(Revised: December 4, 2024)

DRB666 – Applied Developmental and Reproductive Biology
Spring Semester, 2025

Course Director:

Yukiko Yamazaki, DVM, Ph.D.
651 Ilalo Street, BSB222D
e-mail: yyamazak@hawaii.edu
Phone: (808) 692-1416

Instructors:

Yukiko Yamazaki	yyamazak@hawaii.edu
Steve Ward	wward@hawaii.edu
Yusuke Marikawa	marikawa@hawaii.edu
Richard Allsopp	allsopp@hawaii.edu
Monika Ward	mward@hawaii.edu
Stefan Moisyadi	moisyadi@hawaii.edu
Benjamin Fogelgren	fogelgre@hawaii.edu
Tomas Huang	huangt@hawaii.edu
Noemi Polgar	polgar@hawaii.edu
Michelle Tallquist	michelle.tallquist@hawaii.edu
Jesse Owens	jbowens@hawaii.edu
Yiqiang Zhang	yiqiang.zhang@hawaii.edu
Alika Maunakea	amaunake@hawaii.edu

Course Objectives:

This is a mandatory course for DRB graduate students from 2018 onward. The overall goal of this course is to study the fundamental and applied technologies of developmental and reproductive biology. This course, through its lecture and lab structure, will combine scientific principles and technical approaches to warrant a deep understanding of mammalian development and reproduction.

Course Credits:

3 credits

Day and Time:

Tuesday, 9 am -12 pm (3 hours / lecture / week)
Total 15 weeks of lectures.
(It will be necessary for students to come in for a brief time on the 2-3 days following a given lab to evaluate the progress of embryo development.)

Locations (in-person):

Kakaako Campus: BSB222N & Instructor's Lab (651 Ilalo Street)
Manoa Campus: YIBR Conference Room & Instructor's Lab (1960 East-West Rd)
Kapiolani Medical Center, Pacific IVF (1319 Punahou Street)

Capacity:

This course is required for DRB graduate students. Up to eight graduate students will be accepted.

Course Description:

This is a combined lecture-laboratory course on current technologies and methods for mammalian reproduction and developmental biology.
This course is designed to introduce students to the current techniques and science through a lecture and laboratory work. This experimental course consists of 2 sections.

(1) First Section
The students will study basic science of spermatogenesis and oogenesis using histological samples and laboratory mice. They will also practice mouse in vitro fertilization (IVF). After IVF, the students will observe in vitro development of fertilized oocytes. They will watch Intracytoplasmic Sperm Injection (ICSI) and practice sperm freezing. The students will visit Kapiolani Medical Center to learn human IVF. This section will provide theoretical knowledge of reproductive biology and applied reproductive technologies.

(2) Second Section (9 Instructors)
The Instructors will introduce laboratory work for their research projects. In this section, students learn up-dated technologies and protocols in different projects related in the field of Developmental and Reproductive Biology, Stem Cell Biology, Genome Editing etc.

Course Topics:

-Oogenesis
-Spermatogenesis
-In vitro fertilization (IVF) of mouse
-Clinical infertility and IVF of human
-Intracytoplasmic sperm injection (ICSI)
-Pre-implantation embryonic development
-Sperm genetics and function in fertilization in the context of ART
-The mouse one-cell embryo as a model for the study of mammalian DNA replication and DNA degeneration
-Transgenesis & gene therapy
-Epigenetics in the context of development
-Spatial and temporal expression of genes during development
-Modeling tissue morphogenesis
-Embryonic stem cells (mouse, human)
-Stem cell biology/Telomere biology
-Extracellular vesicles (EVs) in early embryonic development
-Genome editing
-Stem cell differentiation

Materials and Textbooks:

All text materials will be provided to students by course instructors. This will include copies of chapters from books/laboratory manuals, unpublished protocols, published review articles, published data articles, etc. All laboratory supplies and materials will be provided by course instructors. The cost of this course will be covered from Department of Anatomy, Biochemistry and Physiology funds.

Course Schedule:

Date (2025)	**Instructor (Location)**	**Lecture Topic**	**Subject**
Jan. 14	Yukiko Yamazaki (Kakaako)	Orientation & Spermatogenesis	Lecture & practice Observation of testis histology (paraffin section). Dissection of fresh adult testis
Jan. 21	Yukiko Yamazaki (Kakaako)	Oogenesis	Lecture & practice Observation of ovary histology (paraffin section). Collection & observation of mature oocytes from fresh adult ovary
Jan. 28	Yukiko Yamazaki (Kakaako)	In vitro fertilization & preimplantation embryo development	Lecture & practice Sperm preparation for IVF (pre-incubation and morphological observation of incubated sperm). Preimplantation embryo observation
Feb. 4	Stefan Moisyadi (Manoa)	Transgenesis and gene therapy	Lecture & practice Active non-viral DNA transfer methods for transgenesis and gene therapy
Feb. 11	Monika Ward (Manoa)	Sperm function in assisted reproduction	Lecture & practice Demonstration of Intracytoplasmic Sperm injection (ICSI), practice of sperm freezing and analysis
Feb. 18	Tomas Huang (Kapiolani Medical Center, Pacific IVF)	Clinical infertility and in vitro fertilization	Lecture and visit human IVF laboratory where different lab procedures such as egg retrieval, insemination, embryo evaluation and cryopreservation may be observed

Feb. 25	Steve Ward (Manoa)	Visualizing Sperm DNA Loop Domains and Understanding their Role in Chromatin Structure	Lecture & practice Learn how to view sperm chromatin by making halos
March 4	Jesse Owens (Kakaako)	Genome editing design	Lecture & practice
March 11	Alika Maunakea (Manoa)	Epigenetics in the context of development	Lecture & practice
March 18	Spring Break	No Lecture	
March 25	Noemi Polgar (Kakaako)	Extracellular vesicles (EVs) in early embryonic development	Lecture & practice Isolation and analysis of extracellular vesicles
April 1	Ben Fogelgren (Kakaako)	Cell Models and Cell Assays	Lecture & practice
April 8	Michelle Tallquist (Kakaako)	Cell lineage in embryonic tissues	Lecture & practice Cell lineage tracing in embryonic tissues
April 15	Rich Allsopp (Kakaako)	Application cell aging and telomere biology	Lecture & Practice
April 22	Yusuke Marikawa (Kakaako)	Embryonic stem (ES) cells	Lecture & practice Basic properties of ES cells. Observation of live and fixed ES cells. Practice simple staining of ES cells.
April 29	Yiqiang Zhang (Kakaako)	Differentiation and development with stem cells	Lecture & practice Observation of stem cell cardiac differentiation and development
May 6	Final Report	No Lecture	

Course Evaluation and Students Grading:

(1) Lecture and lab practice

In this course, all students are strongly encouraged to participate in discussions. During the lab practice, the student should actively contribute to the experiments. To accomplish each task, the student will communicate with the instructor and other students. The instructor will give a grade to their active participation in class (1-10).

(2) Weekly Report

The course learning objectives will be directly assessed through weekly reports. After the lecture, the student needs to submit the report to the instructor within 7 days. The instructor will give a grade to each report (1-10). Average 7 is acceptable to pass the course.

(3) Attendance

A minimum of 85% (36/42 hr) attendance hours will be required for passing.

Active participation in class: 20%
Weekly reports: 40%
Attendance hours: 40%

Although accumulation of a minimum 55% is sufficient to obtain above F grade, less than B grade will not be accepted by a Developmental and Reproductive Biology graduate program.

The final grades will be determined by the following scale:

A 96-100 (%)
A - 90-95
B+ 85-89
B 80-84
B - 75-79
C+ 70-74
C 65-69
C- 60-64
D 55-59
F <55

The course will be assessed through a student survey at the end of the semester. The assessment goal for this course is to have 100% of the students obtain a passing grade or higher.