SCIENCE EDUCATION
LIFE SCIENCE (BIOLOGY) CONCENTRATION

Grade Levels 5-12
REPA 3

NOT VALID WITHOUT OFFICIAL TRANSCRIPT EVALUATION

CONTENT			**Semester Hours**
BIOL	12100	Biology I: Diversity, Ecology, & Behavior	2
BIOL	13100	Biology II: Development, Structure, & Function of Organisms	3
BIOL	23100	Biology III: Cell Structure & Function	3
BIOL	23200	Laboratory in Biology III: Cell Structure and Function	2
BIOL	24100	Biology IV: Genetics and Molecular Biology	3
BIOL	24200	Laboratory in Biology IV: Genetics and Molecular Biology	2
BIOL	28600	Introduction to Ecology and Evolution	2
STAT	50300	Statistical Methods for Biology	3
CHM	12901	General Chemistry with a Biological Focus	5
One of the following:			2
BIOL	13500	First Year Biology Laboratory (2)	
BIOL	14501	First Year Biology Laboratory with Neuro Research Project (2)	
BIOL	19500	Year 1 Bio Lab: Disease Ecology (2)	
BIOL	19500	Year 1 Bio Lab: Phages to Folds (2)	
IT	22600	Biotechnology Laboratory I (2)	
Biology Selectives:			10
Elect ten (10) hours of upper division biology courses			

Choose <u>one</u> Intermediate Biology Selective, choose <u>at least one</u> Group A Selective, <u>at least one</u> Group B Selective, satisfy the Base Laboratory requirement, and <u>at least one</u> 50000-level course from Group A Selectives or Group B Selectives. Overlap (Intermediate Selective, A, B, 500, Lab) is allowed, but 10 credits must still be earned.

Research (49400 or 49900 - maximum of 2 credits), BIOL 36701 Principles of Development Lab, and BIOL 44100 Senior Seminar in Genetics, will count toward the 10 credit requirement, but will not satisfy the Group A, Group B, or laboratory requirement.

One of the following Intermediate Biology Selectives:

BIOL	32800	Principles of Physiology[1, 2] (4)
BIOL	39500	Macromolecules[3] (3)
BIOL	41500	Introduction to Molecular Biology[3] (3)
BIOL	41600	Viruses & Viral Disease[3] (3)
BIOL	42000	Eukaryotic Cell Biology[3] (3)
BIOL	43600	Neurobiology[3] (3)
BIOL	43800	General Microbiology[2, 3] (3)
		OR
BIOL	36700	Principles of Development[2, 3] (2) **AND**
BIOL	36701	Principles of Development Lab[3] (1)

At least one of the following Group A Selectives (continued on page 2):

BCHM	56100	General Biochemistry I (3)
BCHM	56200	General Biochemistry II (3)
BIOL	39500	Macromolecules[3] (3)
BIOL	41500	Introduction to Molecular Biology[3] (3)
BIOL	41600	Viruses & Viral Disease[3] (3)

(Life Science/Biology continued)

Group A Selectives (Continued from page 1):

BIOL	42000	Eukaryotic Cell Biology[3] (3)
BIOL	43600	Neurobiology[3] (3)
BIOL	43800	General Microbiology[2, 3] (3)
BIOL	43900	Laboratory in General Microbiology[2, 4] (2)
BIOL	44400	Human Genetics[2] (3)
BIOL	44600	Molecular Bacterial Pathogenesis (3)
BIOL	47800	Introduction to Bioinformatics[5] (3)
BIOL	48100	Eukaryotic Genetics (3)
BIOL	51100	Introduction to X-Ray Crystallography (3)
BIOL	51600	Molecular Biology of Cancer (3)
BIOL	51700	Molecular Biology: Proteins (2)
BIOL	52900	Bacterial Physiology (3)
BIOL	53300	Medical Microbiology (3)
BIOL	53601	Biological and Structural Aspects of Drug Design and Action (3)
BIOL	53800	Molecular, Cellular, and Developmental Neurobiology (3)
BIOL	54100	Molecular Genetics of Bacteria (3)
BIOL	54900	Microbial Ecology (2)
BIOL	55001	Eukaryotic Molecular Biology (3)
BIOL	56200	Neural Systems[5] (3)
BIOL	56310	Protein Bioinformatics (3)
BIOL	59500	Cellular Biology of Plants (3)
BIOL	59500	Epigenetics in Human Disease (3)
BIOL	59500	Genetics & Omics of Host-Microbe Interaction (3)
BIOL	59500	Methods and Measurements in Physical Biochemistry (3)
BIOL	59500	Neural Mechanisms in Health & Disease (3)
BIOL	59500	Neurobiology of Learning and Memory (3)
BIOL	59500	Practical Biocomputing (3)
BIOL	59500	Theory of Molecular Methods[4] (3)
CHM	33900	Biochemistry: A Molecular Approach (3)
CHM	53300	Introductory Biochemistry (3)

At least one of the following Group B Selectives:

BIOL	30200	Human Design: Anatomy and Physiology (3)
BIOL	32800	Principles of Physiology[1, 2] (4)
BIOL	36700	Principles of Development[1, 2] (2)
BIOL	43200	Reproductive Physiology (3)
BIOL	48300	Great Issues – Environmental & Conservation Biology (3)
BIOL	53700	Immunobiology (3)
BIOL	55900	Endocrinology (3)
BIOL	58000	Evolution (3)
BIOL	58210	Ecological Statistics (3)
BIOL	58705	Animal Communication (3)
BIOL	59100	Field Ecology (4)
BIOL	59200	The Evolution of Behavior (3)
BIOL	59500	Disease Ecology (3)
BIOL	59500	Ecology[2] (3)
BIOL	59500	Sensory Ecology (3)
HORT	30100	Plant Physiology[2] (4)

(Life Science/Biology continued)

Lab Requirement:
Each student will satisfy each of the following three learning objectives:
Objective 1 – Research planning, literature review, and writing
Objective 2 – Observation, experimentation
Objective 3 – Analysis, simulation, and presentation

Objectives may be met by taking courses according to the following chart:

Courses	Title	Objective 1	Objective 2	Objective 3
BIOL 43900	Laboratory in General Microbiology[4]	X	X	X
BIOL 44201	Introductory Module: Protein Expression		X	X
BIOL 44202	Animal Physiology		X	X
BIOL 44205	Introduction to LabVIEW		X	X
BIOL 44207	Exploration of Protein Structure		X	
BIOL 44211	Laboratory in Anatomy & Physiology		X	
BIOL 44212	Microscopy and Cell Biology		X	X
BIOL 44215	Multidisciplinary Design of Systems and Devices for Physiology Measurements	X		X
BIOL 54200	Neurophysiology		X	X
BIOL 58210	Ecological Statistics[7]	X		X
BIOL 59100	Field Ecology[7]	X	X	X
BIOL 59500	CryoEM 3D Reconstruction		X	X
BIOL 59500	Data Analysis in Neurosci			X
BIOL 59500	Theory of Molecular Methods[4]	X		X
BIOL 59500	Neural Mech in Hlth Disease[4]	X		X

If undergraduate research is used to meet the lab requirement, only three credits may count toward the 10-credit requirement.

Students who successfully complete a Biology Honors Research Thesis have successfully met all three objectives.

Undergraduate Research may be used to meet these objectives. Student must get Research Mentor approval for each objective after that objective is completed. Student must also earn at least four credits of BIOL 49400 or 49900 research.

Consult with your academic advisor for the forms used to obtain Research Mentor for each objective.

A combination of courses and research may be used to meet this requirement.

[1] This may count for the Intermediate Biology Selective and as a Group B course and as the CoS Teambuilding & Collaboration requirement.
[2] These courses are recommended for teaching majors.
[3] Courses chosen for the Intermediate Requirement may satisfy part of the 10 credit requirement.
[4] This course may count for a Group A course and for the Base Lab requirement. You must still complete 10 total credits of biology selectives.
[5] This course may count for a Group A course and as the College of Science Multidisciplinary requirement.
[6] This course may count for a Group B course and as the College of Science Great Issues requirement.
[7] This course may count for a Group B course and toward the Biology Lab Selective. However, you must still complete 10 total credits of biology selectives.

(Life Science/Biology continued)

Semester Hours

One of the following: 4

CHM 25500 Organic Chemistry (3) **AND**
CHM 25501 Organic Chemistry Laboratory (1)
OR
CHM 26505 Organic Chemistry (3) **AND**
CHM 26300 Organic Chemistry Laboratory (1)

One of the following: 4

CHM 25600 Organic Chemistry (3) **AND**
CHM 25601 Organic Chemistry Laboratory (1)
OR
CHM 26605 Organic Chemistry (3) **AND**
CHM 26400 Organic Chemistry Laboratory (1)

One of the following: 3-4

CS 15800 C Programming (3)
CS 17700 Programming with Multimedia Objects (4)

One of the following: 3-5

MA 16010 Applied Calculus I (3)
MA 16100 Plane Analytic Geometry and Calculus I (5)
MA 16500 Analytic Geometry and Calculus I (4)

One of the following: 3-5

MA 16020 Applied Calculus II (3)
MA 16200 Plane Analytic Geometry and Calculus II (5)
MA 16600 Analytic Geometry and Calculus II (4)

One of the following:

PHYS 17200 Modern Mechanics (4) 4
PHYS 23300 Physics for Life Sciences I (4)

One of the following:

PHYS 23400 Physics for Life Sciences II (4) **OR** 4
PHYS 27200 Electric and Magnetic Interactions (4)
OR
PHYS 24100 Electricity and Optics (3) **AND**
PHYS 25200 Electricity and Optics Laboratory (1)

Total Content 62-67

PROFESSIONAL EDUCATION

Foundational Courses

EDCI 20500 Exploring Teaching as a Career 3
EDCI 27000 Introduction to Education Technology and Computing 3
EDCI 28500 Multiculturalism and Education 3
EDPS 23500 Learning and Motivation 3
EDPS 26500 The Inclusive Classroom 3
EDST 20010 Educational Policies and Laws 1
EDPS 32700 Classroom Assessment 1
EDPS 43010 Secondary Creating and Managing Learning Environments 1

(Life Science/Biology continued)

			Semester Hours
Methods Courses			
EDCI	30900	Reading in Middle and Secondary Schools: Methods and Problems	3
EDCI	42100	The Teaching of Biology in Secondary Schools	3
EDCI	49800	Supervised Teaching (10 weeks)	10
One of the following:			2-3
EDCI	42800	Teaching Science in the Middle and Junior High School (2)	
EDCI	55800	Integrated Science, Technology, Engineering and Mathematics (STEM) Education Methods-Secondary (3)	_____

Total Professional Education 36-37