Academic Degree Programs Assessment

College of Liberal Arts and Sciences

Department of Biological Sciences

Biological Science Program

Master of Science

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Submitted to the University Assessment Panel by

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Part I: Assessment Plan

1. Introduction

Students interested in obtaining a Master of Science degree in Biological Sciences may select from two options: thesis and non-thesis. In addition, three specialization areas (Human Anatomical Sciences, Bioinformatics, and Biology Teaching) are available within the MS program. A Masters' degree in Biological Sciences prepares students to pursue successful careers in related areas in the public or private sectors, provides credentials for specific jobs, or may serve as a stepping-stone to professional degrees (PhD, MD, DO, DVM, etc.). Regardless of the path chosen within the MS degree, increased depth of training through research and study of the primary literature endows graduates of the program with enhanced content knowledge, applied skills and a fundamental understanding of the process of science and the scientific method. Such working knowledge can be readily applied to jobs in the field or further professional training.

2. Student Learning Outcomes (SLOs)

Graduates of the Biological Sciences MS program will demonstrate:

1. Fundamental understanding of the principles, major research findings and current unresolved problems in their area of emphasis
2. Effective scientific communication skills
3. Effective laboratory and field research skills
4. Proficiency in critical thinking,
5. Appropriate use of the scientific method.
6. Technical writing proficiency

3. Program-by-MS Student Learning Outcomes Matrix (Outcome-by-Methods)

Student Learning outcomes (SLO)	**Summative Assessment**		**Formative Assessment**	
	Oral Exam	**Thesis**	**Committee Meeting**	**Grad Seminar**
1. Principles/Problems	S	S	S	S
2. Communication	S	S	S	S
3. Lab/Field Skills		S	S	
4. Critical Thinking	S	S	S	S

5. Scientific Method	S	S	S	S
6. Technical Writing		S	S	
Program outcome strongly supports (S), moderately supports (M), not support (blank)				

4. Curriculum Map

The curriculum map for MS of biological sciences depends on students' research interest (area of focus) and career goal. In our department, we currently have 8 different of area of focus: Anatomy; Biomedical Science; Bioinformatics; Biology Education; Cellular/Molecular Biology; Ecology, Evolution, Behavior & Conservation Program; Microbiology; and Plant Science. Students and their graduate committee will select the best curriculum map from the following graduate courses.

Course	**Program Student Learning Outcomes**					
	Principles/ problem solving	Communication	Lab/field Research skills	Critical thinking	Scientific methods	Technical writing
BIOS 506 - Conservation Biology	P		P	P	P	
BIOS 509X - Water Quality	P		P	P	P	
BIOS 511 - Plant Physiology	P		P	P	P	
BIOS 512 - Mycology	P		P	P	P	
BIOS 513 - Microbial Physiology	P		P	P	P	
BIOS 517 - Pathogenic Microbiology	P		P	P	P	
BIOS 522X - Plant-Soil Interactions	P		P	P	P	

Course	Program Student Learning Outcomes					
	Principles/ problem solving	Communication	Lab/field Research skills	Critical thinking	Scientific methods	Technical writing
BIOS 523 - Principles of Virology	P		P	P	P	
BIOS 530 - Plant Systematics	P		P	P	P	
BIOS 533 - Behavioral Ecology	P	P	P	P	P	P
BIOS 535X - Primate Evolution	P		P	P	P	
BIOS 537X - Primate Anatomy	P		P	P	P	
BIOS 539 - Molecular Evolution	P		P	P	P	
BIOS 540 - Immunobiology	P		P	P	P	
BIOS 542 - Evolution and the Creationist Challenge	P		P	P	P	
BIOS 544 - Cell and Tissue Culture	P		P	P	P	
BIOS 545 - Human Histology	P		P	P	P	
BIOS 546 - Gross Human Anatomy	P		P	P	P	

Course	Program Student Learning Outcomes					
	Principles/ problem solving	Communication	Lab/field Research skills	Critical thinking	Scientific methods	Technical writing
BIOS 547 - Comparative Vertebrate Anatomy	P		P	P	P	
BIOS 550 - Molecular Biology of Cancer	P		P	P	P	
BIOS 553 - Entomology	P		P	P	P	
BIOS 554 - Developmental Biology	P		P	P	P	
BIOS 555 - Comparative Physiology	P		P	P	P	
BIOS 556 - Biology of Fishes, Amphibians, and Reptiles	P		P	P	P	
BIOS 557 - Biology of Birds and Mammals	P		P	P	P	
BIOS 558 - Vertebrate Paleontology	P		P	P	P	
BIOS 561 - Endocrinology	P		P	P	P	

Course	Program Student Learning Outcomes					
	Principles/ problem solving	Communication	Lab/field Research skills	Critical thinking	Scientific methods	Technical writing
BIOS 564 - Cell Signaling	P		P	P	P	
BIOS 565 - Cellular Physiology	P		p	P	P	
BIOS 567 - Advanced Molecular Biology	P		P	P	P	
BIOS 568X - Geomicrobiology	P		P	P	P	
BIOS 569X - Invertebrate Paleontology	P		P	P	P	
BIOS 570X - General Biological Chemistry	P		P	P	P	
BIOS 571X - Biological Chemistry Laboratory	P	P	P	P	P	P
BIOS 572X - Biological Chemistry I	P		P	P	P	
BIOS 573X - Biological Chemistry II	P		P	P	P	
BIOS 576 - Plant Genetics	P		P	P	P	

Course	Program Student Learning Outcomes					
	Principles/ problem solving	Communication	Lab/field Research skills	Critical thinking	Scientific methods	Technical writing
BIOS 577 - Human Genetics	P		P	P	P	
BIOS 582 - Biology of Forensic Analysis	P		P	P	P	
BIOS 587 - Conservation Genetics	P		P	P	P	
BIOS 588 - Applied Microbial Biotechnology	P		P	P	P	
BIOS 589 - Madagascar Field Biology	P		P	P	P	
BIOS 605 - Institute for Science Teachers in Biology	P	P	P	P	P	P
BIOS 610 - Food and Industrial Microbiology	P		P	P	P	
BIOS 619 - Microbial Systematics and Diversity	P		P	P	P	
BIOS 623 - Graduate Teaching and Research Orientation	P	P		P		

Course	Program Student Learning Outcomes					
	Principles/ problem solving	Communication	Lab/field Research skills	Critical thinking	Scientific methods	Technical writing
BIOS 626 - Methods of Teaching Human Anatomy	P		P	P	P	
BIOS 627X - Neuroanatomical Bases of Behavior	P		P	P	P	
BIOS 628X - Neuroanatomical Bases of Behavior: Laboratory	P		P	P	P	P
BIOS 629 - Human Embryology	P		P	P	P	
BIOS 630X - Neurochemical Bases of Behavior	P		P	P	P	
BIOS 632 - Radiation Biology	P		P	P	P	
BIOS 638 - Molecular Genetics of Prokaryotes	P		P	P	P	
BIOS 640 - Advanced Immunology	P		P	P	P	
BIOS 641 - Practical Bioinformatics for Biologists	P		P	P	P	

Course	Program Student Learning Outcomes					
	Principles/ problem solving	Communication	Lab/field Research skills	Critical thinking	Scientific methods	Technical writing
BIOS 643 - Bioinformatics	P		P	P	P	
BIOS 646 - Programming for Bioinformatics	P		P	P	P	
BIOS 670 - Biostatistical Analysis	P		P	P	P	
BIOS 684 - The Process and Practices of Science	P		P	P	P	
BIOS 690 - Topics in Molecular and Cellular Control Mechanisms	P		P	P	P	
BIOS 699 - Master's Thesis	P	P	P	P	P	P
BIOS 700 - Special Topics in Biology	P	P	P	P	P	P
BIOS 761 - Seminar	P	P	P	P	P	P
BIOS 770 - Independent Study	P	P	P	P	P	P
BIOS 790 - Cooperative Education	P	P		P		

Note. Course supports the outcome at the B=beginning, D=developing, or P=proficient level.

5. Assessment Methods

Method	**Description**	**Target**	**Timeline**	**Person Responsible**	**SLO Assessed**
Final comprehensive examination	All MS students in their final semester of the program must take a comprehensive oral examination administered by their advisor committee. (For MS-thesis students, this follows the thesis defense (see next)) Exams typically are 60-90 minutes in length. Student performance is discussed, evaluated and recorded.	80% of M.S. students initially admitted to the program are expected to successfully pass this oral exam.	Final Semester of the students' MS program	MS Advisory Committee (Graduate faculty members)	1, 2,4,5
Written Research Thesis	MS-thesis students must write and defend a thesis that reviews current literature, describes an experimental problem, details methods of investigation of that problem, and summarizes the student's experimental results. The defense consists of a *public seminar* followed by a	Over 80% of M.S.-thesis students initially admitted to the program, are expected to successfully complete a coherent research project resulting in an important contribution to their field of	Final Semester of the students' MS program	MS Advisory Committee (Graduate faculty members)	1,2,3,4,5, 6

	private defense to the advisory committee, and submission of an approved thesis to the graduate school.	knowledge, and to present the results of that research to the public, the department, and the graduate school in the form of a successfully defended Master's thesis.			
Committee Meetings	This is a tool of *formative* assessment. MS-thesis students meet with their advisory committees during their first year, and again in the second year in the program and present their project and proposed plan of research. The committee asks questions, provides feedback and constructive criticism and frames the expectations for the student's final thesis content.	At least 80% of the students initially enrolled in the program will go on to produce a successful thesis project.	Every 6-9 months	MS Advisory Committee (Graduate faculty members)	1,2,3,4,5, 6
Graduate Seminar (BIOS 761)	All MS students are required to take 2 semesters of Graduate Seminar, in which they read, analyze and present (in seminar format) research papers from the primary literature to an audience of peers and a faculty	At least 80% of MS students will successfully complete 2 semesters of Graduate Seminar	Graduate seminar sections are offered every fall and spring semester.	BIOS Graduate Faculty	1,2,4,5

	member, who assesses their performance in this exercise. This course is designed to develop students' analytical and presentation skills.				