Course Title: Directed Research in Developmental and Reproductive Biology (DRB 699)

Course Description:

This graduate-level course provides students with the opportunity to engage in directed research within the field of developmental and reproductive biology under the guidance of a faculty instructor. Students will gain hands-on experience in all aspects of the research process, from experimental design and data collection to analysis, interpretation, and scientific communication. This course is designed to allow students to delve deeper into a specific research area, develop critical thinking skills, and contribute to ongoing research projects within the lab. The students will also be instructed other aspects of research-related activities, such as literature review, grant proposal preparation, ethical compliance, and other. The course can be tailored to meet the specific needs and interests of the student and their instructor.

Note: This syllabus provides a general guideline and may be subject to change at the discretion of the instructor. If the lab-specific syllabus is prepared by the instructor, it should be shared with student at the beginning of semester. Specific details regarding the research project, required readings, and assessment criteria should be discussed between the student and instructor at the beginning of the course.

Prerequisites:

- Completion of a bachelor's degree in a relevant field.
- Completion of at least the first semester of DRB core coursework.
- Approval from a faculty instructor.

Credits: 1-8 (depending on the scope of the research project and student involvement in each semester)

Course Format:

This course is primarily research-based and will involve the following components:

- **Laboratory Work (80%):** Students will actively participate in research projects within the instructor's laboratory. Specific tasks will be determined in consultation with the instructor and will vary depending on the project. This may include conducting experiments, collecting and analyzing data, troubleshooting experimental issues, and contributing to lab maintenance.
- **Literature Review and Critical Analysis (10%):** Students will engage in ongoing literature review related to their research project. This will involve reading and critically analyzing relevant scientific publications, identifying knowledge gaps, and staying up-to-date with the latest research in their field. Some of the reading may be assigned by the instructor but most should represent students own literature exploration.
- **Presentations, Reports, and Grants (10%):** Students will present their research progress regularly at lab meetings and prepare written reports summarizing their progress, both with the frequency and format determined by the instructor. Depending on the timing of the course and students research advancement, students will present their research results at a regional symposium (JABSOM and TESTER symposium) or a national conference. Students will draft manuscripts and contribute to grant writing.

Course Learning Objectives:

Upon successful completion of this course, students will be able to:

- Formulate testable hypotheses and design appropriate experiments.
- Perform efficiently relevant laboratory techniques and methodologies.
- Collect, analyze, and interpret experimental data.
- Critically evaluate scientific literature related to their research area.

- Communicate scientific findings effectively through oral presentations and written reports.
- Develop professional skills, including time management, organization, scientific ethics, and collaboration.

Specifics of learning objectives are shown below:

Research Design and Methodology:

- Formulate advanced research questions or hypotheses relevant to developmental and reproductive biology.
- Design robust research studies, including experimental protocols and – if relevant – field or clinical trials.

Laboratory and Technical Skills:

- Become proficient in laboratory safety protocols.
- Perform advanced laboratory techniques as assigned by the instructor and as required by the project.
- Perform data analysis techniques as assigned by the instructor and as required by the project.

Grant Writing:

- Develop graduate student level grant proposals, including crafting specific aims, budgets, and justifications.
- Critically review and revise these grant submissions for funding competitiveness.

Literature Review:

- Conduct comprehensive literature reviews to identify critical knowledge gaps.
- Synthesize information to provide a strong foundation for proposed research.

Data Collection and Management:

- Implement accurate, ethical data collection methods in laboratory and – if relevant - clinical or field settings.
- Organize and manage research data using advanced software tools.

Data Analysis:

- Apply complex statistical and computational techniques to analyze research data.
- Interpret findings in the context of existing literature and clinical applications.

Ethical Considerations:

- Navigate ethical dilemmas in clinical and laboratory research.
- Ensure adherence to research ethics guidelines.

Scientific Communication:

- Develop and refine skills in scientific writing, including grant proposals, abstracts, research reports, and peer-reviewed manuscripts.
- Present research findings effectively in professional oral and poster formats.

Collaboration and Teamwork:

- Foster interdisciplinary collaboration among lab members and with other research teams.
- Build leadership and mentorship skills within research environments.

Teaching and Instruction:

- Instructing undergraduate or less advanced students at bench.
- Guide these students in their academic progress, emulating own training.

Professional Development:

- Reflect on research experiences to identify areas for professional growth.
- Plan for future independent research or academic career advancement.

Recommended Readings:

- Assigned readings tailored to the research topic, including current journal articles, advanced textbooks on research methodologies, and grant-writing guides.

Assessment:

Student performance will be evaluated by the instructor based on the following criteria:

- **Research Progress (80%):** Assessed based on the student laboratory competence, technical skills, work ethic, independence, problem-solving abilities, and contributions to the research project
- **Literature Review and Critical Thinking (10%):** Assessed based on the student's understanding of the literature, ability to critically evaluate studies, and contribution to discussions.
- **Presentation and Written Report (10%):** Assessed based on the clarity, organization, scientific rigor, and overall quality of the oral presentations and written reports, including progress reports, abstracts, manuscript drafts, grant proposals, thesis and dissertation.

Required Readings:

- There are no required textbooks for this course. Readings will be assigned by the instructor based on the specific research project. Students are expected to independently search and retrieve relevant scientific literature.

Recommended Readings:

- Literature selected by student, relevant to developmental and reproductive biology and research interest of the lab they are working in.

Lab Safety:

All students are required to complete all necessary lab safety training before beginning any laboratory work. Strict adherence to lab safety protocols is mandatory.

Ethical Conduct:

Students are expected to adhere to the highest ethical standards in all aspects of their research. This includes proper data handling, accurate record keeping, and responsible authorship.

Attendance:

Regular attendance in the laboratory and lab meetings is expected. Detailed weekly schedule should be discussed with the instructor. Any absences should be communicated to the instructor in advance.

Course Schedule:

- **Beginning of Semester:** Meet with instructor to discuss research project, goals for the semester, and expectations for the course. Initial literature review.
- **Ongoing throughout the Semester:** Laboratory work, data collection and analysis, regular literature review, participation in lab meetings, and discussions with instructor, preparation and presentation of reports.
- **End of Semester:** Preparation and submission of the final written report, if required by the instructor.

Instructor(s):

DRB graduate faculty: https://grad-drb.jabsom.hawaii.edu/faculty/index.html. In special circumstances graduate faculty from other programs are appropriate, if their research is relevant to DRB graduate program theme, and if their choice is approved by DRB program chair.

Contact Information:

Contact information about DRB graduate faculty can be found here: https://grad-drb.jabsom.hawaii.edu/faculty/index.html. Contact information about other graduate faculty can be found on their program or personal webpages or in UH faculty directory: https://www.hawaii.edu/directory/

Enrollment:

Interested students should contact DRB graduate faculty to discuss their goals and objectives and to inquire whether they are willing to accept them to their labs as MS or PhD students and commit to mentoring them towards these degrees. If an agreement is reached, faculty members will share their CRN number for DRB 699 which will enable student to register for the course. If a faculty does not have an active CRN number for DRB 699 for a given semester, please inform DRB program chair who will arrange to have this number created.

Note:

This course description and learning objectives are subject to adjustment based on the specific requirements and guidance of the faculty mentor and the DRB graduate program.