This syllabus is a general representation of the course as previously offered and is subject to change.

BIOL 338 – Introduction to Genomics

General Course Syllabus (as of September 2019)

About the Course:

Course Description: An introduction to genome biology and applications of genomics. This course will provide students with an introduction to the relatively new and cutting-edge discipline of genomics. It will be organized into five sections: (1) contents, organization, and dynamics of genomes; (2) genome sequencing and annotation; (3) genomics approaches to studying gene expression; (4) genome analysis and comparative genomics; (5) research in genomics. Applications of genomics to human health and disease, crop plant improvement, and other applied situations will be included. Tutorials will consist of computer labs to introduce students to web resources in genomics, along with group discussions of genomics research papers and timely topics in genomics.

Course Format: Lecture and Tutorial
Credits: 4
Prerequisites: One of BIOL 234, BIOL 233, FRST 302.

Course Learning Objectives:

By the end of this course, students should be able to:

- Achieve a working knowledge of concepts and recent discoveries in genomics.
- Explain how technological advances have led to conceptual advances in genomics.
- Relate concepts and discoveries in genomics to human disease, crop plant improvement, and other applied situations.
- Utilize major web resources in genomics.
- Identify the main results from a genomics research study and interpret figures from a primary research paper.

Textbooks and Additional Resources:

Reading: No textbook. Readings will be posted on the course Canvas page and will consist of literature review articles from journals, primary research papers, and other materials. Readings will give an introduction to the lecture topics and will be used in tutorials and weekly reading quizzes.

Required Materials: A laptop computer or tablet is needed for computer exercises in certain tutorials; do not use a phone for the computer exercises because the screen is too small to be effective. Clickers are needed for all lectures.

Evaluation:

Assessment	Weight
Midterm exam 1	15%
Midterm exam 2	18%
Final exam	35%
Tutorial exercises and participation	18%
Reading quizzes on Canvas	6%
Clicker questions and attendance	8%

Final exam: cumulative with an emphasis on material since midterm 2.
Reading quizzes: there will be a reading quiz approximately once per week.

Schedule of Topics:

Lecture Schedule (sample from 2018W2):

Week	Lecture
1	**Section 1: Contents, organization, and dynamics of genomes** - Course introduction, introduction to genomics - Chromatin structure and methylation
2	- Transposable elements: types and their abundance in genomes - Repetitive DNA: satellites and microsatellites
3	- Introduction to bioinformatics: Sequence databases including GenBank, BLAST, etc. - Centromeres and telomeres
4	- Sex chromosomes
5	**Midterm exam #1** **Section 2: Resource building - Genome sequencing and annotation** - Genomics for modern genetics and other biological disciplines - Concepts of genome assembly and the first Human genome
6	- Advances in genome assembly: the use of high-throughput technologies
7	- Genome annotation: Chromosome structure, gene structure, and gene content - Genome investigation using “Next Generation Sequencing”
8	**Section 3: Genomics approaches to studying gene expression** - Transcriptomics
9	- Proteomics - Uses of high throughput sequencing in evolution studies and other biological disciplines **Midterm exam #2**

10	**Section 4: Genomics-enabled biology: Mutation profiling and comparative genomics** - Interrogation by sequencing / Post-genome genetics study design / Mutational profiling by hierarchical filtering
11	- Concepts of population-level genomics-haplotypes + genome wide association studies(GWAS) / The 1000 genome project–study and application
12	- Concepts of comparative genomics–inferring ancestral state, Ka/Ks (focused on Human Evolution and Macroevolution),etc. - Discussion in class about the Personalized genomics survey
13	- Current topics in genomics: CRISPR system, genomics to combat infectious diseases, and/or other timely topics

Tutorial Schedule (sample from 2018W2):

Week	**Tutorial**
1	No tutorials
2	Research paper discussion: Transposable elements
3	Computer exercise: GenBank gene and chromosome records, BLAST searching
4	Research paper discussion: Sex chromosomes
5	Peer teaching and discussion: Pros and cons of various NGS platforms
6	Computer exercise: Annotation of protein-encoding genes (Computer algorithms and public databases)
7	Research paper discussion: Advances in genome assembly (*K. flaccidum* genome)
8	Research paper discussion: Transcriptomics
9	Computer exercise: Gene expression and human genomics databases
10	Research paper discussion: Exome sequencing (Mendelian genetic disorder) - The statistical power of exome-reads?
11	Take-home survey about public views on the personalized medicine (Briefing of homework in class - no tutorial sessions)
12	Research paper discussion: Comparative genomics study (Human specific traits, focused on comparative techniques)
13	Paper discussion: CRISPR system

Course Policies:

- Tutorials are required. These are not optional help sessions and contain new material related to the lecture topics.
- The mark distribution, indicated in the evaluation section above, will not be re-weighted for individual students.

University Policies:

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence.

UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom.

UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances.

UBC values academic honesty and students ae expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions.

Details of the policies and how to access support are available on the UBC Senate website.