A. Course Description and Rationale:
SFR 402 (3) is a continuation of the topics introduced in SFR 205. The course encompasses methods used to measure log, tree, stand, and forest-level attributes. A key component of the course is learning how to sample and analyze forest resources data.

To manage forest resources sustainably, practitioners must know the quality and quantity of resources and how they change over time. Forest mensuration provides information that support forest management decisions at the stand and forest levels. Although the general topic of the course focuses on quantitative analysis of forest vegetation, we will spend considerable time and effort on measuring other forest resources (e.g., wildlife habitat resources and riparian zones). Moreover, the theory and methodology discussed in this course can be applied to other renewable resources.

B. Course Structure and Organization:
The instructor assumes that you have successfully completed the prerequisite courses listed above. If you have not completed these courses, please notify the course instructor at the beginning of the term. SFR 402 is a lecture-lab course with two 50-minute lectures and one 3-hour lab per week.

The course will have both theoretical and practical components, with major emphasis on application of various quantitative techniques to solve mensurational problems. Topics are presented both in class and
lab sessions. The lab section focuses on learning how to use Microsoft Excel as well as various sampling methods used to obtain and analyze tree, stand and forest-level data.

C. Course Objectives

The overall objective of this course is to understand the principles, concepts, and methods used for log, tree, stand, and forest-level measurements that support management decisions. Also, students will learn practical skills for both office and field settings.

D. Course Outcomes

After completing the course, you will:

1. develop skills necessary to measure, acquire, analyze, and describe mensurational data and interpret resulting information;
2. understand mathematical, statistical, and mensurational principles for designing and applying measurement and sampling protocols;
3. be familiar with commonly used instruments and techniques for log, tree, stand, and forest level measurements; and
4. master conventional timber cruising and log scaling skills, as well as other techniques for measuring attributes needed for ecosystem management.
5. be able to use Microsoft Access to display, analyze, and summarize data

E. Course Topics and Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture</th>
<th>Lab</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 14</td>
<td>Course Introduction</td>
<td>Introduction to using Microsoft Access (Nutting 239)</td>
<td>Iles; p. 21-61</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Review of Statistical Principles and Techniques</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Jan 21</td>
<td><strong>Martin Luther King Day (no class)</strong></td>
<td>Statistics in Access (Nutting 239)</td>
<td>Iles; p. 114 - 125, 135-139</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Basic Tree-Level Measurements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Jan 28</td>
<td>Tree form and volume</td>
<td>Estimate tree volume and develop local volume tables (Nutting 239)</td>
<td>Husch; p. 110-113, 118-150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Volume tables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Feb 4</td>
<td>Tree Growth</td>
<td>Tree Growth; Log Scaling and Rules (Nutting 239)</td>
<td>Iles; p. 141-144</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Log Scaling and Rules; Cord Scaling/Cull Estimation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Week</td>
<td>Date</td>
<td>Lecture</td>
<td>Lab</td>
<td>Reading</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>----------------------------------------------</td>
<td>------------------------------------------</td>
<td>------------------</td>
</tr>
</tbody>
</table>
| 5    | Feb 11  | Stand attributes: Species Composition and Density  
Stand attributes: Site quality and site index | Calculating stand density and species composition (Nutting 239) | 2 book chapters available online | Iles; p. 128-
135; Husch; p. 162-169, 174-
177, 178-181, 188-
190, 193-200 |
| 6    | Feb 18  | Stand growth and stand table projection  
Growth and yield models/Stand Visualization | Site Index; Stand summaries and table projection (Nutting 239) | 2 book chapters available online | Husch; p. 377-
397  
Husch; p. 397-
401 |
| 7    | Feb 25  | Review                                      | Growth models (Nutting 239)               | -                | -            |
| 8    | Mar 18  | Introduction to sampling  
Sample size | Dealing with a large forest inventories (Nutting 239) | Iles; p. 151-
195, p196-250 | Husch; p. 258-
261 |
| 9    | Mar 25  | Sampling the forest  
Fixed radius sampling | Variable radius plot | Iles; p. 332-
360, 360-363 | Husch; p. 261-
265 |
| 10   | Apr 1   | Variable radius sampling  
Variable radius sampling (continued) | Horizontal line sampling | Iles; p. 490-
567, 638-640 | Husch; p. 272-
282 |
| 11   | Apr 8   | 3-P sampling  
Stratified sampling | 3-P | Iles; p. 431-
478, 284-328 | Husch; p. 355-
358, 316-320 |
| 12   | Apr 15  | Regeneration Sampling  
Sampling with Lines | Field exercise | Husch; p. 238-
241  
Iles; p. 378-
422 | Husch; p. 241-
248 |
| 13   | Apr 22  | Growth estimation and monitoring  
Measurements and the real world | Field exercise | Iles; p. 660-
685 | Husch; p. 334-
336 |
| 14   | Apr 29  | Course Review  
Maine Day (no class) | Field exercise | - | - |
| FINAL| May 6 (10:30 am – 12:30 PM) | Final Project Presentation | - | - |
F. Grading Plan:
Grading will be based on eleven weekly laboratory assignments, an oral presentation, and field performance, one-midterm exam, and a final project. All laboratory assignments will have the same weight and will be graded on a percentile basis. The relative weights of the course components are:

Lab reports (11) and field performance 35%
Midterm Exam 25%
Final Project 20%
Participation 15%
Oral presentation 5%

Lab reports, oral presentation, and field performance

Lab reports are due 1 week after they are assigned. Late lab reports will not be accepted.

For field labs, the relevant maps and descriptions of the labs will be handed out prior to each lab session. Field procedures will be explained at the start of each lab session. Laboratory exercises will be conducted in crews of three or four students each. For each lab, crews will work independently, applying the knowledge acquired in lectures and labs.

The final field exercise will involve using the skills developed in this course to inventory a ~5 acre stand and report the results orally and in a written report. The stand can be selected by the group. A stand will be made available if desired.

Exam

One midterm exam will be given during the semester (February 27, 2013). The exam will be open book and will involve an array of formats including multiple choice, short answer, and essay. The questions will come from both the lecture and textbook.

Final Project

In lieu of a final exam, a final project will be turned in and presented on the date of the scheduled final exam (May 6, 2013). The final project will involve summarizing the stand inventory, assessing the performance of the selected sampling scheme and intensity, and recommendations for future inventories. This project will be three to five pages in length and include Introduction, Methods, Results, and Discussion sections. More information will made available later in the term.

G. Availability of Course Materials

All course materials will be made available on Blackboard (https://www.courses.maine.edu). You will be required to enter your University of Maine System user name and password to gain access to the site.

H. Accommodations for Students with Disabilities

If you need course adaptations or accommodations because of a disability, please contact Disability Support Services (East Annex, 581.2319).
I. Student Code of Conduct

School of Forest Resource students must adhere to the University of Maine Student Conduct Code. Each student is expected to work independently on all exams, including take home exams. Students may neither give nor receive any assistance on examinations. All written material, including homework, term papers, reports, etc., must be the student’s original work. The bounds of original work and the degree of collaboration that will be allowed in this course will be established by the professor. The work(s) of others may only be used with proper reference or acknowledgment. Failure to adhere to this policy can result in the receipt of a failing grade, suspension, or dismissal from the University. Official University Policy: No tuition refunds will be allowed for dropped courses after the second week of class unless very extraordinarily extenuating circumstances exist.

J. Attendance Policy

Attendance is expected at all lectures and required at all laboratories. Students missing laboratories for a good reason should notify the instructor or Graduate Teaching Assistant prior to lab to arrange an alternate assignment. Failure to do so will result in a zero for that exercise. Three missed labs will result in an L grade for the course (a failure for nonattendance).

K. Grading Policy

Grades will be assigned as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage Range</th>
<th>Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90 - 100</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>80 - 89</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>70 - 79</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>60 - 69</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Below 60</td>
<td></td>
</tr>
</tbody>
</table>

Plus/Minus grading may be used if warranted. Late assignments will lose 10% each day past the due date unless the Instructor or Graduate Teaching Assistant is notified prior. Students will only be excused from an exam in only two situations: (1) preapproved absence for medical reasons and (2) emergency medical absence.

L. H1N1

In the event of disruption of normal classroom activities due to an H1N1 swine flu outbreak, the format for this course may be modified to enable completion of the course. In that event, you will be provided an addendum to this syllabus that will supersede this version.

M. Competencies

The following are specific skills that one should have after completing this course:

1. Calculate the volume of an individual tree using a volume table, equation, and stem analysis measurements
2. Use volume estimates and wood density to predict carbon content in tree stems
3. Collect data for estimating stand parameters using fixed area plots
4. Collect data for estimating stand parameters using variable radius sampling
5. Collect data for estimating stand parameters using 3-P sampling
6. Demonstrate how to estimate species composition on the basis of stand density, basal area, and volume
7. Develop appropriate histograms to show species composition
8. Estimate arithmetic and quadratic mean from a given set of tree measurements
9. Estimate a basal area-weighted mean tree height from a given set of variable radius sampling data
10. Develop an appropriate stand and stock table from fixed area plot measurements
11. Develop an appropriate stand and stock table from variable radius sampling data
12. Understand how individual tree growth models like FVS function
13. Estimate average stocking or density from a regeneration survey
14. Use increment data to develop a stand table projection system
15. Use stand tables projections to forecast stand volume and value growth
16. Calculate the minimum number of samples to achieve a desired level of statistical precision
17. Use Access to conduct basic data calculations and conversions
18. Use Access to conduct basic statistical analyses
19. Use Access to summarize tree lists
20. Use Access graphics to develop an appropriate display data and fit a regression model
21. Summarize data into meaningful report with appropriately titled tables and graphs
N. Course Concept Map

Forest Measurements & Modeling

Tree and Stand Measurements

- Tree diameter, height, crown, and growth
- Log grading & scaling
- Density, stocking, DBH distribution, and Volume

Statistics

- Descriptive
- Inferential

Sampling Designs

- Simple Random
- Systematic
- Variable Selection
- Probability
- Stratified

Lab 1: Using Access

Lab 2: Descriptive & Inferential Statistics

Lab 3: Tree and Stand Volume

Lab 4: Tree growth and log scaling

Lab 5: Stand density and composition

Lab 6: Stand table projection

Lab 7: Using growth models

Lab 8: Summarizing forest inventory data

Lab 9: Fixed area plots

Lab 10: Variable radius plots

Lab 11: 3P sampling

Final Project

INDOOR

OUTDOOR