

# BIOCHEMISTRY (BCHM)

## Course Descriptions

### **BCHM 113 Medicinal and Aromatic Plants in Culture and Practice 3 Credit Hours**

Medicinal and aromatic plants have been used for thousands of years to treat illness, create aromatic atmospheres, enhance food flavors, and in ritual ceremonies. Recently, use of plants as alternative therapy has increased in medical practices leading to initiatives to regulate and assess their safety and effectiveness. This course is designed for students interested in health-related careers, food, culture and nutrition. The course explores the history, cultural practices, everyday use, and current research on medicinal and aromatic plants. (YR).

**Prerequisite(s):** BIOL 130 or BIOL 140 or CHEM 134

### **BCHM 210 Biochemistry Laboratory Techniques 2 Credit Hours**

Biochemical Laboratory Techniques in an introduction to the equipment, procedures, and concepts used in the biochemistry laboratory. The class will cover topics such as scientific literature, keeping a laboratory notebook, statistical analysis and computer programs, as they relate to biochemistry. (W,YR)

**Prerequisite(s):** (CHEM 134 or CHEM 144) and (CHEM 136 or CHEM 146) and BIOL 140

**Restriction(s):**

Can enroll if Major is Biochemistry

### **BCHM 352 Introduction to Toxicology 3 Credit Hours**

An introduction to the principles of toxicology with an emphasis on environmental toxicology. Major topics include toxic agents, toxicological mechanisms, and use of toxicological reference literature. Discussion of chemical carcinogenesis, genetic toxicology, immunotoxicology, teratology, and toxic responses of the skin, eyes and nervous system. Three hours lecture. (AY,W).

**Prerequisite(s):** CHEM 225

### **BCHM 370 Principles of Biochemistry 4 Credit Hours**

A concise yet comprehensive survey of biochemistry designed for non-biochemistry majors. The structure of biological molecules and enzyme-catalyzed events are presented in a eukaryotic cellular context. Topics include the structure of macromolecules, enzymology, bioenergetics, regulation, intermediary metabolism, signaling, and the flow of cellular information from DNA to RNA to proteins. Homeostasis and evolution are overarching concepts. Students cannot take both BCHM 370 and 470 or 471 for any combination of concentration, cognate or minor requirement. Four hours lecture. (F).

**Prerequisite(s):** BIOL 140 and CHEM 226

### **BCHM 390 Current Topics in Biochemistry 1 to 3 Credit Hours**

Special topics current to the field of biochemistry. Topics and format for the course may vary. See Schedule of Classes for current topic. Permission of instructor. (OC).

**Prerequisite(s):** (BCHM 370\* or BIOL 370\* or CHEM 370\*) or (BCHM 470\* or BIOL 470\* or CHEM 470\*)

### **BCHM 404 Mechanisms of Chronic Human Disease 4 Credit Hours**

This course focuses on the biochemical, molecular and cellular mechanisms underlying the progression of chronic diseases, such as diabetes mellitus and atherosclerosis. Techniques in epidemiology, pathology, genetics, molecular biology, and biochemistry are used to understand how relevant physiological processes become pathological. The examination of chronic diseases provides an opportunity to understand biological processes across many scales of life, from extracellular matrix proteins to cells in blood vessel walls to risk factors in patient populations to the pharmacology of treatments. Use of primary literature is emphasized. Four hour lecture. (AY).

**Prerequisite(s):** BIOL 301 or BIOL 306 or BIOL 357 or BCHM 370 or BIOL 370 or CHEM 370 or BCHM 471 or BIOL 471 or CHEM 471

**Restriction(s):**

Can enroll if Class is Junior or Senior

### **BCHM 413 Extraction, purification, and characterization of Medicinal and Aromatic Plants 4 Credit Hours**

Students will learn the techniques behind essential oil extraction and the biological uses of medicinal plants. Independent work throughout the semester will allow students to grow, extract, and analyze an oil from a medicinal plant of their choosing. Through working in groups, students will collaboratively produce a final product of diffusing oils, candles, or soaps with aromatherapy uses. Uses and case studies throughout the semester will appeal to the pre-health student interested in learning about holistic medicine while manufacturing techniques and discussions will interest scientists with an industrial career outlook. (W).

**Prerequisite(s):** CHEM 227 and (BCHM 370 or BIOL 370 or CHEM 370 or BCHM 470 or BIOL 470 or CHEM 470)

### **BCHM 430 Bioinorganic Chemistry 4 Credit Hours**

This course examines the roles that metals play in biological systems, including the chemical principles that make metal ions well-suited for roles in protein structure, in redox catalysis and in acid base chemistry. The physical and experimental techniques that are applied to explore the structure and function of metals in natural systems will be introduced using case studies from the primary scientific literature in the field. BCHM 370 or its equivalent are strongly recommended but not required. (F, AY).

**Prerequisite(s):** CHEM 136 and BIOL 140

### **BCHM 470 Biochemistry I 4 Credit Hours**

Biochemistry I explores the structure/function relationships of the four major types of biomolecules, including carbohydrates, nucleic acids, and lipids, with an emphasis on proteins and enzyme kinetics. (F).

**Prerequisite(s):** BIOL 130 and BIOL 140 and CHEM 226

### **BCHM 471 Biochemistry II 4 Credit Hours**

BCHM 471 delves into advanced biochemical processes vital to life. Covering biomolecule structure and function, enzymatic reactions, metabolic pathways, and cellular signaling, the course starts with life's chemical basis and progresses to complex biochemical topics. It emphasizes practical skills like data analysis, problem-solving, and biochemical research techniques. Students undertake a research project on a biochemical disease and an oral presentation on recent biochemical research, enhancing their independent research and communication skills. This course prepares students for advanced academic or professional roles in biochemistry. (W).

**Prerequisite(s):** BCHM 470 or CHEM 470 or BIOL 470

**BCHM 472 Biochemistry Laboratory I 2 Credit Hours**

Biochemistry Laboratory I combines a blend of theoretical knowledge and hands-on experience. Students will explore advanced biochemical techniques including chromatography, gel electrophoresis, and spectroscopy. The course also includes molecular biology techniques such as site-directed mutagenesis. Aimed at fostering critical thinking, problem-solving, and scientific communication, BCHM 472 prepares students for advanced roles in biochemistry and medical research, emphasizing the application of laboratory skills to real-world challenges in personalized medicine. (F).

**Prerequisite(s):** (BIOL 470\* or BCHM 470\* or CHEM 470\*) and BCHM 210

**BCHM 473 Biochemistry Laboratory II 2 Credit Hours**

This advanced laboratory class further develops experimental skills to examine receptors, ligands, and signal cascades. These cellular factors are critical to metabolic homeostasis, gene regulation and neurochemistry. This course will teach skills and techniques to understand drug development, signaling, biochemical assays, genomics, and ligand binding affinity, specificity, and competition. (W).

**Prerequisite(s):** (BCHM 471\* or BIOL 471\* or CHEM 471\*) and (BCHM 472 or BIOL 472 or CHEM 472)

**BCHM 474 Molecular Biology 4 Credit Hours**

This course emphasizes the cellular mechanisms of information flow and regulation from DNA to RNA to proteins in eukaryotes. Topics will include chromatin structure, DNA replication, transcription, RNA modification, regulatory RNA, translation, DNA repair, genetic rearrangement, and genome organization. Experimental design, data interpretation and data analysis are emphasized. Four hours lecture (F). (F).

**Prerequisite(s):** (BCHM 470 or BIOL 470 or CHEM 470 or BCHM 370 or BIOL 370 or CHEM 370) and CHEM 227

**BCHM 475 Molecular Biology Laboratory 2 Credit Hours**

This laboratory provides instruction and experience in a variety of molecular biology techniques while performing a semester long project to address a question regarding molecular mechanism. Literature searching and creativity will guide students in designing experiments that together form the project. Skills addressed include experimental design, sample handling and manipulation, instrument use, data analysis, and scientific communication. One hour lecture, three hours laboratory (F).

**Prerequisite(s):** BCHM 210 or CHEM 227 and (BCHM 474\* or BIOL 474\*)

**BCHM 480 Biochemical Pharmacology 4 Credit Hours**

Pharmacology is a study of drugs and medications, and the biochemical and molecular basis of drug action. Pharmacological agents will be emphasized, including drug sources and doses. In addition to traditional drug development and medications, the course will explore nutritional supplements and diagnostic tools which impact therapeutic medication intervention. Different categories of drugs, their use, abuse, and side effects will be presented, including information about nutritional pathways and toxicology. This is a PBL course and requires a collaborative research proposal presentation. Four hours lecture. (OC).

**Prerequisite(s):** CHEM 370 or BCHM 370 or BIOL 370 or BCHM 470 or CHEM 470 or BIOL 470

**BCHM 485 Nutrition and Metabolism 4 Credit Hours**

Full Course Title: The Biochemistry of Human Nutrition and Metabolism  
Human Nutrition and Metabolism is an introduction to the relationship between food and nutrients, and their integration in the metabolic pathways. An understanding of the molecular basis of nutrition, related diseases, and overall health will be built on previous knowledge of cell biology and biochemistry. (AY)

**Prerequisite(s):** (BCHM 471 or BIOL 471 or CHEM 471) or (BCHM 370 or BIOL 370 or CHEM 370)

**BCHM 490 Topics in Biochemistry 1 to 3 Credit Hours**

A course in special topics that examines research problems of current interest in biochemistry. Topics and format may vary. See current Schedule of Classes. One to three hours seminar. (W).

**BCHM 495 Off-Campus Research in Biochem 1 to 3 Credit Hours**

Participation in ongoing research at an off-campus laboratory. No more than 6 hours combined from any Natural Science courses numbered 495, 498, and 499 may be credited toward the 120 hours required for a degree. Four to twelve hours laboratory. Permission of concentration advisor. (F,W,S).

**BCHM 496 Complex Systems 4 Credit Hours**

In this course, we delve into the intricate world of biochemistry, exploring how large-scale interactions and nonlinear dynamics lead to self-organization in biological systems. This course extends beyond traditional academic boundaries by integrating the American Society for Biochemistry and Molecular Biology's on-demand resources, providing students with access to contemporary webinars and presentations at the forefront of biochemical research. A significant focus is placed on the vital skills of grant writing and research proposal development, equipping students with the tools necessary for success in the competitive field of scientific research. The course promotes an interactive learning environment through an enhanced peer-review process, encouraging collaborative learning and critical engagement with course materials. Students will apply their theoretical knowledge to practical challenges, designing and proposing original research projects that mirror real-world scientific inquiries. The course not only imparts a profound understanding of complex biochemical systems but also prepares students for the dynamic and evolving landscape of biochemical research. (W, YR).

**Prerequisite(s):** (BCHM 470 or BIOL 470 or CHEM 470) and (BCHM 471 or BIOL 471 or CHEM 471) and (BCHM 474 or BIOL 474)

**Restriction(s):**

Can enroll if Class is Senior

**BCHM 497 Seminar in Biochemistry 1 Credit Hour**

A seminar course that examines research problems of current interest in biochemistry. The course format may include training students to read and present scientific papers, guest lecturers, and lectures by the instructor on a selected topic. One hour seminar. Permission of instructor. (W).

**Prerequisite(s):** (BCHM 470 or BIOL 470 or CHEM 470) and (BCHM 474 or BIOL 474)

**BCHM 498 Directed Reading in Biochem 1 to 3 Credit Hours**

Library research in a specific area of biochemistry performed under the direction of a faculty member. No more than six hours combined from departmental courses numbered 495, 498, and 499 may be credited toward the 120 hours required for a degree. Four to twelve hours readings. Permission of instructor. (F,W,S).

**BCHM 499 Laboratory Research in Biochem 1 to 3 Credit Hours**

Directed laboratory research performed under the supervision of a faculty member. Research training is encouraged. No more than six hours combined from departmental courses numbered 495, 498, and 499 may be credited toward the 120 hours required for graduation. Four to twelve hours laboratory. Permission of instructor. (F,W,S).

\*An asterisk denotes that a course may be taken concurrently.

Frequency of Offering

The following abbreviations are used to denote the frequency of offering:  
(F) fall term; (W) winter term; (S) summer term; (F, W) fall and winter  
terms; (YR) once a year; (AY) alternating years; (OC) offered occasionally