

BIOCHEMISTRY (BIOCHEM)

BIOCHEM 100 – BIOCHEMISTRY FRESHMAN SEMINAR

1 credit.

Introduction to the discipline of biochemistry, to the UW Biochemistry Department, to some of the research projects the faculty are pursuing, to the University, and to the career options open to an individual with a biochemistry background.

Requisites: None

Repeatable for Credit: No

Last Taught: Spring 2024

BIOCHEM 104 – MOLECULES TO LIFE AND THE NATURE OF SCIENCE

3 credits.

Introduction to how life works at a molecular level and the evolutionary paths that led to the great diversity of life on our planet. With this foundation, discuss current topics in the news such as: exploring the human genome to understand our species' history and to diagnose and treat disease; genetic engineering of crops in relation to foods safety and effects on ecosystems; gene editing of insects and mammals including humans; how to determine whether herbal remedies, vaccines, etc. are effective and safe; and current trends in biotechnology and what might be on the horizon. Focus on appreciating the nature of science and becoming better equipped to explore and evaluate scientific topics of interest.

Requisites: None

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

Level - Elementary

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

Repeatable for Credit: No

Last Taught: Spring 2024

Learning Outcomes: 1. Understand the nature of science and what science can tell us. Audience: Undergraduate

2. Gain an appreciation for the beauty of biology and the remarkable diversity of life on earth. Audience: Undergraduate

3. Discuss fundamentals of the evolutionary process and the molecular basis of how cells and organisms operate. Audience: Undergraduate

4. Appreciate the range of how science is presented and sometimes misrepresented in the media. Audience: Undergraduate

5. Equip students with the ability to inform their own decision making as they encounter scientific topics that may influence their daily life. Audience: Undergraduate

BIOCHEM 289 – HONORS INDEPENDENT STUDY

1-2 credits.

Research work for Honors students under direct guidance of a Biochemistry faculty member. Students are responsible for arranging the work and credits with the supervising instructor.

Requisites: Consent of instructor

Course Designation: Level - Intermediate

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

Honors - Honors Only Courses (H)

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2016

BIOCHEM 299 – INDEPENDENT STUDY

1-3 credits.

Research work for students under direct guidance of a Biochemistry faculty member. Students are responsible for arranging the work and credits with the supervising instructor.

Requisites: Consent of instructor

Course Designation: Level - Intermediate

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2024

BIOCHEM 301 – SURVEY OF BIOCHEMISTRY

3 credits.

Explore the basic chemical properties of proteins, lipids, carbohydrates, and nucleic acids. Topics to be discussed include protein structure and function, the chemical logic of metabolism, and the mechanisms of DNA replication, DNA transcription, DNA repair, and gene expression. Understand principles and themes in biochemistry that relate to metabolic diseases, drug design, virus infection and vaccination, and gene therapy. Does not cover the foundational material necessary to succeed in additional biochemistry coursework, and is not likely to be acceptable for medical or veterinary school admission.

Requisites: CHEM 104, 109, or 116. Not open to students with credit for BIOCHEM 501.

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

Level – Intermediate

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

Repeatable for Credit: No

Last Taught: Spring 2024

Learning Outcomes: 1. Apply basic concepts of protein and enzyme structure and function Audience: Undergraduate

2. Differentiate structures of lipids and their biochemical roles Audience: Undergraduate

3. Differentiate structures of carbohydrates and their biochemical roles Audience: Undergraduate

4. Differentiate structures of nucleic acids and their biochemical roles Audience: Undergraduate

5. Apply chemical concepts involved in both anabolic and catabolic pathways Audience: Undergraduate

6. Explain basics of gene expression and regulation Audience: Undergraduate

7. Describe fundamentals of cancer and certain viral diseases Audience: Undergraduate

BIOCHEM 375 – SPECIAL TOPICS

1-4 credits.

Examines various special topics in biochemistry. Topics and content will vary each semester and by section of the course.

Requisites: None

Course Designation: Level – Intermediate

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2024

BIOCHEM 399 – COORDINATIVE INTERNSHIP/COOPERATIVE EDUCATION

1-8 credits.

An internship under guidance of a faculty or instructional academic staff member in Biochemistry and internship site supervisor. Students are responsible for arranging the work and credits with the faculty or instructional academic staff member and the internship site supervisor.

Requisites: Consent of instructor

Course Designation: Level – Intermediate

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

Workplace – Workplace Experience Course

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2020

BIOCHEM 400 – STUDY ABROAD IN BIOCHEMISTRY

1-6 credits.

Provides an area equivalency for courses taken on Madison Study Abroad Programs that do not equate to existing UW courses. Enrollment in a UW-Madison resident study abroad program

Requisites: None

Repeatable for Credit: Yes, unlimited number of completions

BIOCHEM 501 – INTRODUCTION TO BIOCHEMISTRY

3 credits.

Chemistry, nutrition, and metabolism of biological systems.

Requisites: (CHEM 341, 343, or concurrent enrollment), or graduate/professional standing

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Advanced

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

Repeatable for Credit: No

Last Taught: Spring 2024

BIOCHEM 507 – GENERAL BIOCHEMISTRY I

3 credits.

Chemistry of biological materials, intermediary metabolism and protein structure.

Requisites: CHEM 345

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Advanced

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

Repeatable for Credit: No

Last Taught: Spring 2024

BIOCHEM 508 – GENERAL BIOCHEMISTRY II

3-4 credits.

Biosynthesis of biological molecules, signal transduction mechanisms, chemistry and metabolism of nucleic acids, protein synthesis, and molecular and cellular biology.

Requisites: BIOCHEM 507

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Advanced

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

Repeatable for Credit: No

Last Taught: Spring 2024

BIOCHEM/NUTR SCI 510 – NUTRITIONAL BIOCHEMISTRY AND METABOLISM

3 credits.

Lectures in nutrition with a substantial background in biochemistry. Emphasis on biochemical and physiological fundamentals of nutrition. Discussion of protein, fat, carbohydrate, energy, minerals and vitamins and their roles and interrelationships in nutrition and metabolism.

Requisites: BIOCHEM 301, 501, 507, BMOLCHEM 503, 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 2024

Learning Outcomes: 1. Understand nutrient metabolism in normal and disease states Audience: Both Grad Undergrad

2. Integrate the regulation of metabolism of nutrients under normal and disease state conditions. Audience: Both Grad Undergrad

3. Understand the biochemical and molecular functions of nutrients we consume Audience: Both Grad Undergrad

4. Apply how nutrients affect pathogenesis and health Audience: Graduate

5. Think critically about nutrient claims and fads using your knowledge of nutritional biochemistry. Audience: Both Grad Undergrad

6. Integrate current research in the area of metabolism and micronutrient function into existing knowledge and formulate new hypotheses to guide future research Audience: Graduate

BIOCHEM 551 – BIOCHEMICAL METHODS

4 credits.

Introduction to modern biochemical laboratory techniques and current biochemical literature. Includes student seminar presentations based upon scientific literature that parallels experiments performed in the lab.

Requisites: BIOCHEM 501, 507, or concurrent enrollment

Course Designation: Breadth – Physical Sci. Counts toward the Natural Sci req

Level – Advanced

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

Repeatable for Credit: No

Last Taught: Spring 2024

BIOCHEM/NUTR SCI 560 – PRINCIPLES OF HUMAN DISEASE AND BIOTECHNOLOGY

2 credits.

Covers basic and applied biochemical principles related to human disease. Topics such as: cancer, including cell cycle regulation, oncogenes and tumor suppressors, and cellular metabolism; metabolic disorders, including cardiovascular disease, metabolic syndrome, and diabetes; biotechnology, including metabolomics, CRISPR-based genetic screens, and experimental models of human disease.

Requisites: BIOCHEM 501, 507, 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 2024

Learning Outcomes: 1. Critically evaluate, and accurately describe findings from primary research publications Audience: Both Grad Undergrad

2. Analyze how genetic and cell cycle perturbations contribute to cancer progression Audience: Both Grad Undergrad

3. Identify how genetic and environmental factors impact altered cellular metabolism in cancer Audience: Both Grad Undergrad

4. Describe biochemical mechanisms that contribute to cardiovascular disease, metabolic syndrome, and diabetes Audience: Both Grad Undergrad

5. Explain biochemical techniques, engineering strategies, and state-of-the-art technologies used in biomedical research Audience: Both Grad Undergrad

6. Collaborate with peers in a small group Audience: Both Grad Undergrad

7. Apply knowledge of biochemical principles and biotechnology to solve research and disease treatment related problems Audience: Both Grad Undergrad

8. Execute written critical evaluation of primary research literature related to the molecular basis of human diseases and advances in biotechnology. Audience: Graduate

BIOCHEM 570 – COMPUTATIONAL MODELING OF BIOLOGICAL SYSTEMS

3 credits.

Introduction to the mathematical and computational tools needed to model biological systems spanning from molecules to ecosystems. Topics include protein folding and dynamics, gene regulation, biomolecular networks, and population dynamics. Teaches the fundamentals in quantitative thinking and analytical reasoning about complex biological systems.

Requisites: (MATH 217 or 221) and BOTANY/BIOLOGY/ZOOLOGY 151, ZOOLOGY 153, BIOCORE 381, or (ZOOLOGY/BIOLOGY 101, 102 and BOTANY/BIOLOGY 130), 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 2024

Learning Outcomes: 1. Perform scientific computations in the Python programming language Audience: Both Grad Undergrad

2. Design, simulate, and analyze mathematical models of biological systems Audience: Both Grad Undergrad

3. Understand how to model biological systems across different scales Audience: Both Grad Undergrad

4. Think critically about model assumptions/validity Audience: Both Grad Undergrad

5. Communicate scientific findings in oral and written form Audience: Both Grad Undergrad

6. Integrate current research in the area of computational modeling of biological systems into existing knowledge and formulate new hypotheses to guide future research. Audience: Graduate

BIOCHEM/M M & I 575 – BIOLOGY OF VIRUSES

2 credits.

Broad coverage of animal virology taught at molecular level. Topics include virus structure, viral replication/lifecycle, aspects of pathogenesis and prevention.

Requisites: (BIOCORE 381 and 382), ZOOLOGY/BIOLOGY/BOTANY 151, M M & I 301, or graduate/professional standing

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

Repeatable for Credit: No

Last Taught: Spring 2024

BIOCHEM 601 – PROTEIN AND ENZYME STRUCTURE AND FUNCTION

2 credits.

Protein structure and dynamics. Protein folding. Physical organic chemistry of enzymatic catalysis. Analysis of enzyme kinetics and receptor-ligand interactions. Enzymatic reaction mechanisms.

Requisites: CHEM 345 and (BIOCHEM 501 or 507) or graduate/professional standing

Course Designation: Breadth – Physical 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: Fall 2023

BIOCHEM/B M I/BMOLCHEM/MATH 609 – MATHEMATICAL METHODS FOR SYSTEMS BIOLOGY

3 credits.

Provides a rigorous foundation for mathematical modeling of biological systems. Mathematical techniques include dynamical systems and differential equations. Applications to biological pathways, including understanding of bistability within chemical reaction systems, are emphasized.

Requisites: MATH 415 and (MATH 320, 340, 341, or 375) or graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program

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: Fall 2023

BIOCHEM/GENETICS/MICROBIO 612 – PROKARYOTIC MOLECULAR BIOLOGY

3 credits.

Molecular basis of bacterial physiology and genetics with emphasis on molecular mechanisms; topics include nucleic acid-protein interactions, transcription, translation, replication, recombination, regulation of gene expression.

Requisites: (BIOCHEM 501 or 507) and (MICROBIO 470, GENETICS 466 or 468) 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: Fall 2023

BIOCHEM/NUTR SCI 619 – ADVANCED NUTRITION: INTERMEDIARY METABOLISM OF MACRONUTRIENTS

3 credits.

Discuss metabolic control; gastrointestinal physiology, nutrient absorption; molecular, cellular, organismal aspects of glucose transport, metabolism, regulation; fuel sensing; molecular regulation of fatty acid, lipid metabolism; cellular, organismal aspects of protein metabolism; hormonal control of metabolism; experimental approaches for studying metabolism.

Requisites: NUTRI SCI 510, BIOCHEM 507, 508, or BMOLCHEM 503 or graduate/professional standing

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

Repeatable for Credit: No

Last Taught: Spring 2024

BIOCHEM/GENETICS/MD GENET 620 – EUKARYOTIC MOLECULAR BIOLOGY

3 credits.

Focuses on the basic molecular mechanisms that regulate DNA, RNA, and protein metabolism in eukaryotic organisms.

Requisites: BIOCHEM 501, 508 or graduate/professional standing

Course Designation: Level - Intermediate

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 2024

BIOCHEM/BOTANY 621 – PLANT BIOCHEMISTRY

3 credits.

Biochemistry of photosynthesis, respiration, cell walls, and other metabolic and biosynthetic processes in plants.

Requisites: BIOCHEM 501, 507, 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: Fall 2023

BIOCHEM 625 – MECHANISMS OF ACTION OF VITAMINS AND MINERALS

2 credits.

Emphasizes the importance of coenzyme and cofactors of enzymes (i.e., vitamins and minerals) in biochemistry. All aspects of the biochemistry of coenzymes will be covered, including their biosynthesis as far as is known, the biochemical reactions they catalyze, their chemical and spectroscopic properties, and the mechanisms by which they facilitate biochemical reactions.

Requisites: CHEM 345 and (BIOCHEM 501, 507, or concurrent enrollment), or graduate/professional standing

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

Level - Advanced

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

Repeatable for Credit: No

Last Taught: Spring 2024

BIOCHEM/GENETICS 631 – PLANT GENETICS AND DEVELOPMENT

3 credits.

Covers the basic concepts of genetics and genomics as applied to plants and their development, including discussions on breeding systems (modes of reproduction, sex determination, self incompatibility and crossing barriers), linkage analysis, genome structure and function (structure, function and evolution of nuclear and organellar chromosomes; haploidy and polyploidy; expression regulation and epigenetics), along with a description of current methodologies used in the analysis of these processes within the context of plant development. The objective is to instigate a broader knowledge and understanding of the principles and methodologies used in plant genetics and their applications in investigations of the molecular mechanisms that modulate plant development.

Requisites: GENETICS 466, 468, BIOCORE 587, 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: Fall 2023

BIOCHEM/NUTR SCI 645 – MOLECULAR CONTROL OF METABOLISM AND METABOLIC DISEASE

3 credits.

Examination of various physiological states and how they affect metabolic pathways. Discussion of a number of special topics related to the unique roles of various tissues and to metabolic pathways in disease states, including adipocyte biology, beta-cell biology, epigenetics, inflammation, and aging related diseases.

Requisites: BIOCHEM 501, 508 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

Repeatable for Credit: No

Last Taught: Fall 2023

BIOCHEM 681 – SENIOR HONORS THESIS

2-4 credits.

First semester of individual study for undergraduate students in an Honors program completing a thesis in the area of Biochemistry, as arranged with a Biochemistry faculty member.

Requisites: Consent of instructor

Course Designation: Level - Advanced

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

Honors - Honors Only Courses (H)

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2024

BIOCHEM 682 – SENIOR HONORS THESIS

2–4 credits.

Second semester of individual study for undergraduate students in an Honors program completing a thesis in the area of Biochemistry, as arranged with a Biochemistry faculty member.

Requisites: Consent of instructor

Course Designation: Level - Advanced

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

Honors - Honors Only Courses (H)

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2024

BIOCHEM 691 – SENIOR THESIS

2 credits.

First semester of individual study for undergraduate students completing a thesis in the area of Biochemistry, as arranged with a Biochemistry faculty member.

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: Fall 2023

BIOCHEM 692 – SENIOR THESIS

2 credits.

Second semester of individual study for undergraduate students completing a thesis in the area of Biochemistry, as arranged with a Biochemistry faculty member.

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 2024

BIOCHEM 699 – SPECIAL PROBLEMS

1–4 credits.

Provides academic credit for research, library, and/or laboratory work under direct guidance of a faculty member. Students are responsible for arranging the work and credits with the supervising faculty member.

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 2024

BIOCHEM/BMOLCHEM 701 – RESPONSIBLE CONDUCT IN BIOSCIENCE RESEARCH

2 credits.

Introductory training in the practical aspects of being a graduate-level scientist and the professional standards and expectations of ethical researchers. Covers a wide variety of professional development topics, including choosing a research laboratory and a thesis mentor, transitioning to self-education, managing stress in graduate school, and the importance of diversity in science. Ethics topics include conflicts of interest, the protection of human subjects, the welfare of laboratory animals and workers, safe laboratory spaces, mentor and mentee responsibilities, collaborative research, peer review, data acquisition and data management practices, research misconduct, responsible authorship and publication, contemporary ethical issues in biomedical research, and the roles of responsible scientists in society. Covers all NIH-recommended topics for Responsible Conduct of Research, thus meeting the requirements for trainees involved in NIH-sponsored research programs.

Requisites: Graduate/professional standing

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

Repeatable for Credit: No

Last Taught: Fall 2023

BIOCHEM/CHEM 704 – CHEMICAL BIOLOGY

3 credits.

Chemistry and biology of proteins, nucleic acids and carbohydrates; application of organic chemistry to problems in cell biology, biotechnology, and biomedicine.

Requisites: Declared in Biochemistry or Chemistry graduate program

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

Repeatable for Credit: No

Last Taught: Fall 2023

Learning Outcomes: 1. Be able to describe the chemical basis for replication, transcription, translation and how each of these central processes can be expanded to include new chemical matter. Audience: Graduate

2. Develop skills to critically read the literature and effectively communicate research in a peer setting. Audience: Graduate

3. Describe the substance and importance of chemical biology research in the format of a cover letter to a journal editor, and an original figure. Audience: Graduate

4. Demonstrate knowledge of chemical biology by designing an original research project that focuses on answering a biological question or solving a biomedical problem. Audience: Graduate

BIOCHEM 719 – FROM ATOMS TO MOLECULES

3 credits.

Topics covered include protein structure and folding, protein dynamics, biological catalysis, membrane structure and assembly, nucleic acid structure and folding, and bioenergetics. Each topic includes discussion of the primary literature, hypothesis generation, experimental design, data, analysis and interpretation underlying the facts in the textbook. Supports transition from undergraduate consumers of knowledge to graduate students and future independent scientists who will discover and add new knowledge.

Requisites: Declared in Biochemistry PhD program

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

Repeatable for Credit: No

Last Taught: Fall 2023

Learning Outcomes: 1. Understand the chemical principles underlying the structure, dynamics, interaction, and function of biological molecules Audience: Graduate

2. Design experiments to test a particular hypothesis using various techniques Audience: Graduate

3. Analyze, interpret, test, and share experimental data Audience: Graduate

4. Understand how biochemical principles are derived from primary experimental data and practice developing broader biochemical insights from experimental data Audience: Graduate

BIOCHEM 721 – BIOCHEMICAL COMMUNICATION

2 credits.

Introduction to written and visual communication of biochemical research, both to other scientists and to general audiences, including: how to recognize and adapt work to different audiences; how to construct a scientific argument and the different strategies used for research reports, reviews, and proposals; and how to create figures and posters that clearly convey scientific data and concepts. Learn about the peer review process and revision of scientific writing. An intensive writing component, which requires multiple written and visual documentation on topics related to thesis research.

Requisites: Declared in Biochemistry PhD program

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

Repeatable for Credit: No

Last Taught: Fall 2023

Learning Outcomes: 1. Differentiate different types of scientific writing, including the goals, audience and components of research papers, review articles, and proposals Audience: Graduate

2. Analyze the structure of scientific arguments Audience: Graduate

3. Write about their own research and field of science, both retrospectively (research papers and review articles) and prospectively (proposal), utilizing the strategies previously identified to synthesize data or the literature, organize the work, and construct a convincing scientific argument at the appropriate level for the target audience to demonstrate mastery of these concepts Audience: Graduate

4. Create figures that clearly, accurately, and concisely convey scientific information to support the written words Audience: Graduate

5. Revise their scientific writing to improve clarity, organization, language, and to better achieve the rhetorical goals of the piece Audience: Graduate

6. Develop a scientific poster to visually and orally communicate scientific data and results Audience: Graduate

7. Compose one piece targeted to non-scientists Audience: Graduate

BIOCHEM 729 – ADVANCED TOPICS

1-3 credits.

Specialized subjects of current interest.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2024

BIOCHEM 800 – PRACTICAL NUCLEAR MAGNETIC RESONANCE THEORY

2 credits.

Multiple pulse Nuclear Magnetic Resonance (NMR), off-resonance effects, composite and shaped pulses, product operators, coherence transfer, one- and two-dimensional NMR, phase cycling, multiple quantum coherence, and cross relaxation.

Requisites: Graduate/professional standing

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

Repeatable for Credit: No

Last Taught: Fall 2020

BIOCHEM 801 – BIOCHEMICAL APPLICATIONS OF NUCLEAR MAGNETIC RESONANCE

2 credits.

Survey of current solution-state nuclear magnetic resonance techniques used in biochemical research; the emphasis will be on how data are acquired and on practical applications.

Requisites: Graduate/professional standing

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

Repeatable for Credit: No

Last Taught: Spring 2020

BIOCHEM/BOTANY/GENETICS 840 – REGULATORY MECHANISMS IN PLANT DEVELOPMENT

3 credits.

Molecular mechanisms whereby endogenous and environmental regulatory factors control development; emphasis on stimulus perception and primary events in the signal chain leading to modulated gene expression and cellular development.

Requisites: Graduate/professional standing

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

Repeatable for Credit: No

Last Taught: Fall 2020

BIOCHEM/CHEM 872 – SELECTED TOPICS IN MACROMOLECULAR AND BIOPHYSICAL CHEMISTRY

1-3 credits.

Various selected topics in contemporary macromolecular or biophysical chemistry.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2024

BIOCHEM/NUTR SCI 901 – SEMINAR-NUTRITION AND METABOLISM (ADVANCED)

1 credit.

Presentation of original research results; discussion of recent articles in animal metabolism and nutrition.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Fall 2023

BIOCHEM 906 – TOPICS IN MODELING FOR BIOCHEMICAL SYSTEMS

1 credit.

Discuss topics relevant to predictive modeling of bioenergy systems. Present talks and lead brainstorming sessions intended to sharpen skills at cross-disciplinary communication. Modeling microbes and plants at the genetic, molecular and systems level is emphasized.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Fall 2016

BIOCHEM 909 – SEMINAR-ENZYMOLGY (ADVANCED)

1 credit.

Research reports, special topics, and reports from recent literature in enzymology and enzyme mechanisms.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2016

BIOCHEM 910 – SEMINAR-MOLECULAR VIROLOGY (ADVANCED)

1 credit.

Research reports, special topics, and reports from recent literature in molecular virology.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Fall 2023

BIOCHEM 912 – SEMINAR-MOLECULAR MECHANISMS OF DEVELOPMENT

1 credit.

Classical and current papers concerning molecular and genetic mechanisms of eukaryotic development will be presented and discussed.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Fall 2018

BIOCHEM/BMOLCHEM 913 – SEMINAR-RIBOGROUP (ADVANCED)

1 credit.

Student-led discussions of RNA-related problems.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2024

BIOCHEM/BMOLCHEM/M M & I 914 – SEMINAR-MOLECULAR BIOSCIENCES (ADVANCED)

1 credit.

During the fall semester, molecular biosciences trainees who have not achieved dissertator status will present seminars based primarily on literature related to their projects. During the spring semester, molecular biosciences trainees with dissertator status will present seminars based upon their own research.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Fall 2020

BIOCHEM/B M E/B M I/CBE/COMP SCI/GENETICS 915 – COMPUTATION AND INFORMATICS IN BIOLOGY AND MEDICINE

1 credit.

Participants and outside speakers will discuss current research in computation and informatics in biology and medicine. This seminar is required of all CIBM program trainees.

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 2024

BIOCHEM 916 – CELLULAR MECHANISMS OF PROTEIN BIOGENESIS AND TRAFFICKING

1 credit.

Recent literature relating to cellular aspects of the regulation of protein biogenesis including protein synthesis, folding, modification, degradation and trafficking, as well as function of molecular chaperones, will be presented and discussed.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2019

BIOCHEM/MICROBIO 917 – REGULATION OF GENE EXPRESSION (ADVANCED SEMINAR)

1 credit.

Analysis of recent literature in topics related to prokaryotic and eukaryotic gene regulation, including regulation of transcription, translation, and genome organization.

Requisites: Consent of instructor

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

Repeatable for Credit: No

Last Taught: Spring 2024

BIOCHEM/CHEM 918 – SINGLE MOLECULE APPROACHES TO BIOLOGY

1 credit.

A combination of recent literature and original research presentations relating to the use of single molecule techniques in biochemistry including fluorescence microscopy, tethered particle motion, patch-clamping, cryo-electron microscopy, optical trapping, magnetic tweezers, and super resolution microscopy.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Fall 2023

BIOCHEM 919 – SYNTHETIC BIOLOGY SEMINAR

1 credit.

Synthetic biology is a burgeoning field encompassing understanding and designing biological systems spanning from biomolecules to ecosystems. It builds on advances in molecular and cellular technologies to revolutionize biological engineering in the same way that organic synthesis transformed chemistry and integrated circuit design transformed computing. Synthetic biology has the potential to address many of society's grand challenges including: understanding human disease, sustainable biomanufacturing, medical diagnostics and therapeutics, programming mammalian cell behaviors, engineering living materials, information storage, carbon sequestration, and energy generation. Latest advances in the field will be reviewed by covering literature including but not limited to biomolecular design, sequence-structure-function relationship, regulatory and signaling networks, metabolic engineering, interactions in microbial communities, cell-based therapeutics and genome design.

Requisites: Graduate/professional standing

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2024

Learning Outcomes: 1. Critically analyze data and conclusions reported in current literature on synthetic biology Audience: Graduate

2. Summarize and present the findings of a scientific article Audience: Graduate

3. Lead and contribute productively to discussions of current research in the field Audience: Graduate

BIOCHEM 924 – MEMBRANE PROTEIN STRUCTURE AND FUNCTION

1 credit.

Membrane proteins comprise over a fourth of proteins encoded in any given genome, providing many vital functions to all cells. For example, ion channels and pumps modulate the membrane potential and help conduct information via nerves and other long distance conducting tissue. Transporters mediate the uptake and secretion of molecules. Receptors, such as G protein coupled receptors and receptor protein kinases, transfer information about the environment to the inside of the cell. Membrane proteins also contribute to the shape of the cell, the structure of the membrane and a myriad of other functions. Structure/function relationships for this critical class of proteins are discussed, addressing questions such as "how do membrane proteins fold?", "how do certain important classes of membrane proteins work?", "what are the challenges in studying membrane proteins" and "what methods are available for studying their biophysical properties?"

Requisites: Graduate/professional standing**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** Yes, unlimited number of completions**Last Taught:** Spring 2024

Learning Outcomes: 1. Synthesize recent and classic research literature about membrane proteins structure and function, including relevant methods, biological systems, or general principles. Audience: Graduate

2. Critically analyze data and conclusions presented in research literature, present it with clarity and discuss it with peers. Audience: Graduate

BIOCHEM/CBE 932 – BIOTECHNOLOGY TRAINING PROGRAM SEMINAR

1 credit.

Biotechnology Training Program trainees will present their research for critical review by audience.

Requisites: Graduate/professional standing**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** Yes, unlimited number of completions**Last Taught:** Spring 2024**BIOCHEM/CHEM 945 – SEMINAR-CHEMICAL BIOLOGY (ADVANCED)**

1 credit.

Presentations and discussions of recently published research in chemical biology and related areas.

Requisites: Graduate/professional standing**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** Yes, unlimited number of completions**Last Taught:** Fall 2023**BIOCHEM 990 – RESEARCH**

1-12 credits.

Independent laboratory research in preparation of a graduate thesis or dissertation under supervision of a faculty member.

Requisites: Graduate/professional standing**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement**Repeatable for Credit:** Yes, unlimited number of completions**Last Taught:** Spring 2024