THE FEDERAL UNIVERSITY OF TECHNOLOGY, AKURE

Department of Forestry and Wood Technology

FWT 308 – Forest Mensuration

COURSE PARTICULARS

Course Code: FWT 308
Course Title: Forest Mensuration
No. of Units: 2
Course Duration: One hour of theory and three hours of practical per week for 15 weeks.
Status: Compulsory
Course Email Address: adekunlevaj@rediffmail.com
Course Webpage: http://www.fwt.futa.edu.ng/courseschedule.php?coursecode=FWT%20303
Prerequisite: NIL

COURSE INSTRUCTORS

Dr V. A. J. Adekunle
Room 013, SAAT Annex,
Dept. of Forestry & Wood Technology,
Federal University of Technology, Akure, Nigeria.
Phone: +2348034455805
Email: vajadekunle@futa.edu.ng

COURSE DESCRIPTION

Forest measurement is essential for taking management decision and planning. This course is designed to trained students on how to carry out some basic measurement in the forest, estimation of forest yield (basal area, volume and biomass estimation per unit area). Students are adequately taught the use of the various equipments for measurement in the forest. Such equipments are Girth/Diameter tape, Caliper, bark gauge, simple hypsometer, Haga altimeter, Spiegel relaskop, etc. The students are practically exposed to these equipments and how to handle them. Students are also trained on the management of forest resources for sustainable production with the knowledge of tree growth and increment. Some of the topics to be covered include fundamentals of resource inventory and mensuration, theory of tree measurements (diameter, height, back thickness, crown depth & width etc) and tree measurement's Instruments, taper and form, tree and stand volume estimation methods, volume equations. Concepts of growth, increment of trees and stands. Stand table projection; volume tables and yeild tables, growth and yield equations/modelling, concept of stand structure, stand density and stocking, site quality assessment and site index and tree biomass estimation.

COURSE OBJECTIVES

The objectives of this course are to:

- introduce students to the use of some equipments for tree measurement;
- provide students with opportunities to develop their skills in art and theory of quantifying forest resources for the purpose of valuation and decision making.
- train students on how to compute stand yields and volumes and model forest growth and yield
- enable students to know how to assess the increment/growth rate of forest stand and to understand the basic factors affecting stand increment.

COURSE LEARNING OUTCOMES / COMPETENCIES

Upon successful completion of this course, the student should be able to:
(Knowledge based)

- identify and use some basic equipment for tree measurement;
- understand the principle behind the estimation of tree increment and growth rate
- understand the purpose and functions volume and biomass estimation of forest stands
- carry out efficient assessment of forest stand, estimate yield and volume of tree/stand per unit area

(Skills)

- use the some basic equipment to measure tree growth parameters for quantitative assessment
- estimate the volumes of trees/stands using some analytical formula
- calculate forest stand yield and increment of plantations
- generate stand models for yield and biomass estimation in natural forest and plantations;
- create form factor for different types of stands and tree species
- construct a site index for forest stands
- capable of carrying out measurement of forest resources.

GRADING SYSTEM FOR THE COURSE

This course will be graded as follows:

Class Attendance	5%
Assignments	15%
practical	30%
Final Examination	50%
TOTAL	**100%**

GENERAL INSTRUCTIONS

Attendance: It is expected that every student are in class for lectures and also participate in all practical exercises. Attendance records will be kept and used to determine each person's qualification to sit for the final examination. In case of illness or other unavoidable cause of absence, the student must send his/her notification of absence in writing or sms as soon as possible to the instructor, indicating the reason for the absence.

Academic Integrity: Violations of academic integrity, including dishonesty in assignments, examinations, or other academic performances are prohibited. You are not allowed to make copies of another person's work and submit it as your own; that is plagiarism. All cases of academic dishonesty will be reported to the University Management for appropriate sanctions in accordance with the guidelines for handling students' misconduct as spelt out in the Students' Handbook and all the students involved will score zero in that particular work.

Assignments and Group Work: Students are expected to submit assignments as scheduled. Failure to submit an assignment as at when due will earn you zero for that assignment. Only under justifying circumstances, for which a student has notified the instructor (in writing/sms) in advance, will late submission of assignments be permitted.

Code of Conduct in Lecture Rooms and Laboratories: Students should turn off their cell phones during lectures. Students are prohibited from engaging in other activities (such as texting, watching videos, *etc*.) during lectures. Food and drinks are not permitted in the laboratories.

READING LIST

1 Avery ET, Burkhart HE. 2002. *Forest Measurements*, 5th Edition. New York, USA: McGraw-Hill Higher Education

2 Husch B, Beers TW, Kershaw Jr JA. 2003. *Forest Mensuration*. 4th edition. John Wiley and Sons, Inc.

3 Vanclay JK. 1994. Modelling forest growth-applications to mixed tropical forests. CAB International, Department of Economics and Natural Resource, Royal Veterinary and Agricultural University Copenhagen, Denmark, Wallingford, UK, p.312

Note:
These texts are available in the University Library, Departmental/School Libraries and in local bookshops. Additional materials can be obtained on the internet.

COURSE OUTLINE

Week	Topic	Remarks
1	Introduction and Course Overview - definition and importance of measurement in forestry - fundamentals of resource inventory and mensuration	During this first class, the expectation of the students from the course will also be documented.
2 & 3	Theories of forest measurement: The art and theory of measuring the following tree growth variables: - Diameter (DBH) with Girth/diameter tape, Caliper and Relaskop - Importance of diameter measurement - Abnormalities in diameter measurement and the corrections - Merchantable and total tree height with instruments using both Geometry principle (Simple hypsometer, Chapman Hypsometer & Merit Hypsometer) and Trigonometry principle (Abney level, Haga altimeter & Speigel Relaskop) - Bark thickness with Swedish bark gauge - Crown depth and width determination methods	Practical exercises will involve the training of students on the use of each of these equipments. Every student will be allowed to carry out the measurement of these tree growth variables. It important that every student is able to use these equipments properly.
4 & 5	Indicators of tree form - Form factor- types and estimation of form factor for stands - Form quotient – types and estimation methods - Form point - Basal area estimation formula	The student will be introduced to the various types of form factors and form quotient, how to determine them and their relevance in tree and stand volume estimation. **Practical**: to demonstrate the use of form factor for stand volume estimation. Forest stands will be allocated where students will collect some basic data to generate form factor for stands in the departmental plantations
6	Tree and stand volume estimation methods: - Displacement method - Graphical method - Analytical formula - Volume equations (Simple, standard and more elaborate volume equations)	The three methods for volume estimation will be explained. Emphasis will be placed on the analytical formula especially, the Newton, Smalian and Huber's formula. Models will be developed for volume estimations by the students
7 & 8	Concepts of growth, increment of trees and stands - Mean Annual Increment - Current Annual increment	The various methods for assessing and estimating tree growth and increment will be explained. Field work will be assigned to students and individual student is

	- Periodic annual increment - Increment determination and measurement Factor affecting tree and stand increment: Genetical make up, biotic (soils), abiotic (man and animals, completion, climatic etc	expected to submit his job as an assignment. The use of tree increment for management decision and appropriate evaluation will be demonstrated
9 & 10	Stand structure, Stand density, and site index - Structure and physiognomy of tropical natural forest ecosystem - Natural forests and plantations Stand density and Stocking - Management of stand density to achieve multiple objectives - Spacing Site index - Concept of site index - Site index models and curves using dominant height and base age	Students will be taught on the structure and physiognomy of the tropical natural forest. The difference between natural and man-made forest will be explained with the advantage of one over the other. At the end of this class, every student should be able to generate site index models and construct site index curves
11 & 12	Biomass estimation methods - Destructive methods - Non destructive methods - Biomass models - Carbon estimation from forest biomass	The merit and demerit of each method will be discussed. Data will be collected from the field to estimate stem biomass using the non destructive method (tree density and volume). The inventory data will be adopted to estimate biomass from existing models
13 1 4	- Stand table projection; - volume tables and yeild tables, - growth and yield equations/modelling, - Correlation, simple linear and non linear regression equations - Multiple linear, growth functions and user define models	Model simulation for yield projection will be carried out by the students
15	REVISION	This is the week preceding the final examination. At this time, evaluation will be done to assess how far the students' expectations for the course have been met.