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

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.

Term and Year: **Fall 2023** Course Number and Course Title: **GS11 1113: Introduction to Statistical Genetics and Bioinformatics** (Cross listed with UTHealth School of Public Health PH1986) Credit Hours: **3** Meeting Location: UTHealth School of Public Health 1200 Pressler Street Building/Room#: **RAS Building, Room E705**	Program Required Course: **No** Approval Code: **Yes** **(If yes,** the Course Director or the Course Designee will provide the approval code.) Audit Permitted: **Yes** Classes Begin: **Aug. 30, 2023** Classes End: **Dec. 06, 2023** Final Exam Week: **Dec. 11-15, 2023**

Class Meeting Schedule

Day	Time
Wednesday	**1:00 – 3:50 pm**

Course Director Name and Degree: **Yun-xin Fu, PhD** Title: Professor Department: Dept. Biostatistics and Data Science, UTHealth School of Public Health Institution: UTH Email Address: Yunxin.Fu@uth.tmc.edu Contact Number: 713-500-9813 **Course Co-Director/s:** (if any) Name and Degree: **N/A** Title: Department: Institution: *UTH* *MDACC* Email Address:	**Instructor/s** 1. Name and Degree: **Yun-Xin Fu, PhD** Institution: UTHealth School of Public Health Email Address : Yunxin.Fu@uth.tmc.edu 2. Name and Degree: **James J. Yang, PhD** Institution: UTHealth School of Public Health Email Address : James.J.Yang@uth.tmc.edu

NOTE: Office hours are available by request. Please email me and cc: Sara.A.Barton@uth.tmc.edu to arrange a time to meet.

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 (if any)

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)	
Student 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

Day/Date	Duration (Hr)	Lecture Topic	Lecturer
Aug 30	1:00-3:50 pm	Characteristics of genetic data and statistical preparation	Yun-xin Fu, PhD
Sept 6	1:00-3:50 pm	Essence of population genetics and Hardy-Weinberg equilibrium	Yun-xin Fu, PhD
Sept 13	1:00-3:50 pm	Linkage disequilibrium and TDT	James Yang, PhD
Sept 20	1:00-3:50 pm	Genome-wide association studies	James Yang, PhD
Sept 27	1:00-3:50 pm	Statistical computing and Cloud computing	Yun-xin Fu, PhD
Oct 4	1:00-3:50 pm	DNA fingerprinting	Yun-xin Fu, PhD

Oct 11	1:00-3:50 pm	Introduction to microarray analysis	Yun-xin Fu, PhD
Oct 18	1:00-3:50 pm	Mid-term examination (open book)	Yun-xin Fu, PhD
Oct 25	1:00-3:50 pm	DNA sequence alignment	James Yang,PhD
Nov 1	1:00-3:50 pm	Composition and evolution of DNA sequences	Yun-xin Fu, PhD
Nov 8	1:00-3:50 pm	Phylogenetic analysis	Yun-xin Fu, PhD
Nov 15	1:00-3:50 pm	Artificial intelligence and genetic network	Yun-xin Fu, PhD
Nov 22	1:00-3:50 pm	Genetic variation in a sample from a population	Yun-xin Fu, PhD
Nov 29	1:00-3:50 pm	Next-generation sequencing and statistical issues	Yun-xin Fu, PhD
Dec 6	1:00-3:50 pm	Case study: Characteristics of SARS-CoV-2 pandemic and phylogeny of various strains	Yun-xin Fu, PhD
Dec 13	1:00-3:50 pm	Final examination (open book)	Yun-xin Fu, PhD

NOTE: **This course is Cross-listed with UTHealth School of Public Health PH1986**