UNIVERSITY OF MANCHESTER
DEPARTMENT OF MATHEMATICS
MATH 10282: INTRODUCTION TO STATISTICS
SEMESTER 2

Timetable: The timetable is as follows

1. Week from 7 February 2022 to 11 February 2022

   – Review session, Friday, 11 February 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;

   – Computer based tutorial at the following times
       – Monday, 7 February 2022, 11:00-12:00 in Alan Turing G.105;
       – Monday, 7 February 2022, 14:00-15:00 in Alan Turing G.105;
       – Tuesday, 8 February 2022, 14:00-15:00 in Alan Turing G.105;
       – Thursday, 10 February 2022, 10:00-11:00 in Alan Turing G.105;
       – Thursday, 10 February 2022, 11:00-12:00 in Alan Turing G.105;
       – Friday, 11 February 2022, 14:00-15:00 in Alan Turing G.105.

   The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282EX01IntrotoR.pdf` You will need to attend only one of these tutorials.

2. Week from 14 February 2022 to 18 February 2022

   – Review session, Friday, 18 February 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;

   – Tutorial at the following times
       – Monday, 14 February 2022, 11:00-12:00 in Engineering Building B.025 Flat Lecture Room;
       – Monday, 14 February 2022, 16:00-17:00 in Engineering Building B.025 Flat Lecture Room;
       – Tuesday, 15 February 2022, 9:00-10:00 in Engineering Building A.056 Blended Theatre 1;
       – Tuesday, 15 February 2022, 9:00-10:00 in Alan Turing G.205;
       – Wednesday, 16 February 2022, 12:00-13:00 in Alan Turing G.209;
       – Thursday, 17 February 2022, 10:00-11:00 in Alan Turing G.205.

   The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282Examples02.pdf` You will need to attend only one of these tutorials.

3. Week from 21 February 2022 to 25 February 2022

   – Review session, Friday, 25 February 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;

   – Computer based tutorial at the following times
       – Monday, 21 February 2022, 11:00-12:00 in Alan Turing G.105;

- Monday, 21 February 2022, 14:00-15:00 in Alan Turing G.105;
- Tuesday, 22 February 2022, 14:00-15:00 in Alan Turing G.105;
- Thursday, 24 February 2022, 10:00-11:00 in Alan Turing G.105;
- Thursday, 24 February 2022, 11:00-12:00 in Alan Turing G.105;
- Friday, 25 February 2022, 14:00-15:00 in Alan Turing G.105.

The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282EX03AnRSession` `pdf` You will need to attend only one of these tutorials.

4. Week from 28 February 2022 to 4 March 2022

   - Review session, Friday, 4 March 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;
   - Tutorial at the following times
     - Monday, 28 February 2022, 11:00-12:00 in Engineering Building B.025 Flat Lecture Room;
     - Monday, 28 February 2022, 16:00-17:00 in Engineering Building B.025 Flat Lecture Room;
     - Tuesday, 1 March 2022, 9:00-10:00 in Engineering Building A.056 Blended Theatre 1;
     - Tuesday, 1 March 2022, 9:00-10:00 in Alan Turing G.205;
     - Wednesday, 2 March 2022, 12:00-13:00 in Alan Turing G.209;
     - Thursday, 3 March 2022, 10:00-11:00 in Alan Turing G.205.

   The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282Examples04.` `pdf` You will need to attend only one of these tutorials.

5. Week from 7 March 2022 to 11 March 2022

   - Review session, Friday, 11 March 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;
   - Computer based tutorial at the following times
     - Monday, 7 March 2022, 11:00-12:00 in Alan Turing G.105;
     - Monday, 7 March 2022, 14:00-15:00 in Alan Turing G.105;
     - Tuesday, 8 March 2022, 14:00-15:00 in Alan Turing G.105;
     - Thursday, 10 March 2022, 10:00-11:00 in Alan Turing G.105;
     - Thursday, 10 March 2022, 11:00-12:00 in Alan Turing G.105;
     - Friday, 11 March 2022, 14:00-15:00 in Alan Turing G.105.

   The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282EX05AnRSession` `pdf` You will need to attend only one of these tutorials.

6. Week from 14 March 2022 to 18 March 2022

   - Review session, Friday, 18 March 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;
   - Tutorial at the following times
     - Monday, 14 March 2022, 11:00-12:00 in Engineering Building B.025 Flat Lecture Room;

- Monday, 14 March 2022, 16:00-17:00 in Engineering Building B.025 Flat Lecture Room;
- Tuesday, 15 March 2022, 9:00-10:00 in Engineering Building A.056 Blended Theatre 1;
- Tuesday, 15 March 2022, 9:00-10:00 in Alan Turing G.205;
- Wednesday, 16 March 2022, 12:00-13:00 in Alan Turing G.209;
- Thursday, 17 March 2022, 10:00-11:00 in Alan Turing G.205.

The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282Examples06.pdf` You will need to attend only one of these tutorials.

7. Week from 21 March 2022 to 25 March 2022

   - Review session, Friday, 25 March 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;
   - Computer based tutorial at the following times
     - Monday, 21 March 2022, 11:00-12:00 in Alan Turing G.105;
     - Monday, 21 March 2022, 14:00-15:00 in Alan Turing G.105;
     - Tuesday, 22 March 2022, 14:00-15:00 in Alan Turing G.105;
     - Thursday, 24 March 2022, 10:00-11:00 in Alan Turing G.105;
     - Thursday, 24 March 2022, 11:00-12:00 in Alan Turing G.105;
     - Friday, 25 March 2022, 14:00-15:00 in Alan Turing G.105.

   The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282EX07AnRSession.pdf` You will need to attend only one of these tutorials.

8. Week from 28 March 2022 to 1 April 2022

   - Review session, Friday, 1 April 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;
   - Tutorial at the following times
     - Monday, 28 March 2022, 11:00-12:00 in Engineering Building B.025 Flat Lecture Room;
     - Monday, 28 March 2022, 16:00-17:00 in Engineering Building B.025 Flat Lecture Room;
     - Tuesday, 29 March 2022, 9:00-10:00 in Engineering Building A.056 Blended Theatre 1;
     - Tuesday, 29 March 2022, 9:00-10:00 in Alan Turing G.205;
     - Wednesday, 30 March 2022, 12:00-13:00 in Alan Turing G.209;
     - Thursday, 31 March 2022, 10:00-11:00 in Alan Turing G.205.

   The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282Examples08.pdf` You will need to attend only one of these tutorials.

9. Week from 25 April 2022 to 29 April 2022

   - Review session, Friday, 29 April 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;
   - Tutorial at the following times

– Monday, 25 April 2022, 16:00-17:00 in Engineering Building B.025 Flat Lecture Room;
– Tuesday, 26 April 2022, 9:00-10:00 in Engineering Building A.056 Blended Theatre 1;
– Tuesday, 26 April 2022, 9:00-10:00 in Alan Turing G.205;
– Wednesday, 27 April 2022, 12:00-13:00 in Alan Turing G.209;
– Thursday, 28 April 2022, 10:00-11:00 in Alan Turing G.205;
– Thursday, 28 April 2022, 17:00-18:00 in Engineering Building B.025 Flat Lecture Room.

The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282Examples09.pdf` You will need to attend only one of these tutorials.

10. Week from 2 May 2022 to 6 May 2022

– Review session, Friday, 6 May 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;
– Tutorial at the following times
    – Tuesday, 3 May 2022, 9:00-10:00 in Engineering Building A.056 Blended Theatre 1;
    – Tuesday, 3 May 2022, 9:00-10:00 in Alan Turing G.205;
    – Wednesday, 4 May 2022, 12:00-13:00 in Alan Turing G.209;
    – Thursday, 5 May 2022, 10:00-11:00 in Alan Turing G.205.

The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282Examples10.pdf` You will need to attend only one of these tutorials.

11. Week from 9 May 2022 to 13 May 2022

– Review session, Friday, 13 May 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;
– Tutorial at the following times
    – Monday, 9 May 2022, 16:00-17:00 in Engineering Building B.025 Flat Lecture Room;
    – Tuesday, 10 May 2022, 9:00-10:00 in Engineering Building A.056 Blended Theatre 1;
    – Tuesday, 10 May 2022, 9:00-10:00 in Alan Turing G.205;
    – Wednesday, 11 May 2022, 12:00-13:00 in Alan Turing G.209;
    – Thursday, 12 May 2022, 10:00-11:00 in Alan Turing G.205;
    – Thursday, 12 May 2022, 17:00-18:00 in Engineering Building B.025 Flat Lecture Room.

The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282Examples11.pdf` You will need to attend only one of these tutorials.

12. Week from 16 May 2022 to 20 May 2022

– Review session, Friday, 20 May 2022, 10:00-11:00 in Engineering Building A Lecture Theatre B;
– Tutorial at the following times

- Monday, 16 May 2022, 16:00-17:00 in Engineering Building B.025 Flat Lecture Room;
- Tuesday, 17 May 2022, 9:00-10:00 in Engineering Building A.056 Blended Theatre 1;
- Tuesday, 17 May 2022, 9:00-10:00 in Alan Turing G.205;
- Wednesday, 18 May 2022, 12:00-13:00 in Alan Turing G.209;
- Thursday, 19 May 2022, 10:00-11:00 in Alan Turing G.205;
- Thursday, 19 May 2022, 17:00-18:00 in Engineering Building B.025 Flat Lecture Room.

The tutorial sheet in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282Examples12.pdf` You will need to attend only one of these tutorials.

Lecturer: Dr. Saralees Nadarajah

Office: Alan Turing 2.223.

Office Phone: 0161 275 5912.

ZOOM Hours: 24 / 7, `https://zoom.us/my/saraleesnadarajah`

Skype Hours: 24 / 7, my id is "saraleesan"

I am happy to meeting you in person 24 / 7 for tutoring if you are in Manchester.

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: `https://minerva.it.manchester.ac.uk/~saralees/intro.html`

Unit code: MATH10802.

Credit rating: 10.

Pre-requisite units: MATH10141 - Probability 1.

Aims:
The aims of this course unit are to help students
develop a knowledge of basic statistical concepts and methodology which build on the ideas in probability studied in MATH10141;
develop practical statistical skills.

Overview:
The course gives a general introduction to statistics and is a prerequisite for all future statistics courses.

Intended learning outcomes:
On successful completion of this course unit students will be able to:

define elementary statistical concepts and terminology such as sampling distribution, unbiasedness, confidence intervals and hypothesis tests,
analyse and compare statistical properties of simple estimators and tests,
conduct exploratory data analysis and statistical inferences, including confidence intervals and hypothesis tests, in simple one and two-sample situations,
interpret the results of such analyses,
use the statistical computing software R to carry out simple data analysis, including presentation of graphical and numerical summaries, and simulations.

Course Contents:
Populations and samples, random sampling.
Representing sample data the histogram, boxplot, numerical summary measures.
Probability models for data.
Sampling distributions of sample statistics - the sample mean and its distribution under Normality, using the Central Limit Theorem, the sample proportion, the sample variance, the chi-squared distribution.
Point estimation the bias and variance of an estimator, choosing between competing estimators.
The likelihood function and maximum likelihood estimators for discrete variables.
Confidence intervals. Single sample procedures for a Normal mean and variance, the population proportion. Two sample procedures for the difference between two Normal means and the difference between two population proportions.
Hypothesis testing introductory ideas and concepts.
Tests based on a single sample the Normal mean (variance known and unknown), the Normal variance, a non-Normal mean parameter, the Binomial probability parameter. Relationship between CIs and hypothesis testing.
Calculation of the probability of rejecting the null for a given value of the population parameter.
Tests based on two independent samples for differences between two Normal means, two non-Normal means, two population proportions.

Textbooks:
G M Clarke and D Cooke, A Basic Course in Statistics (Fourth Edition) Oxford University Press, 1998;
Robert V Hogg, Introduction to Mathematical Statistics (Sixth Edition) Prentice Hall, 2005;
Sheldon M Ross, Introduction to Probability and Statistics for Engineers and Scientists (Third edition) Elsevier Science, 2004;
Michael J Crawley, Statistics: An Introduction Using R. John Wiley & Sons Ltd, 2007

Feedback methods:
Feedback supervision will provide an opportunity for students' work to be discussed and provide feedback on their understanding. Coursework or in-class tests (where applicable) also provide an opportunity for students to receive feedback. Students can also get feedback on their understanding directly from the lecturer, for example during the lecturer's office hour.

Study hours:
Lectures - 11 hours

Tutorials - 11 hours
Independent study hours - 67 hours

Assessment:
There will be twelve pieces of assessment:

1. Quiz 1 in `https://minerva.it.manchester.ac.uk/~saralees/intro2022quizz1.pdf` due 11:00am Friday 18 February 2022, worth 1 percent

2. Quiz 2 in `https://minerva.it.manchester.ac.uk/~saralees/intro2022quizz2.pdf` due 11:00am Friday 25 February 2022, worth 1 percent

3. Quiz 3 in `https://minerva.it.manchester.ac.uk/~saralees/intro2022quizz3.pdf` due 11:00am Friday 4 March 2022, worth 1 percent

4. Quiz 4 in `https://minerva.it.manchester.ac.uk/~saralees/intro2022quizz4.pdf` due 11:00am Friday 11 March 2022, worth 1 percent

5. Quiz 5 in `https://minerva.it.manchester.ac.uk/~saralees/intro2022quizz5.pdf` due 11:00am Friday 18 March 2022, worth 1 percent

6. Quiz 6 in `https://minerva.it.manchester.ac.uk/~saralees/intro2022quizz6.pdf` due 11:00am Friday 25 March 2022, worth 1 percent

7. Quiz 7 in `https://minerva.it.manchester.ac.uk/~saralees/intro2022quizz7.pdf` due 11:00am Friday 1 April 2022, worth 1 percent

8. Quiz 8 in `https://minerva.it.manchester.ac.uk/~saralees/intro2022quizz8.pdf` due 11:00am Friday 29 April 2022, worth 1 percent

9. Quiz 9 in `https://minerva.it.manchester.ac.uk/~saralees/intro2022quizz9.pdf` due 11:00am Friday 6 May 2022, worth 1 percent

10. Quiz 10 in `https://minerva.it.manchester.ac.uk/~saralees/intro2022quizz10.pdf` due 11:00am Friday 13 May 2022, worth 1 percent

11. The R course work in `https://minerva.it.manchester.ac.uk/~saralees/MATH10282-R-Coursework-202 pdf` due 11:00am Friday 20 May 2022, worth 10 percent

12. The final examination in May/June 2022 worth 80 percent. The formulas to remember for the final exam are in `https://minerva.it.manchester.ac.uk/~saralees/introexamformulas2022. pdf`

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.