First 3 Terms: Coursework at Knight Campus

Summer

BIO21: Computational Methods in Genomic Analysis (4 cred)
Students learn to think algorithmically by writing scripts in Bash and Python. They manage and analyze next generation sequencing (NGS) data, navigate the UNIX command line, and utilize tools on both their computer and UO’s high-performance computer cluster. (Prerequisites)

BIO22: Genomics Techniques (4 cred)
Learn about experimental design, genomics history and technology, and the molecular techniques for preparing high-quality nucleic acid sequencing libraries for both short and long-read sequencing. This course also develops students’ written and oral scientific communication skills.

BIO23: Topics in Genomics Analysis (4 cred)
Students are introduced to wide-ranging topics including phylogenetics, comparative genomics, transcriptome analysis, and microbial gene expression analysis, as well as statistics used in these analyses. Write scripts to manage and visualize data using RStudio, create professional reports using R markdown, and continue honing Python scripting skills.

Fall

BIO24: Genomics Research Lab (4 cred)
Students write algorithms to analyze NGS data. Expanding upon topics covered in BIO23, students are exposed to new topics in genomics analysis, including single-cell RNA-sequencing and statistical classification methods. Students begin team projects in which they use real world data supplied by UO and external partner labs. This project continues through winter (BIO25).

BIO10: Advanced Biological Statistics for Omics Data (4 cred)
This course will focus on fundamentals of applied statistical analysis for omics data. Students will gain an understanding of probability theory tenets such as sample spaces, basic and conditional probability, distributions, and Bayes’ Theorem. Course material will focus on practical application of non-parametric and parametric statistical tests, regression, generalized linear models, and experimental design to biological data. A strong emphasis is placed on equipping students to have the skills to determine the most appropriate statistical model/test given an omics dataset and biological hypothesis. Computing is done in R.

BIO30: Professional Communication and Development for Scientists I (1 cred)
Students learn best practices for professional scientific communication. Core elements include: composing a competitive resume, providing impactful answers during behavioral and technical interviews, and building a strong professional network. Students prepare for internships through a variety of practical workshops.

In this fall term, students may take optional graduate level elective courses: Students may choose to take one or more elective courses during fall and/or winter terms. Students should consult with program faculty when considering electives.

Winter

BIO25: Advanced Genomics Analysis (4 cred)
Students continue team projects from BIO24 and design and present a poster during the track’s annual scientific conference. Students gain exposure to special topics/projects throughout the term, including object-oriented programming, structured query language (SQL), analyzing PacBio data, creation of custom figures using Python graphics libraries, and the use of containers and cloud computing.

BIO10: Machine Learning for Omics Data (4 cred)
This course introduces core concepts and methods in modern multivariate data analysis and applications to omics data. Major concepts and topics include model selection, validation and boosting, feature selection, and model assumptions for unsupervised and supervised statistical learning. Students will learn to apply a variety of models such as polynomial and logistic regression, discriminant analysis, elastic nets, tree-based methods, k-means, and hierarchical clustering to biological data analysis problems. Methods are presented without heavy reliance on formulas and complex mathematics and instead focus is placed on important elements of the application of modern data analysis. Computing is done in R and Python.

BIO31: Professional Communication and Development for Scientists II (1 cred)
Building upon fall term BIO30.

Additional Electives Information
Students may choose to take one or more optional electives during the first fall and/or winter terms. We recommend that students consult with program faculty when considering electives. Some examples of classes taken by our students in previous years include:

Bi 526 - Genetics of Cancer
Bi 527 - Molecular Genetics Human Disease
BIOE 510 - Protein Engineering and Design

For students with more extensive computer science background or those looking for a challenge:

PHYS 510 - Image Analysis with Applications in Physics
CS 571 - Intro Artificial Intelligence
CS 572 - Machine Learning

For more information visit:

UO Class Schedule
Biology Course Information
Chemistry and Biochemistry Course Information
CIS Course Information
## Second 3 Terms:
### Internship with Partner Company

### Spring, Summer, Fall

**BI601: Internship Credits (10 credits per term for a total of 30 credits)**

Within an academic, clinical, industrial, or national lab setting, students gain hands-on experience in the application of their knowledge. Each term, students write a review paper to demonstrate advancement of technical knowledge and development of written communication skills. Learn more about the internship by visiting our website at internship.uoregon.edu/bioinformatics.

## Academic Timeline

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### Coursework (9 months)

- **BI 621** Computation Methods in Genomic Analysis
- **BI 622** Genomics Techniques
- **BI 623** Topics in Genomics Analysis
- **BI 624** Genomics Research Lab I
- **BI 610** Advanced Biological Statistics for Omics Data
- **BI 610** Machine Learning for Omics Data
- **BI 625** Advanced Genomics Analysis
- **BI 630** Professional Communication in Science I
- **BI/CH/CIS** Optional Elective
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### Internship (9 months)

- **BI 601** Research Internship
  - **START OF INTERNSHIP FLEXIBLE**
  - Must start on or after April 1