

2023-2024 MCB Area of Interest Course Information

Genetics, Genomics, & Evolution

Please check the University of Washington Time Schedule for the most updated course information.

FOUNDATIONAL COURSES

Foundational Course One:

Course Number: GENOME 553

Course Title: Advanced Genetic Analysis

Instructor (s): Celeste Berg

Location: UW

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-10

Attributes: Graded, Discussion

Sub Area (if applicable): Genetics; Genomics

Synopsis: Explores genetic analysis as a powerful approach for dissecting complex biological processes. Covers how scientists use selective removal, addition, or alteration of specific proteins to: identify and order genes in a pathway; define protein function; determine tissue, temporal, and sub-cellular requirements for activity; and distinguish among competing hypotheses to explain biological phenomena.

Size Limit: 20 (required for the 12 GS first-year students); that is, 8 slots will be available on first-come, first-served basis.

Foundational Course Two:

Course Number: GENOME 561

Course Title: Molecular Population Genetics and Evolution

Instructor (s): Kelley Harris

Location (e.g., UW, FH, SLU): UW

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-5

Attributes (e.g., graded, lecture-based): Graded, lecture

Sub Area (if applicable): Evolution

Synopsis: Surveys recent literature to gain an understanding of the basic principles of molecular population genetics and evolution as applied to analysis of genome data. Requires some computer analysis of genome data.

Size Limit: 20 (required for the 12 GS first-year students)

Foundational Course Three:

Course Number: MCB 536

Course Title: Tools for Computational Biology

Instructor (s): Phil Bradley, Melody Campbell, Gavin Ha, Maggie Russell, Manu Setty, Rasi Subramaniam

Location: FH

Credits: 3

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-10, every year

Attributes: Graded, lecture, hands-on computational work

Sub Area (if applicable): Genomics

Synopsis: Introduction to established best practices in computational biology. Learn to organize unstructured data into standard formats, transform data for statistical analyses, and visualize the transformed data. Learn workflows for reproducible research such as version control, project organization, and code documentation. Gain basic experience with Linux command line tools and the Python and R programming languages. Classes will involve hands-on learning through coding exercises, collaborative problem solving, and extensive use of online learning resources.

ELECTIVE COURSES

Elective Course One:

Course Number: CONJ 537

Course Title: Mechanism Of Transcriptional Regulation

Instructor (s): Avgousti, Hahn, Tsukiyama

Location: FH

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 6-10, even years, *will be offered Autumn 2024*

Attributes: Graded, lecture/discussion

Sub Area (if applicable): Genetics

Synopsis: A five-week graduate survey course concentrating on biochemical mechanisms of gene transcription. The course will cover a broad range of transcriptional regulation including: Mechanisms of transcriptional initiation; Regulation of transcription by chromatin; Transcriptional regulation, development and diseases in mammals.

Elective Course Two:

Course Number: CONJ 557

Course Title: Microbial Evolution

Instructor (s): Sokurenko

Location: UW

Credits: 2

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-5, every year, *will be offered in Spring 2024*

Attributes: General microbiology knowledge required prior to taking course

Sub Area (if applicable): Evolution

Synopsis: Selected topics in microbial evolution including evidence for early life on Earth, molecular mechanisms of bacterial and viral evolution, speciation, adaptive niche differentiation, bioinformatics tools to detect selection, and evolution of the virulence and pandemic spread.

Elective Course Three:

Course Number: GENOME 551

Course Title: Principles of Gene Regulation

Instructor (s): Cole Trapnell

Location: UW

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Winter, weeks 6-10

Attributes: Graded, Lecture/discussion

Sub Area (if applicable): Genetics

Synopsis: A detailed examination of the mechanisms of transcription and translation as determined by experimental genetics, molecular biology, and biochemistry.

Size Limit: 20 (required for the 12 GS first-year students)

Elective Course Four:

Course Number: GENOME 552

Course Title: Technologies For Genome Analysis

Instructor (s): Lea Starita

Location: UW

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 6-10

Attributes: Graded, lecture/discussion

Sub Area (if applicable): Genomics

Synopsis: Discussion of current and newly-emerging technologies in genome analysis with regard to applications in biology and medicine and to potential advantages and limitations

Size Limit: 17 (required for the 12 GS first-year students—already filled up for Autumn 2023).

Contact course instructor and state your interest.

Elective Course Five:

Course Number: GENOME 559

Course Title: Introduction To Statistical and Computational Genomics

Instructor (s): Bill Noble, Brian Beliveau

Location: UW

Credits: 3

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10

Attributes: Graded, for students with little/no coding experience

Sub Area (if applicable): Genomics

Synopsis: Rudiments of statistical and computational genomics. Emphasis on basic probability and statistics, introduction to computer programming, and relevant web databases.

Size Limit: 19 (only taken by GS first-year students if they have no prior programming experience)

Elective Course Six:

Course Number: GENOME 562

Course Title: Population Genetics

Instructor (s): Kelley Harris, Alison Feder

Location: UW

Credits: 4

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10, *will be offered in Winter 2024*

Attributes:

Sub Area (if applicable): Genetics; Evolution

Synopsis: Mathematical and experimental approaches to the genetics of natural populations, especially as they relate to evolution. Emphasis on theoretical population genetics.

Size Limit: Probably 20 (Not required for GS students, but popular with Bio students)

Elective Course Seven:

Course Number: GENOME 565

Course Title: Advanced Human Genetics

Updated October 2023

Instructor (s): Evan Eichler, Mary-Claire King

Location: UW

Credits: 4

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10

Attributes: Graded, lecture, literature review, methods

Sub Area (if applicable): Genetics; Genomics

Synopsis: The goal of the course is to provide students with knowledge and tools most useful for successful research in human genomics. Components of the course are: gene discovery and molecular function; genomic architecture; cancer genetics; and human diversity and evolution. The course meets winter quarter, with three lectures per week by the instructors and weekly section meetings. Multiple problem sets are based on real data.

Prerequisite(s): College-level genetics course (GENOME 361 or 371); for genetics courses taken elsewhere, please ask the instructors. The class typically includes about 60 students, including both undergraduate and graduate students.

Size Limit: 20 (the graduate version of the course does not usually fill up although the undergrad version, 465, often does)

Elective Course Eight:

Course Number: GENOME 569

Course Title: Bioinformatics Workflows for High-Throughput Sequencing Experiments

Instructor (s): Cole Trapnell

Location: UW

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-5

Attributes: lectures, graded, hands-on bioinformatics projects

Sub Area (if applicable): If you plan to work with next-gen sequencing data

Synopsis: Programming skills and software tools for building automated bioinformatics pipelines and computational biology analyses. Emphasis on UNIX tools and R libraries for distilling raw sequencing data into interpretable results. For students familiar with UNIX and with some programming experience in Python, R, or C/C++.

Size Limit: 15 (not required of GS students but gets considerable interest)

Elective Course Nine:

Course Number: MCB 517/CONJ 533 (the first year it will be piloted under the MCB number and then switched to CONJ 533, to compliment CONJ 537)

Course Title: Epigenetics and Epigenomics (a revised version of an older course, The Dynamic Chromosome)

Instructor (s): Steve Henikoff

Location: FH

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-5, even years, *will be offered in Autumn 2024*

Sub Area (if applicable): Genetics

Synopsis: Mechanisms of cellular memory mediated through nucleosomes, DNA-binding proteins, DNA and histone covalent modifications, and chromatin dynamics.