Program Change Request

Date Submitted: 03/22/19 1:32 pm

Viewing: SC-MS-BIOL : Biology, MS

Last approved: 03/15/18 1:01 pm

Last edit: 03/29/19 9:53 am

Changes proposed by: jbazaz

Catalog Pages Using this Program Biology, MS

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

Yes

Requestor:

Name	Extension	Email
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Effective Catalog: 2020-2021

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

Concentration(s):

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

Registrar/IRR Use Only – Concentration CIP Code

College/School: College of Science

School of Systems Biology

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: Duration
7. Registrar-Programs

Approval Path

1. 04/30/19 8:13 am Iosif Vaisman (ivaisman): Approved for SSB Program Chair

History

1. Nov 16, 2017 by clmig-jwehrheim
2. Mar 15, 2018 by Rebekah Zacharias (rzachari)

Department / Academic Unit:	
Jointly Owned Program?	No
Justification	Without Concentration: Adding electives: BIOL 508 and 566 Microbiology & Infectious Diseases Concentration: The core courses were modified to align with the concentration course selection in the PhD Biosciences program, MID concentration. By adding additional elective courses students are able to take a wider range of coursework that will allow greater flexibility in planning their course schedule and overall degree program. SSB faculty have recommended additions to the electives to allow a greater choice for students in this concentration. Extended list of approved electives will also facilitate degree audit. Molecular Biology Concentration: The core courses were altered to correct some deficiencies, to give students a more well-rounded concentration curriculum, and to allow students a choice of coursework to reach 12-13 credits. More courses were added to the electives area to give students a broader choice of study. SSB faculty recommended additions to the electives to allow a greater choice for students. BIOL 572 is excluded from core as it is currently not offered. Extended list of approved electives will also facilitate degree audit. Neuroscience Concentration: The Neuroscience curriculum has changed since the MS concentration in Neuroscience was approved. Courses have changed and/or are no longer offered. Dr. Kabbani and Dr. Baranova have collaborated to determine current course offerings in Neuroscience and have recommended changes to the MS concentration also to reflect these changes: Core course area modified to allow students a selection of courses totaling 12-13 credits; two (2) courses removed and two (2) courses added to the core course selection list; one (1) course added to the statistics course list; four (4) courses added to the electives list. Translational and Clinical Research Concentration: More biology course choices in the electives category and two other classes moved from electives and added to the core. SSB faculty recommended additions to the electives to allow a greater choice for students. BIOL 572 is excluded from the core as it is currently not offered. Extended list of approved electives will also facilitate degree audit.
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 provided: Applicants to the program must have a bachelor's degree in biology or its equivalent. Additionally, all MS concentrations require a GPA of 3.00 in biology coursework or in the last 60 credits of undergraduate study. Students must also submit three letters of recommendation and scores on the GRE general exam. Exam scores should be in the 45th percentile or above. Admission is contingent on acceptance by a faculty research advisor.

Microbiology and Infectious Disease (MID) Concentration

Students who choose the Microbiology and Infectious Disease Concentration (MID) must have a lecture and lab course in microbiology and a lecture course in biochemistry.

Translational and Clinical Research (TCR) Concentration

Students who choose the Translational and Clinical Research Concentration may submit MCAT scores in place of GRE general exam scores.

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. GRE score should be approximately 303.

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.

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 faculty in the School of Systems Biology.

Concentration Options

Candidates for the Biology, MS focus their study in one of five approved concentrations below, or by completing coursework for the program in biological sciences in an area of study chosen in consultation with the student's advisor and program director.

Research Options

Students have the option to complete a 3-6 credit master's thesis (BIOL 799 Thesis) or a 1-3 credit research project (BIOL 798 Master's Research Project). In accordance with AP.6 Graduate Policies, the same quality of work is expected of students regardless of which option they choose.

- 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.
- 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.

Course List

Code	Title	Credits
Select a Master's Thesis or Research Project		
BIOL 799	Thesis	3-6
BIOL 798	Master's Research Project	1-3

MS without Concentration

Program in Biological Sciences

Course List

Code	Title	Credits
Research Methodology		1-3
BIOL 690	Introduction to Graduate Studies in Biology	

Code	Title	Credits
or BIOS 702	Research Methods	
Seminar		2
BIOL 692	Seminar in Biology	
or BIOL 695	Seminar in Molecular, Microbial, and Cellular Biology	
Research		1-6
Select one from the following:		
BIOL 798	Master's Research Project	
BIOL 799	Thesis (3-6 credits)	
Electives [1]		19-26
Select 19–26 credits of electives in BIOL, BIOS, or related areas as approved by the student's advisor and the program director.		
BIOL 508	**Selected Topics in Animal Biology [2]**	
BIOL 553	Advanced Topics in Immunology	
BIOL 566	**Cancer Genomics**	
BIOL 568	Advanced Topics in Molecular Genetics	
BIOL 575	Selected Topics in Genetics	
BIOL 579	Molecular Evolution and Conservation Genetics	
BIOL 583	General Biochemistry	
BIOL 585	Eukaryotic Cell Biology Laboratory	
BIOL 682	Advanced Eukaryotic Cell Biology	
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	
Total Credits:		30

[1] These courses are provided as suggestions only; this is not intended to be a comprehensive list of elective options. Note that two courses covering substantially similar topics may not both be counted in the student's program of study. Students should consult their faculty research advisor or the graduate program coordinator when preparing a program of study.

[2] Suggested section topics: Research and Development in Biotechnology Labs; Biology of Obesity and Weight Loss. Other relevant topics may only be applied toward the degree with advisor approval.

MS with Concentration in Microbiology and Infectious Disease (MID)

Course List

Code	Title	Credits
Research Methodology		1-3
BIOL 690	Introduction to Graduate Studies in Biology	
or BIOS 702	Research Methods	
Core Biology		12-13
Select four courses from the following:		
BIOL 553	Advanced Topics in Immunology	
BIOL 563	Virology	
BIOL 583	**General Biochemistry**	
BIOL 669	Pathogenic Microbiology	
BIOL 715	Microbial Physiology	
BINF 739	**Topics in Bioinformatics (Topic: Computational Analysis: Viral Genome)**	
Seminar		2
BIOL 695	Seminar in Molecular, Microbial, and Cellular Biology	
Research		1-6
Select one from the following:		
BIOL 798	Master's Research Project	

Code	Title	Credits
BIOL 799	Thesis (3-6 credits)	
Electives 1		7-14
Select 7-14 credits from the following:		
BIOL 506	**Selected Topics in Microbiology 2**	
BIOL 560	**Infectious Diseases of Wildlife**	
BIOL 564	Techniques in Virology	
BIOL 553	Advanced Topics in Immunology	
BIOL 580	**Computer Applications for the Life Sciences**	
BIOL 682	Advanced Eukaryotic Cell Biology	
BIOL 685	**Emerging Infectious Diseases**	
BIOL 691	**Current Topics in Biology 3**	
BIOL 718	Techniques in Microbial Pathogenesis	
BIOS 710	Current Topics in Bioscience 2	
~~Or relevant graduate-level coursework selected in consultation with the advisor~~		
BIOS 743	Genomics, Proteomics, and Bioinformatics	
Total Credits:		30

1Other relevant graduate-level coursework may be selected in consultation with the advisor.

2Credit for these courses may only be applied toward the degree if the course topic is relevant to microbiology and infectious diseases and approved by the advisor.

3Suggested section topic: Vaccines. Other relevant topics may only be applied toward the degree with advisor approval.

MS with Concentration in Molecular Biology (MOB)

Course List

Code	Title	Credits
Research Methodology		1-3
BIOL 690	Introduction to Graduate Studies in Biology	
or BIOS 702	Research Methods	
Core Biology		12-13
Select 12-13 credits from the following:		
BIOL 568	Advanced Topics in Molecular Genetics	
or BIOS 744	Molecular Genetics	
BIOL 583	General Biochemistry	
BIOL 682	Advanced Eukaryotic Cell Biology	
BIOL 579	Molecular Evolution and Conservation Genetics	
or BIOS 767	Molecular Evolution	
BIOS 742	Biotechnology	
NEUR 651	**Molecular Neuropharmacology**	
Bioinformatics		3
Select one from the following:		
BIOL 580	Computer Applications for the Life Sciences	
BINF 630	Bioinformatics Methods	
BINF 634	Bioinformatics Programming	
Molecular Techniques		2-7
Select 2-7 credits from the following:		
BINF 739	**Topics in Bioinformatics**	
BIOL 585	Eukaryotic Cell Biology Laboratory	
BIOL 678	Cell-Based Assays	
BIOS 716	**Methods in Evolutionary Biology**	
BIOS 740	Laboratory Methods in Functional Genomics and Biotechnology	

Code	Title	Credits
Special topics courses, such as BIOL 575 or BIOL 691, may also be approved for this requirement by the program director, but only in semesters in which they are primarily a laboratory course of at least two credits with substantial content of techniques in molecular biology.		
Seminar		2
BIOL 695	Seminar in Molecular, Microbial, and Cellular Biology	
Research		1-6
Select one from the following:		
BIOL 798	Master's Research Project	
BIOL 799	Thesis (3-6 credits)	
Electives [1]		0-9
Select 0-9 credits of electives in BIOL, BIOS, or related areas as approved by the student's advisor and the program director.		
BIOL 553	Advanced Topics in Immunology	
BIOL 562	**Personalized Medicine**	
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 666	**Human Genetics Concepts for Health Care**	
BIOL 682	Advanced Eukaryotic Cell Biology	
BIOL 793	Research in Biology	
BIOS 740	Laboratory Methods in Functional Genomics and Biotechnology	
BIOL 691	**Current Topics in Biology**	
BIOS 741	Genomics	
BIOS 742	**Biotechnology**	
BIOS 743	Genomics, Proteomics, and Bioinformatics	
BIOS 744	Molecular Genetics	
BIOS 767	Molecular Evolution	
Total Credits:		30

[1] These courses are provided as suggestions only; this is not intended to be a comprehensive list of elective options. Note that two courses covering substantially similar topics may not both be counted in the student's program of study. Students should consult their faculty research advisor or the graduate program coordinator when preparing a program of study.

[2] **Suggested section topic: Epigenetics. Other relevant topics may only be applied toward the degree with advisor approval.**

MS with Concentration in Neuroscience (NEUR)

Course List

Code	Title	Credits
Research Methodology		1-3
BIOL 690	Introduction to Graduate Studies in Biology	
or NEUR 702	Research Methods	
Core Neuroscience		12-13
Select 12-13 credits from the following:		
~~NEUR 600~~	~~Chemistry and the Brain~~	
BINF 705	Research Ethics	
NEUR 601	Developmental Neuroscience	
NEUR 602	Cellular Neuroscience	
NEUR 603	Mammalian Neuroanatomy	
~~NEUR 604~~	~~Ethics in Scientific Research~~	
~~or BINF 705~~	~~Research Ethics~~	
NEUR 634	**Neural Modeling**	

Code	Title	Credits
NEUR 651	**Molecular Neuropharmacology**	
NEUR 701	Neuroscience Laboratory	
Seminar		2
Select 2 credits from the following:		
BIOL 695	Seminar in Molecular, Microbial, and Cellular Biology	
BIOS 704	Topics in Biosciences	
NEUR 709	Neuroscience Seminars	
Statistics		3-4
Select 3-4 credits from the following:		
NEUR 592	**Special Topics in Neuroscience 1**	
ECE 528	Introduction to Random Processes in Electrical and Computer Engineering	
PSYC 611	Advanced Statistics	
STAT 535	Analysis of Experimental Data	
STAT 544	Applied Probability	
STAT 554	Applied Statistics I	
Research		1-6
Select one from the following:		
BIOL 798	Master's Research Project	
BIOL 799	Thesis (3-6 credits)	
Electives		2-11
Select 2-11 credits, suggested electives include but are not limited to the following:		
BIOL 508	**Selected Topics in Animal Biology 1**	
BIOL 566	Cancer Genomics	
BIOL 568	Advanced Topics in Molecular Genetics	
BIOL 583	General Biochemistry	
BIOL 666	Human Genetics Concepts for Health Care	
BIOL 682	Advanced Eukaryotic Cell Biology	
BIOL 691	**Current Topics in Biology 2**	
BINF 630	Bioinformatics Methods	
BINF 705	**Research Ethics**	
BIOS 741	Genomics	
BIOS 742	Biotechnology	
BIOS 743	Genomics, Proteomics, and Bioinformatics	
BIOS 744	Molecular Genetics	
NEUR 592	**Special Topics in Neuroscience 3**	
NEUR 689	Topics in Neuroscience 3	
Total Credits:		30

1Suggested section topic: Biology of Obesity and Weight Loss. Other relevant topics may only be applied toward the degree with advisor approval.

2Credit for these courses may only be applied toward the degree if the topic is relevant to neuroscience and approved by the advsior.

3Suggested section topics include: Neurobiology of Decision Making; MATLAB Brain, Biology, and Cognitive Scientists. Other relevant topics may only be applied toward the degree with advisor approval.

4Suggested section topics include: Glutamergic Systems; Motor Control Rehab; Scientific Writing and Presentations. Other relevant topics may only be applied toward the degree with advisor approval.

MS with Concentration in Evolutionary Biology (EB)

Course List

Code	Title	Credits
Seminar		3-4
BIOL 690	Introduction to Graduate Studies in Biology	
Select 2 credits from the following:		

Code	Title	Credits
BIOL 692	Seminar in Biology	
or BIOL 695	Seminar in Molecular, Microbial, and Cellular Biology	
BIOL 692	Seminar in Biology	
& BIOL 695	and Seminar in Molecular, Microbial, and Cellular Biology	
Core Courses		6-9
Select at least two courses from the following:		
BIOL 574	Population Genetics	
BIOL 579	Molecular Evolution and Conservation Genetics	
BIOL 648	Population Ecology	
Organismal Biology		6-8
Select 6-8 credits from the following suggestions in consultation with an advisor and/or committee and the program director:		
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 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 572	Human Genetics	
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		4-7
EVPP 615	Molecular Environmental Biology II	
EVPP 515	Molecular Environmental Biology I [1]	
Research		1-6
Select one from the following:		
BIOL 798	Master's Research Project	
BIOL 799	Thesis (3-6 credits)	
Electives		0-10
Select 0-10 credits of suggested courses from the following, but other courses are allowed if approved by an advisor and/or committee and the program director		
BIOL 508	Selected Topics in Animal Biology	
BIOL 518	Conservation Biology	
BIOL 537	Ornithology	
BIOL 538	Mammalogy	
BIOL 539	Herpetology	
BIOL 543	Tropical Ecosystems	
BIOL 553	Advanced Topics in Immunology	
BIOL 568	Advanced Topics in Molecular Genetics	
BIOL 575	Selected Topics in Genetics	
BIOL 572	Human Genetics	
BIOL 579	Molecular Evolution and Conservation Genetics	
BIOL 581	Estuarine and Coastal Ecology	
& BIOL 582	and Estuarine and Coastal Ecology Laboratory	
BIOL 583	General Biochemistry	

Code	Title	Credits
BIOL 585	Eukaryotic Cell Biology Laboratory	
BIOL 666	Human Genetics Concepts for Health Care	
BIOL 682	Advanced Eukaryotic Cell Biology	
BIOL 793	Research in Biology	
BIOS 701	Systems 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 762	Phylogenetic Analysis	
BIOS 765	Molecular Systematics	
BIOS 767	Molecular Evolution	
EVPP 536	The Diversity of Fishes	
EVPP 550	Waterscape Ecology and Management	
EVPP 551	Fungi and Ecosystems	
EVPP 555	Lab in Waterscape Ecology	
EVPP 643	Microbial Ecology	
EVPP 651	Multivariate Data Analysis for Ecology and Environmental Science	
Total Credits:		30

1 Only required if not previously completed; this course is a prerequisite to EVPP 615.

MS with Concentration in Translational and Clinical Research (TCR)

Course List		
Code	Title	Credits
Research Methodology		1-3
BIOL 690	Introduction to Graduate Studies in Biology	
or BIOS 702	Research Methods	
Seminar		2
Select 2 credits from the following:		
BINF 704	Colloquium in Bioinformatics	
BIOL 508	Selected Topics in Animal Biology (when the topic is research and development related to biotechnology)	
BIOL 695	Seminar in Molecular, Microbial, and Cellular Biology	
Advanced Eukaryotic Cell Biology		3
BIOL 682	Advanced Eukaryotic Cell Biology	
Bioinformatics/Biostatistics		3
BINF 630	Bioinformatics Methods	
or STAT 535	Analysis of Experimental Data	
Human Genes, Cells and Tissues		3
Select 3 credits from the following:		
BIOL 562	Personalized Medicine	
BIOL 566	Cancer Genomics	
BIOL 666	Human Genetics Concepts for Health Care	
BIOS 743	Genomics, Proteomics, and Bioinformatics	
Biochemistry		3-4
Select 3-4 credits from the following:		
BIOL 583	General Biochemistry	
CHEM 563	General Biochemistry I	
CHEM 660	Protein Biochemistry	
Research		1-6
Select one from the following:		
BIOL 798	Master's Research Project	

Code	Title	Credits
or CHEM 798	Research Project	
BIOL 799	Thesis (3-6 credits)	
or CHEM 799	Master's Thesis	
Electives		6-14
Select 6-14 credits from the following: 1		
BIOL 506	**Selected Topics in Microbiology 2**	
BIOL 508	**Selected Topics in Animal Biology 3**	
BIOL 553	Advanced Topics in Immunology	
BIOL 563	Virology	
BIOL 568	Advanced Topics in Molecular Genetics	
BIOL 572	Human Genetics	
BIOL 585	**Eukaryotic Cell Biology Laboratory**	
BIOL 666	**Human Genetics Concepts for Health Care**	
BIOL 669	Pathogenic Microbiology	
BIOL 678	**Cell-Based Assays**	
BIOL 685	**Emerging Infectious Diseases**	
BIOL 691	**Current Topics in Biology 4**	
BIOL 693	**Directed Studies in Biology 2**	
BIOL 715	Microbial Physiology	
BIOL 718	**Techniques in Microbial Pathogenesis**	
BIOS 710	**Current Topics in Bioscience**	
BIOS 741	Genomics	
BIOS 742	Biotechnology	
BIOS 743	Genomics, Proteomics, and Bioinformatics	
BIOS 744	Molecular Genetics	
~~CHEM 567~~	~~The Chemistry of Enzyme-Catalyzed Reactions~~	
CHEM 579	Special Topics	
~~CHEM 624~~	~~Principles of Chemical Separation~~	
~~CHEM 660~~	~~Protein Biochemistry~~	
CHEM 661	Antibiotic Chemistry and Resistance	
CHEM 662	Modern Methods of Drug Discovery	
CHEM 665	Protein-Protein Interactions: Methods and Applications	
CHEM 796	Directed Reading and Research	
NEUR 651	**Molecular Neuropharmacology**	
Total Credits:		30

1Other relevant graduate-level coursework may be selected in consultation with the advisor.

2Credit for this course may only be applied toward the degree if the course topic is relevant to the concentration or research topic and approved by the advisor.

3Suggested course topic: Biology of Obesity and Weight Loss. Other relevant topics may only be applied toward the degree with advisor approval.

4Suggested course topic: Creativity and Innovation. Other relevant topics may only be applied toward the degree with advisor approval.

Curriculum Notes

- 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 requirements for graduate certificates and requirements for master's degrees

Retroactive Requirements Updates:

Plan of Study:

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

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

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

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

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

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

Are you adding significant new content areas to the program?

Will this program change affect any specialized accreditation?

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