COURSE TITLE & NUMBER: Limnology: BIOL 2251  
CREDITS: 4 (3 Lec / 1 Lab)  
PREREQUISITES: BIOL 1520, CHEM 1610, or instructor’s consent  

CATALOG DESCRIPTION:  
Limnology is an investigation of lakes and streams as representative freshwater habitats. The emphasis is on biological factors and their interaction with the physical and chemical aspects of aquatic systems. Methods of sampling and analyzing water and aquatic organisms are used to explore these functional relationships.  

OUTLINE OF MAJOR CONTENT AREAS:  
1. Facets of limnology  
   A. Geology, physics, and math  
   B. Chemistry and biology  
   C. Historic overview  
   D. Water as a resource  
      1. Hydrology  
      2. Water cycle  
2. Lake perspectives  
   A. Lake regions  
   B. Lake types  
   C. Sediments  
      1. Organic matter & decomposition  
      2. Benthos  
3. Freshwater communities  
   A. The plankton community  
      1. Phytoplankton  
         a. Characteristics  
         b. Ecology  
      2. Zooplankton  
         a. Composition  
         b. Population dynamics  
         c. Interactions & production  
   B. The benthic community  
      1. Compared effects on productivity  
      2. Identification of organisms  
   C. The littoral community  
      1. Metabolism of attached organisms  
      2. Taxonomy of organisms  
   D. The detritus community  
      1. Organic matter and carbon  
      2. Survey of macroinvertebrates  
   E. The nekton community
1. Predation: factors and effects
2. Vertebrate species

4. The aquatic ecosystem
   A. Diversity
   B. Community succession
   C. Trophic organization
   D. Primary production
   E. Secondary production

5. Lake origins
   A. Glacial lakes
   B. Tectonic lakes
   C. Fluvial lakes
   D. Comparing shapes and sizes of lakes
   E. Lake basins
      1. Geomorphology
      2. Watershed (drainage)

6. Stream ecosystems
   A. The physics of streams
   B. Adaptations to moving water
   C. Processing detritus

7. Physical factors affecting aquatic systems
   A. Light
   B. Water density
   C. Heat and water movements
      1. Heat budgets
      2. Thermal characteristics

8. Chemical factors affecting aquatic systems
   A. Oxygen
   B. Carbon dioxide
      1. Distribution of inorganic carbon
      2. Relationship to lake metabolism
   C. Alkalinity and pH
   D. Ions, hardness, and conductivity
   E. Nutrients and organic substances
      1. Nitrogen dynamics
      2. Phosphorus cycling and loading

9. Human impact on freshwater systems
   A. Ponds, bogs, marshes, and swamps
   B. Pollution and exotics

10. Field and laboratory work
    A. The scientific approach to field studies
    B. Methods of sampling water and aquatic organisms
    C. Environmental measurements and statistical analysis
    D. Measuring productivity and community structure
        1. Past productivity: paleolimnology
        2. Peatland studies
COURSE GOALS/OBJECTIVES/OUTCOMES:
1. Students will explain the interplay between the biological, chemical, and physical aspects of lakes and streams.
2. Students will outline the relationship of diversity, succession, and trophic organization as applied to freshwater systems, including the roles of zooplankton, phytoplankton, predators, detritus, decomposition, and productivity rates.
3. Students will discuss the role of physical and chemical influences in freshwater ecosystems, such as drainage, hydrology, nutrient cycling, thermal characteristics, light penetrance, pH, carbon dioxide and oxygen balance, circulation, and sedimentation.
4. Students will apply the methods of observation, sampling, measuring, and statistical analysis to field and lab work in limnology, including water quality analysis and biological sampling.
5. Students will identify lake regions in Minnesota and correlate them to the sediments found in each.
6. Students will utilize morphometric data and sedimentary deposits to classify and examine past lake conditions, and predict future changes within a freshwater system.

MNTC GOALS AND COMPETENCIES MET:
Natural Sciences
People & the Environment

HCC CORE COMPETENCIES:
Working Productively and Cooperatively
Communicating Clearly and Effectively
Thinking Creatively and Critically

STUDENT CONTRIBUTIONS:
Students are expected to attend all lecture and laboratory sessions, participate in and contribute to class discussions, complete all assignments on time and request assistance when needed. Attendance is critical for the successful completion of this course.

STUDENT ASSESSMENT SHALL TAKE PLACE USING INSTRUMENTS SELECTED/DEVELOPED BY THE COURSE INSTRUCTOR.

ADDITIONAL INFORMATION: Field trips are required and involve moderate physical exertion. Transportation to field trip sites is provided by the college.

Clothing appropriate to the field situation should be worn.

Curriculum Approval Date: February 5, 2018

AASC APPROVAL DATE: February 21, 2018
REVIEW DATE: February 2023