Course Outline

PSYC3371

Multivariate Data Analysis for Psychology

School of Psychology

Faculty of Science

T3, 2019

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1. Staff

Position	Name	Email	Consultation times and locations	Contact Details
Course Convenor & Lecturer	Dr. Melanie Gleitzman	m.gleitzman@unsw.edu.au	By appointment Mathews 1108	9385 3019
Tutor				

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

2.1 Course summary

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 analysis: MRA allows for correlated 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 students in fourth year requires the analysis of multivariate data from experimental and non-experimental designs.

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 (prediction, analysing complex experiments and quasi-experiments, and structural modelling). The 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.

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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.

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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

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3. Strategies and approaches to learning

3.1 Learning and teaching activities

This course builds upon univariate data analytic methods and concepts developed in PSYC3001 and demonstrates, among other things, how MRA and MANOVA are special cases of a General Linear

Model, and as such ANOVA is a special case of MRA. 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.

Lecture topics include:

1. Simple Regression Analysis. Predicting scores on a criterion variable from a single predictor variable. Partitioning variation. Testing the regression coefficient null hypothesis. Assumptions. 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. Readings: Pedhazur (Ch. 5).
3. Statistical control by partialling. Relationship between squared correlations (zero-order, partial, semi-partial, multiple). 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. Tests of significance. Role of covariate in randomised vs non-randomised 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 as row-wise and column-wise regression coefficients, and as variable-component correlations. Orthogonal rotation to simple structure. Oblique vs orthogonal rotation. Reproducing variable scores from component scores. The distinction between common factors and components. The factor analysis model, with and without unique factors. 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

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multivariate analyses. Follow-up tests and CIs in MANOVA.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.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 will be posted to Moodle in the preceding week.

Lectures are recorded, however **lecture attendance is strongly advised**. Recordings provide an opportunity to review lecture material in order to clarify your understanding of course material. In order to keep up with this course, you will need to be on track with lecture material. 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 questions and worked solutions are provided for each topic. Students are encouraged to work through these questions 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 statistics or computing tutorial. You may also email your tutor or post your question to the Discussion forum on Moodle course site.

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.

The Discussion Forum provides students with an opportunity to question and clarify the concepts and ideas mentioned in the course. Students are strongly encouraged to engage with this forum by posting questions or comments, and reading, answering, or replying to other student's posts to enhance understanding of the content, critical thinking, and written communication skills.

Formative topic revision quizzes are available for students that provide an opportunity to evaluate understanding of course material on a regular basis. Timely completion of the quizzes will assist students in gaining a proper understanding of each topic so that this knowledge can be built on in future content.

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.

It is expected that students have read through the School of Psychology Student Guide.

Students are expected to undertake sufficient independent learning each week (recommended at least six 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 Support Services must provide the course co-ordinator with a Letter of Support as soon as they are made available.

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4. Course schedule and structure

Typically, each week this course consists of 4 hours of lectures, 2 hours of face to face tutorials 1 hour of online activities. Students are expected to take an additional 5 hours of self-determined study to complete assessments, practice questions, readings, and exam preparation.

NOTE: Dates cannot be included until the T3 2019 Class Timetable is made available. Schedule subject to change.

Week	Lecture topic/s	Tutorial/lab topics	Online activities	Self-determined activities
Week 1 16/09/2019	Topics 1 & 2	no tutorials	Tutorial – Topic 1	Practice questions Topics 1 & 2
Week 2 23/09/2019	Topics 3 & 4	Statistics - Topic 2 Computing – Topic 3	Revision quiz Topic 1	Practice questions Topic 3
Week 3 30/09/2019	Topics 5 & 6	Statistics – Topic 4 Computing – Topic 4	Revision quiz Topics 2 & 3	Practice questions Topic 4
Week 4 07/10/2019	Topics 6 & 7	Statistics – Topic 5 Computing – Topic 5	Revision quiz Topics 4 & 5	Practice questions Topics 5 & 6
Week 5 14/10/2019	Topic 8 & 9	Statistics – Topic 6 Computing – Topic 6, 7	Revision quiz Topics 6 & 7	Practice questions Topics 7 & 8
Week 6 21/10/2019	Topic 9 Mid-semester exam	Statistics – Topic 9 Computing – Topic 8, 9	Revision quiz Topics 8	Practice questions Topic 9
Week 7 28/10/2019	Topic 10	Statistics – Topic 9 Computing – Topic 10	Revision quiz Topics 9	Practice questions Topics 10
Week 8 04/11/2019	Topic 10 & 11	Statistics – Topic 10 Computing – Topic 10	Revision quiz Topics 10	
Week 9 11/11/2019	Topic 11	Statistics – Topic 11 Computing – Topic 11	Revision quiz Topics 11	Practice questions Topics 11

Week 10 18/11/2019	Topic 12	Statistics – Topic 11 Computing – Topic 12	Revision quiz Topics 12	Practice questions Topics 12
Study period 26/11/2019				
Exam period 29/11/2019				

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5. Assessment

5.1 Assessment tasks

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

NOTE: The number and type of assessments (other than the final exam) may be subject to change. The assessment schedule cannot be finalised until T3 2019 Class Timetable is known and CATS Room bookings have been made for the mid-semester test.

Assessment task	Length	Weight	Mark	Due date
Assessment 1 Mid-session test	90 minutes	20%	/20	Week 6
Assessment 2: Assignment	1500-2000 words	20%	/100	Week 10
Assessment 4: Final exam	2 hours	60%	/100.	Exam period

Assessment 1: A Mid-session test worth 20% of the course mark will be held during a lecture timeslot in Weeks 6 (date/time to be determined subject to T3 2019 final timetable and CATS room bookings). The test will be on Topics 1-7. Statistical tables will be provided. 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 10 and is to be submitted to the Turnitin link on Moodle. This exercise will cover material drawn from Topics 8 - 10. The exercise will be set in Week 7. You will be required, among other things, to use SPSS to carry out multiple regression 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. Special consideration applications must be submitted to

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Student Central within 3 working days of the assessment due date along with a physical copy of the 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 (see - https://student.unsw.edu.au/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.

Alternative 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:

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

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- 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 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 Support Services

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- 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

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