

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: WATER POLLUTION (Outline & Lab Manual)

Code No.: BIO 129-4

Program: WATER RESOURCES TECHNOLOGY/PULP & PAPER ENGINEERING TECHNOL.

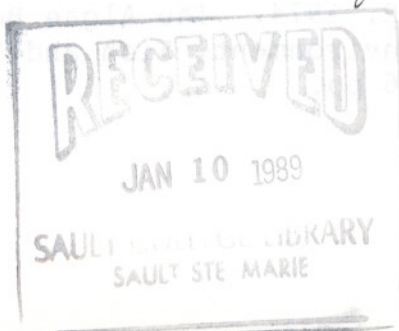
Semester: II V

Date: JANUARY, 1989

Author: V. WALKER

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APPROVED: *[Signature]* Chairperson Jan 9/89 Date



Water Pollution

BIO 129-4

COURSE NAME

COURSE NUMBER

**PREREQUISITE:** AQUATIC BIOLOGY 125-3

**PHILOSOPHY/GOALS:**

This is a course designed to provide an introduction to the biological effects of water pollution and to ways of detecting, describing and quantifying these effects in the field and the laboratory. Types and sources of pollution, sampling strategies and legislation governing water quality will be discussed.

**METHOD OF ASSESSMENT (GRADING METHOD):**

Oral Presentation:	10 marks	90% & over	- A+
Lab Reports	50 marks	80	- A
Term Tests (3)	40 marks	70	- B
		60	- C
	<u>100 marks</u>	Under 60%	- R

**ATTENDANCE:**

Lab attendance is **compulsory**. Students missing labs without documented reason run the risk of repeating the course.

**EVALUATION**

Students with a final grade of less than 60% will receive an "R" grade. There will be NO opportunity for a rewrite examination. All labs must be submitted for a passing grade.

**TEXTBOOK(S):**

Water Pollution Outline & Lab Manual

Optional Purchase:

1. Mason, C. F., 1981. Biology of Freshwater Pollution. Longman Group Ltd., New York.
2. Vallentyne, J.R. 1974. The Algae Bowl. Lakes and Man. Canada Dept. of the Environment, Fish and Marine Service, Misc. Spec. Pub. No. 22:186 pp.

**WATER RESOURCES TECHNOLOGY**

**BIO 129-4**

**WATER POLLUTION**

WEEK

1,2	UNIT 1	<b>INTRODUCTION</b> <ul style="list-style-type: none"><li>- what is pollution?</li><li>- complexity of pollution</li><li>- the ecosystem concept</li><li>- (video) Great Lakes</li></ul>
2,3	UNIT 2	<b>FRESHWATER SYSTEMS</b> <ul style="list-style-type: none"><li>- general characteristics</li><li>- the lotic environment</li><li>- the lentic environment</li><li>- stability of ecosystems</li></ul>
4	TERM TEST #1	
4	UNIT 3	<b>CHEMICAL AND PHYSICAL ASPECTS OF WATER POLLUTION</b> <ul style="list-style-type: none"><li>- nitrates, nitrites, ammonia</li><li>- phosphates</li><li>- dissolved oxygen</li><li>- carbon dioxide</li></ul>
5	LAB 1	<b>TEMPERATURE AND OXYGEN CONSUMPTION IN AQUATIC ORGANISMS</b> <ul style="list-style-type: none"><li>- pH, acidity, alkalinity, hardness</li><li>- hardness</li><li>- phosphorus</li><li>- total dissolved solids</li><li>- Total suspended solids</li><li>- transparency, colour</li><li>- BOD, COD</li></ul>
6	LAB 2	<b>PRIMARY PRODUCTION OF STANDING WATER</b>
7,8	UNIT 4	<b>BIOLOGICAL ASPECTS OF WATER POLLUTION</b> <ul style="list-style-type: none"><li>- eutrophication</li><li>- bottom fauna</li><li>- bacteria, algae</li><li>- MOE speaker (?)</li><li>- zooplankton, fish</li><li>- (Video: H<sub>2</sub> Overview)</li></ul>
8	TERM TEST #2	

<u>WEEK</u>		
9	LAB 3	STANDARD BACTERIAL PLATE COUNT
10,11	UNIT 5	<b>TYPES AND SOURCES OF POLLUTION</b> <ul style="list-style-type: none"><li>- water pollution categories</li><li>- major sources of water contamination</li><li>- toxicity</li></ul>
12	LAB 4	BIOASSAY <ul style="list-style-type: none"><li>- students' oral presentations (speaker: Sea Lamprey)</li><li>- environmental factors affecting toxicity</li><li>- (Video: Early Warning)</li><li>- tolerance, accumulation</li></ul>
13	UNIT 6	<b>SAMPLING FOR WATER QUALITY</b> <ul style="list-style-type: none"><li>- apparatus</li><li>- sampling sites</li><li>- sampling strategy</li><li>- APHU speaker (?)</li><li>- index species (SCI, biotic, diversity, indices)</li></ul>
	LAB 5	TO BE ANNOUNCED
14	UNIT 7	<b>LEGAL ASPECTS OF WATER POLLUTION</b> <ul style="list-style-type: none"><li>- acts and legislation governing water quality</li><li>- Pollution Probe speaker (?)</li><li>- (Video: Speaking Out - The Politics of Garbage)</li><li>- (Video: Strike Force)</li><li>- MOE Speaker</li></ul>
15	TERM TEST #3	

**NOTE: Schedule subject to change**



## LAB SCHEDULE

1. Lab 1. Temperature and Oxygen Consumption in Aquatic Organisms.
2. Lab 2. Primary Production of Standing Water.
3. Lab 3. Standard Bacterial Plate Count.
4. Lab 4. Bioassay
5. Lab 5. TO BE ANNOUNCED

**\*Subject to change**

## PRESENTATION TOPICS

Students are required to deliver a 20-minute oral presentation during a predetermined time slot. Students will work in groups of two and presentations will include visual aids as well as oral material delivered by each student. Term Test #3 will include information from students' presentations. The following topics are available for presentation:

**NOTE: RELATE YOUR TOPIC TO WATER POLLUTION.**

1. Metals (including mercury).
2. PCB's
3. Oil.
4. Insecticides
5. Pulp mill wastes.
6. Waste heat, (thermal pollution).
7. Nuclear pollution (radioactive waste).
8. Dioxin
9. Herbicides
10. Detergents.
11. Acid rain.

12. Mirex, dioxin.
13. Water-borne pathogens.
14. Food Processing Wastes.

NOTE: INCLUDE IN EACH PRESENTATION:

1. Description of the pollutant.
2. Sources of the pollutant (natural, man-caused).
3. The effect of the pollutant on the aquatic environment.
4. The water quality guidelines (standards) for the pollutant.
5. Any pertinent incidents\* involving the pollutant.
6. Clean up/Controls (if applicable).

\*Canadian incidents if possible

Each student group is responsible for producing a typed abstract (summary) of information presented as well as a list of references used.

Copies of each presentation summary and reference list will be produced (by instructor) for all students, prior to each presentation.

## REPORT WRITING

All lab reports should include the following components:

1. Purpose/Objective - a brief statement outlining the intent of the exercise. Objectives may be itemized, i.e.,
  - a) to determine LC<sub>50</sub> for zinc using rainbow trout
  - b) to investigate the relationship between water temperature, pH, alkalinity and the toxicity of zinc to rainbow trout
2. Method/Procedure - a brief outline of how the exercise was conducted. In many instances "Refer to manual" will suffice.
3. Results - a presentation of results, and only results, in an organized format, i.e., TABLE FORMAT. There should be no sentences, no paragraphs--table and figures (graphs) only. Be sure all table and figures are entitled and numbered.
4. Calculations - one example of each different calculation used in presenting the results should appear in this section. Subsequent work using the same calculations should appear in the Appendix. Hence, with the exception of one example calculation, all calculations use to generate data in tables must be shown in the Appendix.
5. Discussion of Results and Conclusions - results are interpreted and discussed. Carefully observe data to determine trends and relationships among all parameters measured.

Are apparent relationships consistent with established relationships present in literature? In this section, you are responsible for conducting a literature search to compare your findings with that of established authors. Be sure to refer to your data using table and figure numbers - e.g., a direct linear relationship between white sucker weight and fork length is apparent in Figure 2. This relationship agrees well with that established for white sucker by J. A. Smith (1982), W. T. Jones (1974) and B. R. Brown (1971).

If your findings are not consistent with other studies or theories, offer some explanation for the deviation.



e.g., According to Saunders (1972), the principle component of lake trout stomach samples (n=785) in Round Lake prior to 1965 was lake herring (Coregonus artedii) at 72% by volume. Data from this study, however, indicates rainbow smelt (Osmerus mordax) as the dominant food item in 525 lake trout sampled, averaging 97% of stomach contents by volume (Figures 1 and 2). This change in forage species preference is attributed to the introduction of rainbow smelt in 1969 (Wilson, 1971).

All questions posed at the end of a lab exercise should be answered in this section.

N.B. There are several acceptable methods of citing references and referring to your data within the text of your report. Footnotes are not acceptable. Quotes are not acceptable.

N.B. Scientific names of species should appear in brackets only once after the first time the common name appears in the text.

In addition to interpreting and discussing, conclusions should be clearly stated, often itemized, at the end of this section.

6. Sources of Error - itemize all conceivable sources of error.
7. Appendix - present calculations for all values appearing in tables.
8. Reference - presented on a separate page at end of report, i.e.

1) **For paper presented in a journal:**

Mason, C. F. and R. J. Bryant. 1974. The structure and diversity of the animal communities in a broad land reed-swamp, J. Zool., 172, 289-309.

issue no. page reference

2) **For book references:**

Hynes, H. B. N., 1970. The Ecology of Running Waters, Liverpool University Press, Liverpool.



MAJOR DO'S AND DON'TS

1. Don't use first person in report text, i.e., I, we, our.
2. Do refer to tables and figures by number. Be sure all tables and figures in Results are numbered and entitled.
3. Use correct citation of references.
4. Do not use quotes.
5. Scientific names of species need only appear once in text of report. They are placed in brackets and underlined after the common name of the species appears for the first time.

REPORT MARKING - ONE REPORT SUBMITTED PER TWO STUDENTS

SECTION	MARK	MARKING BASED ON
1. Purpose	1	Conciseness; completeness
2. Method	1 (if applicable)	Conciseness; completeness
3. Results	2	Organization; labels, numbers on tables, figures; neatness; correctness
4. Calculations	1	Correctness, completeness
5. Discussion	4 or 5 if method not applicable	Conciseness; organiz- ation; reference material used and cited; complete- ness
6. Errors	1	Completeness
TOTAL		10

7. Appendix minus 1 mark if absent or incorrect

8. Reference minus 1 mark if absent or incorrect

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