

**SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE MARIE, ON**



COURSE OUTLINE

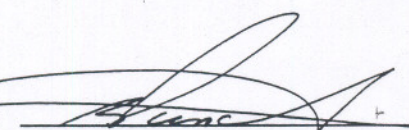
Course Title: AQUATIC BIOLOGY

Code No.: BIO125-4 Semester: ONE

**Programs: ENVIRONMENTAL ENGINEERING/
PULP & PAPER/WATER RESOURCES ENG.**

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Date: JUNE 1998 Previous Outline Date: JUNE 96

Approved:  JUNE 18/98
Dean, Natural Resources Date
Programs

Total Credits: 4

Length of Course: 3 HRS/WEEK x 16 WEEKS

Total Credit Hours: 48

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For additional information, please contact Brian Punch, Dean, Natural Resources
Programs, (705) 759-2554, Ext. 687.

AQUATIC BIOLOGY

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CODE NO.**I. COURSE DESCRIPTION:**

This course will introduce the student to the diversity of micro and macroscopic life around and in the aquatic environment. Students will learn to identify major species of microorganisms, plants and animals that are indicators of water quality (that are in) or important to aquatic habitats. Biological and microbiological procedures for examining organisms, their structures and adaptations will be emphasized in laboratory sessions.

II. LEARNING OUTCOMES:**A. Learning Outcomes and Elements of the Performance:**

Upon successful completion of this course, the student will demonstrate the ability to:

1. Discuss the role of riparian vegetation and identify common tree species found in the vicinity of water bodies.

Potential elements of the performance:

- Describe important adaptations achieved by plants in order to colonize land environments.
- List and describe the major groups of land plants.
- Explain the importance of riparian vegetation to aquatic organisms.
- Collect and present 20 species of trees and shrubs of eligible species.
- Identify on sight important tree species found in Central Ontario.

This learning outcome will constitute **10%** of the course's grade.

2. Describe characteristics of life, levels of organization of matter, the scientific method, classification and naming of organisms.

Potential elements of the performance:

- Describe and give examples of the characteristics exhibited by all living things.
- Describe and give examples of each level in the organization of matter up to the ecosystem.
- Demonstrate use of the scientific method for problem solving using an example.

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- Describe the system used in the classification of organisms.
- Using reference books, place example organisms into their appropriate taxonomic categories.
- Express the name of specific organisms using the binomial system of nomenclature.

This learning outcome will constitute 5% of the course's grade.

3. Describe the structure and function of plant and animal cells and use the compound microscope to draw prepared samples.

Potential elements of the performance:

- Distinguish between primitive and advanced cells.
- Describe the structure and function of important cell parts and organelles.
- Using the compound microscope, draw and label comparative diagrams of typical plant and animal cells.
- Describe the location and purpose of the important microscope parts.
- Prepare a wet mount.
- Using an ocular micrometer, determine scale of drawings taken from the microscope.

This learning outcome will constitute 5% of the course's grade.

4. Describe the structure and importance of viruses, and organisms belonging to Kingdom Monera.

Potential elements of the performance:

- Describe characteristics of viruses and give examples of diseases for which they are responsible.
- Describe the structure of bacteria and give examples of diseases caused by them and describe their other importances.
- Describe conditions required for the growth of bacterial groups.
- Draw and label bacterial cells representing the three different shapes.
- Describe the structure, ecological and industrial importances of blue-greens.
- Draw and label example blue-greens.

This learning outcome will constitute 7% of the course's grade.

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5. Describe the structure and importance of members of Kingdom Protista and describe characteristics of Fungi.

Potential elements of the performance:

- Describe the structure and give importance of algae-like protista.
- Draw and label members of the important groups.
- Describe the structure and give importance of animal-like protista.
- Describe the life cycle of a disease-causing protista.
- Describe and recognize members of the Kingdom Fungi.

This learning outcome will constitute 7% of the course's grade.

6. Describe the structure and importance of multi-celled algae in aquatic environments.

Potential elements of the performance:

- Describe the structure, cell patterns and importance of major groups of multi-celled algae.
- Explain the role of algae as an important component in the aquatic food chain.
- Draw and label selected multi-celled algae.

This learning outcome will constitute 7% of the course's grade.

THE FOLLOWING LEARNING OUTCOMES 7, 8 AND 9 ARE FOR ENVIRONMENTAL AND WATER RESOURCES STUDENTS ONLY. THE LEARNING OUTCOMES 7, 8 AND 9 FOR PULP & PAPER STUDENTS CAN BE FOUND ON PAGE 7 -

7. Recognize and identify from sight and describe the importance of aquatic plants.

Potential elements of the performance:

- Describe how aquatic plants are classified based on their growth form.
- Describe each of the stages and associated species in succession in aquatic and riparian habitats.
- Describe the importance of aquatic plants in aquatic habitats.
- Identify from sight the more common aquatic plants in Ontario.
- Describe the ecological importance of each species of aquatic plant.

This learning outcome will constitute 7% of the course's grade.

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8. Describe the features and importance of primitive invertebrates in freshwater environments.

Potential elements of the performance:

- Describe the major trends that have occurred in the evaluation of animal groups
- Describe the structure and importance of freshwater sponges.
- Describe the structure, typical life cycles and importance of flatworm groups including planarians, flukes and tapeworms.
- Describe the structure and importance of roundworms.
- Draw and label the important features of selected flatworms and roundworms.

This learning outcome will constitute 7% of the course's grade.

9. Describe specific examples of fish diseases caused by various animal organisms and describe the features and importance of molluscs and segmented worms in aquatic environments.

Potential elements of the performance:

- Give examples of fish diseases caused by the various groups of organisms and describe the symptoms of each.
- Describe the structure, feature and importance of segmented worms including the earthworm and leech.
- Describe the structure and importance of mollusc groups including slugs and snails and clams in aquatic environments.
- Dissect, draw and label major earthworm features.

This learning outcome will constitute 7% of the course's grade.

10. Describe the features and importance of arthropods, collect and identify major groups of invertebrates found in aquatic environments and utilize their presence as an indicator of water quality.

Potential elements of the performance:

- Describe the structure of arthropods including mandibulates and chelicerates.
- Describe the structure and importance of spiders.

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- Describe the structure and importance of the freshwater crustacean groups
- Draw and label the features of a crayfish as a crustacean representative.
- Describe and give examples of metamorphosis in insects.
- Draw and label selected aquatic insects in the nymph, larval and adult stages.
- Do a field collection of aquatic invertebrates and plants from a local stream.
- Identify aquatic invertebrates to major group on sight.
- Utilizing the collection made on the field, calculate the Beck biotic index for the site and interpret the result.

This learning outcome will constitute 25% of the course's grade.

11. Describe the features and importance of the various classes of vertebrates found in freshwater environments.

Potential elements of the performance:

- Describe the structure and importance of lamprey, bony fish, amphibians, reptiles, birds and mammals, and their role in fresh waters.
- Identify on sight important Ontario commercial and sport fish.
- Describe the needs of selected species of fish for successful reproduction.

This learning outcome will constitute 5% of the course's grade.

12. Perform and interpret the results of a bioassay test on invertebrates using a toxic discharge.

Potential elements of the performance:

- Set up and make observations in a bioassay testing the impact of a pulp mill effluent on side swimmers.
- Prepare graphs and tables quantifying the experimental results.
- Interpret the results and state their significance.

This learning outcome will constitute 8% of the course's grade.

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THE FOLLOWING LEARNING ELEMENTS 7, 8 & 9 ARE FOR PULP & PAPER STUDENTS ONLY.

7. Describe and illustrate the structure of softwoods.

Potential elements of the performance:

- Describe how trees grow in length and diameter.
- Describe the components, structures and their functions in the woody tissue of softwoods.
- Compare early and late wood
- Draw and label the cross section of a softwood stem.
- Draw and label softwood structure from three different sections.

This learning outcome will constitute 7% of the course's grade.

8. Describe and illustrate the structure of hardwoods.

Potential elements of the performance:

- Compare hardwoods to softwoods.
- Compare the component structures and their functions in the woody tissue of hardwoods.
- Draw and label hardwood structure from three different sections.

This learning outcome will constitute 7% of the course's grade.

9. Identify Wood types to significant groups using a key.

Potential elements of the performance:

- Review difference between softwoods and hardwoods.
- Demonstrate use of a key to separate similar items.
- Separate softwoods with and without resin canals.
- Separate ring porous from diffuse porous hardwoods
- use other features to further separate wood species.
- Make labelled sketches of the different features used in identification.

This learning outcome will constitute 7% of the course's grade.

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CODE NO.**III. TOPICS:**NOTE: Topics in **BOLD** represent laboratory/field activities and/or assignments:

Week 1 Introduction -

- Riparian vegetation, adaptations and importance.
- **Tree identification field trip**
- **Leaf/twig collection**

Week 2 Characteristics of life and organization in Biology -

- Characteristics common to all living things
- Organization of matter
- Scientific method
- Classification of organisms
- Naming of organisms

Week 3 Basic cell structure and microscope use –

- Primitive and advanced cells
- Cell parts and organelles
- **Draw plant and animal cells**
- **Compound microscope use**

Week 4 Viruses and monera –

- Virus structure and importance
- Bacteria and their importance
- **Draw bacterial shapes**
- Blue-greens and their importance – **Draw blue-greens**

Week 5 Protistans and Fungi –

- Algae-like protistans
- Animal-like protistans
- **Life cycles of disease-causing organisms**
- **Draw selected organisms**
- Fungi characteristics

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Week 6 Multi-celled algae –

- Structure and importance
- Ecological importance
- Draw multi-celled algae

THE NEXT 3 TOPICS (WEEKS 7, 8 & 9) ARE FOR ENVIRONMENTAL AND WATER RESOURCES STUDENTS ONLY:

Week 7 Aquatic Plants

- Growth forms
- Succession in aquatic and riparian habitats
- Importance of aquatic plants
- Identify aquatic plants

Week 8 Primitive Invertebrates –

- Trends in animal evolution
- Freshwater sponges
- Planarians, flukes, tapeworms
- Roundworms
- Draw selected animal specimens

Week 9 Fish Diseases, Molluscs and Segmented Worms –

- Fish disease, causes and symptoms
- Segmented worms
- Molluscs
- Dissect and draw earthworm

Week 10 Spiders and Crustaceans -

- Spiders and relatives
- Crustaceans and structure
- Draw crayfish

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Week 11 Collection of Invertebrates -

- Collection equipment
- Field trip to collect at a stream
- Preservation

Week 12 Insect Features –

- Metamorphosis
- Insect anatomy by life stage
- Draw nymph, larva, adult

Week 13 Identification and Biotic Index –

- Invertebrate identification
- Calculation of Biotic Index

Week 14 Vertebrates –

- Fish classes and importance
- Sport fish identification
- Fish reproduction needs
- Other vertebrates in aquatic environments

Week 15 Bioassays –

- Perform a pollutant bioassay
- Summarize results
- Interpret results

THE NEXT 3 TOPICS (WEEKS 7, 8 & 9) ARE FOR PULP & PAPER STUDENTS ONLY:

Week 7 Softwood structure –

- Tree growth
- Components of softwood tissue
- Late wood vs. early wood
- Heart wood vs. sap wood
- Draw softwood structure
- Draw tree stem cross-section

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Week 8 Hardwood Structure –

- Hardwood structure vs. softwood structure
- Components of hardwood tissue
- Draw hardwood structure

Week 9 Wood Identification –

- Separate hardwoods and softwoods
- Separate softwoods based on presence and size of resin canals
- Separate hardwoods based on pore pattern
- Sketch features used in wood identification

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Aquatic Biology Study Guide – 1998

Aquatic Biology Lab Manual – 1998

Other Materials:

Dissecting Kit

Laboratory Coat (suggested)

Plain unlined paper

Variety of pencils, eraser, pens, 2H pencil

Photo album (with waxed pages & plastic overlay) for leaf collection

V. EVALUATION PROCESS/GRADING SYSTEM:

Laboratory Assignments/Field Collections	40%
Term tests based on theory material	40%
Laboratory identification tests	<u>20%</u>
	100%

Grading	A+ = 85% and over consistently
	A = 75% - 84%
	B = 68% - 75%
	C = 60% - 67%

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A passing grade will be based on a composite grade of 60%. For students that attain less than 60%, but over 55% overall, ONE rewrite exam may be allowed providing that attendance and demonstrated effort are satisfactory. Not all lab reports will be marked in their entirety.

Attendance is required at each lab, and all sketches or lab reports must be submitted. Any session that is missed can be made up on the -student's own time. This opportunity will be provided if there is a valid reason for the absence and the student has not established a pattern of absences. Most lab reports are to be submitted at the end of the lab session.

VI. ADDITIONAL RESOURCE MATERIAL:

There will be no assigned text for the course because of the diversity of topics covered. However, the following books will be useful for students to consult for review. Several of these will be put on reserve in the College library.

1. Anon, N.D., Manual of Ontario Aquatic Plants, draft copy, Ontario Ministry of Natural Resources, Toronto, 80 p.
2. Any Basic college-level Biology text.
3. Eddy, S. and J.C. Underhill. 1969. How to Know the Freshwater Fishes. W.C. Brown, Dubuque. 215 pages.
4. Farrar, J.L. 1995. Trees in Canada. Fitzhenry and Whiteside; Markham and Canadian Forest Service, Ottawa. 502 pp.
5. Hosie, R.C. 1973, Native Trees of Canada, Can. Depts. of Environment, Ottawa, 380 p.
6. Lehmkuhl, D. M. 1979. How to Know the Aquatic Insects. W. C. Brown, Dubuque. 168 pages
7. Needham, J. G., and P. R. Needham, 1962, A Guide to the Study of Freshwater Biology, Holden-Day Inc., San Francisco, 108 p.
8. Prescott, G. W. 1978. How to Know the Freshwater Algae. 3rd ed. W. C. Brown. Dubuque. 293 pages
9. Prescott, G. W. 1980. How to Know the Aquatic Plants. W. C. Brown, Dubuque. 158 pages.
10. Scott, W.B. 1967. Freshwater Fishes of Eastern Canada. 2nd Ed. Univ. of Toronto Press, Toronto. 137 p.

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CODE NO.**VII. SPECIAL NOTES:**Special Needs

If you are a student with special needs (eg. Physical limitations, visual impairments, hearing impairments, learning disabilities), you are encouraged to discuss required accommodations with the instructor and/or contact the Special Needs Office, Room E1204, Ext. 493, 717 or 491 so that support services can be arranged for you.

Plagiarism

Students should refer to the definition of "academic dishonesty" in the "Statement of Students Rights and Responsibilities."

Students who engage in "academic dishonesty" will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course, as may be decided by the professor.

In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Advanced Standing

Students who have completed an equivalent post-secondary course should bring relevant documents to the Coordinator, Natural Resources Programs.

Retention of Course Outlines

It is the responsibility of the student to retain all course outlines for possible future use in gaining advanced standing at other post-secondary institutions.

Substitute course information is available at the Registrar's Office.

VIII. PRIOR LEARNING ASSESSMENT:

Please contact the Prior Learning Assessment Office (E2203) for further information.