### CELL AND REGENERATIVE BIOLOGY (CRB)

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#### CRB 610 — FUNDAMENTALS OF MAMMALIAN EMBRYOLOGY
2 credits.

To provide graduate and advanced undergraduate students with a thorough grounding in the conceptual basis of mammalian development using the mouse (and sometimes other species) as a model system.

**Enroll Info:** Undergraduates: 9 credit hours of introductory courses to Biological Sciences and consent of instructor; Junior Standing. Graduate Students: Matriculation in any Master’s/Doctoral Program in Biology or Bioengineering, or consent of instructor.

**Requisites:** None

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2016

#### CRB/MED HIST 615 — REGENERATIVE MEDICINE ETHICS AND SOCIETY
3 credits.

Study of regenerative medicine and stem cell research within social, ethical and political contexts.

**Enroll Info:** None

**Requisites:** Consent of instructor

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2018

#### CRB 630 — PROTEOMICS APPROACHES FOR BIOLOGISTS
2 credits.

Proteomics and metabolomics are playing an increasingly important role in biology and medicine. Many biology labs are now starting to use proteomics and metabolomics in their research projects. This course is designed specifically for students in biological sciences who have interests to learn proteomics and metabolomics. It will integrate formal classroom lectures with one-on-one consultation. Lectures include the essential fundamentals and applications in mass spectrometry-based proteomics and metabolomics to address biological/medical problems. Meanwhile, one-on-one consultation will be offered to respond to students’ individual needs, including the design of proteomics/metabolomics experiments, troubleshooting, and proper interpretation of the results. Students who take this course should have basic chemistry and biochemistry knowledge.

**Enroll Info:** Graduate student standing or BIOCHEM 501 or BIOCHEM 507

**Requisites:** None

**Repeatable for Credit:** No

**Last Taught:** Spring 2019

#### CRB 640 — FUNDAMENTALS OF STEM CELL AND REGENERATIVE BIOLOGY
3 credits.

The course will provide a foundation to understand fundamental biological, mechanistic, and experimental concepts in the field of stem cell and regenerative biology. The course is designed for graduate students and advanced undergraduates with a significant background in one or more of the following fields: biochemistry, molecular biology and cell biology.

**Enroll Info:** None

**Requisites:** Enrollment limited to students who have taken Biochemistry 507 or Biochemistry 508 or GENETICS 566 or ZOOLOGY 570.

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Spring 2019

#### CRB 650 — MOLECULAR AND CELLULAR ORGANOGENESIS
3 credits.

The course is intended for graduate and advanced undergraduate students interested in developmental biology, stem cell biology, molecular basis of normal organ formation, and biomedical engineering. This course will cover the most current knowledge of the basic principles of organogenesis including the molecular and cellular pathways leading to normal organ development and tissue regeneration. Tissue/organ specification, differentiation, and developmental processes, focusing on molecular and associated signal transduction pathways and transcriptional regulation will be covered in depth. Current understanding of the role of stem cells in normal and abnormal development and regenerative biology is included.

**Enroll Info:** Introductory course in developmental biology such as ZOOLOGY 470, Mammalian Embryology, or other is recommended but not required.

**Requisites:** None

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Spring 2019

#### CRB 675 — TOPICS IN CELL AND REGENERATIVE BIOLOGY
1-3 credits.

This course examines various special topics in Cell and Regenerative Biology. See Class Notes for additional information.

**Enroll Info:** None

**Requisites:** Junior standing

**Course Designation:** Level - Advanced

**L&S Credit:** Counts as Liberal Arts and Science credit in L&S

**Grad 50% - Counts toward 50% graduate coursework requirement**

**Repeatable for Credit:** No

**Last Taught:** Spring 2019

#### CRB 699 — INDEPENDENT STUDY
1-4 credits.

One-on-one learning experience allowing undergraduates to work with a faculty adviser to develop research projects and skills.

**Enroll Info:** None

**Requisites:** Consent of instructor

**Repeatable for Credit:** Yes, unlimited number of completions

**Last Taught:** Spring 2019
CRB/MEDICINE 701 — CELL SIGNALING AND HUMAN DISEASE
1 credit.

This course is intended for PhD and MSTP students interested in medically relevant basic science. Landmark discoveries, as well as current knowledge and controversies in human health, with an emphasis on cancer biology, will be covered. Enroll Info: Students must be enrolled in a PhD or MSTP program
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

CRB 800 — INTELLECTUAL PROPERTY, PATENTS AND LICENSING
2 credits.

This course presents important core concepts, including intellectual property, patent law, trademarks, copyrights, trade secrets, licensing and patent litigation, specific to the field of biotechnology. You'll learn about the types of intellectual property and how they fit together to protect a product or service. You'll understand the fundamentals of licensing and technology transfer and the important role of patent examiners. You'll also explore the unique aspects of early-stage intellectual property, including market dynamics, pricing and valuation. Enroll Info: Admission and enrollment in the Master of Science in Biotechnology Program
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

CRB 802 — BUSINESS OF BIOTECHNOLOGY: FUNDAMENTALS OF PRODUCT DEVELOPMENT
2 credits.

The Business Fundamentals course is designed to give the Masters in Biotechnology students their first exposure to business principles as applied to the operation of biotechnology companies and serve as a foundation for the more advanced business curriculum. This course will lay the groundwork for students to fully appreciate the challenges inherent in translating scientific discoveries into a successful business. Enroll Info: Admission and enrollment in the M.S. in Biotechnology Program at UW-Madison
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

CRB 803 — MOLECULAR TECHNOLOGIES I
2 credits.

An intensive workshop that will teach biotechniques, biotechnology product development, and biotechnology applications interfaced with analytical, communication and teaching skills. This workshop will simulate the corporate and academic biotechnology setting. Enroll Info: Admission into the M.S. biotechnology program
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

CRB 804 — BIOTECHNOLOGY REGULATION AND ETHICS
2 credits.

Biotechnology Regulation Ethics is designed as an introductory survey course of the political, legal, and ethical issues that have driven the development of the biotechnology industry. Special emphasis is given to FDA regulation of new drugs, devices, and biologics, and to federal regulation and ethics of human subjects research. Students should come away with an enhanced ability to understand how regulation and politics interact with business and finance to influence the formation and growth of biotechnology companies. Students will be introduced to the ethical issues that help shape public policy regarding applications of biotechnology. Enroll Info: Admission and enrollment in the M.S. in Biotechnology Program at UW-Madison
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

CRB 820 — BIOTECHNOLOGY OPERATIONS
5 credits.

Addresses issues related to the development and manufacture of products for human health, including medical devices and human therapeutics. Topics include regulatory affairs, quality control and validation, clinical and nonclinical studies. Enroll Info: None
Requisites: Declared in the Biotechnology graduate program
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

CRB 824 — MOLECULAR TECHNOLOGIES II
3 credits.

An intensive workshop that will teach biotechniques, biotechnology product development, and biotechnology applications interfaced with analytical, communication and teaching skills. This workshop will simulate the corporate and academic biotechnology setting. Enroll Info: Admission into the M.S. biotechnology program
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019
CRB 830 — EARLY DRUG DISCOVERY
4 credits.
Provides students with an overview of the early drug discovery process, including target identification and validation, generation of diverse chemical libraries, assay development and high throughput screening, lead optimization by compound profiling, and drug targeting and delivery. Enroll Info: Admission to M.S. in biotechnology
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

CRB 834 — MOLECULAR TECHNOLOGIES III
1 credit.
Covers theory and applications of drug discovery. Laboratory assays and methods focus on primary, secondary, and ADMETox (absorption, distribution, metabolism, excretion, toxicity) drug screening. In addition, students build communication skills while working on team projects and reporting scientific results. Enroll Info: Admission to M.S. in biotechnology
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

CRB 841 — BUSINESS OF BIOTECHNOLOGY: CONTEMPORARY CHALLENGES AND APPLICATIONS
2 credits.
This course presents contemporary issues in the business of biotechnology where students apply concepts critical to the success of modern biotechnology firms. Topics focus on modern problem-solving, including issues relating to leadership and management, product development and negotiation and licensing. Enroll Info: Admission to M.S. in biotechnology
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

CRB 843 — PROJECT MANAGEMENT AND LEADERSHIP
2 credits.
With a focus on the biotechnology and medical device industries provides an opportunity for students to share experiences and information and to practice leadership and project management knowledge and skills. It focuses upon understanding and developing a Project Management Plan. The course addresses the issues and various situations faced by Project Managers and their effective response. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

CRB 844 — ADVANCED BIOTECHNOLOGY: GLOBAL PERSPECTIVES
4 credits.
Focuses on state-of-the-art topics of global importance. This course is designed as a capstone experience in which the skills and knowledge gained in the M.S. in Biotechnology Program are integrated and applied to achieve a new level of synthesis and depth of understanding about an important problem in biotechnology today. A major goal of this course is to deepen technical understanding of novel technologies, broaden awareness of ethical and regulatory issues in biotechnology globally, and increase awareness of opportunities for intellectual collaboration and entrepreneurship. Enroll Info: None
Requisites: Declared in the Biotechnology graduate program
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

CRB 850 — FUNDAMENTALS OF STEM CELL AND REGENERATIVE BIOLOGY
1 credit.
Gain in-depth knowledge of the fundamentals of stem cell and regenerative biology. This knowledge forms the basis for novel translational research and both diagnostic and therapeutic options. Topics to be covered include the origins of embryonic stem cells (ESCs) and induced pluripotent stem cells (iPSCs) and how they are being used for both research and for clinical applications. Read, discuss, and present cutting-edge literature on how iPSCs are being used to model a variety of human diseases and how stem cell therapies are being used to treat autoimmune disorders such as Lupus Erythematosus, Multiple Sclerosis, and Crohn’s disease. Participate in the Stem Cell and Regenerative Medicine Center weekly seminar, and hear from top UW researchers about how they are using stem cells to develop therapies for bone and vascular repair. Enroll Info: None
Requisites: MED SC-M 810, 811, 812, and 813
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

CRB 842 — BUSINESS OF BIOTECHNOLOGY: SUSTAINING GROWTH
2 credits.
Examines how companies gain and sustain competitive advantages. To be successful, a company’s strategy must permeate all departments and functional areas. Knowledge and skills gained from prior business courses (for instance, marketing, management, finance, accounting) will be applied to specific case studies exploring general corporate management and strategy with respect to the total enterprise. This discussion-based course draws heavily on experiential exercises to develop a deeper understanding of strategic management. Enroll Info: None
Requisites: Declared in the Biotechnology graduate program
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019
CRB 860 — THE BEAT GOES ON: GENERATION AND REGENERATION OF THE HEART
2 credits.

The molecular and cellular development of the heart and of its regenerative potential. This knowledge forms the basis for novel translational research and both diagnostic and therapeutic options. Topics to be covered include the genetics underlying normal heart development as well as cardiac tissue specification and differentiation with a focus on molecular signals, associated signal transduction pathways, and transcriptional regulation. Read, discuss, and present cutting-edge literature on the genetic contributions to congenital heart defects and adult heart disease and on cardiac stem cells and the regenerative capacity of the heart. Participate in Adult and Pediatric Cardiology Grand Rounds, the Madison Perinatology Conference, learn about cutting-edge molecular diagnostics for fetal, pediatric and adult cardiac disease, and learn when and how to perform an adult echocardiogram. Enroll Info: None

Requisites: MED SC-M 810, 811, 812, and 813
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

CRB 990 — RESEARCH AND THESIS
1-9 credits.

Research and Thesis. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019