UNIVERSITY OF MANCHESTER
SCHOOL OF MATHEMATICS
MATH 20802: STATISTICAL METHODS
SEMESTER 2

Lectures: Tuesdays 16:00–17:00 Stopford Building, Theatre 1; Wednesdays 12:00–13:00 Simon Theatre E.

Example Classes: Tuesdays 15:00–16:00 Kilburn Theatre 1.4; Tuesdays 17:00–18:00 Schuster BRAGG Theatre; Thursdays 11:00–12:00 Alan Turing Building, G207; Thursdays 16:00–17:00 Humanities Bridge Street G7.

Lecturer: Dr. Saralees Nadarajah

Office: Alan Turing 2.223.

Office Phone: 0161 275 5912.

Office Hours: Tuesdays 14:00-15:00 and Thursdays 14:00-15:00, you are most welcome to see me any other time, no appointments needed. I am also prepared to see you during weekends .

E-mail: mbbsssn2@manchester.ac.uk, best way to contact me if I am not in my office, you are most welcome to email me 24 / 7.

WWW: http://www.maths.manchester.ac.uk/∼saralees/MATH20802.html

Unit code: MATH20802.

Credit rating: 10.

Pre–requisite units: MATH10141, MATH20701.

Aims: To introduce estimation and hypothesis testing methods based on likelihood and other approaches.

Brief description: Statistical methodology is concerned with taking the numerical information contained in a sample (the data) and using it to make statements (or inferences) about the population from which the sample is drawn. In that the sample provides incomplete information about the entire population, there is inevitably some uncertainty relating to any inferences made. The methods developed in this course unit not only acknowledge this uncertainty but seek to model it in a meaningful way.

Intended learning outcomes: On successful completion of this unit students will: 1) have an understanding of the underlying theory; and, 2) be able to use these techniques on simple data sets.

Course Contents: I plan to cover all of the following topics:

Point estimator, point estimate, sampling distribution; unbiased estimator, bias, MSE, asymptotic unbiasedness, consistency, relative efficiency and their relationships; Properties given with some proofs [2].

Maximum likelihood estimation: likelihood function, ML estimators for single and multi parameter cases, ML estimators for discrete and continuous models; Properties of ML estimation including invariance principle and asymptotic confidence intervals (without going into details about the Fisher information); Many examples of ML estimation given, including simple linear regression and ANOVA [10].

Simple hypotheses, composite hypotheses, null hypotheses, alternative hypotheses; test statistic, acceptance region, rejection region, type I error, type II error, level of significance [2].

Power, power function; N-P lemma; N-P lemma illustrated using one-sample and two-sample problems; Two-sample tests for differences in means; Two-sample tests for equality of variances; Uniformly most powerful tests, examples; Generalized likelihood ratio tests; Confidence intervals for one-sample, two-sample and multi-sample problems; One-way ANOVA [10].

Textbooks:
J.E. Freund, Mathematical Statistics with Applications, 7th edition, Pearson Prentice Hall 2004.
W. Mendenhall, D.D. Wackerly and R.L. Scheaffer, Mathematical Statistics with Applications, PWS-Kent 1990.
J.A. Rice, Mathematical Statistics and Data Analysis, 2nd edition, Duxbury Press 1995.

Learning and teaching processes: Two lectures and one examples class each week. In addition students are expected to do at least four hours private study each week on this course unit.

Assessment: There will be weekly quizzes due at the following times:
Wednesday 7 February 2018, 12:00noon
Wednesday 14 February 2018, 12:00noon
Wednesday 21 February 2018, 12:00noon
Wednesday 7 March 2018, 12:00noon
Wednesday 14 March 2018, 12:00noon
Wednesday 21 March 2018, 12:00noon
Wednesday 28 March 2018, 12:00noon
Wednesday 25 April 2018, 12:00noon
Wednesday 2 May 2018, 12:00noon
Wednesday 9 May 2018, 12:00noon
Each quizz will be worth 1 percent. There will be an in-class test on **Wednesday 18 April 2018, 12:00-13:00pm** accounting for 10 percent. Finally, there will be a two hour end of semester examination accounting for 80 percent.

I would very much welcome your comments and suggestions for a smooth running of this course. If you have problems or feel unhappy about certain aspects of this course then please feel free to air them to me. I am here to help you and I am prepared to adjust to your needs.

I hope you will enjoy this course.