

**SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY  
SAULT STE. MARIE, ONTARIO**



**C O U R S E   O U T L I N E**

**Course Title:** Forest Mensuration Theory

**Code No.:** OEL816

**Semester:**

**Program:** Forestry Technician

**Author:** Bob Currell

**Date:** June 2001

**Previous Outline Dated:**

**Approved:**

**Total Credits:** 2

**Prerequisite(s):**

**Length of Course:** 16 weeks

**Total Credit Hours:** 32

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## I. COURSE DESCRIPTION:

This course provides an introduction to Forest Mensuration; the measurement of trees and forests. It will introduce the theory of measuring; tree diameter, height, age and forest density or basal area. Methods of measuring these tree attributes will be described and equipment use explained. Methods of estimating tree diameter, height and basal area using household materials will be provided.

The final module of the course provides an explanation of how forest measurements are made, compiled and displayed in Ontario's Forest Resource Inventory.

## II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

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

### 1. Measure, classify and record tree diameters using accepted equipment and techniques.

#### Potential Elements of the Performance:

- Explain the reasons for measuring tree diameter.
- Show the standard location (breast height) where diameter measurements are made on trees exhibiting different stem characteristics.
- Assign trees to different diameter classes if given actual diameter measurements to 0.1 cm. accuracy.
- Calculate the basal area of trees if given their diameters.
- Explain the use of a diameter tape and parallel calipers to measure tree diameter.
- Use a standard measuring tape to measure tree diameter.
- Describe methods of estimating tree diameter.

### 2. Measure and record tree heights.

#### Potential Elements of the Performance:

- Illustrate five different types of tree heights it is possible to measure.
- Describe at least five methods of measuring tree height.
- Calculate tree height from measurements made using different measurement scales on a manual clinometer.
- Describe how to measure tree heights using a Suunto, Haga, and height pole.
- Construct and correctly use a staff hypsometer.
- Describe how to minimize possible errors when measuring tree height.

**3. Explain how a tree grows, how tree age can be accurately measured and describe practical applications of tree age measurement.**

Potential Elements of the Performance:

- Describe how a tree grows in height and diameter.
- Distinguish differences between annual rings of conifers, ring porous hardwoods and diffuse porous hardwoods.
- Demonstrate how tree age can be measured by counting annual rings.
- Explain how to carry out destructive and non-destructive sampling of tree age.
- Identify common problems encountered when increment boring trees and explain how to minimize these problems.
- Describe four applications of tree aging.
- Explain how dendrochronology is carried out to date past events.

**4. Measure, record and explain the importance of basal area as an indicator of forest density.**

Potential Elements of the Performance:

- Determine the basal area of a tree of a known diameter.
- Calculate the basal area of trees per hectare given inventory information.
- Show the principle of calculating basal area through the use of angle gauges.
- List the types of instruments which can be used to measure basal area per hectare of a forest.
- Explain how to correctly use a wedge prism to measure basal area.
- Estimate the basal area of a forest sample using your thumb as an angle gauge.

**5. Explain how Forest Resource Inventory ground plots are measured, their data compiled and summaries displayed in Ontario's FRI system.**

Potential Elements of the Performance:

- List the three component parts of the Ontario Forest Resource Inventory.
- Explain why the accurate measurement of FRI ground plots is an essential part of preparing an accurate inventory of the forests of Ontario.
- List and describe the information collected in FRI ground plots.
- Calculate the basal area per hectare and species composition of a forest area if given complete tally information from FRI ground plots for that area.
- Determine whether data collected in FRI ground plots is acceptably accurate compared with audit data.

- Read an FRI basemap, describe its UTM reference number and locate a spot to within 100 metres accuracy if given its UTM co-ordinates.
- Decode the information contained in an FRI stand description table.
- Prepare an FRI stand description table entry for a forest stand if provided with FRI ground plot information.

## 111. TOPICS

### 1. Measuring Tree Diameter

- Reasons for measuring tree diameter.
- The location where tree diameter is measured on trees exhibiting different stem characteristics and slope positions.
- Tree diameter classes.
- Introduction to tree stem basal area.
- Measuring diameters with dendrometers.
- Measuring diameters with a standard measuring tape.

### 2. Measuring Tree Height

- Types of tree height measurements.
- Methods of measuring tree height.
- Calculating tree heights from clinometer readings:
  - use of the degree scale, % scale, 15 and 20 scales on a variety of instruments.
- Measuring tree heights using Suunto and Haga clinometers.
- Making and using a staff hypsometer to estimate tree heights.

### 3. Tree Age

- How trees grow in height and diameter.
- Identifying annual growth rings of conifers, ring porous and diffuse porous hardwoods.
- Tree aging techniques.
- Care and use of an increment borer to determine tree age.
- Common problems encountered when increment boring trees and solutions to these problems.
- Applications of tree aging.
- Dendrochronology

#### 4. **Measuring Forest Density**

- Description of tree basal area and basal area per hectare.
- Importance of forest basal area per hectare information.
- Calculating basal area using angle gauges.
- Using a wedge prism.
- Estimating basal area using your thumb.

#### 5. **The Ontario Forest Resource Inventory (FRI)**

- Introduction to the Ontario Forest Resource Inventory System.
- FRI ground plots:
  - information collected in ground plots
  - completing stand description table entries
  - calculating stand basal area/ha., stocking and site class from ground plot data
  - ground plot data collection standards
- FRI maps and Stand Data Tables
  - FRI basemap reference numbers
  - Reading UTM (Universal Transverse Mercator) coordinates
  - FRI mapping symbols
  - Normal Yield Tables
  - FRI Stand Data Table and map descriptions

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

None

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

Online Tests (2 x 20%)	<b>40%</b>
Assignments (5 x 10%)	<b>50%</b>
Discussions (5 x 2%)	<b>10%</b>

Minimum passing grade is 50%. Your final grade will be assigned as a percentage. Your home college will determine the letter grade.

The percentage received for the course will be used to calculate your letter grade based on Sault College standards **only** if you wish to apply this course towards your diploma in Natural Resources at Sault College.

## 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 Department. Visit Room E1204 or call (705)759-2554 Ext. 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.

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.

### 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.

### Testing Absence

If a student is unable to write a test on the date assigned, the following procedure must be followed:

1. The student shall provide the professor with advance notice, of his/her need to miss the test.
2. The student may be required to document the absence at the discretion of the professor.
3. All decisions regarding whether tests shall be rescheduled will be at the discretion of the professor.
4. The student is responsible for making arrangements with the professor, immediately upon return to the course, with respect to make-up of the missed test.
5. In the event of an emergency on the day of the test, the student may be required to produce documentation to support the absence and must telephone the College to identify the absence. The College has a 24-hour electronic voice messaging system at (705)759-2554.

## **VII. PRIOR LEARNING ASSESSMENT**

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

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*Forest Mensuration  
Course Outline*