The University of British Columbia

Department of Statistics

Graduate Brochure

2011-2012

GRAD COURSES TERM 2: (January to April 2012)

		Sec No	Creds	Days Met	Start Time	End time	Long Title	Building	Room	Instructor
STAT	536 C	201	3	T R	9:30 AM	11:00 AM	Statistical Theory for the Design and Analysis of Clinical Studies	LSK	301	Gustafson, Paul
STAT	540	201	3	M W	9:30 AM	11:00 AM	Statistical Methods for High Dimensional Biology	SWNG	307	Bryan, Jenny Pavlidis, Paul
STAT	548 B	201	3				Directed Studies in Statistics - Qualifying Course (students are to register in both terms)			
STAT	547 M	201	1.5	M W	*1:30 PM	*3:00 PM	Statistical Modelling in Extreme Values 4 Jan. to 22 Feb.	LSK	301	Nolde, Natalia
					* or 3:00 PM	*or 4:30		*or WMAX	216	
Stat	521 B	201	1.5	M W	*1:30 PM	*3:00 PM	Topics in Multivariate Analysis - Copula Foundtions and Applications 27 Feb to 5 April	LSK	301	Joe, Harry
					* or 3:00 PM	*or 4:30		*or WMAX	216	
STAT	550	201	3	T R	2:30 PM	4:00 PM	Techniques of Statistical Consulting	LSK	301	Brant, Rollin
STAT	561	201	3	M W F	11:00 AM	12:00 PM	Statistical Theory II	LSK	301	Wu, Lang
STAT	549 A		6				Thesis for Master's Degree			
STAT	589		3				M.Sc. Project			
STAT	649		0				Doctoral Dissertation			

GRADUATE COURSES FROM OTHER DEPARTMENTS which may be of interest:

Some courses may have restricted registration. If you are interested in taking a course but are unable to register in it, please contact the appropriate department or the Instructor. If you are still unable to register, please speak with the Statistics Graduate Services staff member.

BAMS	501	1	1.5	T R	2:00 PM	4:00 PM	Probabilistic Models for Management (6 Sept. to 15 Oct. 2011	Swing Space	106	Zhang, George
BAMS	502	1	1.5	T R	2:00 PM	4:00 PM	Stochastic Processes (24 Oct. to 3 Dec. 2011)	Swing Space	106	Zhang, George
BAMS	517	2	1.5	T	2:00 PM	5:30 PM	Decision Analysis (3 Jan. to 11 Feb. 2012)	Swing Space	106	Zhang, George
BAMS	518	2	1.5	W F	10:00 AM	12:00 PM	Markov Decision Process (27 Feb. to 5 April 2012)	Swing Space	106	Steven Shechter
CPSC	540	201	3	T R	11:00 AM	12:30 PM	Machine Learning	DMP	101	Nando de Freitas
PSYCH	546 Y	2	To be confirmed				Structural Equation Modelling			Victoria Savalei

Courses of Potential Interest to Graduate Students 2011-2012

GRAD COURSES TERM 1: (September to December 2011)

		Sec No	Creds	Days Met	Start Time	End time	Long Title	Building	Room	Instructor
STAT	404	101	3	M W	3:00 PM	4:30 PM	Design and Analysis of Experiments	Geog	101	Chen, Jiahua
STAT	538 A	101	1.5	M W	9:30 AM	11:00 AM	(24 Oct. to 2 Dec. 2011) Generalized Linear Models	LSK	301	Wu, Lang
STAT	545 A	101	1.5	M W	9:30 AM	11:00 AM	(7 Sept. to 21 Oct. 2011) Exploratory Data Analysis	LSK	301	Bryan, Jennifer
STAT	547 C	101	3	M W	1:30 PM	3:00 PM	Topics in Probability for Statistical Modelling	LSK	301	Bouchard-Côté, Alexandre
STAT	547 N	101	1.5	MW	12:00 PM	1:30 PM	Topics in Statistics - Topic in Robustness (2 Sept. to 21 Oct.)	LSK	301	Zamar, Ruben
STAT	548 A	101	3				Directed Studies in Statistics - Qualifying Course (students are to register in both terms)			
STAT	551	101	3	T R	9:30 AM	11:00 AM	Statistical Consulting Practicum	LSK	301	Petkau, John
STAT	560	101	3	M W F	11:00 AM	12:00 PM	Statistical Theory I	LSK	301	Zamar, Ruben

STAT 404 – DESIGN AND ANALYSIS OF EXPERIMENTS
2011/2012 Term 1

Course description: Theory and application of analysis of variance for standard experimental designs, including blocked, nested, factorial and split plot designs. Fixed and random effects, multiple comparisons, analysis of covariance.

Prerequisite: Statistics 305.
Co-requisite: Statistics 306.

Textbook: Wu and Hamada, *Experiments: Planning, Analysis and Parameter Designs Optimization.*

References:
Box, Hunter & Hunter. *Statistics for Experimenters*. Wiley

Montgomery. *Design and Analysis of Experiments.* Wiley.

Scheffe. *The Analysis of Variance*. Wiley

Topics:

Introduction to DOE and Basic Regression Analysis.

Experiments with a Single Factor: One Way ANOVA

Experiments with More Than One Factor

Full Factorial Experiments at Two Levels

Fractional Factorial Experiments at Two Levels

Fractional Factorial Experiments at Three Levels

Orthogonal Arrays and Response Surface Methodology

Robust Parametric Design (Time permits)

Course work: Five assignments; one midterm (Oct 26) and a regular final exam.

Final mark: 20% assign + 30% Midterm + 50 % final.
One must attain 50% in the final exam to pass the course.

STAT 538A - GENERALIZED LINEAR MODELS
2011/2012 - Term 1

Prerequisite: Open to any interested graduate students in the Department of Statistics. Graduate students from other departments are welcome provided they have sufficient statistical and mathematical backgrounds. Such students should consult the instructor about suitability.

Textbook: "Extending the linear model with R: generalized linear, mixed effects, and nonparametric regression models," by Julian Faraway. Chapman and Hall / CRC Press, 2006 (ISBN 1-58488-424-X).

Description: Generalized Linear Models (GLMs) extend much of the `niceness' of linear models to situations where the response variable is not continuous. Consequently these models are popular for analysis in the common scenarios of response variables which are binary, categorical, counts, proportions, or directions. GLMs have become a big part of the `statistical toolbox' in most application areas. This course will be a core introduction to GLMs, including a quick review of linear models, the fundamental formulation of GLMs, discussion of link functions, iterative least-squares algorithms, deviance and asymptotic theory, residuals, quasi-likelihood, and quadratic variance functions. A wide range of GLM applications will be discussed.

Coursework will include a mix of data-analytic and empirical exercises (i.e., using the computer) and more theoretical exercises. Students will develop (or already have) some computing skills with the R software package.

Other References:

An Introduction to Generalized Linear Models, Second Edition, by Annette J. Dobson. Chapman and Hall / CRC Press, 2001 (Freely available to UBC community via library subscription to StatNetBase.)

Generalized Linear Models, Second Edition. McCullagh and Nelder. Chapman and Hall / CRC Press, 1989.

Modern Applied Statistics with S. Venables and Ripley. Springer, 2002.

STAT 545A – DATA ANALYSIS
2011/2012 - Term 1

Term 1, 2010/11 (6.5 weeks: *7 Sept.– 21 Oct. 2011*, 1.5 credits)

DESCRIPTION. This course has three intertwined goals;

- Expose students to state-of-the-art R/S-Plus software for data analysis and statistical research.
- Expose students to datasets and scientific problems that exemplify modern statistical practice.
- Expose students to statistical methods ranging from core techniques (linear models, generalized linear models) to more modern and flexible techniques (methods which are robust to outliers, classification and regression trees, clustering techniques, curve-fitting techniques, and others).

Knowledge and skills from this course may be useful to first-year graduate students as preparation for summer Research Assistant work.

AUDIENCE. This course is open to any graduate student in the Department of Statistics. Graduate students from other departments are welcome after consultation and permission of the instructor.

TEXTBOOK. Venables and Ripley (2002). Modern Applied Statistics with S-PLUS, fourth edition. Springer.
The listed textbook is a suggested reference, but students are not required to buy. We will use eBooks available through the UBC site licenses.

PREREQUISITE. Sufficient statistical background or permission of the instructor.

STAT 547C - TOPICS IN PROBABILITY
2011/12 - Term 1

Instructor:

Alexandre Bouchard, LSK 330, Email: bouchard@stat.ubc.ca (all emails should have a subject starting with the exact string 'STAT547C ').
See the following webpage for the latest course information:
http://www.stat.ubc.ca/~bouchard/courses/stat547-fa2011/index.html

Outline:

A graduate level course in probability with an emphasis on how the theory is applied in statistics. The main topics covered include:

- Measure-theoretic foundations with examples in statistics (sufficient statistic in terms of sigma-algebras, exponential families as collections of Radon-Nikodym derivatives, etc.).
- Convergence theorems: Kolmogorov's LLN, Glivenko-Cantelli Theorem, Lindeberg's CLT, Poisson convergence. Normal and stable limit laws. Applications to Monte Carlo simulation and asymptotic statistics.
- Moment generating and characteristic functions, inversion formula.
- Conditioning, Markov Chains and Martingales: asymptotic behavior and important inequalities. Examples from Bayesian statistics and statistical computing.

Prerequisites:

STAT 460 / 560 or equivalent. Ideally, one upper division undergraduate course in probability, and one in analysis. If you are unsure, contact me by email with your (unofficial) graduate and undergraduate transcripts attached.

Textbook:

G.R. Grimmett and D.R. Stirzaker, Probability and Random Processes, 3rd edition, Oxford, (2001). There is a solutions manual to this text: G.R. Grimmett and D.R. Stirzaker, One Thousand Exercises in Probability, Oxford, (2001).

Other References:

- R. Durrett, Probability: Theory and Examples, 4th edition, Cambridge U. Press (2010). Available online for free:
http://www.math.duke.edu/~rtd/PTE/PTE4_Jan2010.pdf
- P. Billingsley, Probability and Measure, 3rd edition, John Wiley & Sons, New York (1995).

STAT 547N- Robustness
2011/2012- Term 1

Description: Statistician often handle data of uneven quality, that is, data contaminated by a fraction outliers and other types of "bias generating" contamination. Classical MLE and least squares procedures commonly used to process these data are very sensitive to contamination in the data. The classical approach for dealing with contaminated data is "to clean the data first and then apply classical statistical procedures". This approach may not be feasible/practicalwhen dealing with a large number of variables and in occasions it may not work at all (e.g. some outliers may not be detected because of masking and swamping).

Modern robust procedures address the question of data quality. When it is found that the model cannot fit all the data well, the robust procedure will automatically search for the largest fraction of data that can be well fit by the model. Robustness theory is also concerned with the issue of measuring the sensitivity of statistical procedures and the development tools to assess "sensitivity". An advantage of robust methods is that they produce reasonable fits in the presence of outliers and other departures from model's assumptions. On the other hand, to apply robust methods we need fast and reliable algorithms. The development of such algorithms is then an area of current research interest.

In this course, the students will learn about the main robust procedures recently implement in available R libraries. They will also learn some basic theoretical concepts of the modern robustness theory. Students will analyze real data sets using robust and non-robust methods and compare their findings.

Instructor: Ruben Zamar

Prerequisite: Stat grad student. Other students, please consult with the instructor.
Evaluation: will be based on 3 Assignments and a final project.

Textbook: There is no textbook for this course. A set of photocopied material from course notes and several papers will be made available to the students throughout the course.

References:
Maronna, Martin and Yohai (2006). *Robust Statistics: Theory and Methods*. Wiley Series in Probability and Statistics.

Rousseeuw and Leroy (1987). *Robust regression and outlier detection*. Wiley.
Hampel, Ronchetti, Rousseeuw and Stahel (1986). *Robust statistics: The approach based on influence functions*. Wiley
Huber (1981). *Robust statistics*. Wiley

Some Topics Covered in This Course:

Location and dispersion models

- S- and M- estimates
- Influence function and contamination sensitivity.
- Breakdown point.
- Maxbias function.
- Huber's and Hampel's optimality problems: Optimally robust estimates.

Regression Model

- S-estimates.
- MM-estimates.
- Tau-estimates

Multivariate Location and Scatter

- M-Estimates
- S-Estimates
- Coordinatewise and pairwise estimates

Local and global robustness

- One-step GM-estimates.

Robust inference

- Robust confidence intervals.
- Robust testing of hypothesis.

Diagnostic tools and outlier tests based on robust procedures

STAT 551 - STATISTICAL CONSULTING
2011 - 2012

Term 1, T & Th 9:30-10:50, LSK 301 **Instructor: John Petkau, LSK 328**

Calendar Description: Supervised statistical practice directed toward the solution of current problems posed by subject-area researchers.

Prerequisite: STAT 550 **and** adequate writing ability, as measured by completion of UBC's English 100, or by achieving a score of 4 or higher on the Language Proficiency Exam (a test administered at UBC).

Remarks: This course gives students practical experience in consulting and in the application of statistical thinking and techniques to current subject-area research problems. Students will apply the basic skills of consulting, developed in STAT 550, to problems posed by subject-area researchers in response to a widely distributed announcement of STAT 551. Course activities include meeting with clients, formulating approaches to clients' problems, making oral presentations, and writing reports summarizing results and recommendations.

Students should aspire to:

- Effectively communicate orally and in writing with non-statisticians so clients understand and can apply your advice.
- Gain practical consulting experience from their clients as well as from other students' clients.

Required Text: None

Selected References:

Boen, J.R. and Zahn, D.A. (1982). *The Human Side of Statistical Consulting.* Lifetime Learning Publications.

Cabrera, J. and McDougall, A. (2002): *Statistical Consulting.* Springer.

Chatfield, C. (1995). *Problem Solving: A Statistician's Guide, 2nd edition.* Chapman & Hall.

Cohen, A.R. and Bradford, D.L. (1991). *Influence Without Authority.* John Wiley and Sons.

Derr, J. (2000). *Statistical Consulting: A Guide to Effective Communication.* Brooks/Cole.

Fisher, R. and Ury, W. (1981). *Getting to Yes.* Houghton-Mifflin.

Hand, D.J. and Everitt, B.S. (1987). *The Statistical Consultant in Action.* Cambridge.

McGuire, P.J. and Putzell, S.M. (1988). *A Guide To Technical Writing.* Harcourt.

Samuels, M.S. (1989). *The Technical Writing Process.* Oxford University Press.

Strunk, W., White, E.B. and Angell, R. (2000). *The Elements of Style, 4th edition.* Pearson Higher Education.

Notes:

1. Students who are required to take STAT 551 may apply for an exemption based on previous equivalent coursework or consulting experience.
2. STAT 551 is graded on a Pass/Fail basis. To earn a Pass, the requirement in the past has been that students must satisfactorily complete reports for four clients **during the term**.
3. The skills developed in STAT 551 are essential for effective employment as an applied statistician. The skills required to interact effectively with non-statisticians in collaborating on research problems will be valuable no matter what career path you are contemplating.

University of British Columbia

STAT 460/560 - STATISTICAL INFERENCE I
2011/2012, TERM I

Course description: A detailed theoretical development: statistical models, exponential families, sufficiency, completeness, and detailed properties of point estimation. Intended for Honours and MSc students.

Pre-requisites: MATH 320, STAT 305 is recommended.

Textbook: Casella, G. and Berger R.L. (2001). Statistical Inference. Second Edition. Duxbury Advanced Series.

Instructor: Ruben Zamar, LSK 331, ruben@stat.ubc.ca

Website: http://www.stat.ubc.ca/~ruben/website/

References:
Hogg, McKean and Craig (2005). Introduction to Mathematical Statistics. Prentice Hall.
Cox and Hinkley (1974). Theoretical Statistics. Chapman and Hall.
J. Shao (1998). Mathematical Statistics. Springer-Verlag.
E.L. Lehmann (1983) Theory of Point Estimation. Wiley/Wadsworth.
C.R.Rao(1980). Linear Statistical Inference and its Applications. Wiley.

Tentative topics:

1. Probability review (Chapter 1-4; two weeks).

2. Sampling from normal distributions. (Chapter 5; one week).

3. Order statistics (Chapter 5, one week)

4. Convergence and asymptotic approximation concepts (Chapter 5; one week). Midterm cutoff point).

5. Point Estimation. MLE and EM algorithm (Chapter 6-7; three weeks).

6. Robustness. (one week)

7. Bayesian methods (Chapter 7 one week).

STAT 536C - DESIGN AND ANALYSIS OF CLINICAL STUDIES
2011/12 – Term 2

Instructor: Dr. Paul Gustafson, e-mail: gustaf@stat.ubc.ca
Lectures: Tuesday, Thursday, 9:30 -11:00
Pre-requisite: STAT 460 or equivalent

Text: Some references we may use are as follows. The first three are available via the UBC library e-book collection.
Vittinghoff et. al. *Regression methods in biostatistics.* Springer 2008.
Moye._*Statistical Reasoning in Medicine-The Intuitive P-Value Primer 2nd Ed. Springer 2006.*
Steyerberg. *Clinical prediction models.* Springer 2009.
Lachin. *Biostatistical Methods.* Wiley 2000.

Course description: This course will present basic statistical concepts and methodology for the most common types of studies in health sciences research. Topics include studies of agreement, diagnostic tests, clinical trials, standardization, cohort studies, case-control studies, survival analysis, longitudinal data, and other topics. The course is as a core course for students in Statistics following the Biostatistics option in the M.Sc. program. It should also be of interest to students in Statistics and other departments who seek a broad introduction to biostatistics.

Course Outline: Not yet determined. An example from a previous year follows.

Week	Topics
1	Introduction, Two group comparisons
2	Likelihood, Inference
3	Study Design
4	Clinical Measurement
5	Stratified Analysis for Two Groups
6	Random Effects
7	Case Control and Matched Studies
8	More on Likelihood
9	Logistic Regression
10-11	Count data and Poisson Regression
12-13	Event-Time Data: Survival Analysis

STAT 540 – STATISTICAL PROBLEMS ARISING IN GENOMICS
2011/2012 – Term 2

This year the course will be offered by Jenny Bryan and Paul Pavlidis. The topics mentioned are reasonably indicative but the instructors will be revamping the course so closer to January 2012 please check Jenny's website (http://www.stat.ubc.ca/~jenny/) for more developments in the syllabus.

Instructors: Jenny Bryan (jenny@stat.ubc.ca)
Paul Pavlidis (paul@chibi.ubc.ca)

When/where: Mon & Wed 9:30 - 11:00 am, SWNG 307

Objectives: (a) To provide students from the computational sciences, especially statistics, an introduction to the exciting problems arising in genomic research; and (b) to provide students with a primary background in molecular biology and biochemistry with an introduction to the statistical techniques that are particularly relevant for genomic data. Emphasis will be placed on gene expression profiling, but we may also cover selected topics in other genome-wide investigations (ChIP-chip, tiling arrays, SNP arrays, etc.).

Requirements: There will be 2 data analysis-oriented assignments and a term project.

Background and skills, grading, etc.: See course website, URL given above.

Topics (tentative, not necessarily in order, more detail available from course website)

- Overview of bioinformatics and computational biology.
- Basic molecular biology and genetics.
- Intro to gene expression profiling techniques.
- DNA Microarrays (spotted and Affymetrix).
- Normalization.
- Multivariate techniques (PCA, Clustering).
- Multiple testing.
- Bayesian modeling.

STAT 547M - INTRODUCTION TO STATISTICAL MODELLING OF EXTREME VALUES
2011/2012 – Term 2

Course description: The statistical analysis of extreme values is of great importance in diverse fields of application, including finance and insurance, civil and reliability engineering, hydrology and environmental sciences. The largest insurance claims may lead to the insurer's insolvency; the highest sea-levels may cause floods. These examples illustrate situations in which it is of interest and concern not just the typical behaviour of the underlying physical process but rather the behaviour of its extremes. Since, by definition, extreme observations are rare, there is too little data for adequate statistical modelling and inference in the context of extremes. To address this challenge, one can rely on asymptotic theory, known as Extreme Value Theory (EVT). The aim of the course is to motivate and demonstrate the use of EVT and its extensions as a basis for extreme value data modelling, with a greater emphasis on data analysis and associated inference techniques.

The course material will comprise three components: (1) probabilistic development of asymptotic theory, (2) statistical modelling and inference, and (3) case studies of real data chosen based on students interests.

Prerequisites: Sufficient background in basic probability theory and statistics (Stat 547 and 560 or their equivalents). Some experience with statistical software Splus/R will be helpful.

References:

Beirlant, J., Goegebeur, Y., Segers, J., and Teugels, J., *Statistics of Extremes: Theory and Applications*, Wiley Series in Probability and Statistics, Wiley, Chichester, UK, 2004.

Coles, S. G., *An Introduction to Statistical Modeling of Extreme Values*, Springer Series in Statistics, Springer-Verlag, London, 2001.

Embrechts, P., Klueppelberg, C., and Mikosch, T., *Modelling Extremal Events for Insurance and Finance*, Springer-Verlag, Berlin, 1997.

Reiss, R.-D. And Thomas, M., *Statistical Analysis of Extreme Values with Applications to Insurance, Finance, Hydrology and Other Fields*, 3rd ed., Birkhaeuser Verlag, Basel, Switzerland, 2007.

Coursework: Several written assignments and a course project.

STAT 521A(101) - Copula Foundations and Application
2011-2012 - Term 2

Instructor: Harry Joe

Outline: This is a statistics course in the theory and applications of dependence modeling with copulas. The course will show why copulas have become increasingly popular in the past 15 years.
The course covers copulas and inference for multivariate non-normal response data, such as binary, count, extreme value, heavy-tailed. Applications of copula models can be found in finance, insurance,
environmetrics, biostatistics etc. Both theory and practice will be emphasized.

Pre-requisites: Familiarity with a software such as R is essential.
Familiarity with probability, statistical inference (especially likelihood inference) and classical multivariate statistics is desirable.

***Tentative* topics**

1. Multivariate distributions: from univariate to multivariate (including history); some extreme value theory.

2. Multivariate normal and classical multivariate statistics.

3. Copula models. When classical multivariate methods are inappropriate, data examples and diagnostics.

4. Construction methods for multivariate copulas. Desirable properties for parametric families of copulas; the difficulty of extending from bivariate to multivariate.

5. Properties of parametric families of copulas.
Tail dependence and asymmetry, measures of dependence, measure of deviation from multivariate normal, Kullback-Leibler divergence.

6. Likelihood inference and computing for copula models.

7. Simulation from parametric families of copulas.

8. Applications and data examples: model comparisons, assessing model adequacy.

9. Newer research on copulas and tail dependence concepts; copula models for high-dimensional data.

STAT 550 - TECHNIQUES OF STATISTICAL CONSULTING
2011-2012

Term 2, T & Th 2:30-3:50, LSK 301 **Instructor: Rollin Brant, LSK 308d**

Description: The overall objective of this course is to train students to apply their statistical knowledge, to develop the skills required to work with non-statisticians either as consultant or collaborator, and to communicate effectively, both orally and in writing, with non-statisticians.

Specific objectives are to provide simulated and real exposure to the process of statistical consultation and thereby to develop:

- the techniques required to attain a clear understanding of a client's needs,
- the oral and written skills that facilitate communication with clients,
- the ability to write succinct, comprehensive and understandable reports,
- a working knowledge of the aids, hard and soft, required in consultation,
- an understanding of the processes involved in solving statistical problems,
- an awareness of the knowledge base that underlies statistical consulting.

Most course activities will be organized around a series of case studies based on former and current projects from our Statistical Consulting and Research Laboratory (SCARL), consulting projects of Statistics faculty, and other sources. For each case study, the practical problem will be presented and students will be required to participate in:

- formulation of problems in practical contexts,
- written and oral presentations of proposed approaches,
- data management, data exploration and model building,
- written and oral presentations of results of analyses,
- critical and interactive discussion of all aspects of the case study.

Lectures on special topics arising from the case studies will be arranged as necessary. Occasional lectures by others (e.g., guest consultants) may also be arranged.

Corequisite: STAT 404, or its equivalent.

Practical Prerequisites: A substantial background in the statistical sciences, good oral and written communication skills, and an interest in statistical consultation.

Recommended Reading:

C. Chatfield (1995). *Problem Solving: A Statistician's Guide, 2nd edition.* Chapman & Hall.
J. Derr (2000). *Statistical Consulting: A Guide to Effective Communication.* Brooks/Cole.

Additional References: A list will be provided in the first class.

Notes:

1. STAT 550 is **required** of all Statistics graduate students, although students with equivalent coursework or consulting experience may apply for an exemption.
2. STAT 550 is graded on a Pass/Fail basis. To earn a Pass, students must demonstrate they have attained the objectives outlined above.
3. STAT 550 (and 551) develop the skills required for employment as a SCARL RA and for success in jobs involving applied work in statistics (including academic positions).

STAT 461/561 - STATISTICAL INFERENCE II
2011/2012 - TERM 2

Course description: Detailed development of the theory of testing hypotheses and confidence regions, Bayesian models and inference, elements of decision theory and additional topics. Intended for Honours and MSc students.

Pre-requisites: Stat 460-560.
Pre-requisites: MATH 320, STAT 305 is recommended.

Textbook: Casella and Berger, Statistical Inference, 2nd ed.

Instructor: Lang Wu

References:
Cox and Hinkley (1974). Theoretical Statistics. Chapman and Hall.
J. Shao (1998). Mathematical Statistics. Springer-Verlag.
E.L. Lehmann (1983) Theory of Point Estimation. Wiley/Wadsworth.
C.R.Rao(1980). Linear Statistical Inference and its Applications. Wiley.

Tentative topics:

1. Review: statistics and their distributions, point estimation. (One week)

2. Test of hypothesis and confidence intervals, simple and composite hypotheses, statistical significance, p-value, pivotal statistics. (Chapter 5; two weeks)

3. Likelihood ratio test, score test, sample size calculation, likelihood interval, empirical likelihood test and intervals. (Chapter 6; two weeks)

4. Most powerful test, Lehman-Pearson lemma, results on exponential families. (Chapter 8; one week)

5. Inference about normal models. (Chapters 9 and 5; two weeks)

6. Resampling methods: bias reduction, variance estimation, confidence intervals. (two weeks).

7. Bayesian Statistics: prior and posterior distributions, Bayesian procedures and notion. (Chapter 11; two weeks).