BIOMOLECULAR SCIENCE (BMSC)

BMSC 3001: Found of BioMolecular Sci I
Biomolecular Sciences
The Foundations of BioMolecular Sciences I course is the first semester of a two-semester sequence that integrates the underlying principles of medicinal and natural products chemistry, pharmacology, and toxicology necessary for developing a comprehensive understanding of disease processes, drug-associated side effects, and drug safety. This first semester introduces principles of biochemistry and the chemical and physical properties of medicinal agents, as well as the relationship between the structural properties of drugs and their pharmacological effects. This course integrates the following aspects of biomolecular sciences: Biochemistry •Structure and function of fundamental biological molecules, including proteins, carbohydrates, lipids, and nucleic acids •Principles of enzyme kinetics, mechanisms, and regulation of enzyme activity •Flow of genetic information, including DNA replication, transcription, translation, and the regulation of gene expression •Metabolic pathways and bioenergetics Medicinal Chemistry •Physicochemical properties of drug molecules in relation to pharmacodynamics and pharmacokinetics •Relationships of structural properties of drugs to pharmacological properties •Chemical stability, mechanisms of action, and clinically significant drug interactions
4 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 3002: Found of BioMolecular Sci II
Biomolecular Sciences
The Foundations of BioMolecular Sciences II course is the second semester of a two-semester sequence that integrates the fundamental principles of pharmacology, toxicology, and pharmacognosy. This semester introduces core concepts of pharmacology and pharmaceutical and environmental toxicology, provides an overview of natural product drugs, and offers detailed coverage of antimicrobial chemotherapy for the treatment of infectious diseases. This course integrates the following aspects of biomolecular sciences: Pharmacology • Drug absorption, distribution, metabolism, and excretion (ADME) • Principles of receptor and ligand pharmacology • Mechanisms of action of drugs Pharmaceutical and Environmental Toxicology • Management of poisoned patients • Toxicity of specific drugs and heavy metals • Overview of occupational and environmental toxicology Pharmacognosy • Overview of classes of pharmacologically active natural products • Cannabinoids • Mechanism(s) of action of antimicrobial agents • Mechanisms of microbial resistance to antimicrobial agents • Structural and chemical features of antimicrobial agents • Adverse effects and drug interactions of antimicrobial agents
4 credits
Prerequisites
BMSC 3001.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 3210: Pathogenesis of Infectious Dis
Biomolecular Sciences
This course covers all aspects of infectious diseases, including etiology, epidemiology and characteristics of disease-causing pathogens, host-pathogen interactions, symptoms and prognosis of specified infectious diseases.
3 credits
Prerequisites
(min grade of C in BISC 1620 and BISC 1630) and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 3430: Biochemical Fndtns of Tx.
Biomolecular Sciences
A detailed introduction to the chemistry of life processes, structure-activity relationships for biological molecules, metabolism and its regulation.
3 credits
Prerequisites
(min grade of C in CHEM 2220 and CHEM 2221) and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 3440: Physiological Fndtn of Tx.
Biomolecular Sciences
Systemic physiology with a study of organ function and an emphasis on human physiology. The structure and function of the major body systems will be explored including the integumentary, muscular, skeletal, cardiovascular, lymphatic, respiratory, digestive, nervous, endocrine, urinary, reproductive and body fluids and electrolytes. Aspects of cell structure, organization and physiology and molecular aspects of cell biology will be covered. The students will gain an understanding of normal physiology of the body at the cell and organ level. These basic understandings combined with critical thinking will enable the students to progress through the curriculum with a knowledge and analytical base necessary for understanding pathogenesis, pharmacological treatments and clinical outcomes. Ultimately, the factual material and the critical clinical thinking ability acquired in the case studies and laboratory sessions will provide the basis and rational for selective pharmacotherapy and the understanding of its use in varying disease states. Course is only open to pre-professional and early entry students enrolled in the School of Pharmacy.
3 credits
Prerequisites
(min grade of C in BISC 1620 and BISC 1630) and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture/Lab

BMSC 3450: Anatomical Fndtns in Hum. Hlth
Biomolecular Sciences
Systemic anatomy with a study of organ function and an emphasis on human anatomy. The structure of the major body systems will be explored including the integumentary, muscular, skeletal, cardiovascular, lymphatic, respiratory, digestive, nervous, endocrine, urinary, reproductive, and body fluids and electrolytes. Aspects of gross human anatomy and microanatomy, cell structure, organization and molecular aspects of cell biology will be covered. The students will gain an understanding of anatomy of the human body at the cell and organ level. These basic understandings combined with critical thinking will enable the students to progress through the curriculum with a knowledge and analytical base necessary for understanding pathogenesis, pharmacological treatments, and clinical outcomes.
3 credits
Prerequisites
(min grade of C in BISC 1620 and BISC 1630) and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 4010: Honors Intro. to Cancer Res.
Biomolecular Sciences
This course introduces UM Honors College students to some of the basic techniques used in laboratory research and establishes a fundamental scientific framework for tumor cell biology and cancer-related UM Honors thesis research projects. This course includes discussions of the critical biochemical molecular and/or cellular events underlying the etiology and progression of cancer, anticancer target selection and validation, biochemical and cell-based bioassay methods, screening libraries of compounds and/or extracts, bioassay-guided isolation, and biological characterization/evaluation of active leads. Emphasis is placed on natural product-based anticancer research.
1 credit
Prerequisites
(BISC 1600 and BISC 1610) and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 4510: Directed Research St. in BMS I
Biomolecular Sciences
This course provides an opportunity for students to engage in independent research under the mentorship of a faculty member in the Department of BioMolecular Sciences. This is the first course in a three-part series. Throughout the directed studies series, students will design, conduct, and analyze a research project within a specific area of interest, guided by their faculty mentor. Activities within these courses will be aimed at developing scientific research skills, which include, but are not limited to, literature review, data collection, analysis, and academic writing.
1 - 3 credits
Potentially offered with the following Instruction Type(s):
Independent Study

BMSC 4520: Dir. Research St. in BMS II
Biomolecular Sciences
This course provides an opportunity for students to engage in independent research under the mentorship of a faculty member in the Department of BioMolecular Sciences. This is the second course in a three-part series. Throughout the directed studies series, students will design, conduct, and analyze a research project within a specific area of interest, guided by their faculty mentor. Activities within these courses will be aimed at developing scientific research skills, which include, but are not limited to, literature review, data collection, analysis, and academic writing.
1 - 3 credits
Prerequisites
BMSC 4510.
Potentially offered with the following Instruction Type(s):
Independent Study

BMSC 4530: Dir. Research St. in BMS III
Biomolecular Sciences
This course provides an opportunity for students to engage in independent research under the mentorship of a faculty member in the Department of BioMolecular Sciences. This is the third course in a three-part series and serves as the research capstone. Throughout the directed studies series, students will design, conduct, and analyze a research project within a specific area of interest, guided by their faculty mentor. Activities within these courses will be aimed at developing scientific research skills, which include, but are not limited to, literature review, data collection, analysis, and academic writing.
1 - 3 credits
Potentially offered with the following Instruction Type(s):
Independent Study

BMSC 4700: Antimicrobial Resistance Mech.
Biomolecular Sciences
This course discusses the proliferation of antimicrobial resistance mechanisms of clinical relevance. The course will also address recent scientific advances in understanding the history and proliferation of microbial enzymology (resistance enzymes) responsible for modifying biologically active secondary metabolites (antimicrobials).
2 credits
Prerequisites
BMSC 3210 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 4710: Targeting Neurodegenerative Di
Biomolecular Sciences
This course examines the current therapeutic strategies for treating neurodegenerative diseases, including Alzheimer's disease. The course will also address recent scientific advances in understanding the mechanisms underlying these diseases, as well as highlight potential pharmacological treatments that are currently under investigation.
2 credits
Prerequisites
BMSC 3440 and 24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 4720: Spanish for Pharmacists
Biomolecular Sciences
The Hispanic or Latino(a) population now comprises 18 percent of the population of the United States, and Mississippi is among the states with the fastest growing Hispanic population. In order to better serve the health care needs of the U.S. population, pharmacists and health professionals should reflect more cultural and linguistic competence. This course is designed to provide intermediate to advanced professional Spanish communication skills for the pharmacist. The context-related vocabulary and expressions will include those used during the initial patient encounter, data collection, and patient consultation directions (drug effects, cautions, adverse events warnings, directions, insurance).
2 credits
Prerequisites
24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 4730: Medical Cannabis
Biomolecular Sciences
This pharmacy elective will present relevant information for pharmacists about medical cannabis. Lecture topics will be federal and state regulations, botany, plant biochemistry and pharmacognosy, terpenes and cannabinoids, the endocannabinoid system, cannabinoid receptor pharmacology, and cannabis therapeutics. The major focus of the elective will be to provide relevant information about medical cannabis to clarify the current role of pharmacists.
2 credits
Prerequisites
24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 4740: Pandemics and Society
Biomolecular Sciences
The recent outbreaks of an infectious novel coronavirus, across international boundaries, is the latest example of a pandemic disease. Throughout history, pandemics have had significant impacts on global morbidity and mortality, and have reshaped societies. While the impacts of COVID-19 on society as a whole are still emerging, immediate health care responses have been hampered by poor information and/or misinformation. The elective course "Pandemics & Society" is designed to provide pharmacy students with the requisite knowledge of pandemics that they might be effective health care providers under those conditions. Specific objectives include: 1) student familiarity with epidemiology, 2) understanding routes of transmission, 3) recognition of political versus biomedical discourse, and, 4) risk assessment/mitigation of pandemics.
2 credits
Prerequisites
24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 4750: Mol. Basis of Future Medicines
Biomolecular Sciences
This course is designed to familiarize students with both the molecular basis and the future directions of drug development. A key focus of the course will be the foreseeable global health challenges that might be (or might not be) addressed by new pharmaceuticals. Central to this will be thinking about how the chemistry underlying drug development might change in the face of new approaches, such as personalized medicine and advanced gene sequencing, and new needs, such as an aging society and emerging diseases (as exemplified by the COVID-19 pandemic).
2 credits
Prerequisites
24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 4760: Intro to AI & Apps. in Pharm
Biomolecular Sciences
This course provides an introduction to the basic/core concepts of artificial intelligence and popular algorithms in machine learning methods. The course will also address recent scientific/technological advances in AI-driven applications in different aspects of pharmacy, such as drug design, pharmaceutics, clinical trials, harmacovigilance/ pharmacoepidemiology, health care policy, clinical practice and patient care, and other related health areas.
2 credits
Prerequisites
24 Earned Credits.
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6010: Grad Stud. Survival Strategies
Biomolecular Sciences
This first-semester course is designed to provide entering graduate students in pharmaceutical sciences with the appropriate set of knowledge, skills, and attitudes to be successful in graduate school.
2 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6020: Tech. in BioMolecular Sci.s
Biomolecular Sciences
This graduate elective provides junior (first-second year) graduate students with an introduction to the ongoing research and methodologies conducted in pharmacology and related (environmental toxicology and pharmacognosy) biomolecular fields. Students will engage with faculty in the classroom and in their lab space for hands-on experience in common laboratory methods and techniques such as biostatistics, microscopy, polymerase-chain reaction, protein quantification, Western blot, enzyme-linked immunosorbent assay, mass spectrometry, grant writing/reviewing, etc.
2 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6050: Original Research Proposal BMS
Biomolecular Sciences
This course is required for all biomolecular sciences Ph.D. track graduate students seeking candidacy. Students are required to write, present, and defend an original research proposal to the faculty.
1 credit
Potentially offered with the following Instruction Type(s):
Seminar

BMSC 6080: Scientific Writ. for BioMol. S
Biomolecular Sciences
This course introduces the basic principles of scientific manuscripts and provides opportunities for students to draft sections of a scientific manuscript based on an existing research project. It is appropriate in scope for graduate pharmaceutical sciences and biology students.
2 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6100: Carbohydrates & Glycoconjugate
Biomolecular Sciences
The purpose of this course is to provide an overview of the role of carbohydrates and glycoconjugates in biology and biomedical science. Topics covered include glycan and glycoconjugate synthesis, functions of glycans and glycoconjugates, and methods of glycan and glycoconjugate isolation and analysis.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6110: Teaching in Biomolecular Sci I
Biomolecular Sciences
This two-part course series is designed for individuals considering careers in academia who want to develop the foundational knowledge and skills needed to be effective educators and communicators while gaining mentored teaching experience. BMSC 6110 is the first part of the series, providing instruction on effective teaching practices in the pharmaceutical sciences. Students will explore pedagogical theories, instructional design, and assessment strategies tailored to higher education. Emphasis is placed on developing communication skills, creating engaging learning experiences, and applying evidence-based teaching methods. Participants will also gain practical experience through lesson planning, delivering content, and reflecting on their teaching approaches.
1 credit
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6120: Teaching in Biomolecular Sci I
Biomolecular Sciences
This two-part course series is designed for individuals considering careers in academia who want to develop the foundational knowledge and skills needed to be effective educators and communicators while gaining mentored teaching experience. BMSC 6120 is the second part of the series, where students will design and deliver discipline-specific teaching experiences in undergraduate pharmacy-related courses. Students will receive close mentorship throughout their teaching activities and conclude the course by developing a teaching portfolio.
1 credit
Potentially offered with the following Instruction Type(s):
Practicum

BMSC 6410: BioMolecular Sciences Seminar
Biomolecular Sciences
A seminar consisting of presentations by faculty, graduate students, B.S. in Pharmaceutical Science/medicinal chemistry track students and invited speakers. Taken by students presenting seminars during the fall semester.
1 credit
Potentially offered with the following Instruction Type(s):
Seminar

BMSC 6430: BioMolecular Sciences Seminar
Biomolecular Sciences
A seminar consisting of presentations by faculty, graduate students, and invited speakers in the divisions of medicinal chemistry, pharmacognosy, pharmacology, and environmental toxicology. Taken by students NOT presenting a seminar. Z grade.
1 credit
Potentially offered with the following Instruction Type(s):
Seminar

BMSC 6510: Fndmtls. of Pharmacogn. & Phyt
Biomolecular Sciences
BMS 651 is an asynchronous online course designed to equip students with a comprehensive understanding of the field of pharmacognosy. Students will learn about the historical basis of pharmacognosy, including landmark events that have shaped its evolution. Throughout the course, students will gain a deeper understanding of the chemical space around dietary supplements and develop skills in analyzing and synthesizing reliable scientific literature. By the end of the course, students will be able to demonstrate their knowledge by authoring key monograph sections such as identity, and chemical composition for a dietary ingredient.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6520: Regulation of Dtry. Supplement
Biomolecular Sciences
BMS 652 is an asynchronous online course designed to provide students with a thorough understanding of the regulatory landscape of the dietary supplement industry. By exploring key legislation, going over cGMPS, as well as challenges related to monitoring safety, enforcement, and compliance, students will be able to make informed decisions around compliance. The course will also provide students with hands-on experience in responding to FDA Form 483s, creating compliant product labels, and identifying cGMP violations with case studies. By the end of the course, students will have the knowledge and skills necessary to identify and mitigate compliance risks and ensure products and operations meet regulatory requirements.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6530: Form. & Manufacturing of Dtry.
Biomolecular Sciences
BMS 653 is an asynchronous online course in which students will learn about the formulation and manufacturing of dietary supplements. We will briefly highlight the cGMPs that govern this area; however, most of the course will be spent working through manufacturing from start to finish including areas such as research and development, sourcing, formulation from conception, sustainability, and testing. The culmination of this course will equip students with the ability to formulate a dietary supplement from concept to market ready while maintaining cGMP compliant records along the way.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6540: Identification & Authenticatio
Biomolecular Sciences
BMS 654 is an asynchronous online course designed to equip students with comprehensive knowledge of the identification and authentication of dietary ingredients. Students will learn nomenclature specific to individual ingredient identification as well as the terminology associated with this field. Throughout the course, students will gain an understanding of the analytical tools and techniques utilized in evaluating raw and processed materials and products for identity, purity, strength, and composition (IPSC). A final report will demonstrate students' ability to profile an unknown dietary ingredient with fit for purpose proposed analyses to determine IPSC.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6550: Pharm. and Tox. of Dtry. S
Biomolecular Sciences
BMS 655 is an asynchronous online course focused on the pharmacology and toxicology of dietary supplements. Through the exploration of basic principles of pharmacokinetics and pharmacodynamics, students will gain a comprehensive understanding of how dietary ingredients interact with the body and their potential contraindications. Students will learn how to evaluate products and individual ingredients for potential interactions, and the culmination of the course will prepare students with the skills to make evidence-based decisions regarding formulating products with minimized risks.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6610: Cannabis Identification, Genom
Biomolecular Sciences
BMS 661 is an asynchronous online course where students will gain a foundational knowledge of cannabis botany from distinguishing features to growing cycles. Students will learn the pros and cons of techniques employed in industry to make informed decisions within their future workplaces. We will introduce and cover genomics and engineering at a base level with the opportunity to dive further. By the end of the course, students will be able to propose a controlled cultivation experiment to manipulate cannabis genetics.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6620: Cannabis Policy & Law Syllabus
Biomolecular Sciences
BMS 662 is an asynchronous online course designed to provide students with a foundational understanding of the ever-evolving regulatory landscape related to cannabis. We will begin by exploring the historical context of cannabis use and criminalization and highlight key legislative turning points. Students will navigate through conflicting laws and regulations specifically within the United States. By the end of the course, students will be able to critically evaluate the current regulatory framework and contribute to policy discussions at various levels, ranging from local to federal.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6630: Form. & Manufacturing of Canna
Biomolecular Sciences
BMS 663 is an asynchronous online course in which students will learn about the formulation and manufacturing of cannabis products. We will briefly highlight the cGMPs that govern this area; however, most of the course will be spent working through manufacturing from start to finish including areas such as research and development, sourcing, formulation from conception, sustainability, and testing. The culmination of this course will equip students with the ability to formulate a cannabis product from concept to market ready while maintaining cGMP compliant records along the way.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6640: Chem. & Std.ization of Cannabi
Biomolecular Sciences
BMS 664 is an asynchronous online course where students will learn how to identify and standardize Cannabis spp. and individual molecules including cannabinoids and terpenes. We will cover the macro and microscopic botanical characteristics of cannabis before learning optimal extraction methodology and analytical machines, as well as how to standardize previously identified constituents. By the end of the course, students will be able to demonstrate their ability to develop a hypothetical extraction and/or standardization scheme based on their foundational knowledge.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6650: Pharm. & Tox. of Cannabinoid
Biomolecular Sciences
BMS 665 is an asynchronous online course focused on the pharmacology and toxicology of cannabinoids. Through the exploration of basic principles of pharmacokinetics and pharmacodynamics, students will gain a thorough understanding of how cannabinoids interact with the body. The course will then focus on honing skills to critically analyze reliable scientific literature along with exploring pertinent case studies. Students will develop the ability to make informed decisions regarding the use of cannabinoids, identifying potential adverse effects and evaluating drug interactions.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 6997A: Thesis
Biomolecular Sciences
No grade
1 - 12 credits
Potentially offered with the following Instruction Type(s):
Thesis

BMSC 7250: Mass Spectrometry: Fndmtls.
Biomolecular Sciences
This course will provide students an overview of mass spectrometry and its applications, especially in the analysis of organic and biological samples. Students will learn the basic information required to evaluate and design mass spectrometry-based experiments in the biomedical sciences. Topics include an introduction to modern instrumentation and a survey of techniques and applications in mass spectrometry.
3 credits
Potentially offered with the following Instruction Type(s):
Lecture

BMSC 7998A: Dissertation
Biomolecular Sciences
No grade
1 - 12 credits
Potentially offered with the following Instruction Type(s):
Dissertation

BMSC 7999A: Advanced Topics in Toxicology
Biomolecular Sciences
Through this course, students will use the text and class discussions to familiarize themselves with common target organ toxicities, mechanisms of action of the major classes of toxicants, and consider the various applications of toxicology in the workforce.
2 credits
Potentially offered with the following Instruction Type(s):
Lecture