

IMPORTANT: This syllabus form should be submitted to OAA (gsbs_academic_affairs@uth.tmc.edu) a week before the start of each semester.

NOTE to STUDENTS: If you need any accommodations related to attending/enrolling in this course, please contact one of the Graduate School's 504 Coordinators, Cheryl Spitzenberger or Natalie Sirisaengtaksin. We ask that you notify GSBS in advance (preferably at least 3 days before the start of the semester) so we can make appropriate arrangements.

<p>Term and Year: Fall 2024</p> <p>Course Number and Course Title: GS11 1113: Introduction to Statistical Genetics and Bioinformatics <i>(Cross listed with UTH Health School of Public Health PH1986)</i></p> <p>Credit Hours: 3</p> <p>Meeting Location: UTHealth School of Public Health 1200 Pressler St., Houston 77030</p> <p>Building/Room#: RAS Building, Room E705</p>	<p>Program Required Course: No</p> <p>Approval Code: Yes (If yes, the Course Director or the Course Designee will provide the approval code.)</p> <p>Audit Permitted: Yes</p> <p>Classes Begin: August 26, 2024</p> <p>Classes End: December 06, 2024</p> <p>Final Exam Week: Dec. 09-13, 2024</p>				
<p>Class Meeting Schedule</p>					
<table border="1"> <thead> <tr> <th data-bbox="82 1024 797 1066">Day</th> <th data-bbox="797 1024 1531 1066">Time</th> </tr> </thead> <tbody> <tr> <td data-bbox="82 1066 797 1108">Wednesday</td> <td data-bbox="797 1066 1531 1108">1:00 – 3:50 pm</td> </tr> </tbody> </table>	Day	Time	Wednesday	1:00 – 3:50 pm	
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<p>Course Director</p> <p>Name and Degree: Yun-xin Fu, PhD</p> <p>Title: Professor</p> <p>Department: Dept. Biostatistics and Data Science, UTH Health School of Public Health</p> <p>Institution: UTH</p> <p>Email Address: Yunxin.Fu@uth.tmc.edu</p> <p>Contact Number: 713-500-9813</p> <p>NOTE: Office hours are available by request. Please email me and cc: Sara.A.Barton@uth.tmc.edu to arrange a time to meet.</p> <p>Teaching Assistant: N/A</p>	<p>Instructors</p> <p>1. Yun-xin Fu, PhD Institution: UTHH-SPH Email Address : Yunxin.Fu@uth.tmc.edu</p> <p>2. James J. Yang, PhD Institution: : UTHH-SPH Email Address: James.J.Yang@uth.tmc.edu</p> <p>Email Address</p>				

Course Description:

This course is offered in the Fall semester every year and will provide basic principles for understanding statistical genetics and bioinformatics. This course is intended for masters and doctoral level students. Course requirements will be the same for masters and doctoral level students.

This course is designed as an introduction to statistical genetics/ bioinformatics and serves as the entry point to several courses in this area. It reviews the key statistical concepts and methods relevant to statistical and epidemiological genetics, discusses various topics that have significant statistical component in genetics and genomics, including population genetics. Topics include estimation of gene frequencies, linkage/association analysis, sequence alignment and phylogenetic analysis, forensic inference, microarray analysis and genetic network.

This course has been revamped in 2021 to merge the course "Introduction to Statistics Genetics" and "Introduction to Genomics and Bioinformatics".

Textbook/Supplemental Reading Materials:

The course is not based on a single text book but the following text books are highly relevant. These texts are on reserve in the UTHealth School of Public Health Library, RAS Building, 1200 Pressler St., 1st floor, Room E109, phone 713-500 9121.

<https://sph.uth.edu/research/library/index.htm>; <https://libguides.sph.uth.tmc.edu/c.php?g=1055822>

- Weir, B., 1996. *Genetic Data Analysis II*. Sunderland, MA.: Sinauer Assoc. Inc.
- Evett, I.W., Weir, B.S. 1998. *Interpreting DNA Evidence: Statistical Genetics for Forensic Scientists*. Sunderland, MA.: Sinauer Assoc. Inc.
- Hartl D.L. and Clark, A. G. 2007. *Principles of Population Genetics*. 4th Edition. Sunderland, MA: Sinauer Assoc. Inc.

Course Objective/s:

Upon successful completion of this course, students are expected to gain adequate knowledge on several key areas of statistical genetics for taking more advanced courses in statistical genetics. The overall learning objective of this course is to understand various situations in which significant interplay between statistics and genetics is fundamental.

Specific Learning Objectives:

1. Understand the fundamental principles and theory in selected areas of genetics/bioinformatics in which statistics plays important roles.
2. Apply some widely used statistical methods and approaches for answering specific questions.
3. Be ready for more advanced courses in the area of statistical genetics.

Student Responsibilities and Expectations:

Students enrolled in this course are expected to attend and participate in all class lectures and complete homework assignments which will be graded and returned to the student an open book mid-term and final examinations.

Handouts will be in either Power Point or PDF format; students are expected to have access to computers with Power Point and Adobe Acrobat reader.

Students may work and discuss all course materials and assignments in groups, all writing assignments must be your own. Plagiarism and failure to properly cite scientific literature and other sources will not be tolerated and are grounds for dismissal from the course and further GSBS disciplinary action. Cheating or engaging in unethical behavior during examinations (mid-term and final) will be grounds for dismissal from the course without credit and further GSBS disciplinary action.

Students are expected to prepare for and take an open book mid-term and final examination.

Grading System: Letter Grade (A-F)

Assessment and Grading Criteria : (May include the following:)

Homework/presentation (25%)	Description: A number of graded home work assignments will be given
Midterm Exams (35%)	Description: Open book in class exam
Final Exam (35%)	Description: Open book in class exam
Participation and/or Attendance (5%)	Description: Students are expected to attend class

CLASS SCHEDULE – Fall 2024

Day/Date	Duration (Hr)	Lecture Topic	Lecturer
Aug 28	1:00-3:50 pm	Characteristics of genetic data and statistical preparation	Yun-xin Fu, PhD
Sept 4	1:00-3:50 pm	Essence of population genetics and Hardy-Weinberg equilibrium	Yun-xin Fu, PhD
Sept 11	1:00-3:50 pm	Linkage disequilibrium and TDT	James Yang, PhD
Sept 18	1:00-3:50 pm	Genome-wide association studies	James Yang, PhD
Sept 25	1:00-3:50 pm	Statistical computing and Cloud computing	Yun-xin Fu, PhD
Oct 2	1:00-3:50 pm	DNA fingerprinting	Yun-xin Fu, PhD
Oct 9	1:00-3:50 pm	Introduction to microarray analysis	Yun-xin Fu, PhD

Oct 16	1:00-3:50 pm	Mid-term examination (open book)	Yun-xin Fu, PhD
Oct 23	1:00-3:50 pm	DNA sequence alignment	James Yang, PhD
Oct 30	1:00-3:50 pm	Composition and evolution of DNA sequences	Yun-xin Fu, PhD
Nov 6	1:00-3:50 pm	Phylogenetic analysis	Yun-xin Fu, PhD
Nov 13	1:00-3:50 pm	Artificial intelligence and genetic network	Yun-xin Fu, PhD
Nov 20	1:00-3:50 pm	Genetic variation in a sample from a population	Yun-xin Fu, PhD
Nov 27	1:00-3:50 pm	Next-generation sequencing and statistical issues	Yun-xin Fu, PhD
Dec 3	1:00-3:50 pm	Case study: Characteristics of SARS-CoV-2 pandemic and phylogeny of various strains	Yun-xin Fu, PhD
Dec 10	1:00-3:50 pm	Final examination (open book)	Yun-xin Fu, PhD

This course is Cross-listed with UHealth School of Public Health PH1986

XF/SB/jal