UNIVERSITY OF ALASKA ANCHORAGE

COURSE CONTENT GUIDE

1. **Implementation Date:** Spring 2012.
2. **Course Information**

**A. College:** College of Arts and Sciences.

**B. Course Subject/Number:** BIOL A661L.

**C. Course Title:** Molecular Biology Laboratory.

**D. Course Description:** A practical implementation of the theory learned in BIOL A661, which includes in vitro DNA techniques, gene expression analysis, and genomics. Students will also learn and practice experimental design, proposal writing, and oral and written presentation skills, lead research groups, and learn mentorship skills.

 May be stacked with: BIOL A461L.

**E. Credit Hours:** 3.0

**F. Contact Hours:** 0+6.

**G. Grading Basis:** A-F.

**H. Status of Course Relative** Elective course for graduate students studying at

**to Degree Program:** UAA.

**I. Lab Fees (Yes/No):** Yes.

**J. Coordination:** UAA Faculty Listserv, UAA Deans and Directors.

**K. Prerequisites/Corequisite:** BIOL A661, with minimum grade of C, or concurrent enrollment

**L. Registration Restrictions:** None

**III. Course Activities:** This is a laboratory class meeting for two 3 hour sessions per week for 15 weeks.

**IV. Evaluation:** Course grading is A-F. The evaluation methods, while at the discretion of the faculty member teaching the course, may include participation in group discussions and experimental work, reading and interpreting primary scientific literature and a presentation of project outcomes.

**V. Course Level Justification:** Designed for graduate students in the biological sciences as an elective graduate course comparable to 600-level molecular biology laboratory courses offered at other universities. This course covers the practical applications of molecular biology, cell biology, genetics and genomics essential to the student's ability to succeed in biological research and apply this content to research topics in the biological sciences.

**VI. Course Outline**

1.0 Research Project Proposals

 1.1 Choice of topic and experimental system

 1.1.1 Developing a research project from a topic of interest

 1.1.2. Choosing an effective model organism or model system

 1.2 Experimental design

 1.2.1 Developing research aims

 1.2.2 Developing hypotheses and designing experiments to address them

 1.2.3 Elaborating experimental protocols

2.0 Experimentation

 2.1 Practical methodology

 2.1.1 Chemical safety

 2.1.2 Handling reagents and making solutions

 2.1.3. Biological media and organism care

 2.1.4 Biological assays and molecular techniques

 2.1.5 Data collection

 2.2 Data analysis

 2.2.1. Qualitative data analysis

 2.2.2. Quantitative data analysis

 2.2.3. Critical analysis and troubleshooting

3.0 Research communication

 3.1 In-lab journal article presentation/discussion

 3.2 In-lab research project presentation/discussion

 3.3 Research Proposal

 3.3.1 Peer review

 3.4 Primary research manuscript

 3.5 Oral presentation to a scientific audience - In-class presentation

 3.6 Poster presentation

**VII. Instructional Goals and Student Learning Outcomes:**

1. **The instructor will:**

Support the development of group projects aimed at investigating one or more biological phenomena using molecular approaches. This includes facilitating the discussion of research topics, the developments of research aims and experimental design. The instructor will provide review and critical analysis of student proposals in addition to the student-to-student peer review.

1. **Student Learning Outcomes:**

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| --- | --- |
| Students will be able to: | Assessment Method |
| Develop an experimental research plan, including the elaboration of research aims and experimental strategies, and the evaluation of similar research proposals. | Oral literature summary, written proposal, group discussion and peer review. |
| Demonstrate competency in molecular laboratory technique including, in vitro DNA/RNA protein methods, genomics and gene expression analysis. | Laboratory exercises and group discussion. |
| Lead a small research team by coordinating group activity, maintaining communication and coordination of group efforts in written work and oral presentation | Laboratory exercises, primary research, written proposals, oral presentation and group discussion.  |
| Communicate, to an audience of scientific peers, their project as primary scientific research. | Oral presentation, primary research paper. |

**VIII. Suggested Text(s):**

Barker K. 1998. At the Bench: A Laboratory Navigator. CSHL Press, Woodbury, NY

**IX. Bibliography:**

Journal articles from the primary literature (Science, Nature, Cell, EMBO J, Cell and Molecular Biology, etc) related to student research projects.

Web-based resources for project development and data analysis, including genomic analysis (NCBI and model organism databases), microarray and image analysis platforms (Image J and MAGIC Tool), and DNA sequence analysis.

Reference books related to student research topics and model systems, including:

Ashburner M, Golic K, Hawley S. 2004. Drosophila: a laboratory handbook. CSHL Press, Woodbury, NY

Liu J. 2005. Xenopus Protocols: Cell Biology and Signal Transduction. Humana Press, New York, NY

Simpson R, Adams P, Golemis E. 2009. Basic Methods in Protein Purification and Analysis: A Laboratory Manual. CSHL Press, Woodbury, NY