The University of British Columbia, Faculty of Forestry
Forestry 430 Advanced Biometrics
Course Outline for Fall 2010

Instructor:
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Calendar Description:
FRST 430. Advanced biometrics. Analysis of variance, multiple regression and analysis of covariance. Design and analysis of experiments. Prerequites: FRST 231.
NOTE: The prerequisite for FRST 430 is an introductory course in probability and statistics (e.g., FRST 231), which 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:
Suborna Ahmed (head GTA) and Irena Fundova

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   30%
Midterm   30%
Final Exam   40%
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

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 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
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*
	December 7 to 21	**Final Exam: Date To be Announced**