SEP 2 6 2000

GRANDE PRAIRIE REGIONAL COLLEGE

DEPARTMENT OF SCIENCE AND TECHNOLOGY

F.00

Bachelor of Applied Forest Resource Management

FOREST MENSURATION I: FO2370

Transfer status: Under discussion

Pre-requisite: ST 1510 (Introduction to applied statistics)

Calender Description:
Sequential treatment of the collection of forest data. Design of a survey, location of points on the ground. The theory behind basic mensuration equipment and how to use it. How to make simple instruments to estimate tree height and DBH. Collection and compilation of data. Analysis of collected data. Development of volume tables, scaling, grading. Using the Global Positioning System (GPS). Aerial photographs, their interpretation and use in cover-type mapping, volume estimation etc. Measurement of other forest values, e.g. wildlife, recreation.

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Lectures:	Tuesdays and Thursdays	10:00 – 11:30	B305
Lab:	Mondays 14:30 – 17:30	Field - then B305	

Course Description:
Forest mensuration is defined (Young and Giese, 1990) as "the science dealing with the measurement of volume, growth and development of individual trees and stands and the determination of various products obtainable from them". The 'various products' refers to fibre products and also to other forest values such as recreation, wildlife.
Our initial discussions will cover the purpose of forest mensuration, i.e. why do we need to measure and assess our forests? This discussion will lead us into the concept of the Annual Allowable Cut (AAC). Also, in the concept of modern forestry, it will lead us to consideration of other values of the forest resource such as wildlife and recreation.
From the philosophical consideration of the "why of forest mensuration" we will move to the more practical consideration of "how is it done". We will look at the different aspects of forest mensuration by considering the steps a forester would follow to obtain information on the volume and growth of the forest.
The following are some of the steps he/she would consider in setting up an inventory survey, i.e. a timber cruise:

- Temporary versus permanent sample plots.
- Sampling intensities and stratified sampling.
- Laying out a cruise on a map or aerial photograph.
- Directional and measurement instruments needed.
- What information to collect.
- Contacting other Departments/Sections re collection of information.

- Collecting 'other than fibre' information.
- Running the cruise in the field, using different measurement equipment
- Recording information in the field, tally cards and data-loggers
- Analysis of the collected data

We will consider how cruise results can be used to develop growth and yield, and volume tables and how they can be used in mapping the forest.

The foregoing might be considered as 'pre-harvest' data collection and analysis.

In the 'post-harvest' situation we will look at scaling and grading of harvested timber.

We will study the concept, principles and use of aerial photographs, also their interpretation and advantages and disadvantages in stand mapping and volume estimation.

As part of our course we will discuss the basic theory underlying the various mensuration instruments and we will see how, if we had to, we could ourselves design simple instruments to take measurements such as tree height, and diameter at breast height (DBH).

TEXTS AND REFERENCES

RECOMMENDED FOR PURCHASE

Avery, T.A. and H.E. Burkhardt. (1994). Forest Measurements. 4th Ed. McGraw-Hill, New York. 408 pp.

TEXTS AVAILABLE IN THE LIBRARY

Husch, B., Miller, C.I. and T.W Beers. (1993). Forest Mensuration. Krieger Publishing Company, Malabar, Florida. 402 pp.

Compendium of Canadian Forestry Statistics. (1996). Canadian Council of Forest Ministers.

SCIENTIFIC JOURNALS AND PERIODICALS AVAILABLE IN THE LIBRARY

Canadian Journal of Forest Research
Forestry Chronicle
Northern Journal of Applied Forestry
Silviculture

WEBSITE

www.canadian-forests.com; www.fs.fed.us

EXAMINATIONS AND MARK ALLOCATION

Mid-term examination	30%
Mid-term lab exam	15%
Assignments	10%
Final lab report	5%
Final examination	40%

LECTURE SCHEDULE

Introduction to Forest Mensuration	**2 lectures**
- what is forest mensuration?	
- occasions when we need measurements from the forest	
- one-time measurements vs repeated measurements	
- principles and units of measurement	
- variables, precision and accuracy	
Field Measurements, Methods and Instruments	**1 lectures**
- linear measurement	
- areal measurement	
Mapping systems	**1 lecture**
- lat and long; township and range	
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Forest Inventory Surveys (timber cruises)	
- information required from a cruise, collecting information for other sections/agencies, including wildlife and recreation	**1 lecture**
- design and layout of a cruise, temporary vs permanent sample plots	**1 lecture**
- horizontal point sampling vs monareal plots instruments needed for a cruise	**1 lecture**
- theoretical basis of the compass, height instruments, DBH instruments	**3 lectures**
- GPS, principles and use	**2 lectures**
- recording information in the field, tally cards, data-loggers	**2 lectures**
- data entry to computer, analysis of data	**2 lectures**
Forest Inventory in Alberta, Phase III and AVI	**1 lecture**
Analysis of Tree and Stand Growth, Stand Structure	**2 lectures**
Scaling, grading and weight measurement	**3 lectures**
Aerial photographs	
- basic principles, cameras, filters, scale, focal length,	**2 lectures**
- stereoscopic vision	
- Determining tree height from single photo or stereo pair	**2 lectures**
- Mapping, planimetric and topographic	**1 lectures**
- Applications in forestry, species identification, cover-type mapping, volume estimation	**2 lectures**
- orthophotos, derivation, use	**1 lecture**
Other information-gathering systems,	**1 lecture**
- satellite imagery, multi-spectral scanning	

LAB SCHEDULE

Lab I — **Introduction to Forest Surveys and mensuration equipment**
- lay out square and circular plots along a compass bearing
- cpmpare accuracy and efficiency of following techniques
- tree heights (Suunto),
- diameters (estimate, d-tape, calipers Biltmore stick, seamstress tape)

Lab II — **Plot layout and basal area assessment**
- circular plots
- tree dbh and count trees in plots
- prism sweep (10 factor) at each plot centre
- assess basal area by each method

Lab III — **Running an Inventory Survey (Timber Cruise)**
- what information to collect?
- what instruments and equipment are needed?
- figuring out the bearing, laying out the cruise line
- height, age, dbh of trees in plot.

Lab IV — **Stem analysis**
- selecting the tree(s)
- measuring height after felling
- sectioning, adjusting for branch whorls etc.
- marking each section and recording measurements.

Lab V — **Stem analysis**
- record length of sections, dib for each
- cross-sectional area for top and bottom of each section
- volume of each section from Smalian's formula
- graphs to show pattern of growth

Lab VI — **Mid-term lab exam**

Lab VII — **GPS (global positioning system)**
- use in different situations (open ground, open pine, closed canopy spruce)
- for each stand type record PDOP, SNR, satellite health and accuracy
- compare results for each stand type - explain.

Lab VIII — **Taking areas from a map or photograph**
- dot grid and rolling ball planimeter
- do each for several different areas, compare results
- explore other options on planimeter

Lab IX — **Site index**
- pine stand and a white spruce stand
- how to select the sample trees (AFS technique)
- recording the measurements
- (back in the classroom) work out the site indices
- potential pitfalls and weaknesses of site index as a tool

Lab X — **Aerial photographs**
- **Preparation for stereo pair examination** principle points, conjugate points
- tree height from one photograph, from the stereo pair using the parallel wedge

Lab XI — **Aerial photographs**
- Interpretation of cover-type, stand delineation ground truthing

Note: Students are expected to keep full notes and records of all lab activities. These will be taken in and graded at the end of term.