

DRB666 – Applied Developmental and Reproductive Biology Spring Semester, 2018

Director:

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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 16 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:

Kakaako Campus BSB222P & Instructor's Lab (651 Ilalo Street)
Manoa Campus IBR 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

A Director (Yukiko Yamazaki) of this course will take care of basic technologies and science of gametogenesis and assisted reproductive technologies (ART). 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. The students will visit Dr. Tom Huang at the human clinics (Kapiolani Medical Center) to learn human IVF. Dr. Monika Ward will show Intracytoplasmic Sperm Injection (ICSI) and teach sperm freezing. This section will provide theoretical knowledge of reproductive biology and applied reproductive technologies.

(2) Second Section (7 Instructors)

Seven instructors will give lab lectures individually (see Course Topics below). 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.

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
- Spatial and temporal expression of genes during development
- Sex differentiation of fetal germ cells
- Modeling tissue morphogenesis
- Embryonic stem cells (mouse, human)
- Stem cell biology/Telomere biology
- Epigenetics in the context of development

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 (2018)	Instructor (Location)	Lecture Topic	Subject
Jan. 16	Yukiko Yamazaki (Kakaako)	Spermatogenesis	Lecture & practice Observation of ovary histology (paraffin section). Collection & observation of mature oocytes from fresh adult ovary.
Jan. 23	Yukiko Yamazaki (Kakaako)	Oogenesis	Lecture & practice Observation of testis histology (paraffin section). Dissection of fresh adult testis.
Jan. 30	Yukiko Yamazaki (Kakaako)	In vitro fertilization (1)	Lecture & practice Sperm preparation for IVF (pre-incubation and morphological observation of incubated sperm).
Feb. 6	Yukiko Yamazaki (Kakaako)	In vitro fertilization (2)	Lecture & practice IVF (pre-incubation of sperm, oocyte preparation, IVF, observation of fertilized oocytes).
Feb. 7, 8, 9*	Yukiko Yamazaki (Kakaako)	In vitro development of mouse embryo after IVF	Lecture & observation Development of fertilized oocytes (from 1-cell to blastocyst stage).
Feb. 13	Monika Ward (Manoa)	Sperm function in assisted reproduction	Lecture & practice Demonstration of Intracytoplasmic Sperm injection (ICSI), practice of sperm freezing and analysis.
Feb. 20	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. 27	Exam. 1 (Kakaako)		

March 6	Ben Fogelgren (Kakaako)	Modeling tissue morphogenesis	Lecture & practice
March 13	Alika Maunakea (Kakaako)	Epigenetics in the context of development	Lecture & practice
March 20	Yukiko Yamazaki (Kakaako)	Sex differentiation of fetal gonads	Lecture & practice Observation of fetal testis & ovary.
March 27	Spring Break		
April 3	Stefan Moisyadi (Manoa)	Transgenesis and gene therapy	Lecture & practice Active non-viral DNA transfer methods for transgenesis and gene therapy.
April 10	Steve Ward (Manoa)	The mouse one-cell embryo as a model for the study of mammalian DNA replication and DNA degeneration during apoptosis.	Lecture only. Micromanipulation of mouse gametes as unique models for analyzing DNA replication. Autonomy of the nucleus from oocyte cytoplasmic controls.
April 17	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 24	Rich Allsopp (Kakaako)	Methods to purify hematopoietic stem cells	Lecture and cell sorting Modern methods to identify and purify hematopoietic stem cells from mice and human.
May 8	Exam. 2 (Kakaako)		

Course Evaluation and Students Grading:

The course learning objectives will be directly assessed through two examinations. In addition to the exams, a minimum of 85% (40/48hr) attendance hours will be required for passing. Two examinations will be multiple choice questions or essay provided by course instructors. For passing, a minimum of 55% of questions will have to be answered correctly.

Attendance hours: 50%
1st examination: 25%
2nd examination: 25%

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.

Detailed Syllabus:

The detailed syllabus provided below refers to 3 hr lab work including lecture. (The order of lectures will be changed).

* This lecture is followed by IVF experiment.