Program Change Request

Date Submitted: 09/27/21 1:06 pm

Viewing: SC-PHD-BIOS : Biosciences, PhD

Last approved: 02/26/21 2:40 pm

Last edit: 11/15/21 10:30 am

Changes proposed by: jbazaz

Catalog Pages Using this Program

Biosciences, PhD

2022-2023

Rationale for

Are you completing this form on someone else's behalf?

Yes

Requestor:

Name	Extension	Email

In Workflow

1. **SSB Program Chair**
2. **SC Curriculum Committee**
3. SC Associate Dean
4. SC CAT Editor
5. Assoc Provost-Graduate
6. Registrar-Programs

Approval Path

1. 11/12/21 3:45 pm Iosif Vaisman (ivaisman): Approved for SSB Program Chair

History

1. Nov 16, 2017 by clmig-jwehrheim
2. Oct 19, 2018 by Jennifer Bazaz Gettys (jbazaz)
3. Mar 5, 2020 by Johanna Riemen (jriemen)
4. Feb 23, 2021 by Johanna Riemen (jriemen)
5. Feb 26, 2021 by Johanna Riemen (jriemen)

Name	Extension	Email
Alessandra Luchini	8945	aluchini@gmu.edu

Effective Catalog: 2022-2023

Program Level: Graduate

Program Type: Doctoral

Degree Type: Doctor of Philosophy

Title: Biosciences, PhD

Banner Title: **Biosciences, PhD**

Is this a retitling of an existing

Existing Program

Registrar/OAPI Use Only – SCHEV Status Approved

Registrar's Office Use Only – Program Start Term

Registrar/OAPI Use Only – SCHEV Letter

Registrar/OAPI Use Only – SACSCOC Status

Concentration(s):

	Associated Concentrations	Registrar's Office Use Only: Concentration Code
1	Cell and Molecular Biology	CMB
2	Microbiology and Infectious Disease	MID
3	Biocomplexity and Evolutionary Biology	BEB

INTO Major(s):

Registrar/IRR Use Only – Concentration CIP Code

College/School: College of Science

Department / Academic Unit:	School of Systems Biology
Jointly Owned Program?	No

Participating

Participating

Justification

What: Adding various courses to the curriculum: BIOL 502, 667, and 689

Why: The modification of the bioscience PhD program is requested in order to provide the required skill set for future job success.

NIH guidelines encourages graduate education to impart “technical (e.g., appropriate methods, technologies, and quantitative/computational approaches), operational (e.g., independent knowledge acquisition, rigorous experimental design, and interpretation of data) and professional (e.g., management, leadership, communication, and teamwork) skills required for careers in the biomedical research workforce” (https://grants.nih.gov/grants/guide/pa-files/par-19-102.html).

BIOL 689: Interdisciplinary Tools in the Biosciences will introduce relevant operational skills, including data interpretation, independent knowledge acquisition, biostatistics, experimental design, that are currently delivered to biosciences PhD students in an elective class. Making the Interdisciplinary tools in biosciences a concentration class will provide students with these fundamental skills.

BIOL 667: Signal Transduction in Cancer will introduce relevant technical skills including a thorough understanding of molecular mechanisms of cancer metastasis for applications in personalized medicine. Additionally, students are required to independently read papers, provide summaries, participate in scientific discussions and presentations. This second aspect of the class will foster professional skills, such as leadership, communication and teamwork.

BIOL 502: Adaptation in Biosystems will introduce the following main training elements: systems biology, principles of control theory, a choice of different levels of biological system investigation: structural biology, cell signaling and cellular networks, environmental network systems. Integration of the research and training will foster development of cognitive synergy, sense of self, and professional capacity in students attending the course. In class discussions, presentations and debates will foster leadership, communication and teamwork skills.

Catalog Published Information

Total Credits Required:	Total credits: 72

Registrar's Office Use Only - Program Code:

SC-PHD-BIOS

Registrar/IRR Use Only – Program CIP Code

Admission Requirements:

Admissions

University-wide admissions policies can be found in the Graduate Admissions Policies section of this catalog.
To apply for this program, please complete the George Mason University Admissions Application.

Application Requirements

The following are required of applicants to this program:

- Minimum 3.25 GPA in previous coursework with significant training in the biological sciences from an institution of higher education accredited by a Mason-recognized U.S. institutional accrediting agency or international equivalent.
- Three letters of recommendation from faculty members or individuals who have firsthand knowledge of the applicant's academic or professional capabilities.
- Statement of purpose consistent with the research interests of at least one faculty member in the program.
- Scores on GRE general exam (required) and biology or biochemistry subject exam (recommended) taken within the past five years prior to date of application submission. The GRE exam is waived if applicants hold a master's degree from a fully-accredited U.S. university at the time of their application.
- A TOEFL score of 575 on the paper-based exam or 230 on the computer-based exam is required of international students.

An interview may also be required. Applications should be submitted by January 1st for fall admission. Under unusual circumstances, applications may be considered for spring admission if they are received by October 1st. Applications will be considered until positions are filled. Students are encouraged to meet application deadlines to be considered for scholarships and stipends.
Strong candidates who lack several prerequisites may be admitted to provisional status. Removal from provisional status and continuation in the program is contingent on earning a GPA of 3.25 in the program's fundamental courses, plus completion of missing prerequisites.
Students who have not taken a course in basic biochemistry will be required to complete one prior to BIOS 701 Systems Biology.

Program-Specific Policies:

Policies

For policies governing all graduate programs, see AP.6 Graduate Policies.

Reduction of Credits

For students entering the doctoral program with a master's degree in a related field from an institution of higher education accredited by a Mason-recognized U.S. institutional accrediting agency or international equivalent, the number of required credits may be reduced up to 30 credits, subject to approval of the program faculty and the college's associate dean for student affairs.

Transfer of Credit

Graduate credits taken previously and not used toward another degree may be transferred, subject to the approval of the advisor, the program director, and the associate dean. See AP.6.5 Credit by Exam, Reduction or Transfer for more information.

Degree Requirements:

Students should refer to the Admissions & Policies tab for specific policies related to this program.
Students in the doctoral program are required to present two research papers at a meeting or conference any time before graduation.

Doctoral Coursework

Bioscience Core

BIOL 682	Advanced Eukaryotic Cell Biology	3
Six credits or two instances of		6
BIOS 703	Laboratory Rotation	
Three credits of		3
BIOS 704	Topics in Biosciences	
Total Credits		12

Concentration in Cell and Molecular Biology (CMB)

This concentration prepares students for significant contributions in an academic or industrial research career. Coursework covers microarray analysis of gene expression, proteome analysis, sequencing and analysis of gene polymorphisms, gene and genome evolution, molecular studies of disease mechanisms, mechanisms of toxicology and mutagenesis, developmental neuroscience, and biotechnological applications.

Select 12 credits from the following: 12

BIOL 666	Human Genetics Concepts for Health Care
BIOL 667	**Signal Transduction in Cancer**
BIOL 689	**Interdisciplinary Tools in the Biosciences**
BIOS 702	Research Methods
BIOS 740	Laboratory Methods in Functional Genomics and Biotechnology
BIOS 741	Genomics
BIOS 742	Biotechnology

BIOS 743	Genomics, Proteomics, and Bioinformatics	
BIOS 767	Molecular Evolution	
Total Credits		12

Concentration in Microbiology and Infectious Disease (MID)

Students in this concentration will be prepared for employment in academia, government, or industry. By stressing mechanisms of pathogenicity, physiology, metabolism, and genomic and proteomic analysis of pathogens, students will have a firm foundation for future research in infectious disease. Students will also be introduced to advanced laboratory practices, such as animal research methodologies and biocontainment laboratory work.

Select 12-13 credits from the following:		12-13
BIOL 553	Advanced Topics in Immunology	
BIOL 563	Virology	
BIOL 583	General Biochemistry	
BIOL 669	Pathogenic Microbiology	
BIOL 689	**Interdisciplinary Tools in the Biosciences**	
BIOL 715	Microbial Physiology	
BIOS 702	Research Methods	
Total Credits		12-13

Concentration in Biocomplexity and Evolutionary Biology (BEB)

This concentration prepares students for careers in academia, government or industry. Through this concentration students will learn laboratory and quantitative skills that will enable them to investigate evolutionary relationships among organisms at the population, species or ecosystem level. Students will be encouraged to explore a wide range of coursework in order to develop a broad background in evolutionary biology and a deep knowledge of relevant methodologies necessary to keep abreast in this rapidly changing field.

The science of evolutionary biology is fundamentally concerned with documenting not only genetic change, but also the processes that cause it. Evolutionary biology includes paleobiology, population genetics, evolutionary ecology and phylogenetics. Biocompexity is the study of living organisms, including their unique structural, chemical and genetic properties, their distribution and abundance in nature, and their evolutionary relationships to all other organisms. Given the fact that most of the earth's biodiversity is unknown, collecting, cataloging and studying organisms have always been and will continue to be one of the most challenging aspects of biology.

Select 12 credits from the following:		12
BIOL 502	**Adaptation in Biosystems**	
BIOL 574	Population Genetics	
BIOL 585	Eukaryotic Cell Biology Laboratory	
BIOL 689	**Interdisciplinary Tools in the Biosciences**	
BIOS 716	Methods in Evolutionary Biology	
BIOS 767	Molecular Evolution	
Total Credits		12

Electives

Select 23-36 credits from the following lists associated with the chosen concentration: 23-36

Cell and Molecular Biology & Microbiology and Infectious Disease Concentrations

BIOL 564	Techniques in Virology
BIOL 568	Advanced Topics in Molecular Genetics
BIOL 579	Molecular Evolution and Conservation Genetics
BIOL 580	Computer Applications for the Life Sciences
BIOL 685	Emerging Infectious Diseases
BIOL 718	Techniques in Microbial Pathogenesis
BIOS 701	Systems Biology
BIOS 702	Research Methods
BIOS 710	Current Topics in Bioscience
BIOS 740	Laboratory Methods in Functional Genomics and Biotechnology
BIOS 741	Genomics
BIOS 742	Biotechnology
BIOS 743	Genomics, Proteomics, and Bioinformatics
BIOS 744	Molecular Genetics
BIOS 898	Directed Studies in Biosciences
BIOS 899	Directed Research in Biosciences
BINF 633	Molecular Biotechnology
BINF 641	Biomolecular Modeling
BINF 705	Research Ethics

Biocomplexity and Evolutionary Biology Concentration 1

BIOL 506	Selected Topics in Microbiology
BIOL 507	Selected Topics in Ecology
BIOL 508	Selected Topics in Animal Biology
BIOL 518	Conservation Biology
BIOL 532	Animal Behavior
BIOL 533	Selected Topics in Plant Biology
BIOL 537	Ornithology
BIOL 538	Mammalogy
BIOL 539	Herpetology
BIOL 543	Tropical Ecosystems
BIOL 559	Fungi and Ecosystems
BIOL 561	Comparative Animal Physiology
BIOL 566	Cancer Genomics
BIOL 572	Human Genetics
BIOL 573	Developmental Genetics
BIOL 643	Microbial Ecology

BIOL 715	Microbial Physiology
BIOS 741	Genomics
BIOS 742	Biotechnology
BIOS 743	Genomics, Proteomics, and Bioinformatics
BIOS 744	Molecular Genetics
BIOS 898	Directed Studies in Biosciences
BIOS 899	Directed Research in Biosciences
EVPP 536	The Diversity of Fishes
GEOL 501	Selected Topics in Modern Geology (may be repeated once)
GEOL 534	Vertebrate Paleontology
Total Credits	23-36

1 Students may take other courses related to their research topic if approved by their committee. Courses in Geographic Information Systems or Statistics are encouraged.

Dissertation Committee

Upon admission to the program, each student is assigned an advisor from the bioscience faculty. The advisor may be changed by mutual consent of student and advisor, or petition to the program director and associate dean. With their advisor, students adopt an individual program that focuses on a specific area of research.

By the end of the fourth semester of coursework, students assemble a dissertation committee of four graduate faculty members with representation from at least two academic departments. The faculty advisor and the program director approve the program of study.

Qualifying Examination

On nearing completion of course requirements, students take a qualifying exam with a written and an oral component. At the discretion of the committee, the written qualifying exam may be retaken once if the student's performance was deemed below satisfaction.

Advancement to Candidacy

Upon successful completion of the qualifying exam, the majority of all coursework, and an accepted dissertation proposal, students will be recommended for advancement to candidacy by the committee and the program director.

The semester after advancement to candidacy, students are eligible to enroll in dissertation research (BIOS 999 Doctoral Dissertation Research). Students must review their progress on the dissertation with their graduate committee on a regular basis until graduation.

Dissertation Research

No more than 24 combined credits from BIOS 998 Doctoral Dissertation Proposal and BIOS 999 Doctoral Dissertation Research may be applied toward satisfying doctoral degree requirements. Students register for a minimum of 3 credits of BIOS 999 Doctoral Dissertation Research in the first semester of advancement.

Select 12-24 credits from the following:		12-24
BIOS 998	Doctoral Dissertation Proposal	
BIOS 999	Doctoral Dissertation Research	
Total Credits		12-24

Doctoral Dissertation

After advancing to doctoral candidacy, students work with their dissertation committee to develop their dissertation proposal into a completed doctoral dissertation. The dissertation research should represent a significant contribution that is publishable in a refereed scientific journal. When the dissertation is complete, students will present their results to their graduate committee and defend their dissertation in a public forum.

Retroactive Requirements Updates:

Plan of Study:

Honors Information:

Accelerated Description/Dual Degree Description:

INTO-Mason Requirements:

College Requirements & Policies:

Department / Academic Unit Requirements & Policies:

Program Outcomes

Additional Program Information

This information is required by the Office of Accreditation and Program Integrity.

Courses offered via distance (if applicable):

Indicate whether students are able

What is the primary delivery format for the program?	Face-to-Face Only

Does any portion of this program occur off-campus?

No

Off-campus details:

Are you working with a vendor / other collaborators to offer your program?

No

Please explain:

Related Departments

Could this program prepare students for any type of professional licensure, in Virginia or elsewhere?

No

Please explain:

Are you adding or removing a licensure component?

No

Please explain:

Additional SCHEV & SACSCOC Information

Are you changing the total number of credits required for this program?

No

Are you changing the delivery format in any way (e.g adding an online option)?

No

Are you adding/removing a licensure option which was approved by SCHEV?

No

Will any portion of this program be offered at an off-campus location?

No

What off-campus location(s)? List all

What percentage of credits toward this program are offered at the off-campus location(s)? Please list percentages by site (i.e. 15% at Site A, 35% at Site B etc.)

Will this program change affect any specialized accreditation?

No

Is the content of the new program closely related to that of an existing approved program?

No

Which existing approved program(s)?

Is this new program considered to be "advancing the degree level of a currently approved program" (i.e. existing content is at lower degree level, new content is at the higher degree level)?

No

Which existing approved program(s)?

Is this new program considered to be "lowering the degree level of a currently approved program" (i.e. existing content is at higher degree level, new content is at the lower degree level)?

No

Which existing approved program(s)?

Does this change represent a repackaging of content in an existing approved degree/certificate program?

No

Which existing approved program(s)?

Percentage of total credits containing new course content, excluding gen ed courses for undergraduate programs ("New content" means content that is not currently included in an existing approved degree/certificate program.) Please choose a percentage (i.e. 0%-100%)

less than 25%

Are the total credits for the program increasing or decreasing by more than 3 credits?

No

Will any additional equipment/facilites be needed?

No

Description of institutional impact:

Will any additional faculty be required?

No

Description of institutional impact:

Will any additional financial resources be needed?

No

Description of institutional impact:

Will any additional library/learning resources needed?

No

Description of institutional impact:

OAPI Use Only – Determination of SACSCOC Impact

Comments or Notes

Green Leaf Program Designation

Is this a Green Leaf program? No

Green Leaf

Sustainability-focused academic programs require at least one green leaf course. Either that course is itself sustainability-focused or else the program requires a set of sustainability-related courses with aggregated

Relationship to

Relationship to

List sustainability-focused courses currently required in the degree

Sustainability-related academic programs either require at least one sustainability-related

List sustainability-related courses currently required in the degree

Does this program cover material which crosses into another department?

No

Impacted

Additional Attachments ~~PHDBIOSMID.pdf~~ ~~PHDBIOSCMB.pdf~~

SCHEV Proposal

Executive Summary

Reviewer Comments

Additional Comments

Is this course required of all students in this degree program?

%wi_required.eschtml%

Attached Document

Key: 420