

Klein College of Science

BA Biology

Student Learning Outcome:

1. Our students will be able to understand and apply critical thinking skills to the fundamental biological principles from the major content areas of the curriculum which include the following five learning themes.
 - Complex systems
 - energy transfer
 - evolution
 - form and function
 - information flow
2. Our students will be able to demonstrate effective skills related to the analysis, synthesis, and evaluation of scientific work, including their written communication, which includes the following learning themes:
 - Effective application of laboratory and/or field techniques
 - Proficiency in data and statistical analyses
 - Effective reasoning and interpretation skills
 - Ability to draw biological conclusions from raw data
3. Our students will be able to demonstrate effective skills in the oral communication of scientific work which include the ability to communicate on all aspects of the following learning themes:
 - Effective application of laboratory and/or field techniques
 - Proficiency in data and statistical analyses
 - Effective reasoning and interpretation skills
 - Ability to draw biological conclusions from raw data

BS Biology

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Graduate Certificate Biomedical Sciences

Student Learning Outcome:

1. Students will demonstrate knowledge of anatomy, physiology, and homeostasis principles.
2. Students will demonstrate knowledge of biochemistry and metabolic pathways principles.
3. Students will demonstrate knowledge of microbiology and immunology principles.
4. Students will demonstrate knowledge of embryology, cell biology, and development principles.

Graduate Certificate Biotechnology

Student Learning Outcome:

1. Students will demonstrate knowledge of environmental biotechnology principles.
2. Students will demonstrate knowledge of cellular and microbial biotechnology principles
3. Students will demonstrate knowledge of proteomics and genomics biotechnology principles.

MS Biology

Student Learning Outcome:

1. Develop skills to conduct independent research capable of generating at least one peer reviewed publication, demonstrated through (holistic assessment will include assessment of):
 - Ability to survey scientific literature appropriate for the MS thesis research topic
 - Ability to generate hypotheses and propose appropriate experimental design
 - Ability to formulate and justify expected results
 - Ability to propose appropriate statistical analyses
 - Ability to formulate conclusion
2. Demonstrate depth of knowledge about the specific sub-discipline related to the MS thesis research topic.
3. Demonstrate breadth knowledge about general biological principles related to: • Cellular biology and genetics • Physiology • Ecology and Environmental Biology • Evolution.

4. Develop presentation and communication skills, as demonstrated by the ability to present a PowerPoint Presentation of the MS Thesis Research Topic that (holistic assessment will include assessment of):
 - Provides sufficient background information to justify the proposed project.
 - Clearly presents testable hypotheses
 - Clearly present the proposed experimental design and statistical analyses
 - Clearly outlines the expected results and possible pitfalls to the proposed research
 - Provides an overall clearly conceived and designed project.

PhD Biology

Student Learning Outcome:

1. Develop skills to conduct independent research capable of generating multiple peer reviewed publications demonstrated through (holistic assessment will include assessment of):
 - Ability to survey scientific literature appropriate for the dissertation research topic
 - Ability to generate hypotheses and propose appropriate experimental design
 - Ability to formulate expected results and conclusion
 - Ability to propose appropriate statistical analyses
 - Ability to propose future research questions
2. Demonstrate depth of knowledge about the specific sub-discipline related to the dissertation research topic.
3. Demonstrate breadth of knowledge about general biological principles related to the core required courses:
 1. Hypothesis testing (i.e. statistics and experimental design)
 2. Cellular biology
 3. Molecular biology
 4. Biochemistry
4. Develop presentation and communication skills, as demonstrated by the ability to present a PowerPoint Presentation of the Dissertation Research Topic that (holistic assessment will include assessment of):
 - Provides sufficient background information to justify the proposed project.
 - Clearly presents testable hypotheses
 - Clearly present the proposed experimental design and statistical analyses
 - Clearly outlines the expected results and possible pitfalls to the proposed research
 - Provides an overall clearly conceived and designed dissertation project.

BA Chemistry

Student Learning Outcome:

1. Make accurate quantitative chemical measurements in the laboratory.
2. Demonstrate the ability to apply knowledge of organic chemistry.
3. Demonstrate the ability to communicate scientific information effectively in oral format.
4. Demonstrate the ability to communicate scientific information effectively in writing.

5. Demonstrate the ability to apply critical thinking to chemistry-related situations.

BS Chemistry

Student Learning Outcome:

1. Demonstrate the ability to apply knowledge of biochemistry.
2. Make accurate quantitative chemical measurements in the laboratory.
3. Demonstrate the ability to apply knowledge of organic chemistry.
4. Demonstrate the ability to communicate scientific information effectively in oral format.
5. Demonstrate the ability to communicate scientific information effectively in writing.
6. Demonstrate the ability to apply critical thinking to chemistry-related situations.

MS Chemistry

Student Learning Outcome:

1. Demonstrate ability to apply knowledge of chemistry to plan a research project
2. Demonstrate proficiency in conducting scientific research.
3. Demonstrate ability to communicate scientific information effectively in an oral presentation
4. Demonstrate the ability to communicate scientific information effectively in writing.

PhD Nanoscale Science

Student Learning Outcome:

1. Demonstrate ability to apply knowledge of nanoscale science
2. Demonstrate expertise in conducting scholarly research in nanoscale science
3. Demonstrate ability to communicate scientific information effectively in an oral presentation
4. Demonstrate ability to communicate scientific information effectively in writing

BA Mathematics

Student Learning Outcome:

1. Students will be able to communicate mathematical concepts in writing with clarity and precision.
2. Students will be able to communicate mathematical concepts orally with clarity and precision.
3. Students will demonstrate proficiency in mathematical skills and basic field knowledge.
4. Students will understand the nature of proof and will be able to construct valid mathematical arguments.

BA Mathematics for Business

Student Learning Outcome:

1. Students will be able to communicate mathematical concepts in writing with clarity and precision.
2. Students will be able to communicate mathematical concepts orally with clarity and precision.
3. Students will demonstrate proficiency in the fundamental concepts and skills of financial mathematics.

BS Mathematics

Student Learning Outcome:

1. Students will be able to communicate mathematical concepts in writing with clarity and precision.
2. Students will be able to communicate mathematical concepts orally with clarity and precision.
3. Students will demonstrate proficiency in mathematical skills and basic field knowledge.
4. Students will be able to present well-reasoned proofs of advanced results using core concepts and axioms.

BS Mathematics for Business

Student Learning Outcome:

1. Students will be able to communicate mathematical concepts in writing with clarity and precision.
2. Students will be able to communicate mathematical concepts orally with clarity and precision.
3. Students will demonstrate proficiency in the fundamental concepts and skills of financial mathematics.
4. Students will demonstrate an understanding of more advanced concepts and skills in financial mathematics: present and accumulated values for various streams of cash and financial instruments, including derivatives.

MS Mathematics

Student Learning Outcome:

1. Students will develop mathematical reasoning and analytical problem-solving abilities.

PhD Applied Mathematics

Student Learning Outcome:

1. Students will demonstrate their mastery of basic mathematical knowledge and skills by passing a written Qualifying Examination.
2. Students will demonstrate their ability to effectively conduct and engage collegiately in a successful program of substantial original research by passing a dissertation Topic Proposal Defense.

3. Students will demonstrate their competency to conduct original research by writing and defending a dissertation representing a substantial and effective contribution to the mathematical research literature.

Undergraduate Certificate in Actuarial Studies

Student Learning Outcome:

1. Students will understand the key concepts and procedures of financial mathematics.
2. Students will demonstrate an understanding of more advanced concepts and skills in financial mathematics: present and accumulated values for various streams of cash and financial instruments, including derivatives.
3. Students will demonstrate an understanding of concepts and skills in general probability, univariate probability, and multivariate probability:

BA Physics

Student Learning Outcome:

1. To demonstrate that physics majors have an understanding of basic physics concepts in classical mechanics, and how to apply them in various manifestations.
2. To demonstrate that physics majors have an understanding of basic physics concepts in classical electricity and magnetism, and how to apply them in various manifestations.
3. Students will demonstrate the ability to apply critical thinking and analytical decision-making skills in experimental physics situations.
4. Students will be able to demonstrate good communication skills while describing their experimental work by conveying logical arguments based on scientifically sound reasoning in the context of problem solving.

BS Physics

Student Learning Outcome:

1. To demonstrate that physics majors have an understanding of basic physics concepts in classical mechanics, and how to apply them in various manifestations.
2. To demonstrate that physics majors have an understanding of basic physics concepts in classical electricity and magnetism, and how to apply them in various manifestations.
3. Students will demonstrate the ability to apply critical thinking and analytical decision making skills in experimental physics situations.
4. Students will be able to demonstrate good communication skills while describing their experimental work by conveying logical arguments based on scientifically sound reasoning in the context of problem solving.

Dual Degree Programs in Engineering (BS) and Physics (BS):

Student Learning Outcome:

1. To demonstrate that physics majors have an understanding of basic physics concepts in classical mechanics, and how to apply them in various manifestations.

2. To demonstrate that physics majors have an understanding of basic physics concepts in classical electricity and magnetism, and how to apply them in various manifestations.
3. To demonstrate that dual degree majors can successfully identify all requirements and specifications of the design of a real-world engineering project while ensuring that the design's concept of operations is sensible and grounded in scientific thought.

MS Applied Physics

Student Learning Outcome:

1. Students will be able to demonstrate knowledge of fundamental physical principles as they apply to macroscopic and microscopic systems, which comprise of classical and quantum mechanics, electromagnetism and statistical physics.
2. Students will be able to demonstrate good technical writing skills to convey logical arguments based on scientifically sound reasoning in the context of problem solving.
3. Students will be able to demonstrate good communication while defending their work by conveying logical arguments based on scientifically sound reasoning in the context of problem solving.

MS Optical Science and Engineering

Student Learning Outcome:

1. Students will be able to demonstrate knowledge of principles of geometrical and physical optics, mathematics, optical properties of materials and electromagnetic wave theory.
2. Students will be able to demonstrate good technical writing skills to convey logical arguments based on scientifically sound reasoning in the context of problem solving.
3. Students will be able to demonstrate good communication while defending or describing their work by effectively conveying logical arguments based on scientifically sound reasoning in the context of problem solving.

PhD Optical Science and Engineering

Student Learning Outcome:

1. Students will be able to demonstrate knowledge of principles of geometrical and physical optics, mathematics, optical properties of materials and electromagnetic wave theory.
2. Students will be able to demonstrate good technical writing skills to convey logical arguments based on scientifically sound reasoning in the context of problem solving.
3. Students will be able to demonstrate good communication while defending their work by conveying logical arguments based on scientifically sound reasoning in the context of problem solving.