

FOR 306: Forest Biometry
Spring 2009

Lecture: Mon, Wed, Fri: 12:40 – 1:30, Room 225

Lab: Wed, 3pm to 4:50pm, Varied locations

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Office hours: Mon., 1:30-2:30 and Fri., 1:30-2:30, or by arrangement.

Course Description: Forest Biometry is the application of mathematics and statistics to forestry data. The subject is heavily focused on measuring the attributes of trees and forests, i.e., forest measurements and inventory. Without specific quantitative information on the state of a forest, it is difficult to make any decisions regarding what to do (or not to do) with it. Lectures and discussions are oriented toward thinking about and solving basic problems of quantifying tree and forest attributes. Outdoor labs will focus on learning to use measurement tools and indoor (computer) labs will focus on developing competence in data analysis and applied statistics.

Lab requirements: You are required to complete outdoor labs under almost all weather conditions. Labs are about 2 hours long. Please dress appropriately.

All data collected during labs should be submitted in Excel® Spreadsheet format.

Lab reports are due at the beginning of the Wednesday lecture after the Lab is assigned, unless otherwise specified.

Grading policy: Grading will be based on total points accumulated by a student over the semester, standardized to fit the university scale for grade points. Grading points will be derived mainly from Lab assignments, but will also be accumulated from tests and random quizzes. Points will be deducted from late incomplete or improperly formatted assignments.

Course textbook/ reading materials: *Forest Measurements*, 5th edition. T.E. Avery and H.E. Burkhart (A&B). Comments: Not a complete reference for the course, but most of the important concepts in the course are illustrated in this book and we will use it often as a reference for discussions and lab. The textbook will be supplemented by other information sources.

Course Lecture Outline	Readings and Labs
<u>Unit I. Statistical concepts & Tree-scale measurements systems</u>	
<i>Week 1. Introduction & review of basic statistical concepts</i> <ul style="list-style-type: none">• Measurement systems• Metrics of central tendency• Metrics of variability• Measurement error	A&B Ch. 1 & 2 Lab, Jan – 14: Wells B100A <i>Data management and statistics</i>

<p><i>Week 2. Correlation between measurements</i> (Short Week MLK holiday- no Mon. Lec.)</p> <ul style="list-style-type: none"> • Covariance and Correlation • Introduction to Linear regression 	<p>A&B Ch. 2 Lab, Jan – 21: Wells B100A <i>Correlation & linear regression</i></p>
<p><i>Week 3. Basic tree measurements</i></p> <ul style="list-style-type: none"> • Parts of trees and measurement units • Stem measurements: height and diameter 	<p>A&B Ch. 7 Outdoor Lab, Jan – 28 <i>Basic tree measurements</i></p>
<p><i>Week 4. Scaling of logs and other wood products</i></p> <ul style="list-style-type: none"> • Log rules, taper models • Logs, bolts and other scaling units • Ratio estimation 	<p>A&B Ch. 5 & 6 Lab, Feb – 4: Wells B100A <i>Wood products scaling and taper models. Ratio estimators.</i></p>
<p><i>Week 5. Estimating wood volume in standing trees</i></p> <ul style="list-style-type: none"> • Tree valuation, merchantability standards • Stem taper, form factors, bark measurements • Branch wood modeling 	<p>A&B Ch. 5, 6, 7 Outdoor Lab, Feb – 11: <i>Estimating wood volume in standing trees</i></p>
<p><i>Week 6. Quantifying tree biomass, carbon and energy</i></p> <ul style="list-style-type: none"> • Biomass equations; wood carbon and energy conversions • Allometric equations • Non-linear regression • Regression estimation 	<p>A&B Ch. 5, 8 Lab, Feb – 18: Wells B100A <i>Allometry and Log-linear regression. Regression estimators</i></p>
<p><i>Week 7. Growth metrics</i></p> <ul style="list-style-type: none"> • Tree growth • Dendrochronology • Stem analysis 	<p>A&B Ch. 7,15,16,17 Lab, Feb – 25: NR 306: <i>Stem analysis</i></p>
<p><i>Week 8. Crown, root and live wood metrics</i></p> <ul style="list-style-type: none"> • Crown measurements • Root measurements • Sapwood area, heartwood area 	<p>Text supplement Outdoor Lab, Mar – 4: <i>Crown measurements</i></p>
SPRING BREAK	March 9-13
<u>Unit II. Survey sampling & forest / stand -scale measurements</u>	
<p><i>Week 9. Forest inventory / measurements of forest structure</i></p> <ul style="list-style-type: none"> • Metrics of stocking, density & canopy structure • Diameter distributions, stocking- and stand- tables • Metrics of biodiversity 	<p>Outdoor Lab, Mar – 18: <i>Forest structure measurements - stem mapping</i></p>

<p><i>Week 10. Sampling concepts and Survey strategies</i></p> <ul style="list-style-type: none"> • Sampling statistics and sampling error • Cost, efficiency and effort allocation • Sampling designs: simple random & systematic 	<p>A&B Ch. 3,9</p> <p>Lab, Mar – 25: Wells B100A <i>Stand statistics and data analysis / 3D-stand visualization</i></p>
<p><i>Week 11. Sampling methods-fixed area</i></p> <ul style="list-style-type: none"> • Tree selection-fixed probability sampling • Quadrats, strips and radial plots • Continuous vs. discrete sample frames • Scaling up per-tree to per-area estimates 	<p>A&B Ch. 3,9</p> <p>Outdoor Lab, Apr – 1 <i>Fixed-area plot sampling</i></p>
<p><i>Week 12. Strategic sampling & spatial variability</i></p> <ul style="list-style-type: none"> • Spatial variation in stand and tree attributes. • Stratified sampling. • Forest edge and other special considerations 	<p>A&B Ch. 3,9</p> <p>Lab, Apr – 8: Wells B100A <i>Strategic sampling</i></p>
<p><i>Week 13. Horizontal Point Sampling</i></p> <ul style="list-style-type: none"> • Tree selection-variable probability sampling • Timber cruising with point sampling • Analyzing point sample data 	<p>A&B Ch. 11</p> <p>Outdoor Lab, Apr – 15: <i>Horizontal point sampling</i></p>
<p><i>Week 14. Line Intersect Sampling</i></p> <ul style="list-style-type: none"> • Measuring fuel loads and coarse woody debris • Line Intersect Sampling methods 	<p>Outdoor Lab, Apr – 22. <i>Line-intersect sampling</i></p>
<p><i>Week 15. Measuring Forest Change</i></p> <ul style="list-style-type: none"> • Continuous Forestry Inventory (CFI) and repeated measures designs • Forest Health Monitoring (FHM) • Carbon sequestration 	<p>Lab, Apr – 29. TBA</p>
<p>FINAL EXAM 12:45-2:45 pm</p>	<p>Tuesday, May 5th.</p>