BIOL F697: Individual Study
Title: Intro to NGS Technology

Syllabus

Course Information
Title: Individual Study
Number: BIOL F697
Credit: 3
Prerequisites: Laboratory safety training required by university
Location: 228 Murie Life Science Building -Chen Lab
Meeting time: 12 hours per week, flexible schedule

Instructor Contact Information
Name: Dr. Jack Chen
Office Location: 223B Murie Building
Office Hours: Flexible office hours by appointment
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Email: j.chen@alaska.edu

Email is the best way to reach the instructor. You should receive a response to your email within
24 hours when it is received. If you do not receive a reply within this time frame, assume that the
email was not received and please resend your message.

Course Readings/Materials/Requirements
All participating students are required to receive information and training related to potential
biohazards, relevant biosafety practices, the responsible conduct of research, project specific
techniques, storage, waste disposal and emergency procedures.

In addition, each participating student is required to receive Institutional Biosafety Committee
(IBC) approval, if potential biohazardous material is involved, and/or Institutional Review Board
(IRB) approval, if human subject sample is involved.

Course Description
This course aims to provide graduate students an opportunity to work in UAF Virology Laboratory
in a research project using next generation sequencing (NGS) technology to address a specific
research question/hypothesis, developing a research plan, and using the state-of-the-art technology
to solve a real-world problem in infectious disease field.
Course Goals

Next generation sequencing (NGS) technology has started a revolution in genomics and provided opportunities for its broad application in many fields, including in the detection of unknown pathogens (human, animal, or plant) and investigation of infectious disease outbreaks. By taking this course, students will conduct their own research project through identifying a specific research question/hypothesis, developing a research plan, and using the state-of-the-art NGS technology to solve a clinical/translational research question. The participating students are expected to understand basic molecular biology skills such as extraction of nucleic acids from various biological samples, gel electrophoresis, spectrophotometer measurement, PCR, and real time PCR. The individual research project will focus on the application of next generation sequencing (NGS) technology in the detection of unknown pathogens from various sources. The students will have hands-on experience with NGS technology including extraction of nucleic acids, sequencing library construction, use of Illumina NGS system, and bioinformatics analysis of NGS data. To the end of the course, the graduate student is required to write an NIH Small Research Grant (R03) style research proposal describing their research project, which includes: Specific Aims (one page), Research Strategy (six pages including Significance, Innovation, and Approach), and References (unlimited pages).

Student Learning Outcomes

After completing this course, students will be able to:

- Explain the principles of basic molecular biology techniques.
- Explain the principle and application of NGS.
- Use this knowledge to design a research project to investigate an unknown pathogen or an infectious disease outbreak.

Instructional Methods

The course is primarily laboratory based individual study, working on a research project. Students must keep a detailed laboratory notebook, which will be checked regularly by the Instructor. Students are required to report their research progress on the laboratory meeting on a bi-weekly basis.

Course Calendar

This course will be provided according to UAF Academic Calendar in Spring and Fall semesters. If the participating student has an uncompleted project and wants to continue in the next semester, the student can register this course as an Individual Study - Part II.

Course Policies

Students should work in the laboratory on the research project for a minimum of 12 hours per week. Although time is flexible, student should coordinate your schedule with the Instructor.
Evaluation and Grading Policies

Each graduate student will write an NIH Small Research Grant (R03) style research proposal toward the end of the course.

The NIH R03 style research proposal includes:

1. Specific Aims - Limited to 1 page
2. Research Strategy - Limited to 6 pages to include the following 3 sections:
   - Significance
   - Innovation
   - Approach

Your grade will be broken down into three parts: research proposal (80%), lab presentation (10%), and lab notebook (10%).

Research proposal will be evaluated based on NIH Study Section Review Criteria:

Significance

Does the project address an important problem or a critical barrier to progress in the field? Is there a strong scientific premise for the project? If the aims of the project are achieved, how will scientific knowledge, technical capability, and/or clinical practice be improved? How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field?

Innovation

Does the application challenge and seek to shift current research or clinical practice paradigms by utilizing novel theoretical concepts, approaches or methodologies, instrumentation, or interventions? Are the concepts, approaches or methodologies, instrumentation, or interventions novel to one field of research or novel in a broad sense? Is a refinement, improvement, or new application of theoretical concepts, approaches or methodologies, instrumentation, or interventions proposed?

Approach

Are the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project? Have the investigators presented strategies to ensure a robust and unbiased approach, as appropriate for the work proposed? Are potential problems, alternative strategies, and benchmarks for success presented? If the project is in the early stages of development, will the strategy establish feasibility and will particularly risky aspects be managed? Have the investigators presented adequate plans to address relevant biological variables?

The grades "A", "B", "C", "D", and "F" will be used.

Plagiarism

Plagiarism is the overt or covert use of other people's work or ideas without acknowledgement of the source. This includes using ideas or data from a classmate or colleague without permission and acknowledgement, including sentences from journal articles in your writing without citing the author, or copying parts of a website into your essay. Plagiarism and cheating are serious offenses that violate the student code of conduct which may result in an "F" in the course and/or
referral to the university disciplinary committee.

Support Services
If you require more assistance than can be provided in class, and office hours, you may want to contact Student Support Services (http://www.uaf.edu/sssp/).

Disability Services
If you have a disability, or think you may have a disability, please contact the Office of Disabilities Services (203 WHIT, 474-7043). We will work with this office to provide reasonable and appropriate accommodation to students with disabilities.