Program Change Request

Date Submitted: 11/16/22 11:34 am

Viewing: SC-MS-BIOL : Biology, MS

Last approved: 09/28/22 9:10 am

Last edit: 11/16/22 11:34 am

Changes proposed by: jbazaz

Catalog Pages Using this Program

Biology, MS

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

Yes

Requestor:

In Workflow

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

Approval Path

1. 11/17/22 11:46 am Iosif Vaisman (ivaisman): Approved for SSB Program Chair

History

1. Nov 16, 2017 by clmig-jwehrheim
2. Mar 15, 2018 by rzachari
3. Sep 30, 2019 by Jennifer Bazaz Gettys (jbazaz)
4. Feb 5, 2020 by Jennifer Bazaz Gettys (jbazaz)
5. Aug 4, 2020 by Jennifer Bazaz Gettys (jbazaz)
6. Oct 30, 2020 by Tory Sarro (vsarro)
7. Jan 29, 2021 by Jennifer Bazaz Gettys (jbazaz)

8. Feb 23, 2021 by jriemen
9. Mar 7, 2021 by jriemen
10. Feb 8, 2022 by Jennifer Bazaz Gettys (jbazaz)
11. May 2, 2022 by Jennifer Bazaz Gettys (jbazaz)
12. Sep 28, 2022 by Jennifer Bazaz Gettys (jbazaz)

Name	Extension	Email
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Effective Catalog: 2023-2024

Program Level: Graduate

Program Type: Master's

Degree Type: Master of Science

Title: Biology, MS

Banner Title: Biology, MS

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

	Associated Concentrations	Registrar's Office Use Only: Concentration Code
1	Evolutionary Biology	EB
2	Microbiology and Infectious Disease	MID
3	Molecular Biology	MOB
4	Neuroscience	NEUR
5	Nutrition Genetics and Nutraceuticals	NGN
6	Translational and Clinical Research	TCR

Registrar/IRR Use Only – Concentration CIP Code

College/School: College of Science

Department / Academic Unit: School of Systems Biology

Jointly Owned Program? No

Justification

What: Changing some NUTR courses from the Nutrition Genetics and Nutraceuticals concentration.
Why: Some courses have been added and some have been replaced or no longer align with the concentration.

What: Clarifying allowable topics in a special topics course.
Why: To ease advising.

Total Credits Required: Total credits: 30

Registrar's Office Use Only - Program Code: SC-MS-BIOL

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.
While each applicant's qualifications are reviewed as a whole, the following are required: Applicants to the program must have a bachelor's degree in biology or other relevant fields from an institution of higher education accredited by a Mason-recognized U.S. institutional accrediting agency or international equivalent. Additionally, all MS concentrations require a GPA of 3.00 in biology coursework or in the last 60 credits of undergraduate study.
Prospective students should supply a copy of official transcripts from each college and graduate institution attended, a current résumé, and an expanded goals statement. Applicants should also include two letters of recommendation. TOEFL or IELTS scores are required for all international applicants.
Previous research experience or relevant employment is a plus. Admission is contingent on acceptance by a faculty research advisor.
The GRE is not required for admission into this program.

Evolutionary Biology (EB) Concentration

Students who choose the Evolutionary Biology concentration must also submit a personal statement/statement of interest consistent with at least one faculty member's research program.

Microbiology and Infectious Disease (MID) Concentration

Students who choose the Microbiology and Infectious Disease concentration must have a lecture and lab course in microbiology and a lecture course in biochemistry.

Program-Specific Policies:

Policies

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

Degree Requirements:

Students should refer to the Admissions & Policies tab for specific policies related to this program.
Candidates for the Biology, MS must complete the Core Courses and may choose one concentration or the MS without concentration requirements, detailed below, for a total of 30 credits (minimum).

Program of Study

The faculty advisor and the student work together to develop a program of study that best fits the student's background and interests. The student must submit a program of study to the program director for approval within the first 12 credits of coursework. By the end of the second semester of coursework, students will form a graduate committee made up of three faculty members. At least two committee members must be full-time faculty in the School of Systems Biology.
Students must complete all core courses and choose one concentration option:

Core Courses

Cell and Molecular Requirement		3
BIOL 682	Advanced Eukaryotic Cell Biology	
or BIOS 744	Molecular Genetics	
Professional Methods Requirement		4
BIOL 690	Introduction to Graduate Studies in Biology	
Choose one from the following:		
BIOL 689	Interdisciplinary Tools in the Biosciences	
BIOL 691	Current Topics in Biology 1	
or BIOS 702	Research Methods	
NEUR 702	Research Methods	
Seminar Requirement		3
Select a total of 3 credits from the following courses:		
BINF 704	Colloquium in Bioinformatics	
BIOL 692	Seminar in Biology (may be repeated) 2	
BIOL 695	Seminar in Molecular, Microbial, and Cellular Biology (may be repeated) 3	
BIOS 704	Topics in Biosciences	
Systems Biology/Evolution Requirement		3
BIOL 691	Current Topics in Biology 4	
or BIOL 502	Adaptation in Biosystems	
or BMED 604	Fundamentals of Human Physiology	
Research Requirement		2-6

Students have the option to complete a 2-3 credit research project (BIOL 798 Master's Research Project) or a 3-5 credit master's thesis (BIOL 799 Thesis). In accordance with AP.6 Graduate Policies, the same quality of work is expected of students regardless of which option they choose.

Research Project: The MS project is most appropriate for students who have scheduling commitments, such as a full-time job, that may preclude performing a complete series of laboratory experiments. Students pursuing the project option must successfully complete written and oral comprehensive exams. Additionally, students should present their research orally or as a poster to a community outside of the classroom, at Mason conferences or at external conferences.

Thesis: In general, the MS thesis is most appropriate for students planning or considering a research career. Students pursuing the thesis option must write a formal thesis that meets the requirements of the school and must defend their thesis and present their results in a public seminar.

Select a Research Project or a Master's Thesis		
BIOL 798	Master's Research Project (2-3 credits)	
BIOL 799	Thesis (3-5 credits)	
Total Credits		15-19

1 When the topic is "Research Methods," or "Creativity and Innovation," or "Principles of Biomedical Literature

Review".

2 May be taken up to two times in this program under different topics.

3 May be taken up to six times in this program under different topics.

4 BIOL 691 Current Topics in Biology is permissible when the topic is "Fun Concepts of Evolution".

5 Available only to students in the Advanced Biomedical Sciences Graduate Certificate.

MS without Concentration

General Coursework	12

In consultation with an advisor, select at least 12 credits of graduate coursework from BIOL, BIOS, BMED, or NEUR-prefixed courses. Suggestions include:

BIOL 508	Selected Topics in Animal Biology 1
BIOL 553	Advanced Topics in Immunology
BIOL 566	Cancer Genomics
BIOL 568	Advanced Topics in Molecular Genetics 2
BIOL 575	Selected Topics in Genetics
BIOL 579	Molecular Evolution and Conservation Genetics
BIOL 583	General Biochemistry
BIOL 585	Eukaryotic Cell Biology Laboratory
BIOL 667	Signal Transduction in Cancer
BIOL 693	Directed Studies in Biology 3
or BINF 795	Bioinformatics Internship
BIOL 793	Research in Biology
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 767	Molecular Evolution
BMED 604	Fundamentals of Human Physiology 4

Total Credits:	30

1 Suggested section topics: "Research and Development in a Biotechnology Company," "Biology of Obesity and Weight Loss," "Human Anatomy," or "Medical Biochemistry". Other relevant topics may only be applied toward the degree with advisor approval.

2 When the topic is "Epigenetics".

3
- No more than 3 credits of directed study or internship can be applied.
- Topics should be relevant and approved by the program director.

4 Course is only available for students also enrolled in the Advanced Biomedical Sciences Graduate Certificate.

Concentration in Evolutionary Biology (EB)

Populations and Species	3-6

Select 3-6 credits from the following:

BIOL 574	Population Genetics
BIOL 579	Molecular Evolution and Conservation Genetics
or BIOS 767	Molecular Evolution
BIOL 648	Population Ecology
BIOL 691	Current Topics in Biology

Organismal Biology 3-6

Select 3-6 credits from the following:

BIOL 501	Microbial Diversity: An Organismal Approach
BIOL 507	Selected Topics in Ecology
BIOL 508	Selected Topics in Animal Biology
BIOL 518	Conservation Biology
BIOL 528	Planetary Health
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 566	Cancer Genomics
BIOL 581	Estuarine and Coastal Ecology
BIOL 582	Estuarine and Coastal Ecology Laboratory
BIOL 643	Microbial Ecology
EVPP 536	The Diversity of Fishes

Molecular Techniques 3-4

Select 3-4 credits from the following:

BIOL 693	Directed Studies in Biology 1
or BINF 795	Bioinformatics Internship
BINF 630	Bioinformatics Methods
BIOS 716	Methods in Evolutionary Biology
EVPP 515	Molecular Environmental Biology I
EVPP 615	Molecular Environmental Biology II

Electives 2-6

If needed in order to reach a total of 30 credits, select from the following courses: 2

BIOL 693	Directed Studies in Biology 1
or BINF 795	Bioinformatics Internship
BIOS 741	Genomics
Any additional course listed in the Core Courses section	

Total Credits: 30

1 • No more than 3 credits of directed study or internship can be applied to this concentration.

- Topics should be relevant to the concentration and should be approved by the program director.

2 Other relevant graduate-level coursework may be selected in consultation with the advisor.

Concentration in Microbiology and Infectious Disease (MID)

Microbiology and Infectious Diseases		12
In consultation with an advisor, select 12 credits from the following:		
BINF 739	Topics in Bioinformatics 1	
BIOL 553	Advanced Topics in Immunology	
BIOL 563	Virology	
BIOL 685	Emerging Infectious Diseases	
BIOL 693	Directed Studies in Biology 2	
BIOL 669	Pathogenic Microbiology	
BIOL 715	Microbial Physiology	
Electives		0-3
If needed to reach a total of 30 credits, select from the following courses:		
BIOL 508	Selected Topics in Animal Biology 3	
BIOL 560	Infectious Diseases of Wildlife	
BIOL 564	Techniques in Virology	
BIOL 583	General Biochemistry	
BIOL 718	Techniques in Microbial Pathogenesis	
BIOS 742	Biotechnology	
Any additional course listed in the Core Courses section		
Total Credits:		30

1 When the topic is "Computational Analysis: Viral Genomes".

2
- No more than 3 credits of directed study can be applied to this concentration.
- Topics should be relevant to the concentration and should be approved by the program director.

3 When the topic is "Water and Disease".

Concentration in Molecular Biology (MOB)

Molecular Biology		12
In consultation with an advisor, select 12 credits from the following:		
BIOL 508	Selected Topics in Animal Biology 1	
or BIOL 583	General Biochemistry	
BIOL 568	Advanced Topics in Molecular Genetics	
BIOL 579	Molecular Evolution and Conservation Genetics	
or BIOS 767	Molecular Evolution	
BIOL 580	Computer Applications for the Life Sciences	
or BINF 630	Bioinformatics Methods	
BIOL 583	General Biochemistry	
BIOL 585	Eukaryotic Cell Biology Laboratory	

BIOL 678	Cell-Based Assays
BIOL 693	Directed Studies in Biology 2
or BINF 795	Bioinformatics Internship
BIOS 701	Systems Biology
BIOS 716	Methods in Evolutionary Biology
BIOS 742	Biotechnology
or BINF 633	Molecular Biotechnology
BINF 739	Topics in Bioinformatics
NEUR 651	Molecular Neuropharmacology

Electives 0-3

If needed to reach a total of 30 credits, select from the following courses:

BINF 641	Biomolecular Modeling
BIOL 693	Directed Studies in Biology 2
or BINF 795	Bioinformatics Internship
BIOS 741	Genomics
NEUR 592	Special Topics in Neuroscience 3
or NEUR 689	Topics in Neuroscience
CHEM 564	General Biochemistry II
CHEM 660	Protein Biochemistry
Any additional course listed in the Core Courses section	

Total Credits: 30

1 When the topic is "Research and Development in a Biotechnology Company," or "Medical Biochemistry".

2
- No more than 3 credits of directed study or internship can be applied to this concentration.
- Topics should be relevant to the concentration and should be approved by the program director.

3 When the topic is "Glutamatergic Systems" or "Epigenetics".

Concentration in Neuroscience (NEUR)

Statistics 3

Select 3 credits from the following:

BINF 530	Introduction to Bioinformatics Methods
BINF 630	Bioinformatics Methods
BINF 702	Biological Data Analysis
BIOL 691	Current Topics in Biology 1
STAT 535	Analysis of Experimental Data
STAT 544	Applied Probability
STAT 554	Applied Statistics I

Neurobiology 9

In consultation with an advisor, select 9 credits from the following, at least 6 of which must be in NEUR-prefixed courses:

BIOL 508	Selected Topics in Animal Biology 2

BIOL 568	Advanced Topics in Molecular Genetics 3	
BIOL 693	Directed Studies in Biology 4	
or BINF 795	Bioinformatics Internship	
NEUR 592	Special Topics in Neuroscience	
NEUR 601	Developmental Neuroscience	
NEUR 602	Cellular Neuroscience	
NEUR 603	Mammalian Neuroanatomy	
NEUR 612	Bioscience, Neurotechnology Society	
NEUR 621	Synaptic Plasticity	
NEUR 634	Neural Modeling	
NEUR 651	Molecular Neuropharmacology	
NEUR 689	Topics in Neuroscience (any topic is allowed; may be repeated)	
NEUR 701	Neuroscience Laboratory	
NEUR 709	Neuroscience Seminars	
NEUR 710	Special Topics in Neuroscience	
NEUR 734	Computational Neurobiology	
NEUR 741	Introduction to Neuroimaging	
Electives		0-3

If needed to reach a total of 30 credits, select from the following:

BIOL 583	General Biochemistry	
BIOL 691	Current Topics in Biology 5	
or BIOS 743	Genomics, Proteomics, and Bioinformatics	
BIOL 693	Directed Studies in Biology 4	
or BINF 795	Bioinformatics Internship	
Any additional NEUR-prefixed course at the 500-700 levels		
Other relevant graduate-level coursework may be selected in consultation with the advisor		
Total Credits:		30

1 When the topic is "MATLAB for Brain, Biological, and Cognitive Scientists".

2 When the topic is "Biology of Obesity and Weight Loss".

3 When the topic is "Epigenetics".

4
- No more than 3 credits of directed study or internship can be applied to this concentration.
- Topics should be relevant to the concentration and should be approved by the program director.

5 When the topic is "Genomics, Proteomics, and Bioinformatics".

Concentration in Nutrition Genetics and Nutraceuticals (NGN)

Nutrition		6

In consultation with an advisor, choose 6 credits from the following:

BIOL 508	Selected Topics in Animal Biology 1
NUTR 522	Nutrition Across the Lifespan

~~NUTR 642~~	~~Macronutrients~~
NUTR 553	**Nutrients**
NUTR 651	**Nutrition Assessment**
NUTR 670	Nutrition Research Methods

Human Diseases 6

In consultation with an advisor, choose 6 credits from the following:

BIOL 508	**Selected Topics in Animal Biology (when the topic is "Medical Biochemistry")**
BIOL 566	Cancer Genomics
or BIOL 667	Signal Transduction in Cancer
BIOL 586	**Medical Biochemistry**
BIOL 666	Human Genetics Concepts for Health Care
BIOS 743	Genomics, Proteomics, and Bioinformatics
NUTR 662	**Medical Nutrition Therapy I**

Electives

If needed to reach a total of 30 credits, select from the following courses:

BIOL 508	Selected Topics in Animal Biology 2
BIOL 562	Personalized Medicine
BIOL 568	Advanced Topics in Molecular Genetics
BIOL 583	General Biochemistry
BIOL 693	Directed Studies in Biology 3
or BINF 795	Bioinformatics Internship
CHEM 564	General Biochemistry II
Any additional course listed in the Core Courses section	

Total Credits 30

1 When the topic is "Biology of Obesity and Weight Loss," or "Medical Biochemistry".

2 When the topic is "Research and Development in Biotechnology Companies".

3
- No more than 3 credits of directed study or internship can be applied to this concentration.
- Topics should be relevant to the concentration and should be approved by the program director.

Concentration in Translational and Clinical Research (TCR)

Translational and Clinical Research 1 12

In consultation with an advisor, select 12 credits from the following:

BIOL 508	Selected Topics in Animal Biology 2
BIOL 562	Personalized Medicine
BIOL 566	Cancer Genomics
BIOL 666	Human Genetics Concepts for Health Care
BIOL 667	Signal Transduction in Cancer
BIOL 691	Current Topics in Biology 3
or BIOS 743	Genomics, Proteomics, and Bioinformatics
BIOL 693	Directed Studies in Biology 4

or BINF 795	Bioinformatics Internship
BMED 603	Cell Biology and Microscopic Anatomy 5
BMED 604	Fundamentals of Human Physiology 5
BMED 605	Introduction to Human Anatomy 5

Electives 0-3

If needed to reach a total of 30 credits, select from the following courses:

BIOL 508	Selected Topics in Animal Biology 6
BIOL 568	Advanced Topics in Molecular Genetics
BIOL 693	Directed Studies in Biology 4
or BINF 795	Bioinformatics Internship
BIOS 741	Genomics
Any additional course listed in the Core Courses section	
Other relevant graduate-level coursework may be selected in consultation with the advisor	

Total Credits: 30

1 For students concurrently enrolled in the Advanced Biomedical Sciences Graduate Certificate, contact your advisor for details regarding:
- BMED course credit that may be counted towards this concentration
- Meeting the requirements for graduate certificates and for master's degrees

2 When the topic is "Research and Development in a Biotechnology Company," "Biology of Obesity and Weight Loss," or "Medical Biochemistry".

3 When the topic is "Genomics/Proteomics/Bioinformatics".

4
- No more than 3 credits of directed study or internship can be applied to this concentration.
- Topics should be relevant to the concentration and should be approved by the program director.

5 Course is only available for students enrolled in the Advanced Biomedical Sciences Graduate Certificate.

6 When the topic is "Research and Development in a Biotechnology Company".

Retroactive Requirements Updates:

Plan of Study:

Program Outcomes

Additional Program Information

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

Courses offered via distance (if applicable):

What is the primary delivery format for the program?	Both Face-to-Face and Distance

Does any portion of this program occur off-campus?

No

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

No

Related Departments

Department
Health & Human Services

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

No

Are you adding or removing a licensure component?

No

Additional SCHEV & SACSCOC Information

Is this change a simple retitling of an existing program, with no other changes, to any existing program content, curriculum requirements, etc?

No

Does this change represent a repackaging of content in an existing approved degree/certificate program at the same instructional level (i.e., baccalaureate, master's, or doctoral)?

No

Percentage of total credits containing new course content. ("New course content" is defined by SACSCOC as content that is not currently included in an existing approved degree/certificate program at the same instructional level. Do not exclude gen ed credits in calculations for undergraduate programs.)

0%-24%

Does this change include the addition of a distance education or face-to-face method of delivery for this program?

No

Does this change include the addition of a course/credit-based competency-based education delivery option?

No

Will any additional equipment/facilities be needed?

No

Will any additional faculty be required?

No

Will any additional financial resources be needed?

No

Additional library/learning resources needed?

No

OAPI Use Only – Determination of SACSCOC Impact

Comments or Notes

Green Leaf Program Designation

Is this a Green Leaf program? No

Does this program cover material which crosses into another department?

No

Additional Attachments

SCHEV Proposal

Executive Summary

Reviewer Comments

Additional Comments

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

%wi_required.eschtml%

Key: 418