

PROPOSED

M.Ed. Biology Curriculum

The following courses will be required of students enrolling in the M.Ed. Program in Biology:

- Biology 605 Microbiology for Educators, [Syllabus](#)
- Biology 606 Genetics for Educators, [Syllabus](#)
- Biology 607 Ecology and Environmental Science for Educators, [Syllabus](#)
- Biology 608 Animal Biology for Educators, [Syllabus](#)
- Biology 609 Cell and Molecular Biology for Educators, [Syllabus](#)
- Biology 610 Plant Biology for Educators, [Syllabus](#)
- Education 600 Contemporary Issues in Education
- Education 602 Human Growth and Development
- Education 604 Educational Assessment and Evaluation
- Education 732 Foundations of Education
- MSA 725 Thesis Seminar I
- MSA 726 Thesis Seminar II

Total credits = 36

For students who enter the program without certification, the following courses are required:

- Education 605 Content Reading in the Middle and Secondary School
- Education 401 or 403 Student Teaching
- Math Classes - For certification, students must have taken two college-level math classes

For the M.Ed. and certification, the student must have a cumulative GPA of 3.0 with no individual grade less than C.

Biology 605 - Microbiology for Educators

Description: Microbiology is the study of microorganisms. Students in this course will develop a basic understanding of the morphology and physiology of bacteria, fungi, viruses and other microorganisms. Their roles in ecosystems and their relationships with other organisms will be covered.

Laboratory exercises suitable for the secondary classroom will be demonstrated.

Text: Microbiology (An Introduction) 7th Edition. G.D. Tortora, B.R. Funke and C.L. Case; 2000. Benjamin Cummings, Pub.

Attendance: Attendance will be taken each class day starting with the first class. If you are absent more than once, you may receive a failing grade for the course.

Grading: Your grade will be determined based on the following:

- Examinations 50%
- Research Paper 30%
- Oral Presentations 20%

The highest grade that you can earn in this course is A+ which requires that you excel in all components of the course. The lowest grade is F.

Academic Integrity: In November, 1995, the faculty approved a University Statement on Academic Integrity. For acts of academic dishonesty (cheating or plagiarism), there are three possible sanctions; these include a written warning, failure for the project (exam or paper), and failure for the course. The written warning becomes part of your file in the Registrar's office and, if there are no subsequent incidents of academic dishonesty, the letter will be removed at the time of graduation. For this course, the first instance of academic dishonesty will result in a failure for the project; a second instance will result in an "F" grade for the course.

Course Objectives: After the successful completion of this course, you will have a good understanding of the following:

1. The methods used to culture microorganisms and the microscopic techniques used to visualize them
2. The diversity and taxonomy of microorganisms
3. Basic metabolic processes carried out by these organisms
4. Microbial genetics
5. Viruses, their structure and mechanisms of infection
6. Methods of sterilization and disinfection
7. Host-Microbe relationships
8. Environmental microbiology

Course Schedule

Topic:	Week:
1	History of Microbiology
2	Methods of Microbiology
3	Prokaryotic vs eukaryotic cells; Metabolism of microorganisms
4	Genetics of microorganisms; Exam #1
5	Recombinant DNA technology and genomics
6	The growth of microorganisms
7	Classification of microorganisms
8	Lab demonstration; Exam #2
9	Viruses
10	Microorganisms and human health
11	Microorganisms and human disease
12	Immune system; Exam #3
13	Microorganisms and the environment
14	Microbial biotechnology
15	Final Examination

Bio 606 - Genetics for Educators

Description: This course covers both Mendelian and non-Mendelian inheritance. Emphasis is placed on understanding inheritance at both the organismal and molecular levels. Special attention will be paid to introducing exercises that can be done in the secondary classroom.

Text: Genetics from Genes to Genomes by Leland H. Hartwell, et al. 2nd Edition, 2004, McGraw Hill Publishers.

Attendance: Attendance will be taken each class day starting with the first class. If you are absent more than once, you

may receive a failing grade for the course.

Grading: Your grade will be determined based on the following:

- Examinations 50%
- Research Paper 30%
- Oral Presentations 20%

The highest grade that you can earn in this course is A+ which requires that you excel in all components of the course. The lowest grade is F.

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Course Objectives: After the successful completion of this course, you will have a good understanding of the following:

1. the basic concepts of genetics
2. how to do genetic crosses involving Mendelian and non-Mendelian inheritance
3. how to map chromosomes
4. the structure of the gene
5. the processes of transcription and translation
6. the structure and regulation of the eukaryotic genome
7. the structure and regulation of the prokaryotic genome
8. the current methods of genetics research
9. the process of DNA replication
10. the basics of population genetics
11. evolution at the molecular level

You will also have experience with the following:

1. laboratory experiments suitable for high school use that illustrate the principles listed above
2. computer simulations of genetic crosses and population

genetics

3. genetics websites

Course Schedule

Week:	Topic:
1	introduction; biological information; Mendelian inheritance
2	extensions of Mendelian inheritance; chromosome structure
3	mitosis and meiosis; gametogenesis
4	linkage, recombination and chromosome mapping; Exam #1
5	DNA, how it carries and replicates and recombines information
6	anatomy and function of a gene
7	gene expression; information from DNA to RNA to protein
8	deconstructing the genome; Exam #2
9	the human genome
10	the eukaryotic chromosome
11	the prokaryotic chromosome
12	gene regulation in eukaryotes; Exam #3
13	gene regulation in prokaryotes
14	population genetics
15	Final Examination

Bio 607 - Environmental Science and Ecology for Educators

Description: This course explores the relationships of humans and other life forms with their environment. Topics covered include: community and ecosystem structure, population dynamics, biodiversity, energy transformations, nutrient cycles and environmental degradation. Experiments

that can be done at the secondary education level will be demonstrated.

Text: Environmental Science A Global Concern by Cunningham, Cunningham and Saigo, 7th edition (required).

Attendance: Attendance will be taken each class day starting with the first class. If you are absent more than once, you may receive a failing grade for the course.

Grading: Your grade will be determined based on the following:

- Examinations 50%
- Research Paper 30%
- Oral Presentations 20%

The highest grade that you can earn in this course is A+ which requires that you excel in all components of the course. The lowest grade is F.

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Course Objectives: After successful completion of this course, you will have a good understanding of the following:

1. the basic concepts of ecology and their application to environmental science
2. the basic structure and function of the major biomes
3. the history of human population growth
4. population dynamics
5. agriculture and its associated environmental problems
6. air, weather and climate
7. air pollution
8. water use and management
9. water pollution

10. solid, toxic and hazardous waste
11. energy sources and use
12. conservation/preservation of biodiversity and natural resources

You will also have experience with the following:

1. laboratory experiments suitable for high school use that illustrate the principles listed above
2. computer simulations of environmental and ecological phenomena
3. environmental and ecological websites
4. appropriate field trips

Course Schedule

Week:	Topic:
1	introduction; ecological concepts: ecosystem structure, matter cycling and energy flow; food chains and food webs
2	distribution of organisms; tolerance limits; toxicity; species interactions
3	terrestrial and aquatic biomes
4	population dynamics; human population issues; Exam #1
5	food and agriculture; pest control
6	air, weather and climate; global warming
7	air pollution; acid deposition; ozone depletion
8	water use and management; Exam #2
9	water pollution
10	conventional and sustainable energy
11	solid, toxic and hazardous waste
12	urbanization and sustainable cities; Exam #3
13	environmental health and toxicology

14	environmental ethics and environmental justice
15	Final Examination

Biology 608 - Animal Biology for Educators

Description: This is a survey course of all aspects of zoology. The course will include evolution and ecology of animals, taxonomy, anatomy and physiology of animals, and animal behavior. Laboratory demonstrations pertinent to animal biology and suitable for high school students will be included in the course.

Text: Integrated Principles of Zoology, 12th Edition by Cleveland Hickman, Jr., Larry S. Roberts, Allan Larson, and Helen I'Anson

Attendance: Attendance will be taken each class day starting with the first class. If you are absent more than once, you may receive a failing grade for the course. Grading: Your grade will be determined based on the following: Examinations 50% Research Paper 30% Oral Presentations 20% The highest grade that you can earn in this course is A+ which requires that you excel in all components of the course. The lowest grade is F.

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After successful completion of this course, you will have a good understanding of the following:

1. Physiological processes occur to maintain homeostasis.
2. Structure and function are complementary.
3. A tightly regulated volume of body fluids is necessary for

proper functioning of all systems.

4. Transportation is vital for proper cell and organ function.

5. Pressure gradients are involved in all physiological processes

6. Physiological processes are designed to conserve energy.

7. Biochemical processes and developmental patterns are similar in all animals and reflect their evolutionary history.

Course Schedule

Week:	Topic:
1	Introduction and Animal Classification
2	Animal Evolution and Development
3	Animal Structure and Architecture
4	Support and Protection; Exam #1
5	Movement
6	Nervous Coordination
7	Nervous System and Sense Organs
8	Lab Demonstrations; Exam #2
9	Homeostasis
10	Chemical Coordination: Endocrine System
11	Lab Demonstrations
12	Internal Fluids and Respiration; Exam #3
13	Digestion and Nutrition
14	Lab Demonstrations
15	Final Examination

Biology 609 - Cell and Molecular Biology for Educators

Description: This course covers all aspects of cellular and subcellular morphology and physiology. Emphasis is placed on organelle structure and function, metabolic pathways, regulation and cellular reproduction. The laboratory demonstration portion of the course emphasizes modern

techniques of examining cell structure and function, and how these techniques can be implemented in the secondary classroom.

Text: Cell and Molecular Biology Concepts and Experiments, Third Edition by Gerald Karp, 2002, John Wiley & Sons

Attendance: Attendance will be taken each class day starting with the first class. If you are absent more than once, you may receive a failing grade for the course.

Grading: Your grade will be determined based on the following:

- Examinations 50%
- Research Paper 30%
- Oral Presentations 20%

The highest grade that you can earn in this course is A+ which requires that you excel in all components of the course. The lowest grade is F.

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Course Objectives: After successful completion of this course, you will have a good understanding of the following:

1. the cell and its organelles from an anatomical and ultrastructural perspective (plant and animal)
2. cellular chemistry and the interactions of carbohydrates, fats, proteins, vitamins and minerals
3. protein metabolism with relationship to RNA and DNA
4. biotechnology and its relationship to gene manipulation
5. computer search networks and data acquisition from scientific data banks

Course Schedule

Week:	Topic:
1	Introduction to the study of cell biology; The chemical basis of life
2	Bioenergetics, enzymes and metabolism
3	Structure and function of the plasma membrane
4	Aerobic respiration; Exam #1
5	Photosynthesis and the chloroplast
6	Cytoplasmic membrane systems
7	Cytoskeleton and cell motility
8	Lab demonstrations; Exam #2
9	The gene and the genome
10	Transcription and translation
11	Control of gene expression
12	DNA replication and repair; Exam #3
13	Cellular reproduction
14	Cell signaling
15	Final Examination

Biology 610 - Plant Biology for Educators

Description: The concepts in Plant Biology will revolve around an understanding of plant structure and function. This course also will include topics of plant ecology and plant diversity and the environment. Laboratory assignments will emphasize the relevance of plant biology experiments for high school students.

Text: Plant Biology, 2003 by Linda E. Graham, Jim M. Graham, and Lee W. Wilcox. Attendance: Attendance will be taken each class day starting with the first class. If you are absent more than once, you may receive a failing grade for

the course.

Grading: Your grade will be determined based on the following:

- Examinations 50%
- Research Paper 30%
- Oral Presentations 20%

The highest grade that you can earn in this course is A+ which requires that you excel in all components of the course. The lowest grade is F.

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Course Objectives: After successful completion of this course, you will have a good understanding of the following:

1. Basic structure and function of the plant cell
2. Photosynthesis
3. Structure and function of stems, roots and leaves
4. Reproductive mechanisms of plants
5. Evolution and classification of plants
6. Ecological relationships of plants with their environments

Course Schedule

Week:	Topic:
1	Introduction to plant biology; naming and organizing plants
2	Metabolism: photosynthesis and respiration
3	Cell division - mitosis and cytokinesis

4	Plant structure and growth; Exam #1
5	Life cycles and reproduction
6	Structure and growth of roots and stems
7	Structure and function of leaves
8	Algae, mosses and liverworts; Exam #2
9	Ferns and primitive vascular plants
10	Conifers
11	Morphology of flowering plants
12	Flowering plants: fruits and seeds; Exam #3
13	Flowering plants and animal coevolution
14	Plant diversity and the environment
15	Final Examination