Course Outline

PSYC3371

Multivariate Data Analysis for Psychology

School of Psychology

Faculty of Science

T3, 2019

Last updated: 06/09/2019 1:25 PM

1. Staff

Position	Name	Email	Consultation times and contact details
Course convenor, Lecturer	Dr Melanie Gleitzman	m.gleitzman@unsw.edu.au	By appointment and email. Office: Mathews 1108. Phone: 9385 3019
Tutors	Sonny Li (Head Tutor)	sonny.li@unsw.edu.au	By appointment and email.
	Jodie Kidd	j.kidd@unsw.edu.au	
	Alison Lam	tbc	

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 Gleitzman 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 Disability Services, you are required to provide your Letter of Support at the commencement of the course, or within one week of receiving your adjustments.*

2. Course information

Units of credit: 6

Pre-requisite(s): 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.

Teaching times and locations: PSYC3371 Timetable

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

	Program Learning Outcomes						
CLO	1. Knowledge	2. Research Methods	3. Critical Thinking Skills	4. Values and Ethics	5. Communication, Interpersonal and Teamwork	6. Application	**Assessment**
1.	Lectures, tutorials, online activities, readings	Lectures, tutorials, online activities, readings	Lectures, tutorials, online activities, readings			Lectures, tutorials, online activities, readings	Mid-semester exam, Assignment, Final exam
2.		Lectures, tutorials, online activities, readings	Lectures, tutorials, online activities, readings			Lectures, tutorials, online activities, readings	Mid-semester exam, Assignment, Final exam
3.	Lectures, tutorials, online activities, readings	Lectures, tutorials, online activities, readings				Lectures, tutorials, online activities, readings	Mid-semester exam, Assignment, Final exam
4.	Lectures, tutorials, online activities, readings	Lectures, tutorials, online activities, readings				Lectures, tutorials, online activities, readings	Mid-semester exam, Assignment, Final exam
5.	Lectures, tutorials, online activities, readings	Lectures, tutorials, online activities, readings				Lectures, tutorials, online activities, readings	Mid-semester exam, Assignment, Final exam
6.	Lectures, tutorials, online activities, readings	Lectures, tutorials, online activities, readings				Lectures, tutorials, online activities, readings	Mid-semester exam, Assignment, Final exam
7.	Lectures, tutorials, online activities, readings	Lectures, tutorials, online activities, readings				Lectures, tutorials, online activities, readings	Mid-semester exam, Assignment, Final exam
8.	Lectures, tutorials, online activities, readings	Lectures, tutorials, online activities, readings				Lectures, tutorials, online activities, readings	Mid-semester exam, Assignment, Final exam

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 two weekly two-hour lectures, a weekly one-hour statistics tutorial and a weekly one-hour computing tutorial. Lectures and tutorials provide a valuable and necessary context in which students gain an understanding of course material. Lecture slides and course notes will be made available before the start of a new lecture topic. Tutorial worksheets and online activities will be posted to Moodle on a weekly basis.

Lectures are recorded, however **lecture attendance is strongly advised**. Attendance at lectures is the best way to ensure you do not fall behind. After each lecture 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 and can take full advantage of the learning opportunity afforded by the lectures and tutorials.

Practice activities are provided on Moodle for each topic. Students are encouraged to work through these activities on a regular basis. If you have course related questions you should ask these in the first instance in your statistics or computing tutorial. You may also email your tutor or post your question to the Discussion forum on Moodle course site. Students are encouraged to use the Discussion forum to enhance understanding of course content, develop critical thinking and written communication skills by posting questions or comments, reading or replying to others' posts.

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.

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;
- undertake sufficient independent learning each week (recommended at least nine hours of independent learning per week).

Attendance at face to face tutorials and timely completion of online tutorials is an essential requirement of the course, in accordance with UNSW Assessment Implementation Procedure.

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

The final exam for this course will take place on UNSW Sydney campus during the UNSW examinations period. Students should not arrange travel during the UNSW exam period.

Students registered with Disability Services must provide the course co-ordinator with a Letter of Support as soon as they are made available.

4. Course schedule and structure

This course consists of 40 hours of lectures, 20 hours of face to face tutorials and 4 hours of online 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.

Weekly Lectures	**Lecture Topics**	**Tutorials**	**Self-determined Activities**
Week 1 16/09/2019 Mon 12-2pm 18/09/2019 Wed 12-2pm	Lecture 1: Topic 1 Lecture 2: Topic 2	Topic 1 (Statistics) Topic 2 (Computing)	See Moodle
Week 2 23/09/2019 Mon 12-2pm 25/09/2019 Wed 12-2pm	Lecture 3: Topic 3 Lecture 4: Topic 4	Topic 2 (Statistics) Topic 3 (Computing)	See Moodle
Week 3 30/09/2019 Mon 12-2pm 02/10/2019 Wed 12-2pm	Lecture 5: Topic 4, 5 Lecture 6: Topic 5	Topic 4 (Statistics) Topic 4 (Computing)	See Moodle
Week 4 *07/10/2019 Monday* 09/10/2019 Wed 12-2pm	*Public Holiday* Lecture 7: Topic 6	Topic 5 (Statistics) Topic 5 (Computing)	See Moodle
Week 5 14/10/2019 Mon 12-2pm 16/10/2019 Wed 12-2pm	***Mid-Semester Test*** Lecture 8: Topic 6, 7	Topic 6 (online) Topic 6 (Statistics) Topic 6, 7 (Computing)	See Moodle
Week 6 21/10/2019 Mon 12-2pm 23/10/2019 Wed 12-2pm	Lecture 9: Topic 7 Lecture 10: Topic 8	Topic 7 (Statistics) Topic 7 (Computing) Topic 8 (online)	See Moodle
Week 7 28/10/2019 Mon 12-2pm 30/10/2019 Wed 12-2pm	Lecture 11: Topic 9 Lecture 12: Topic 9, 10	Topic 9 (Statistics) Topic 9 (Computing)	See Moodle
Week 8 04/11/2019 Mon 12-2pm 06/11/2019 Wed 12-2pm 08/11/2019 Friday 11pm	Lecture 13: Topic 10 Lecture 14: Topic 10 **Assignment due by 11pm**	Topic 10 (Statistics) Topic 10 (Computing)	See Moodle
Week 9 11/11/2019 Mon 12-2pm 13/11/2019 Wed 12-2pm	Lecture 15: Topic 10, 11 Lecture 16: Topic 11	Topic 10 (Statistics) Topic 10 (Computing)	See Moodle
Week 10 18/11/2019 Mon 12-2pm 20/11/2019 Wed 12-2pm	Lecture 17: Topic 11 Lecture 18: Topic 12	Topic 11 (Statistics) Topic 11 (Computing) Topic 12 (online)	See Moodle
Week 11 25/11/2019 Mon 12-2pm	Lecture 19: Topic 12, Review		

Study period: 26/11/2019 – 28/11/2019.

Exam period: 29/11/2019 – 14/12/2019.

5. Assessment

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
Assessment 1 Mid-semester test	90 minutes	20%	out of 100	Week 5, Monday October 15, 2019
Assessment 2: Assignment	1500-2000 words	20%	out of 100	Week 8, Friday November 8, 2019
Assessment 4: Final exam	2 hours	60%	out of 100.	Exam period

Assessment 1: A Mid-semester test worth 20% of the course mark will be held during the Monday lecture timeslot in Week 5 (12-2pm, October 14, 2019 in New South Global Theatre). The test will be on Topics 1-4. You are required to provide your own UNSW approved calculator.

Assessment 2: An assignment worth 20% of the course mark is due by 11pm Friday of Week 8 (November 8, 2019) and is to be submitted to the Turnitin link on Moodle. This exercise will cover material drawn from Topics 5 - 8. The exercise will be set in Week 5. 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. Statistical tables will be provided, you are required to provide your own UNSW approved calculator –see Required Equipment (section 7 of this outline).

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

Supplementary examinations: will be made available for students with approved special consideration application and implemented in accordance with UNSW Assessment Policy.

5.4. Feedback on assessment

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

Assessment	When	How
Assessment 1	Ten working days after the assessment date	Test papers plus solution returned to students in class
Assessment 2	Ten working days after the assessment date	Feedback from Turnitin
Final exam	N/A	N/A

6. Academic integrity, referencing and plagiarism

The APA (6th 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 6th 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.[1] 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/presenting

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.

7. Readings and resources

Textbook (recommended)	Pedhazur, E.J. (1997). Multiple regression in behavioral research: Explanation and prediction. (3rd Ed.). Fort Worth: Harcourt Brace. *(Note: Chapter pdfs can be downloaded from Moodle)* Bird, K.D. (2004). Analysis of Variance via Confidence Intervals. London: Sage. NOTE: available ***online*** via UNSW Library
Calculator	Students should bring a calculator to each tutorial, the Mid-semester Exam and Final Exam. **Note**: You must have a *UNSW approved calculator* for the final exam. Information regarding this matter can be found on MyUnsw.
Course information	Available on Moodle
Required readings	School of Psychology Student Guide.
Recommended internet sites	UNSW Library UNSW Learning centre ELISE Turnitin Student Code of Conduct

[1] International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

	Policy concerning academic honesty Email policy UNSW Anti-racism policy statement UNSW Equity and Diversity policy statement UNSW Equal opportunity in education policy statement

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
- Disability Services
- 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
- Disability Support Services: https://student.unsw.edu.au/disability-services
- UNSW IT Service Centre: https://www.it.unsw.edu.au/students/index.html