

I. COURSE DESCRIPTION:

This course is designed to provide the student with basic knowledge of the nature of liquid and gaseous waste streams arising from the manufacture of pulp and paper. Concepts of suspended and dissolved solids, biological and chemical oxygen demand (BOD and COD), toxicity, particulates and total reducible sulphur (TRS) will be briefly dealt with.

Current and innovative waste treatment processes, pollution laws, control orders and pollution economics will be covered. Provincial and Federal Environmental Acts and how they relate to employee responsibilities will also be dealt with.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

1. Indicate a knowledge of how papermaking processes create effluents.

Potential Elements of the Performance:

List and explain the various chemical components of wood.

List four obvious causes for the generation of effluents by the pulp and paper industry.

Explain the difference between pulp yield and bleached shrinkage.

Discuss which properties of hemicelluloses make them more likely to be lost during pulping.

Give two examples of what can happen to extractives during pulping or bleaching.

Give two examples of how wood components are lost during mechanical pulping.

Indicate what three conditions must be met in order for chemical pulping effluents not to create environmental hazards.

Give reasons why losses of gasses and chemical particles in stack gasses cause environmental problems.

2. Indicate of knowledge of the regulated classes of pollutants.

Potential Elements of the Performance:

Name two problems that arose from the on-site production of chlorine in earlier mills.

Explain Minamata disease.

List four factors that led to changes in the way the pulp and paper

industry dealt with effluents.

Name six regulated classes of pollutants from the pulp and paper industry.

Explain the difference between aerobic and anaerobic bacteria.

Define BOD₅.

Define AOX.

Name the two components in chemical pulp bleaching needed to form dioxins.

Explain how a toxicity test is carried out.

Explain what a control order is.

3. Indicate a knowledge of the potential environmental and economic impact of mill pollutants.

Potential Elements of the Performance:

Describe the concept of the process cell and define its inputs, wastes and products.

Define and differentiate between respiration and photosynthesis.

Calculate mass balances in chemical equations.

Describe the economic impact of losses of suspended solids, BOD, particulates and gasses from the mill.

Explain why dioxins and furans are not produced in a BCTMP mill.

4. Indicate a knowledge of the process variables that control pollutants.

Potential Elements of the Performance:

Define the term "process variable".

Define and use a "fishbone diagram".

List and describe the process variables that affect suspended solids losses.

List and describe process variables that affect BOD losses.

List and describe process variables that affect the loss of AOX compounds.

List and describe process variables that affect the loss of toxic compounds, including dioxins.

List and describe process variables that affect the loss of particulates and gaseous emissions.

5. Indicate a knowledge of the methods of primary treatment in the pulp and paper industry.

Potential Elements of the Performance:

Define primary treatment.

Define the term "High Solids Sewer".
 Explain the function of screens and strainers.
 Explain the function and operation of a settling basin.
 Explain the function and operation of a gravity clarifier.
 Explain the function and operation of a flotation clarifier.
 Define "Rise Rate" for a clarifier.
 Explain reasons for sludge dewatering.
 Discuss the choices of sludge disposal methods.

6. Indicate a knowledge of secondary treatment of pulp and paper effluents.

Potential Elements of the Performance:

Define secondary treatment.
 Define aerobic respiration.
 Describe the mass-time relationship between micro-organisms and BOD.
 Differentiate between anaerobic digestion and aerobic respiration.
 Describe operational parameters of oxidation lagoons.
 Describe operational parameters of aeration lagoons.
 Describe operational parameters of activated sludge systems.
 Define and give an example of tertiary treatment.

7. Indicate a knowledge of Canadian Environmental Legislation.

Potential Elements of the Performance:

Describe the general intents of the government regulations for the control of pulp and paper effluents.
 Describe the specific requirements of government regulations.
 Define the difference between the Federal Fisheries Act and the Canadian Environmental Protection Act.
 Describe the scope of offences and penalties allowed by government regulations.
 Define the purpose of Ontario's MISA program.
 Describe the general objectives for receiving water quality.

III. TOPICS:

1. How Pulp and Papermaking Processes Create Effluents.
2. Regulated Classes of Pollutants.
3. Potential Environmental and Economic Impact of Mill Pollutants.
4. Process Variables that Control Pollutants.
5. Primary Treatment of Pulp and Paper Effluents.
6. Secondary Treatment of Pulp and Paper Effluents.

7. Canadian Environmental Legislation.

IV. REQUIRED RESOURCES/TEXTS/MATERIALS:

Sugden, Adam, Course manual for PPE 164 Environmental Control, Sault College of Applied Arts and Technology, Sault Ste. Marie, 1991

V. EVALUATION PROCESS/GRADING SYSTEM:

A final grade for this course will be based on the results of three tests weighted equally.

The following semester grades will be assigned to students in postsecondary courses:

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
A+	90 - 100%	4.00
A	80 - 89%	3.75
B	70 - 79%	3.00
C	60 - 69%	2.00
R (Repeat)	59% or below	0.00
CR (Credit)	Credit for diploma requirements has been awarded.	
S	Satisfactory achievement in field placement or non-graded subject areas.	
U	Unsatisfactory achievement in field placement or non-graded subject areas.	
X	A temporary grade. This is used in limited situations with extenuating circumstances giving a student additional time to complete the requirements for a course (see <i>Policies & Procedures Manual – Deferred Grades and Make-up</i>).	
NR	Grade not reported to Registrar's office. This is used to facilitate transcript preparation when, for extenuating circumstances, it has not been possible for the faculty member to report grades.	

Students receiving a final grade of 55-59% MAY be permitted to write a supplementary exam for a maximum grade of C.

VI. SPECIAL NOTES:Special Needs:

If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your instructor and/or the Special Needs office. Visit Room E1204 or call Extension 493, 717, or 491 so that support services can be arranged for you.

Retention of course outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Plagiarism:

Students should refer to the definition of “academic dishonesty” in *Student 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/program, as may be decided by the professor/dean. 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.

Course outline amendments:

The Professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

VIII. DIRECT CREDIT TRANSFERS:

Students who wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide a transcript and course outline related to the course in question.