

CELL AND REGENERATIVE BIOLOGY (CRB)

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.

Requisites: Consent of instructor

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

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Understand current and past legal, political and social issues related to regenerative medicine. This includes laws and regulations, but also an understanding of clinical ethics issues, translational research and commercialization, and emerging, novel techniques requiring careful ethical consideration.

Audience: Both Grad & Undergrad

2. Understand more about relations of science, the state, and public, particularly around controversial or novel innovations and will learn how best to address emerging controversies and public concerns ethically in their professional careers.

Audience: Both Grad & Undergrad

3. Learn the guidelines for the responsible conduct of research for stem cell science, where to access regulatory and oversight documents, and how to apply for research protocols with ethics oversight.

Audience: Both Grad & Undergrad

4. Gain analytical skills for addressing policy, legal and social issues through research and writing exercises. Analytical and professional presentation skills will also be learned through classroom interactions and discussion.

Audience: Graduate

CRB 625 – STEM CELL SEMINAR

1 credit.

Examines various special topics in stem cell and regenerative medicine research.

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: Yes, unlimited number of completions

Last Taught: Spring 2025

Learning Outcomes: 1. Appreciate the broad range of stem cell and regenerative medicine research and potential clinical applications

Audience: Both Grad & Undergrad

2. Critically consider the current state of specific regenerative medicine applications

Audience: Both Grad & Undergrad

3. Evaluate the ethical and public policy questions that stem cell research raises

Audience: Both Grad & Undergrad

4. Identify and describe potential clinical applications of current stem cell and regenerative medicine research

Audience: Undergraduate

5. Apply the knowledge gained on current themes in stem cell and regenerative medicine to research in the field

Audience: Graduate

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. Includes the essential fundamentals and applications in mass spectrometry-based proteomics and metabolomics to address biological/medical problems. Design of proteomics/metabolomics experiments, troubleshooting, and proper interpretation of the results.

Requisites: BIOCHEM 501, 507, or graduate/professional standing

Repeatable for Credit: No

Last Taught: Fall 2024

CRB 640 – FUNDAMENTALS OF STEM CELL AND REGENERATIVE BIOLOGY

3 credits.

Provides a foundation to understand fundamental biological, mechanistic, and experimental concepts in the field of stem cell and regenerative biology.

Requisites: BIOCORE 383, BIOCHEM 501, BIOCHEM 507, GENETICS 466, GENETICS 467, ZOOLOGY 570, or graduate/professional standing

Course Designation: Breadth - Biological Sci. Counts toward the Natural Sci req

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 2025

Learning Outcomes: 1. Identify the characteristics of embryonic stem cells, induced pluripotent stem cells, and adult stem cells from cardiac, blood, neural, endodermal, and vascular tissues

Audience: Both Grad & Undergrad

2. Identify experimental technologies used to investigate stem cells

Audience: Both Grad & Undergrad

3. Present scientific articles assigned by the instructor

Audience: Both Grad & Undergrad

4. Moderate a scientific discussion among their peers

Audience: Both Grad & Undergrad

5. Critique and discuss scientific articles

Audience: Both Grad & Undergrad

6. Formulate hypotheses and propose experiments as future directions that could follow from the discussed articles

Audience: Graduate

CRB 650 – MOLECULAR AND CELLULAR ORGANOGENESIS

3 credits.

Covers the most current knowledge of the principles of organogenesis.

Focuses on the molecular and cellular pathways leading to normal tissue and organ development and regeneration, including in depth discussions of specification and differentiation processes.

Requisites: (ZOOLOGY/BIOLOGY/BOTANY 151 or BIOCORE 383) and junior standing, or graduate/professional standing

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

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Describe common biological principles of organogenesis and unique pathways for different organs

Audience: Both Grad & Undergrad

2. Describe current experimental technologies used to investigate organogenesis

Audience: Both Grad & Undergrad

3. Critically read, discuss, and summarize scientific articles

Audience: Both Grad & Undergrad

4. Recognize and restate the hypothesis underlying a research article

Audience: Both Grad & Undergrad

5. Give a formal scientific presentation

Audience: Both Grad & Undergrad

6. Identify strengths and weaknesses of different experimental approaches

Audience: Graduate

7. Propose future experimental directions based on data presented

Audience: Graduate

CRB/B M E 670 – BIOLOGY OF HEART DISEASE AND REGENERATION

3 credits.

Presents diverse topics in contemporary heart biology to facilitate understanding of biological, mechanistic, and experimental concepts of cardiac physiology, disease, and regeneration. Learn cellular and molecular mechanisms underlying heart physiology, function, disease and regenerative ability in various model systems. Includes thinking critically about methodology, experimental design and interpretation, and how conclusions are reached in heart biology through cutting-edge literature.

Requisites: (ZOOLOGY/BIOLOGY/BOTANY 151 and BIOCHEM 501) or graduate/professional standing.

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

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Gain knowledge of cardiovascular physiology and biology, use of genetic model organisms, stem cell biology and regenerative medicine (didactic portion of course; attendance, and exams).

Audience: Both Grad & Undergrad

2. Understand the main themes of heart biology by reading and discussing state-of-the-art literature (journal reviews; evaluated by lecturer for each journal review session).

Audience: Both Grad & Undergrad

3. Develop ability to critically evaluate published scientific research in the cardiovascular field by discussing with peers and instructors.

Audience: Both Grad & Undergrad

4. Analyze scientific data and methodology employed in the field of heart biology.

Audience: Graduate

5. Develop ability to create an experimental design for different types of heart biology research (such as hypothesis, methodology or phenomenon driven studies).

Audience: Graduate

6. Understand the current challenges for developing therapeutic strategies for heart disease and regeneration and propose feasible approaches to resolve these challenges.

Audience: Graduate

7. Understand the concepts of techniques and methods that are currently used for cardiac biology research.

Audience: Undergraduate

8. Describe the challenges for developing therapeutic strategies for heart disease and regeneration.

Audience: Undergraduate

CRB 675 – TOPICS IN CELL AND REGENERATIVE BIOLOGY

1-3 credits.

Examines various special topics in Cell and Regenerative Biology.

Requisites: (ZOOLOGY/BIOLOGY 101 and 102) or BOTANY/BIOLOGY 130 or (ZOOLOGY/BIOLOGY/BOTANY 151 and 152) or BIOCORE 383; or graduate/professional 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: Yes, unlimited number of completions

Last Taught: Spring 2021

Learning Outcomes: 1. Apply, analyze, or evaluate advanced theories, concepts, or methods in cell and regenerative biology

Audience: Both Grad & Undergrad

2. Identify and describe key theories, concepts, and methods in cell and regenerative biology

Audience: Both Grad & Undergrad

3. Explore a new phenomenon or modality in cell and regenerative biology and apply the knowledge gained to research in the field

Audience: Graduate

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.

Requisites: Consent of instructor

Course Designation: Level - Advanced

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2025

Learning Outcomes: 1. Apply concepts learned in coursework to real life situations and settings

Audience: Undergraduate

2. Read, understand, and effectively search scientific literature

Audience: Undergraduate

3. Develop critical, analytical, and independent thinking skills

Audience: Undergraduate

CRB/MEDICINE 701 – CELL SIGNALING AND HUMAN DISEASE

1 credit.

Landmark discoveries, as well as current knowledge and controversies in human health, with an emphasis on cancer biology.

Requisites: Graduate/professional standing

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

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Critically evaluate the primary literature underlying medical knowledge.

Audience: Graduate

2. Practice presentation and leading discussion of primary literature.

Audience: Graduate

3. Read the basic evidence underlying landmark discoveries and controversies in cancer biology.

Audience: Graduate

4. Understand how grant proposals are written and evaluated.

Audience: Graduate

CRB/GENETICS 710 – DEVELOPMENTAL GENETICS

3 credits.

Covers a broad range of topics in animal development, with an emphasis on molecular mechanisms. Focuses on common themes, with the goal of understanding and analyzing current research in developmental biology and genetics.

Requisites: Graduate/professional standing

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

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Ability to critically evaluate published scientific work (journal reviews).

Audience: Graduate

2. Ability to communicate critical evaluations professionally and articulately (lecturer and TA feedback at each session).

Audience: Graduate

3. Develop deep knowledge of developmental biology, use of genetic model organisms, stem cell biology and regenerative medicine (didactic portion of course).

Audience: Graduate

4. Improved presentation skills (each student has a scheduled presentation four times during the semester in addition to ad hoc participation).

Audience: Graduate

5. Skills in providing feedback to peers (through student evaluations peer presentations each class period).

Audience: Graduate

CRB 800 – INTELLECTUAL PROPERTY, PATENTS AND LICENSING

2 credits.

Presents important core concepts, including intellectual property, patent law, trademarks, copyrights, trade secrets, licensing and patent litigation, all specific to the field of biotechnology. Covers the types of intellectual property and how they fit together to protect a product or service. Covers the fundamentals of licensing and technology transfer and the important role of patent examines. Explores the unique aspects of early-stage intellectual property, including market dynamics, pricing and valuation.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Understand the principal types of intellectual property.

Audience: Graduate

2. Appreciate how the various types of intellectual property fit together to protect a service or product.

Audience: Graduate

3. Apply the fundamentals of licensing intellectual property.

Audience: Graduate

4. Gain a basic understanding of what is meant by technology transfer and its importance to the field of biotechnology.

Audience: Graduate

5. Develop an understanding of the market dynamics, pricing, and valuation of early-stage intellectual property.

Audience: Graduate

CRB 802 – BUSINESS OF BIOTECHNOLOGY: FUNDAMENTALS OF PRODUCT DEVELOPMENT

2 credits.

Exposure to business principles as applied to the operation of biotechnology companies and serve as a foundation for the more advanced business curriculum. Lays the groundwork to fully appreciate the challenges inherent in translating scientific discoveries into a successful business.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Understand the difference between scientific and commercial success. Bring awareness of technology evolution processes to both issues.

Audience: Graduate

2. Appreciate the challenge of selecting and developing new products that will both provide useful products and deliver a positive return on investment.

Audience: Graduate

3. Be able to select and use the appropriate financial tools for evaluating investments and monitoring the financial progress of a company.

Audience: Graduate

4. Integrate what they have learned into an Opportunity Assessment for a candidate technology.

Audience: Graduate

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. Simulates the corporate and academic biotechnology setting.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Develop effective communication and basic science theory & practice by writing and maintaining a laboratory notebook.

Audience: Graduate

2. Perform and evaluate molecular based technology protocols.

Audience: Graduate

3. Learn the vocabulary of biotechnology and the science that underlies it through hands-on experience.

Audience: Graduate

4. Critique research studies and laboratory results.

Audience: Graduate

CRB 804 – BIOTECHNOLOGY REGULATION AND ETHICS

2 credits.

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. 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. Introduction to the ethical issues that help shape public policy regarding applications of biotechnology.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Understand the structure of the US legal and regulatory system.

Audience: Graduate

2. Identify some areas of ethical concern regarding research on biotechnology and applications of biotechnology.

Audience: Graduate

3. Identify and understand the source and some content of key laws and regulations governing biotechnology research and its medical applications.

Audience: Graduate

CRB 810 – MOUSE GENETICS AND EMBRYONIC STEM CELLS: LAB IMMERSION AND UNDERSTANDING CURRENT LITERATURE

2 credits.

Clinically relevant methods of scientific thought, inquiry and analysis via the presentation of specific research topics. Emerging concepts in developmental genetics and embryonic stem (ES) cell biology are used as a means of introducing the participants to the critical importance of identifying the "right" question, selecting the "best" tools to answer the question, using the appropriate logic to interpret experimental results and finally, constructing appropriate conclusions. Application of the literature of mouse genetics and laboratory research to biomedical health decisions. Strong emphasis on the tools used in the research literature and to 'get your hands dirty' learning the basics of the laboratory techniques involved.

Requisites: MED SC-M 810, 811, 812, and 813

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

Repeatable for Credit: No

Learning Outcomes: 1. Demonstrate competencies in design and interpretation of mouse genetic experiments from literature.

Audience: Graduate

2. Demonstrate competencies in techniques in early embryonic stem cell fate decisions.

Audience: Graduate

3. Successful performance of basic wet lab techniques related to mouse genetic experiments

Audience: Graduate

4. Successful performance of embryonic stem cell culture derivation and differentiation.

Audience: Graduate

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.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Understand key disciplines and principles required to successfully develop a variety of biotechnology products for targeted markets.

Audience: Graduate

2. Appreciate the need to, and understand the procedures required to, plan, manage, coordinate and synchronize development activities within a biotechnology company.

Audience: Graduate

3. Comprehend the regulatory environments under which biotechnology products are developed and approved for market.

Audience: Graduate

4. Be able to foster team participation leading to increased product value and the fastest route to the marketplace.

Audience: Graduate

5. Demonstrate the ability to design a development strategy, to clearly communicate objectives, and to provide leadership throughout implementation.

Audience: Graduate

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. Simulates the corporate and academic biotechnology setting.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Analyze importance of biotechnology research and diagnostic applications, especially in the area of nucleic acid and protein applications.

Audience: Graduate

2. Perform biomanufacturing protocols required to purify target protein from a number of different laboratory techniques.

Audience: Graduate

3. Critically analyze and maintain biomanufacturing operations.

Audience: Graduate

CRB 830 – EARLY DRUG DISCOVERY

4 credits.

Provides 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.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Outline the early drug discovery process, from target identification up to nonclinical trials.

Audience: Graduate

2. Develop a scientific understanding of mechanisms of one or more disease processes.

Audience: Graduate

3. Identify a disease target and explain how modulation of that target could treat or prevent a disease.

Audience: Graduate

4. Describe current and emerging methods for generating compound diversity in chemical libraries, natural products, and antibodies, including molecular modeling and structure-based drug design.

Audience: Graduate

5. Be able to research a technology used in drug discovery, understand the unmet need it addresses, and summarize the key information in a clear and concise way, both verbally and in a written format.

Audience: Graduate

CRB 834 – MOLECULAR TECHNOLOGIES III

2 credits.

Covers topics and concepts in the drug discovery process, with emphasis on laboratory assays and methods used in primary, secondary, and in vitro ADMETox (Absorption, Distribution, Metabolism, Excretion, Toxicity) drug screening. In addition, students build communication and critical thinking skills while working on team projects and analyzing scientific results.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Employ effective scientific communication methods demonstrating knowledge and skills when: writing scientific papers; preparing detailed scientific protocols, critiquing scientific journal articles in the area of ADMET and drug discovery, and organizing and presenting detailed scientific presentations.

Audience: Graduate

2. Investigate how protein kinase and cytochrome P450 enzyme assay technology are used in the drug discovery process.

Audience: Graduate

3. Perform and evaluate multiple assays using a variety of technologies including, but not limited to: Cytochrome P450 enzyme and TR-FRET kinase assay technologies, cell culture techniques, and genome editing and CRISPR/Cas-9.

Audience: Graduate

4. Evaluate multiple assay methods for efficiency by measuring viability, toxicity, permeability, and ion channel activity.

Audience: Graduate

5. Compare the following roles in biotechnology and the drug discovery processes for fluorescent microscopy, high content screening, and in vivo imaging.

Audience: Graduate

6. Analyze and summarize data and quality control measures for assays as they relate to biotechnology and drug discovery, which will facilitate critical thinking.

Audience: Graduate

CRB 841 – BUSINESS OF BIOTECHNOLOGY: CONTEMPORARY CHALLENGES AND APPLICATIONS

2 credits.

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.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Fall 2024

Learning Outcomes: 1. Recognize and appreciate risks and challenges associated with commercialization of early-stage research and innovation.

Audience: Graduate

2. Determine those elements that make up a viable business opportunity.

Audience: Graduate

3. Recognize strengths and limitations of a variety of business models.

Audience: Graduate

CRB 842 – BUSINESS OF BIOTECHNOLOGY: SUSTAINING GROWTH

3 credits.

Examine how companies gain and sustain competitive advantages.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Analyze industry forces and environmental trends to assess industry potential.

Audience: Graduate

2. Assess company's resources for potential to generate a competitive advantage.

Audience: Graduate

3. Identify opportunities and strategies to add or supplement capabilities.

Audience: Graduate

4. Understand the challenges and opportunities of creating value through a global strategy.

Audience: Graduate

5. Explain how companies might add value across diverse lines of business through knowledge of R&D strategic management.

Audience: Graduate

6. Understand how to apply negotiation and management skills to guide strategic change efforts.

Audience: Graduate

7. Apply tools learned across curriculum, including quantitative and qualitative analysis.

Audience: Graduate

CRB 843 – PROJECT MANAGEMENT AND LEADERSHIP

2 credits.

With a focus on the biotechnology and medical device industries, provides an opportunity to share experiences and information and to practice leadership and project management knowledge and skills. Focuses upon understanding and developing a Project Management Plan. Addresses the issues and various situations faced by Project Managers and their effective response.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Describe the components of technical project management, and the social and leadership skills that are needed to lead a team in the global biopharmaceutical or medical device industries.

Audience: Graduate

2. Apply effective leadership skills to work within diverse groups of professionals and communities as they address and solve problems, make critical decisions, and measure and mitigate risk.

Audience: Graduate

3. Describe the nature of and responses to social forces that impact a team or team leader and the technologies managed by that team.

Audience: Graduate

4. Design, use, and defend a project management plan using common project management methods.

Audience: Graduate

5. Compare and contrast the challenges and unique components of leading teams in a global environment compared to domestically.

Audience: Graduate

CRB 844 – ADVANCED BIOTECHNOLOGY: GLOBAL PERSPECTIVES

3 credits.

Focuses on state-of-the-art topics of global importance in biotechnology. Skills and knowledge from previous courses are integrated and applied to achieve a new level of synthesis and depth of understanding about important programs in biotechnology today. Deepen technical understanding of novel technologies and broaden awareness of ethical and regulatory issues in biotechnology globally. Increase awareness of opportunities for intellectual collaboration and entrepreneurship.

Requisites: Declared in the Biotechnology graduate program

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

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Identify, research, and devise a final research topic with both faculty and peer input, from numerous perspectives (science, business, law, regulatory, ethical, and political)

Audience: Graduate

2. Summarize and communicate an assigned special topic in global biotechnology, including stem cell applications, healthcare innovations, biomanufacturing issues, or metagenomic and microbiome analysis.

Audience: Graduate

3. Demonstrate effective written and oral communication through a variety of formats and to a variety of audiences.

Audience: Graduate

4. Develop effective strategies for researching different biotechnologies in depth and critical analysis, using a variety of sources.

Audience: Graduate

CRB 845 – PROFESSIONAL DEVELOPMENT AND EFFECTIVE MANAGEMENT

1 credit.

Focus on effective management and career development. Learn and practice the applied skills needed for effective managers that lead to synergistic team success within a biotechnology company. Different communication styles will be explored that are used to engage and assess employees. Professional development will be explored to expand career pathways through networking and by generating professional resumes and interviewing skills.

Requisites: Declared in Biotechnology MS

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

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Analyze skills required to influence, prioritize, and set goals in a biotechnology company.

Audience: Graduate

2. Evaluate team culture in terms of what really matters to enable results and provide psychological safety.

Audience: Graduate

3. Create situational, behavioral, and impact driven feedback strategies so that both the employee and manager are successful.

Audience: Graduate

4. Explore the differences between managing and coaching the team through case studies and scenarios.

Audience: Graduate

5. Generate a career development plan that includes effective resumes, cover letters, networking, and employment research skills.

Audience: Graduate

CRB 846 – BIOTECHNOLOGY CAPSTONE

1 credit.

Goal is to identify a global biotechnology problem, find a technical solution, and analyze all aspects from a business, regulatory, and scientific perspective.

Requisites: Declared in Biotechnology MS

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

Repeatable for Credit: No

Last Taught: Spring 2025

Learning Outcomes: 1. Identify an important global biotechnology-based problem and define a novel biotechnology-based solution to address it.

Audience: Graduate

2. Analyze the economic logic of the global biotechnology problem and solution. Consider customers, market, pricing, and competitors.

Audience: Graduate

3. Provide insightful business and technical questions to research including finding effective resources and subject matter experts.

Audience: Graduate

4. Discuss the global/international technical and business considerations using information and tools covered in previous courses in the MS in Biotechnology Program.

Audience: Graduate

5. Identify a company to implement your proposed solution to augment the company's current portfolio.

Audience: Graduate

6. Identify key regulatory, intellectual property, manufacturing, social, or political issues that could impact the success of the solution.

Audience: Graduate

7. Critique both technical and business considerations in a clear, concise, and logical manner to make credible technical and business solutions and recommendations.

Audience: Graduate

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.

Requisites: MED SC-M 810, 811, 812, and 813**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** No**Learning Outcomes:** 1. Describe the fundamentals of stem cell biology, including the derivation of embryonic and induced pluripotent stem cells
Audience: Graduate2. Describe the ethical considerations for using stem cells in research
Audience: Graduate3. Describe the ethical considerations for using stem cells in the clinic
Audience: Graduate4. Discuss how induced pluripotent stem cells can be used to model human diseases
Audience: Graduate5. Discuss translational approaches to use of stem cells for bone and vascular regeneration
Audience: Graduate6. Discuss the current status of stem cell transplantation for treatment of autoimmune disorders
Audience: Graduate**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.

Requisites: MED SC-M 810, 811, 812, and 813**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** No**Learning Outcomes:** 1. Describe the fundamentals of cardiac development, including the transcription factors and signaling pathways that regulate normal cardiac morphogenesis
Audience: Graduate2. Describe the genetic factors underlying normal and pathological cardiac development
Audience: Graduate3. Provide examples of fetal, neonatal and adult cardiac defects that have genetic etiologies
Audience: Graduate4. Discuss animal models and tissue-engineering systems used to investigate cardiac development
Audience: Graduate5. Discuss the current status of cardiac regeneration using stem cells and resident cardiac cells
Audience: Graduate6. Describe state of the art molecular and imaging tools used to diagnose cardiac defects
Audience: Graduate7. Explain when each of these tools should be applied
Audience: Graduate

CRB 990 – RESEARCH AND THESIS

1-9 credits.

Research and Thesis.

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 2025

Learning Outcomes: 1. Exhibit a broad understanding of general cell and regenerative biology principles.

Audience: Graduate

2. Conduct independent research using a variety of approaches.

Audience: Graduate

3. Think critically to address research challenges.

Audience: Graduate

4. Exhibit and foster professional and ethical conduct in their research.

Audience: Graduate

5. Collaborate with other investigators within or outside the thesis lab.

Audience: Graduate