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, ever 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.

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