- Writing Center, <http://www.writingprogram.wsu.edu/units/writingcenter/>
- Library Services, <http://www.wsulibs.wsu.edu/>
- CACD, Center for Advising and Career Development, <http://www.cacd.wsu.edu/>
- Office of Student Conduct, <http://conduct.wsu.edu>
- Counseling and Testing Services, <http://counsel.wsu.edu/>
- Academic Integrity, <http://academicintegrity.wsu.edu>

Students with Disabilities: Reasonable accommodations are available for students with a documented disability. If you have a disability or may need accommodations to fully participate in this class, please visit the Access Center. All accommodations MUST be approved through the Access Center (Washington Building, Room 217). Please stop by or call 509-335-3417 to make an appointment with a disability specialist. <http://accesscenter.wsu.edu>

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 Tue, Thu 4:15-5:05PM
 116 Johnson Hall
 1 credits

Date	No.	Chapter	Lecture
8/25/2015	1	Fundamentals	Syllabus/course overview and introduction
8/27/2015	2		Genotype
9/1/2015	3		Phenotype
9/3/2015	4		R programming
9/8/2015	5		Linkage Disequilibrium (LD)
9/10/2015	6	(HW1 due)	Statistical inference and power
9/15/2015	7	Methods	Population structure and General Linear Model (GLM)
9/17/2015	8		Kinship and Mixed Linear Model (MLM)
9/22/2015	9		MLM approximation (P3D/EMMAx)
9/24/2015	10	(HW2 due)	Compressed MLM
9/29/2015	11		Enriched compressed MLM
10/1/2015	12		Complimentary kinship (SUPER/Fast-LMM-Select)
10/6/2015	13		Multiple Loci MLM
10/8/2015	14	(HW3 due)	Advance topic