

**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY**

**SAULT STE. MARIE, ONTARIO**



Sault College

**COURSE OUTLINE**

**COURSE TITLE:** PAPER MANUFACTURE

**CODE NO. :** PPE 110 **SEMESTER:** 2

**PROGRAM:** PULP AND PAPER OPERATIONS CERTIFICATE

**AUTHOR:** J. BETHUNE

**DATE:** NOV. 2001 **PREVIOUS OUTLINE DATED:** DEC 1999

**APPROVED:**

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	<b>DEAN</b>	<b>DATE</b>
<b>TOTAL CREDITS:</b>	4	
<b>PREREQUISITE(S)</b>	NIL	
<b>HOURS/WEEK:</b>	4	

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*School of Trades and Technology*  
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**I. COURSE DESCRIPTION:**

**This course is designed to provide the student with the basic knowledge of the entire papermaking process starting with the nature of the fibres and stock preparation. It progresses through stock proportioning and the use of chemical additives to stock delivery on the paper machine. Wet-end papermaking specifics for single and twin wire machines as well as cylinder machines will be discussed. Presses and their operation will also be covered along with paper dryers, their operation and energy consumption. On-machine controls, overall operation and paper quality will also be studied.**

**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 the different types of fibres used in papermaking and the main operations and equipment used in stock preparation.

Potential Elements of the Performance:

- Explain why stock preparation is normally considered the first papermaking process.
- Explain when softwoods and when hardwoods are preferred in papermaking.
- Explain why softwood is used in newsprint.
- Describe the problem that can occur when using long fibres in papermaking.
- Name five synthetic fibres used in papermaking.
- Explain why synthetic fibres would be used in papermaking.
- Name five paper properties that could be improved with the addition of synthetic fibre.
- Explain what a pulper is.
- Name the three variables that may be controlled in a pulper.
- List two criteria that must be met in order to prepare a successful papermaking furnish.
- Name three possible problems with using an unrefined, dried pulp as a raw material to furnish a paper machine.
- Explain why starches, fillers, drainage aids and defoamers are used for papermaking.
- Give two reasons why dyes are used in papermaking.
- Explain how clay improves printing properties.

- Give three possible uses for retention aids.
- Perform stock proportioning flow calculations.

2. Indicate a knowledge of the major components of approach piping.

Potential Elements of the Performance:

- Explain the function of a fan pump.
- Explain why stock valves are used.
- Describe how a pressure screen operates.
- Describe how cleaners operate.
- Explain why a deaerator is used.
- Describe the function of a flow spreader.
- Explain jet to wire ratio.
- Explain L/b ratio.
- Explain pressure and velocity formation.
- Explain how a slice is adjusted.
- Define rushing and dragging.
- Explain the purpose of a saveall.
- List five objectives of a headbox.
- Explain the purpose of a holey roll.
- List four variables which affect the operation of holey rolls.

3. Indicate a knowledge of the types and importance of formers.

Potential Elements of the Performance:

- Quote the usual consistency in a headbox.
- Name the percentage of water usually removed between the headbox and the press section.
- Define good paper formation.
- Explain the function of the breast roll, the forming board and the couch roll.
- List five variables which Affect drainage.
- Explain the effect of three drainage variables on formation.
- Distinguish between foils and flatboxes.
- Name five basic requirements of a forming fabric.
- Define warp.
- Explain why foils were developed and why they are preferred to table rolls.
- Explain harmonic rhythm.
- Explain how vacuum is controlled with a foil.
- Describe the dry line and what forms it.
- Explain the purpose of a dandy roll.

- Explain the purpose of squirts.
  - Explain why twin wires were developed.
4. Indicate a knowledge of the function of the press section and the theory of pressing.

Potential Elements of the Performance:

- Name the physical force that removes water in a press.
  - Describe what happens to the sheet during pressing.
  - Explain what higher press loading does to bonding, burst, tensile, bulk and caliper.
  - Explain how a sheet could be damaged in a press.
  - Describe how water is removed from the felt.
  - Discuss the felt run.
  - Explain why modern press rolls are vented.
  - Define the press nip.
  - Explain the purpose of suction presses.
  - List six variables that influence water removal in presses.
  - Describe the four phases of pressing.
  - Explain a trade line.
  - Explain a suction pick-up.
  - Explain the use of steam boxes.
  - Explain why press rolls are grooved.
  - List the four purposes of felts.
  - List five criteria for designing felts.
5. Indicate a knowledge of dryers and the theory behind drying.

Potential Elements of the Performance:

- Cite the primary and secondary objectives of drying.
- Cite the two main mechanisms of drying.
- Explain where water can be found in the sheet.
- Name the three stages in the dryers.
- Name five common problems with heat transfer in a dryer.
- Explain why spoiler bars are used.
- Define blow-through steam.
- Explain what happens in each phase of the drying cycle.
- Explain what a yankee dryer is.
- Explain the purpose of pocket ventilation.
- Explain the use of desuperheaters.
- Explain how a thermocompressor works.
- Explain the purpose of a dryer felt.

- List three secondary functions or purposes of a dryer felt.
6. Indicate a knowledge of the operation of the calendar stack and the reel on a paper machine.

Potential Elements of the Performance:

- Define calendaring and reeling.
  - Explain the purposes of calendaring and reeling.
  - Briefly describe how calendaring is carried out.
  - Explain how the pressure is created on the paper in a calendar stack.
  - Briefly explain how paper is transferred from one reel to the next.
  - Name five quality parameters that are measured by a scanner.
  - Describe where the five quality parameters might be controlled.
7. Indicate a knowledge of the relationship between paper properties and the paper machine components.

Potential Elements of the Performance:

- Explain why quality is important.
- Explain the terms ISO and Total Quality Management.
- Name the areas of the paper machine associated with basis weight, formation and caliper.

**III. TOPICS:**

1. Stock Preparation
2. Approach Piping
3. Formers
4. Pressing
5. Drying
6. Calendaring and Reeling
7. Quality

**IV. REQUIRED RESOURCES/TEXTS/MATERIALS:**

Tunney, Anne, AND Bethune, Jack, "Study Guide for PPE 110, Paper Manufacture", Sault College of Applied Arts and Technology, Sault Ste. Marie, 2001

**V. EVALUATION PROCESS/GRADING SYSTEM:**

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

Test No. 1 on Module 1

Test No. 2 on Module 2

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 &amp; 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 with a final grade between 55-59 % may be permitted to write a supplementary exam.

**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.

