



# Course Outline

PSYC3371

Multivariate Data Analysis for Psychology

School of Psychology

Faculty of Science

T3, 2022

## 1. Staff

Position	Name	Email	Consultation times and contact details
Course convenor, Tutor	Dr Sonny Li	<a href="mailto:sonny.li@unsw.edu.au">sonny.li@unsw.edu.au</a>	By appointment and email.
Tutors	Jodie Kidd	<a href="mailto:j.kidd@unsw.edu.au">j.kidd@unsw.edu.au</a>	

### Enquiries and Consultation

Email is the preferred method of communication with course personnel. Use your student UNSW email account and include your student ID. Contact Dr Li if you have any special learning needs which may affect your access to this course or your ability to undertake any of the assessments. If you are registered with UNSW Equitable Learning Services, you are required to provide your Equitable Learning Plan at the commencement of the course, or within one week of receiving your adjustments.

## 2. Course information

<b>Units of credit:</b>	6
<b>Pre-requisite(s):</b>	This course is designed for students intending to undertake an honours year in psychology. Students are required to have completed PSYC3001 and are assumed to have an advanced understanding of ANOVA-based inferential statistical procedures and be able to competently carry out simple and complex analyses of data using SPSS and PSY.
<b>Teaching times and locations:</b>	<a href="#">PSYC3371 Timetable</a> Lectures and Tutorials begin in Week 1.

### 2.1 Course summary

Research studies in psychology generate multivariate data whenever participants are measured on more than one variable. This course deals with multiple regression analysis (MRA), principal components analysis (PCA), factor analysis (FA) and multivariate analysis of variance (MANOVA). Each of these is a form of multivariate data analysis: MRA allows for continuous and categorical independent variables, and therefore provides the basis for a general data-analytic system; PCA and FA make use of correlations to account for the structure of relationships within a set of variables; and MANOVA extends the application of ANOVA models to multivariate data and within-subjects designs. Much of the research carried out by honours and postgraduate students requires the analysis of multivariate data from experimental and non-experimental designs.

#### Course topics:

1. Simple Regression Analysis. Predicting scores on a criterion variable from a single predictor variable. Partitioning variation. Significance test of the regression coefficient. Assumptions and detecting outliers. Readings: Course Notes; Pedhazur (Ch. 2, pp. 15-28, 30-37).
2. Multiple Regression Analysis. Basic Concepts. Predicting scores on a single criterion variable from a linear combination of predictor variables. Partitioning variation and degrees of freedom, the MRA  $F$  test. Tests of individual predictors. Readings: Pedhazur (Ch. 5).
3. Statistical control by partialling. Relationship between squared correlations (zero-order, partial, semi-partial, multiple). Suppressor variable. Readings: Course Notes; Pedhazur (Ch. 5; Ch. 7: pp. 160-170, 174-188).
4. MRA for the purposes of prediction. Subset regression methods – stepwise, forwards and backwards selection. Bias and cross-validation. Readings: Course Notes; Pedhazur (Ch 8: pp. 195-203-225).

5. One-way ANOVA via MRA. Coding schemes for categorical independent variables. Example of effect coding and contrast coding for  $J = 3$ . Tests of significance. Unequal  $n$ 's. MRA as General Linear Model. Readings: Course Notes. Pedhazur (Ch. 11 pp.342-367, 378-383)
6. ANCOVA via MRA. Test of treatment effect. Role of covariate in experimental and quasi-experimental designs. Readings: Course Notes; Pedhazur (Ch. 15 pp. 628-653).
7. Non-orthogonal factorial ANOVA via MRA. Simultaneous vs hierarchical MRA. Effect coding and contrast coding. Tests of significance. Readings: Course Notes. Pedhazur (Ch. 12 pp. 414-430, 447-455, 481-491).
8. Factorial designs via MRA where one or more factors are continuous variables. Meaning of product variable. Hierarchical MRA. Readings: Pedhazur (Ch. 14 pp. 560–592).
9. Structural Equation Modelling via MRA. Causal hierarchy of independent variables. Path diagrams. Regression coefficients as direct effects. Mediating variables and indirect effects. Effects (direct and indirect) vs spurious contributions to correlations. Simplifying structural models. Assumptions. Readings: Course Notes. Pedhazur (Ch. 18: pp. 769-783, 788-799.)
10. Principal Components Analysis and Factor Analysis. Accounting for variance in a set of standardised measures by PCA. Interpretation of loadings. Orthogonal rotation to simple structure. Oblique vs orthogonal rotation. Reproducing variable scores from component scores. The distinction between common factors and components. Factors as latent variables. Rotation in FA. The problem of estimating factor scores. FA vs PCA. Readings: Course Notes.
11. Multivariate analysis of variance (MANOVA). Detecting the effect of a grouping variable (with any number of levels) on an optimal linear combination of dependent variables (a discriminant function). Choice of a test statistic in MANOVA. Multiple comparisons issues. Statistical coherence in multivariate analyses. Follow-up tests and CIs in MANOVA.
12. Post-hoc analysis of data from within-subjects experiments and two factor mixed designs. Multivariate approach vs univariate approach. Tests of homogeneity hypothesis using the *GCR* MANOVA criterion. Heterogeneity inference using SPSS. Post-hoc contrast analysis using PSY and SPSS. *Reading*: Bird, Ch. 6 and 7.

## 2.2 Course aims

The aims of the course are to provide students with an understanding of multiple regression procedures which will allow you to choose analysis strategies appropriate for a range of contexts, such as prediction, the analysis of complex experiments or quasi-experiments or passive observational designs. This course aims to provide students with an introductory knowledge of principal components analysis and factor analysis, and their application, as well as an understanding of multivariate analysis of variance methods.

## 2.3 Course learning outcomes (CLO)

At the successful completion of this course the student should be able to:

1. Describe, apply and evaluate different research methods used by psychologists.
2. Design complex studies to address psychological questions; frame research questions; formulate testable hypotheses; operationalise variables; choose appropriate data analysis methods and strategies; analyse data and interpret results; and write research reports.
3. Demonstrate an understanding of the basic concepts of multiple regression analysis and its application in the context of prediction vs explanation.
4. Use MRA methods to analyse data from experiments with categorical and continuous independent variables.
5. Use MRA methods to analyse data from passive observational studies.
6. Demonstrate an understanding of multivariate analysis of variance and the application of MANOVA to the analysis of multivariate data from between-subjects and within-subjects designs.
7. Make confident inferences regarding interval estimates of parameters and test outcomes for multivariate statistical methods.
8. Use the statistical programs SPSS and PSY to carry out the analysis methods covered in this course.

## 2.4 Relationship between course and program learning outcomes and assessments

CLO	Program Learning Outcomes						Assessment
	1. Knowledge	2. Research Methods	3. Critical Thinking Skills	4. Values and Ethics	5. Communication, Interpersonal and Teamwork	6. Application	
1	L, T, OA	L, T, OA	L, T, OA	L, T, OA	L, T, OA	L, T, OA	All
2	L, T, OA	L, T, OA	L, T, OA	L, T, OA	L, T, OA	L, T, OA	All
3	L, T, OA	L, T, OA	L, T, OA	L, T, OA	L, T, OA	L, T, OA	All
4	L, T, OA	L, T, OA	L, T, OA			L, T, OA	All
5	L, T, OA	L, T, OA	L, T, OA			L, T, OA	All
6	L, T, OA	L, T, OA	L, T, OA	L, T, OA	L, T, OA	L, T, OA	All
7	L, T, OA	L, T, OA	L, T, OA			L, T, OA	All
8	L, T, OA	L, T, OA	L, T, OA			L, T, OA	All

Note: L = lectures, T = tutorials, OA = online activities.

## 3. Strategies and approaches to learning

### 3.1 Learning and teaching activities

The methods covered in this course are relevant for the analysis of multivariate data from experimental and non-experimental designs. These methods are often used across the range of sub-disciplines of psychology and as such are relevant for the analysis of data from Honours research projects.

Formal teaching in this course is via recorded lectures (given by Dr Melanie Gleitzman) with accompanying lecture slides, and a weekly two-hour tutorial (either online or face-to-face). It is expected that students have viewed the lecture recording for the relevant topic prior to attending the weekly tutorial. Lecture slides, tutorial materials and related activities will be posted to Moodle on a regular basis for each topic.

In order to keep up with this course, you will need to be on track with lecture material. After viewing each lecture recording you should spend some time reviewing your notes and undertaking additional reading where necessary (such as relevant course notes and chapter of the textbook) to ensure that you fully understand the course material for that topic.

Practice activities and selected worked solutions are provided on Moodle for each topic. Students are encouraged to work through these activities after the topic has been covered in lectures and tutorials. If you have course related questions you should ask these in the first instance in your tutorial. You may also email your tutor or Dr Li, or post your question to the Discussion forum.

An aggregate mark of 50 or higher across the assessments is required to pass the course. Students need not pass each assessment in order to pass the course. Note that students who do not attempt an assessment will receive a mark of 0 for that component.

All news updates and announcements will be posted to Moodle page and/or to your UNSW email account. It is each student's responsibility to check Moodle and your UNSW email regularly to keep up to date.

All assessments for this course will be delivered online and student submissions are to be made to a plagiarism checking tool. The final exam for this course will take place during the UNSW examinations period for Term 3.

### 3.2 Expectations of students

It is expected that students

- are aware of UNSW Assessment policy and understand how to apply for special consideration if they are unable to complete an assignment/exam due to illness and/or misadventure;
- have read through the [School of Psychology Student Guide](#);
- have read through the [Student Code of Conduct](#) and are aware of their responsibilities referred to therein;
- undertake sufficient independent learning each week (recommended at least nine hours of independent learning per week).

Attendance at interactive online tutorials is an essential requirement of the course, in accordance with [UNSW Assessment Implementation Procedure](#).

Students registered with Equitable Learning Service must provide the course co-ordinator with their ELP as soon as they are made available.

## 4. Course schedule

This course consists of approximately 40 hours of recorded lectures, 18 hours of interactive tutorials and approximately 4-6 hours of video tutorials. Students are expected to take an additional 90 hours of self-determined study to complete assessments, practice questions, readings, and exam preparation. See Section 3.1 for description of Topics.

NOTE: Schedule subject to change.

Week beginning:	Lecture Topics	Tutorials	Activities
Week 1 12/09/2022	Topics 1 & 2	Topics 1 & 2	See Moodle
Week 2 19/09/2022	Topic 3 & 4	Topics 3 & 4	See Moodle
Week 3 26/09/2022	Topic 5	Topic 5	See Moodle
Week 4 03/10/2022* <i>Assignment 1 due by 11pm on Friday 8/10/2022</i>	Topic 6	Topic 6	See Moodle
Week 5 10/10/2022	Topic 7 & 8	Topics 7 & 8	See Moodle
Week 6 17/10/2022	Flex week		
Week 7 24/10/2022	Topic 9	Topic 9	See Moodle
Week 8 31/10/2022 <i>Assignment 2 due by 11pm on Monday 1/11/2022</i>	Topic 10	Topic 10	See Moodle
Week 9 07/11/2022	Topic 11	Topic 11	See Moodle
Week 10 14/11/2022	Topic 12 Course Review	Topic 12	See Moodle

\* Public Holiday Monday October 3<sup>rd</sup> 2022.

Study period: 19/11/2022 – 24/11/2022.

Exam period: 25/11/2022 – 08/12/2022.

## 5. Assessment

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### 5.1 Assessment tasks

All assessments in this course have been designed and implemented in accordance with UNSW Assessment Policy.

Assessment task	Length	Weight	Mark	Due date
<b>Assessment 1</b> Assignment 1	1500-2000 words	20%	out of 100	Week 5, Monday October 10 <sup>th</sup> , 2022
<b>Assessment 2:</b> Assignment 2	1500-2000 words	20%	out of 100	Week 10, Monday November 14 <sup>th</sup> , 2022
<b>Assessment 4:</b> Final exam	2 hours	60%	out of 100.	Exam period.

**Assessment 1:** Assignment 1 worth 20% of the course mark is due by 11pm Monday of Week 5 (October 10<sup>th</sup>, 2022) and is to be submitted to the Turnitin link on Moodle. This exercise will cover material drawn from Topics 1 - 4. The exercise will be set in Week 2. You will be required, among other things, to use SPSS to carry out multiple regression analyses.

**Assessment 2:** Assignment 2 worth 20% of the course mark is due by 11pm Monday of Week 10 (November 14<sup>th</sup>, 2022) and is to be submitted to the Turnitin link on Moodle. This exercise will cover material drawn from Topic 9. The exercise will be set in Week 7. You will be required, among other things, to use SPSS to carry out analyses of multivariate data.

**Assessment 3:** A two-hour Final Exam worth 60% of your course mark will be held during the T3 Examination period. All topics can be assessed, but the emphasis will be on content from the latter half of the course. More information regarding the final exam will become available later in the term.

**UNSW grading system:** <https://student.unsw.edu.au/grades>

**UNSW assessment policy:** <https://student.unsw.edu.au/assessment>

### 5.2 Assessment criteria and standards

Further details and marking criteria for each assessment will be provided to students closer to the assessment release date (see 4.1: [UNSW Assessment Design Procedure](#)).

### 5.3 Submission of assessment tasks

**Written assessments:** In accordance with UNSW Assessment Policy written pieces of assessment must be submitted online via Turnitin. No paper or emailed copies will be accepted.

**Late penalties:** deduction of marks for late submissions will be in accordance with School policy (see: [School of Psychology Student Guide](#)).

**Special Consideration:** Students who are unable to complete an assessment task by the assigned due date can apply for special consideration.

UNSW operates under a Fit to Sit/ Submit rule for all assessments. If a student wishes to submit an application for special consideration for an exam or assessment, the application must be submitted **prior to the** start of the exam or **before** an assessment is submitted. If a student sits the exam/ submits an assignment, they are declaring themselves well enough to do so.

Special consideration applications must be submitted to the online portal along with Third Party supporting documentation. Students who have experienced significant illness or misadventure during the assessment period may be eligible. Only circumstances deemed to be outside of the student's control are eligible for special consideration. Except in unusual circumstances, the duration of circumstances impacting academic work must be more than 3 consecutive days, or a total of 5 days within the teaching period. In the case of the assignment, if approved, students may be given an extended due date to complete the assignment, or a supplementary assessment may be set.

See <https://student.unsw.edu.au/special-consideration>.

**Supplementary assessment:** will be subject to approval and implemented in accordance with UNSW Assessment Implementation Procedure.

**Supplementary examination:** will be made available for students with approved special consideration application and implemented in accordance with UNSW Assessment Policy. Students are reminded that the School of Psychology offers **one opportunity only** to sit a supplementary exam.

## 5.4. Feedback on assessment

Feedback on assessment in this course will be provided in accordance with UNSW Assessment Policy.

Assessment	When	Who	Where	How
Assessment 1	Ten working days after due date.	Tutor	Online	Moodle
Assessment 2	Ten working days after due date.	Tutor	Online	Moodle
Final exam	N/A	N/A	N/A	N/A

## 6. Academic integrity, referencing and plagiarism

The APA (7<sup>th</sup> edition) referencing style is to be adopted in this course. Students should consult the publication manual itself (rather than third party interpretations of it) in order to properly adhere to APA style conventions. Students do not need to purchase a copy of the manual, it is available in the library or online. This resource is used by assessment markers and should be the only resource used by students to ensure they adopt this style appropriately: [APA 7th edition](#).

**Referencing** is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at <https://student.unsw.edu.au/referencing>.

**Academic integrity** is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect, responsibility and courage.<sup>1</sup> At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity and **plagiarism** can be located at:

The *Current Students* site <https://student.unsw.edu.au/plagiarism>, and the *ELISE* training site <http://subjectguides.library.unsw.edu.au/elise>.

The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>.

<sup>1</sup> International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

## 7. Readings and resources

<b>Course information</b>	The <b>PSYC3371 Moodle site</b> provides course information and lecture slides and recordings, course notes, tutorial videos and exercises, practice activities, discussion forum, announcements and course resources. Most students should find that course materials and resources on Moodle will provide enough material for understanding the course content and completing the assessments.	
<b>Textbook (recommended)</b>	Pedhazur, E.J. (1997). Multiple regression in behavioral research: Explanation and prediction. (3rd Ed.). Fort Worth: Harcourt Brace. <i>(Note: Chapter pdfs can be downloaded from Moodle course site).</i> Bird, K.D. (2004). Analysis of Variance via Confidence Intervals. London: Sage. NOTE: available <b>online</b> via UNSW Library	
<b>Calculator</b>	Students should bring a calculator to each tutorial and to the Final Exam.	
<b>Recommended internet sites</b>	<a href="#">UNSW Library</a> <a href="#">UNSW Learning centre</a> <a href="#">ELISE</a> <a href="#">Turnitin</a> <a href="#">Student Code of Conduct</a>	<a href="#">Policy concerning academic honesty</a> <a href="#">Email policy</a> <a href="#">UNSW Anti-racism policy statement</a> <a href="#">UNSW Equity and Diversity policy statement</a>

## 8. Administrative matters

The [School of Psychology Student Guide](#) contains School policies and procedures relevant for all students enrolled in undergraduate or Masters psychology courses, such as:

- Attendance requirements
- Assignment submissions and returns
- Assessments
- Special consideration
- Student code of conduct
- Student complaints and grievances
- Student Equity and Disability Unit
- Health and safety

It is expected that students familiarise themselves with the information contained in this guide.

## 9. Additional support for students

- The Current Students Gateway: <https://student.unsw.edu.au/>
- Academic Skills and Support: <https://student.unsw.edu.au/academic-skills>
- Student Wellbeing, Health and Safety: <https://student.unsw.edu.au/wellbeing>
- Equitable Learning Services: <https://student.unsw.edu.au/els>
- UNSW IT Service Centre: <https://www.myit.unsw.edu.au/>