

# MATH 1004 BIOMETRY (WSTC)

**Credit Points** 10

**Legacy Code** 700033

**Coordinator** Michael Casey ([https://directory.westernsydney.edu.au/search/name/Michael Casey/](https://directory.westernsydney.edu.au/search/name/Michael%20Casey/))

**Description** This subject introduces students to various statistical techniques necessary in scientific endeavours. Presentation of the content will emphasize the correct principles and procedures for collecting and analysing scientific data, using a 'hands-on' approach. Topics include effective methods of gathering data, statistical principles of designing experiments, error analysis, describing different sets of data, probability distributions, statistical inference, non-parametric methods, and simple linear regression and correlation.

**School** Computer, Data & Math Sciences

**Discipline** Statistics

**Student Contribution Band** HECS Band 1 10cp

Check your fees via the Fees ([https://www.westernsydney.edu.au/currentstudents/current\\_students/fees/](https://www.westernsydney.edu.au/currentstudents/current_students/fees/)) page.

**Level** Undergraduate Level 1 subject

**Equivalent Subjects** MATH 1030 Statistics for Business ECON 1006 Introduction to Economic Methods MATH 1032 Statistics for Science MATH 1028 Statistical Decision Making MATH 1031 Statistics for Business (WSTC) MATH 1029 Statistical Decision Making (WSTC)

**Incompatible Subjects** MATH 1025 Quantitative Techniques

**Restrictions** Students must be enrolled at Western Sydney University, The College. Students enrolled in Extended Diploma programs (7086, 7087) must have passed 40 credit points in order to enrol in this subject. Students enrolled in the combined Diploma/Bachelor programs listed below must pass all College Preparatory subjects listed in the program structure before progressing to the Year 2 subjects.

**Assumed Knowledge**

Basic computer use. Basic understanding of mathematical algebra.

## Learning Outcomes

On successful completion of this subject, students should be able to:

1. Apply the basic principles of statistical design incorporating error analysis.
2. Design a simple scientific experiment, and then carry out analysis of the data obtained.
3. Estimate population means using confidence intervals.
4. Test hypotheses about population means using parametric and find appropriate sample sizes for experiments.
5. Use regression and correlation techniques to describe relationships between variables.
6. Use the chi-square test for goodness of fit and test for independence to analyse categorical type data.
7. Develop statistical computing skills as part of a 'tool-kit' for solving statistical problems (R-commander).
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## Subject Content

1. Overview ? What is statistical thinking? What role does it play in scientific research?
2. Gathering Data ? Types of data and dealing with measurements.
3. Statistical Principles of Design - Understanding randomness; types of sampling including observational studies, experiments, blocking and stratification, and levels of replication; sampling concerns.
4. Describing Sets of Data ? Qualitative data; graphical methods for describing quantitative data; numerical measures of central tendency and variability; dealing with errors; error bars.
5. Basic probability concepts; enough to understand p-values, confidence intervals and independence. Normal distribution and methods for assessing normality; use of transformations to meet assumptions; sampling distributions; the Central Limit Theorem.
6. Estimation with Confidence Intervals: Single sample ? Large and small sample confidence intervals for a population mean; determining the sample size.
7. Tests of Hypothesis: Single sample ? Elements of a statistical test; type I and type II errors; large and small sample test of hypothesis about a population mean; p-values.
8. Comparing Population Means: Estimation and Hypothesis testing Comparing two population means: independent sampling and paired difference sampling; comparing three or more population means: one-way and two-way ANOVA.
9. Simple Linear Regression and Correlation Least squares approach; assessing the usefulness of the model; using the model for estimation and prediction; the coefficients of correlation and determination.
10. Analysis of Categorical Data Test for independence and Goodness-of-fit test.

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## Assessment

The following table summarises the standard assessment tasks for this subject. Please note this is a guide only. Assessment tasks are regularly updated, where there is a difference your Learning Guide takes precedence.

Type	Length	Percent	Threshold	Individual/ Group Task	Mandatory
Intra-session Exam	1 hour	10	N	Individual	
Applied Project	1,500 words	15	N	Group	
Intra-session Exam	1 hour	25	N	Individual	
Final Examinator	2 hours	50	Y	Individual	

Prescribed Texts

- MacGillivray, H., Utts, J. M., & Heckard, R. F. (2014). *Mind on statistics* (2nd Australian & New Zealand ed.). South Melbourne, Vic.: Cengage Learning, 2014.