

2024-2025 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): TBD

Location: UW

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-10. **Course is not currently being offered**

Attributes: Graded, Discussion

Sub Area (if applicable): Genetics; Genomics

Synopsis: Explores genetic analysis as a powerful approach for dissecting complex biological processes. Discusses methods for selectively removing, adding, or altering specific proteins, to identify and order genes in a pathway, define protein function, determine tissue and temporal requirements for gene function, and distinguish among competing hypotheses to explain biological phenomena. Formerly called GENET 551. **Prerequisite(s):** GENOME 371, GENOME 551 or equivalent.

Capacity Limit: 20 (required for the 14 GS first-year students); that is, remaining 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. *Will be offered in Winter 2025*

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.

Capacity Limit: 20 (required for the 14 GS first-year students); that is, remaining slots will be available on first-come, first-served basis.

Foundational Course Three:

Course Number: MCB 536

Course Title: Tools for Computational Biology

Instructor (s): Arvind Subramaniam

Location: FH

Credits: 3

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 1-10, every year. *Will be offered in Autumn 2025*

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 533

Course Title: Epigenetics and Epigenomics

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 2026*

Sub Area (if applicable): Genetics

Synopsis: Mechanisms of cellular memory mediated through nucleosomes, DNA-binding proteins, DNA and histone covalent modifications, and chromatin dynamics. This course is an updated version of the Dynamic Chromosome (CONJ 533 Autumn 2016 and earlier).

Elective Course Two:

Course Number: CONJ 537

Course Title: Mechanism Of Transcriptional Regulation

Instructor (s): TBD

Location: FH

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Autumn, weeks 6-10, even years. *Will be offered in Autumn 2026*

Attributes: Graded, lecture/discussion

Sub Area (if applicable): Genetics

Synopsis: Biochemical mechanisms of gene transcription covering a broad range of transcriptional regulation, including mechanisms of transcriptional initiation, elongation, and termination. Regulation of transcription by chromatin. Includes a special lecture regarding regulation of transcription in cell growth and differentiation.

Elective Course Three:

Course Number: CONJ 557

Course Title: Microbial Evolution

Instructor (s): TBD

Location: TBD

Credits: 2

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-5. **Course is not currently being offered**

Attributes:

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. **Prerequisite(s):** MICROM 412 or general microbiology background.

Elective Course Four:

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. *Will be offered in Winter 2025*

Attributes: Graded, Lecture/discussion

Sub Area (if applicable): Genetics

Synopsis: Course covers fundamentals of gene regulation in eukaryotes including principles of cis and trans regulation of gene expression; DNA and RNA binding proteins; role of chromatin structure in gene expression; epigenetic regulatory mechanisms; RNA-based regulatory mechanisms; and post-transcriptional regulation. The course centers on reading and discussion of landmark primary literature in the aforementioned areas.

Capacity Limit: 29 (required for the 14 GS first-year students); that is, remaining slots will be available on first-come, first-served basis.

Elective Course Five:

Course Number: GENOME 552

Course Title: Technologies For Genome Analysis

Instructor (s): TBD

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: Introduces students to the nature of genomes, the structure of chromosomes, the organization of sequences, and the diversity of these features in different species. Discusses current and newly emerging technologies for mapping and sequencing genomes, determining linkage of simple and complex disorders, and identifying variations in DNA.

Capacity Limit: 17 (required for the 14 GS first-year students); that is, remaining slots will be available on first-come, first-served basis. Contact course instructor and state your interest.

Elective Course Six:

Course Number: GENOME 559

Course Title: Introduction To Statistical and Computational Genomics

Instructor (s): Bill Noble, Brian Beliveau

Location: UW

Credits: 3

Updated December 2024

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10. *Will be offered in Winter 2025*

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.

Capacity Limit: 20 (only taken by GS first-year students if they have no prior programming experience)

Elective Course Seven:

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, odd years. *Will be offered in Winter 2025*

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.

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

Elective Course Eight:

Course Number: GENOME 565

Course Title: Advanced Human Genetics

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

Location: UW

Credits: 4

Quarter, Weeks, and Frequency course is offered: Winter, weeks 1-10. *Will be offered in Winter 2025*

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.

Capacity Limit: 20 (the graduate version of the course does not usually fill up—there is a combined total enrollment of 80)

Elective Course Nine:

Course Number: GENOME 569

Course Title: Bioinformatics Workflows for High-Throughput Sequencing Experiments

Instructor (s): TBD

Location: UW

Updated December 2024

Credits: 1.5

Quarter, Weeks, and Frequency course is offered: Spring, weeks 1-5. ***Couse is not currently being offered***

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++.

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