BIOL F497/697: Individual Study

Title: Application of Next Generation Sequencing Technology in the Detection of Unknown Pathogen(s)

Syllabus

Course Information

Title: Individual Study
Number: BIOL F497/697
Credit: 3
Prerequisites: Laboratory safety training required by university (www.uaf.edu/safety/training/)
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
Office Phone: 907-474-6966
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 submit a research plan and 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.

The research plan must include the following information:

1) Project purpose and objectives
2) Sample type and source
3) Potential pathogen(s) (human, animal, or plant)
   • Method of transmission
   • NIH risk group
   • Safety level requirement and shipping requirement
4) No living plant or animal is allowed to bring in the laboratory
5) A statement that the result generated from this research project provides no diagnostic value of any kind
Course Description

This course aims to provide upper level undergraduate students (BIOL F497) and graduate students (BIOL F697) an opportunity to work in a research laboratory by bringing in their own research question, developing a research plan, and using the state-of-the-art technology to solve a real world problem.

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. At the end of the research project, the student is required to write a report (for undergraduate students) or a manuscript (for graduate students) describing their research objective, materials and methods, results/interpretation, discussion and conclusion.

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

For undergraduate students who take BIOL F497:

Each student will write a research report and present at lab meeting at the end of the project. In addition, the student will also present a poster at UAF research day.

The report consists:
1. Abstract
2. Introduction: A description of the current literature about NGS technology and its application in the detection of pathogens
3. Materials and Methods: Description of the materials and methods you used in your project
4. Results and interpretation
5. Conclusion and discussion

Your grade will be breakdown into three parts: research report (50%), lab presentation (30%), and poster at UAF Research Day (20%). Research Report will be evaluated based on the clarity of the logic and prose, use of proper formatting for the paper and references, and comprehensiveness. The grades “A”, “B”, “C”, “D”, and “F” will be used.

For graduate students who take BIOL F697:

Each student will write a research manuscript in a publishable format at the end of the project.

The manuscript consists:
1. Abstract
2. Introduction: literature review related to your research project
3. Materials and Methods: Description of the materials and methods you used in your project
4. Results and interpretation
5. Conclusion and discussion
6. Reference

Your grade will be breakdown into two parts: manuscript (60%) and presentation at bi-weekly lab meeting (40%). Manuscript should be eligible for publication. The manuscript will be evaluated based on the clarity of the logic and prose, use of proper formatting for the paper and references, and comprehensiveness. 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.