The University of British Columbia, Faculty of Forestry
FRST 533C Course Outline for Fall 2010

Instructor:
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Calendar Description:
FRST 533. Problems in statistical methods. Directed studies in problems of advanced statistical techniques as a tool in forestry research. **NOTE: This is now a formal graduate course. Classes will be taught jointly with FRST 430. Labs will be a bit different for FRST 533 students than for FRST 430 students, and there is a project required for FRST 533. A prior introductory course in probability and statistics (e.g., FRST 231) is essential to understanding the course content.**

Lectures:
Monday, Wednesday, and Friday 1200 to 1300 Location: FSC 1003

Labs/Tutorials:
Tuesday 1100 to 1300 FSC 1222
Thursday 1400 to 1600 FSC 1222

Graduate Teaching Assistants:
Leah Rathbun (head GTA) and Suborna Ahmed

Course Objectives and Overview:
The objectives of this course are:

1. To be able to use simple linear and multiple linear regression to fit models using sample data;
2. To be able to design and analyze lab and field experiments;
3. To be able to interpret results of model fitting and experimental analysis; and
4. To be aware of other analysis methods not explicitly covered in this course.

In order to meet these objectives, background theory and examples will be used. A statistical package called "SAS" will be used in examples, and used to help in analyzing data in exercises. Texts are also important, both to increase understanding while taking the course, and as a reference for future applied and research work.

Evaluation:
Assignments	25%
Midterm	25%
Project	15%
Final Exam	35%

NOTE: A reduction in grade of 1 mark per day will be assigned to late labs. Labs will not be accepted for grading once graded labs have been handed back to the class.

Important Dates:
Friday October 22, 2010: MIDTERM EXAM, Week 7, Friday October 22, 2010 covering Fitting Equations only. OPEN BOOK EXAM

Friday November 5: PROJECT PROPOSAL DUE. See last page of this outline for details.

Wednesday, December 8: PROJECT DUE. See last page of this outline for details

December 7 to 21: FINAL EXAM PERIOD. Date and time will be available by mid-October.

Required Texts:

Notes for the course: Purchase from Debbie or Marissa in FSC 2045. $15.00. You must have these notes for the course. You can also find an electronic version in the www.forestry.ubc.ca/biometrics website. It is cheaper to buy the printed copy (double-sided, two pages per side, and hole-punched).

Freese, F. Elementary statistical methods for foresters. [www.forestry.ubc.ca/biometrics and then clink on "links" to find a .pdf copy of this simple textbook with good examples.

Recommended Texts:

Kutner, M.H., C.J. Nachtsheim, J. Neter, and W. Li. 2005. Applied linear statistical models, 5th edition. [Woodward library two copies in 3 hour reserve; you may purchase a copy from the book store on online book sellers such as Indigo/chapters or Amazon – NOTE: There is a 4th edition (1996) with a slightly different listing of authors that is also good]

Der, Geoff and Brian S. Everitt. 2002. A handbook of statistical analysis using SAS. 2nd edition. Chapman & Hall/CRC Press, Washington. [You can download an e-copy via www.library.ubc.ca then select "e-resources", then "Indexes and databases", and choose the database "STATSNETBASE" . Search for the book and download a .pdf copy of each chapter.]

Spencer, Neil. 2004. SAS Programming: The One-Day Course. Chapman & Hall/CRC Press, Washington. [You can download an e-copy via www.library.ubc.ca then select "e-resources", then "Indexes and databases", and choose the database "STATSNETBASE" . Search for the book and download a .pdf copy of each chapter.]

Other Reference Materials:

Biometrics Pamphlets (www.forestry.ubc.ca/biometrics and then clink on "links" to find the biometrics pamphlets by Ministry of Forests, Research Branch [excellent with a variety of examples for each experiment]

Hicks, C.R. 1993. Fundamental concepts in the design of experiments, 4th edition. Saunders College Publishing, Toronto. [good text on experimental design.]

Cody, R.P., and Smith, J.K. 2006. Applied statistics and the SAS programming language, 5th Edition. Pearson Education Inc., New Jersey.

Course Content:

You will find greater details on the specific course content, along with page references for each topic in the course notes.

I. **Course Introduction, SHORT Review Probability and Statistics [Week 1]**

II. **Fitting Equations [Weeks 2 to 5]**

- Simple Linear Regression (SLR) [Weeks 2 and 3]
- Multiple Linear Regression [Weeks 3 and 4]
- Using class variables as predictors [Weeks 4 and 5]
- Tools to Select Variables [Week 5]

III. Experimental Design and Analysis [Weeks 6 to 12]

- Introduction, concepts and terminology [Week 5]
- Completely Randomized Design (CRD) [Weeks 6 and 7]
- Restrictions on Randomization
    - Randomized Block Design [Week 8]
    - Split-Plot Design [Week 9]
- Nested and hierarchical designs [Weeks 9 and 10]
- Adding Covariates (continuous variables) [Week 11]
- Expected Mean Squares – Method to Calculate These [Week 12]
- Power Analysis [Week 12]

IV. Course Review [Week 13]

Assignments/Exams/Project Schedule:

Week	Dates	Assignments/Exams/Project
1	Sept 6 (holiday) Sept 7 to 10	Class on Wednesday and Friday. Review of statistics; practice exercise and assigned readings. *No formal lab sessions.*
2	Sept 13 to 17	Assignment 1: Review of statistics and simple linear regression (SLR).
3	Sept 20 to 24	Assignment 1 (con't): SLR and using SAS
4	Sept 27 to Oct 1	Assignment 2: Multiple Linear Regression (MLR)
5	Oct 4 to 8	Assignment 3: MLR – model selection and class variables
6	Oct 11 (holiday) Oct 12 to 15	Assignment 4: Completely Randomized Design, One Factor Fixed Effect, and Two Factor Fixed Effects
7	Oct 18 to 22	Assignment 4 (con't): Completely Randomized Design, One Factor Fixed Effect, and Two Factor Fixed Effects **MIDTERM EXAM, Friday, October 22, 2010**
8	Oct 25 to 29	Assignment 5: Randomized Block Design (RBD)
9	Nov 1 to 5	Assignment 6: Split plot designs **PROJECT PROPOSAL DUE, Friday, Nov 5**
10	Nov 8 to 12; holiday Nov 11	*No new assignment*
11	Nov 15 to 19	Assignment 7: Subsampling
12	Nov 22 to 26	Assignment 8: Analysis of covariance
13	Nov 29 to Dec 3	*Review*
	Wednesday, December 8	**PROJECT DUE**
	December 7 to 21	**Final Exam: Date To be Announced**

Project Guidelines

Score: 5 (proposal) + 15 (project) = 20 (maximum score)

Project*:* The project part of the requirements for completion of this course is intended to give you the opportunity to use the tools presented in the course on a problem that is of interest to you (*Option* 1) or to study another method not covered in the course (*Option 2*).

Proposal To obtain some early feedback on your chosen project, a proposal for the project is due by **Friday, November 5**. In the proposal, indicate:

1. Your name
2. Which option you have selected.
3. If option 1, then include:
    a. Introduction: A brief description of the background and the objectives for your project
    b. Methods:
        i. A brief description of the data you will use
        ii. A brief description of the methods you will use
4. If option 2, then indicate
    a. Introduction: A brief description of the technique (or method) you will study
    b. Background: A brief description of textbooks and other materials you have already examined
    c. Example: A brief description of the data that you will use as an example of using the method.

I will give you feedback on your outline and let you know if this is suitable for the time that you have. The outline is worth 5 points.

Report: The report will differ depending upon the option that you have selected.
Option 1: (often the easier option) research report for some data that you analyze using methods from the class.

- maximum 10 pages, including outputs
- 11 or 12 pt
- 1.5 line spacing
- outline:
    - 1.0 introduction – briefly introduce the problem, any background papers and information, and end with your objective for this report
    - 2.0 Methods – describe the data and the analysis used
    - 3.0 Results – present graphs, tables, fitted equations in a formal report style. Any results should appear only if introduced in the text. For example, if you put in a graph of y versus x, indicate in the text that this graph will appear ("A graph of height versus dbh indicated a curved relationship (Figure 2)") along with observations about this graph.
    - 4.0 Discussion – discuss your results in the context of the references from your introduction, and other references.
    - 5.0 Conclusions – refer back to your objective(s), give a couple of concluding statements that relate to your objective. Also state how the research might be improved and/or what further research is needed.
    - 6.0 References Cited
- Calculations/SAS outputs either formatted as tables and figures within the text, or as LABELLED AND FORMATTED appendices.

Option 2: Report describing another technique not covered in class

- maximum 10 pages, including outputs
- 11 or 12 pt
- 1.5 line spacing
- outline:
    - 1.0 introduction – briefly introduce the method and what it might be used for
    - 2.0 background – explain the technique in detail, with equations where necessary, and references to your sources of information.
    - 3.0 Example – provide a worked out example of the use of the method, along with SAS outputs. Format outputs into tables and graphs and insert these into the text.
    - 4.0 Summary – summarize generally what the method is and how it might be used
    - 5.0 References Cited
- Calculations/SAS outputs either formatted as tables and figures within the text, or as LABELLED AND FORMATTED appendices.

CAUTION: You must be careful to give credit to the work of others. You cannot take materials from textbooks or papers, or other works and simply copy them into your work (called plagerism). Instead, take the ideas of several authors, summarize them in your own words, and reference all of these authors.