The Department of Biology offers the Master of Science and the Master of Science in Teaching as well as a minor at the graduate level. Normally, the required test score for admission to either program is 30 on the Miller Analogies Test or a satisfactory Graduate Record Examination score.

Requirements for the Master of Science
Candidate must
1. have an undergraduate minor in biology or its equivalent at time of admission;
2. complete a minimum of 30 semester hours including a thesis of 3 semester hours with no more than 30 percent of the total degree hours dually listed as undergraduate/graduate hours;
3. complete 6 semester hours of a foreign language or pass a language examination or complete one year of approved research tools in addition to the 30 hours;
4. pursue a major of at least 16 semester hours which includes
   - BIOL 6620 Biological Research
   - BIOL 6630 Biological Literature*
   - BIOL 6640 Thesis Research
   - BIOL 6650,6660 Seminar

   Remaining courses will include approved courses in biology, chemistry, mathematics, physics, or other related disciplines.

   The appropriate education courses are determined by the State of Tennessee’s most current licensing requirements. All M.S.T. candidates, whether licensed or seeking initial licensing, must contact the chair of the Department of Educational Leadership for number of hours and education courses necessary to complete the degree.
5. file a Candidacy Form with the Graduate Office prior to the completion of 24 credit hours;
6. successfully complete a written comprehensive examination (may be taken no more than twice).

*Students who completed BIOL 3230 or equivalent should consult with department chair.

Requirements for the Master of Science in Teaching
The Master of Science in Teaching degree should be pursued by those individuals interested in teaching at the secondary level. Candidates seeking initial licensure must meet the major requirements listed below, satisfy a professional education component, and meet discipline-related requirements. The candidate should contact the chair of the Department of Educational Leadership for the professional education component and the chair of the Department of Biology for the discipline-related requirements.

Courses in Biology [BIOL]

5010 (501) Embryology. Four credits. Prerequisites: BIOL 1110 and 1120. Early development of the frog, chick, pig, and human. Living material, whole mounts, and serial sections used for the study of cleavage, germ layer formation, histogenesis, and organogenesis. Three lectures and one three-hour laboratory.

5020 (502) Comparative Anatomy of the Vertebrates. Four credits. Prerequisites: BIOL 1110 and 1120. Vertebrate morphology and the development and function of systems and organs. Three lectures and one three-hour laboratory.

5030 (503) Non-Flowering Plants. Four credits. Prerequisites: BIOL 1110 and 1120. Structure, physiology, methods of reproduction, and classification of the algae, fungi, liverworts, mosses, and ferns. Three lectures and one three-hour laboratory.

5040 (504) General Entomology. Three credits. Prerequisites: BIOL 1110 and 1120. Structure, classification, evolution, importance, and life history of insects. Two lectures and one three-hour laboratory.

5050 (505) Parasitology. Three credits. Prerequisites: BIOL 1110 and 1120. Life histories, host-parasite relationships, and control measures of the more common parasites of humans and domesticated animals. Two lectures and one three-hour laboratory.
5100 (510) History and Philosophy of Biology. Three credits. Prerequisites: BIOL 1110 and 1120. Development of biology; the philosophy, ideas, and contributions of outstanding biologists. Two lectures.

5120 (512) Flowering Plants. Four credits. Prerequisites: BIOL 1110 and 1120. Structure and classification of seed plants and a survey of local flora. Three lectures and one three-hour laboratory.

5130 (513) Histology. Four credits. Prerequisites: BIOL 1110, 1120, 2120, and CHEM 1110 and 1120. Microscopic anatomy of vertebrate cells, tissues, and organs. Three lectures and one three-hour laboratory.

5140 (514) Invertebrate Zoology. Four credits. Prerequisites: BIOL 1110 and 1120. Structure, functions, life histories, and economic importance of the invertebrate phyla. Laboratory work comprises detailed studies of representative specimens. Three lectures and one three-hour laboratory.

5170 (517) Endocrinology. Three credits. Prerequisites: BIOL 1110 and 1120, and CHEM 1110 and 1120. Structure, function, and integrative mechanisms of vertebrate endocrine organs, with additional attention to invertebrate hormones. Three lectures.

5180 (518) Vertebrate Zoology. Four credits. Prerequisites: BIOL 1110 and 1120. Structure, life history, and classification of fish, amphibians, reptiles, birds, and mammals. Local representatives emphasized. Three lectures and one three-hour laboratory.

5220 (522) Ichthyology. Four credits. Prerequisites: BIOL 1110 and 1120. The morphology, physiology, taxonomy, and ecology of fishes. Three lectures and one three-hour laboratory.

5240 (524) General Ecology. Four credits. Prerequisites: BIOL 1110 and 1120, and CHEM 1110 or consent of instructor. Basic concepts of the ecosystem and community, aquatic and terrestrial habitats, and population ecology; complemented by field and laboratory activities. Three lectures and one three-hour laboratory per week.

5250 (525) Limnology. Four credits. Prerequisites: BIOL 1110, 1120, 4240, and CHEM 1110. Biological, chemical, and physical aspects of lakes and streams. Not open to students who have had Aquatic Ecology. Three lectures and one three-hour laboratory.

5260 (526) Nature Study. Three credits. Prerequisites: BIOL 1110 and 1120. Identification of local plants and animals and a consideration of the ecological principles governing them. Two lectures and one two-hour laboratory.

5320 (532) Seminar: Advancements in Biology. Two credits. A broad overview of biological principles and recent research developments. Two lectures.

5331 (533 A-Z) Biome Analysis. One to four credits. Prerequisite: Permission of department. An intensive classroom and on-site study of a specific biome with special emphasis on data collection and analysis. Consult department head for specific credits and costs.

5333 (533A) Biome Analysis - Cedar Glade
5332 (533B,D,E) Biome Analysis
5333 (533C) Biome Analysis - Desert

5390 (539) Ethology. Four credits. Prerequisite: BIOL 1110. Innate and learned animal behavior in primitive and advanced animals including behavior associated with space, reproduction, and food getting. Three lectures and one three-hour laboratory.

5460 (546) Human Genetics. Three credits. Prerequisite: BIOL 2120. Application of the fundamental laws of inheritance to humans. Two lectures and one two-hour laboratory.

5500 (550) Plant Physiology. Four credits. Prerequisites: BIOL 1110, 1120, 2120, and CHEM 2030 or 3010. Plant growth; development and metabolism at the cellular and whole plant levels. Three lectures and one three-hour laboratory.

5510 (551) Food/Industrial Microbiology. Four credits. Prerequisite: BIOL 2230. The interaction between microorganisms and food and industrial processes of importance to humans. Two lectures and two two-hour laboratory periods.

5520 (552) Plant Anatomy. Four credits. Prerequisite: BIOL 1120. Plant cells, tissues, and organs. Emphasis on the survival value of the plant’s various structural features. Three lectures and one three-hour laboratory.

5540 (554 A-Z) Topics in Environmental Education. One to four credits. Prerequisite: Junior standing or above. An intensive classroom and field study of natural science and resources in Tennessee. Special emphasis on data collection, analysis, and problem solving. Target groups are graduate students and upper-division undergraduates in the areas of biology and education. Consult the department chair for specific credits and costs. This course will not apply to the biology major or minor.

5550 (555) Biotechnology. Three credits. Prerequisites: BIOL 1110, 1120, 2230, and senior/graduate level. Introduction in both theory and application of current research methodologies in biology and molecular biology. Topics included immunochrometry, polymerase chain reaction, restriction enzyme analysis, and electrophoresis. One two-hour block and one three-hour block which includes both lecture and laboratory.

5560 (556) Neurobiology. Four credits. Prerequisites: BIOL 1110 and 1120, and PSY 4030 or 4240. Introduces comparative neurobiology. Topics include the basic structure and function of the nerve cell and organization of nervous systems of representative species of invertebrate and vertebrate animals. Three hours lecture and one three-hour laboratory.

5570 (557) Principles of Toxicology. Three credits. Prerequisites: BIOL 1110 and 1120, and CHEM 1110, 1120, 3010. Adverse effects of chemical agents on living organisms; current toxicological techniques in laboratory portion of course. Two hours lecture and one three-hour laboratory.

5580 (558) Marine Biology. Four credits. Prerequisites: BIOL 1110 and 1120, and CHEM 1110 and 1120. Biological, chemical, and physical characteristics of major marine environments and their associated flora and fauna. Three lectures and one three-hour laboratory.

6060 (606) Advanced Dendrology. Three credits. Prerequisite: BIOL 1120. Woody plants with special emphasis on classification, identification, and literature of important timber trees of North America. Two lectures and one three-hour laboratory.

6070 (607) Plants and Man. Three credits. Prerequisite: BIOL 1120. Human dependence on plants emphasized. Topics include origin of agriculture, fruits and nuts, grains and legumes, vegetables, spices and herbs, oils and waxes, medicinal plants, psychoactive plants, beverages, fibers and dyes, tannins, wood and ornamental plants. Three lectures.
6080 (608) Advanced Mycology. Four credits. Prerequisites: Graduate standing plus BIOL 1120. Fungi, with emphasis on taxonomy, morphology, culture, and importance to humans. Three lectures and one three-hour laboratory.

6120 (612) Aquatic Ecology. Three credits. Physical, chemical, and biotic conditions of freshwater lakes and streams and of population structure and dynamics in these environments. Not open to students who have had Limnology. Two lectures and one three-hour laboratory.

6130 (613) Ornithology. Three credits. Structure, taxonomy, natural history, and identification of birds. Emphasizes field work. Two lectures and one three-hour laboratory.

6180 (618) Mammalogy. Three credits. Morphology, physiology, systematics, and the development of mammals. Two lectures and one three-hour laboratory.

6200 (620) Speciation. Three credits. Prerequisite: BIOL 2120. Mutation, natural selection, adaptation, isolating mechanisms, genetic drift, hybridization, ploidy in the process of species formation, and a history of the development and ideas of evolution. Two lectures.

6210 (621) Protozoology. Three credits. Morphology, physiology, reproduction, ecology, taxonomy, and life cycles of the protozoa. Two lectures and one three-hour laboratory.

6220 (622) Herpetology. Three credits. Prerequisites: BIOL 1110, 1120, and 4240. Morphology, natural history, and identification of amphibians and reptiles. Local representatives emphasized. Two lectures and one three-hour laboratory.

6270 (627) Cell Metabolism. Three credits. Prerequisites: Organic chemistry and one course in physiology or biochemistry or permission of instructor. Metabolic pathways in cells including regulation and genetic aspects of metabolism.

6290 (629) Advanced Scanning Electron Microscopy. Four credits. Prerequisite: Permission of instructor. Application of scanning electron microscopy to study materials with emphasis on theory of scanning electron microscopy and preparation of biological specimens for microscopy. One lecture and six hours laboratory.

6300 (630) Principles of Physiology. Four credits. Prerequisites: BIOL 1110, 1120, 2120, and CHEM 1110 and 1120. Physical and chemical properties of protoplasm, cells, and organisms and their relationships to life processes. Three lectures and one three-hour laboratory.

6350 (635) Biostatistical Analysis. Four credits. Prerequisites: BIOL 1110, 1120, and 2120. Intermediate-level introduction to biostatistical procedures used in research. Three lectures and one three-hour laboratory.


6380 (638) Experimental Immunology. Four credits. Prerequisite: BIOL 2230. Mechanisms of immunity including the more recent developments in immunology. Three lectures and one two-hour laboratory.
6460 (646) Conservation Biology. Four credits. Prerequisite: BIOL 4240 or 5240. Measuring biodiversity: species, ecosystem, and genetic diversity. Topics include conservation ethics, extinctions, habitat degradation, exotic species, and management of populations and ecosystems. Meets six hours per week for lecture and laboratory.

6500 (650) Special Problems in Biology. Four credits. Prerequisite: Permission of department. Plan, implement, and interpret a research problem in some area of biology. Available topics limited to areas of graduate faculty interest and expertise.

6590 (659) Environmental Toxicology. Four credits. Prerequisites: BIOL 1110 and 1120, and CHEM 1110, 1120, and 3010. Ecological effects of chemicals in the environment and techniques currently utilized to assess these effects. Current environmental assessment techniques, including biomonitoring, will be covered in the laboratory. Three hours lecture and one three-hour laboratory.

6620 (662) Biological Research. Three credits. Prerequisite: Permission of department. Selection of a research problem, review of pertinent literature, and execution of the research.

6630 (663) Biological Literature. Three credits. Literature sources, forms of literature, bibliographic methods, scientific writing. Two lectures.

6640 (664) Thesis Research. One to six credits. Prerequisites or corequisites: BIOL 6620 and permission of department. Completion of the research problem begun in BIOL 6620; preparation of the thesis. Once enrolled, student should register for at least one credit hour of master's research each semester until completion. Minimum of three credits required for M.S. degree. S/U grading.

6650/6660 (665/666) Seminar. One credit each. Discussion of recent advances and problems in biology. Individual problems for oral and written reports.

6700 (670) Plant-Animal Interactions. Three credits. Prerequisite: Graduate standing. Evolutionary and ecological perspectives on how plants attract and repel symbionts and how those symbionts influence plant fitness. Topics include angiosperm evolution, the coevolution of plants with pollinators, herbivores, mycorrhizae, and N-fixing bacteria, and how plant secondary metabolites facilitate or mitigate these interactions. One two-hour block and one three-hour block include lecture and laboratory.

6710 (671) Biostatistical Analysis II. Three credits. Prerequisite: BIOL 4350 or 6350. Advanced-level applied, multivariate biological statistics. Three lectures per week.

**Field Station Affiliation**

MTSU is an affiliate of the Gulf Coast (Miss.) Research Laboratory. Certain courses in marine biology may be taken for graduate credit and transferred to MTSU. See department head for list of courses.