PSYC3010 – Advanced Statistics for Psychology

Unit of Study Code: PSYC3010

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Format of Unit: 2 x 1 hour lectures/week x 13 weeks
1 x 2 hour tutorial/week x 11 weeks

Credit Point Value: 6 Credit Points

Qualifying: PSYC (2012 or 2112) plus one other Intermediate Psychology Unit from PSYC (2011 or 2111), PSYC (2013 or 2113), PSYC (2014 or 2114).

Assessment: Classwork:
SECTION 1 Tutorial test, 10% of the total mark of the unit
Week 5, August 27 to August 31
1,000 words Assignment, 15% of the total mark of the unit
Due Date: Wednesday 12th September

SECTION 2 Tutorial Tests, 20% of the total mark of the unit (10% each)
Week 11, October 15 to October 19
Week 13, October 29 to November 2

Examination: 55% of the total mark of the unit (25% for Section1 and 30% for Section 2)
part multiple choice, part short answer questions

Evaluation of teaching and learning: Date: week 13 of semester
Type: questionnaire
Unit of study general description:

The first section of this course deals with the design and analysis of experiments in psychology for which some form of analysis of variance is appropriate. The second section of the course deals with multiple regression and path analyses. Tutorials for both parts will involve the use of statistical packages on a computer as well as hand calculators. Students should bring a calculator to all tutorials.

Graduate Attributes and Student Learning Outcomes

This course is structured around the graduate attributes associated with the scientist-practitioner model, the basis for the training of psychologists in Australia and internationally. Graduate Attributes are the generic skills, abilities and qualities that students should acquire during their university experience and the School of Psychology is committed to providing an environment to promote these skills. In addition, this unit of study will provide students with generalised and transferable skills that will also be useful in careers outside psychology.

The following graduate attributes and student learning outcomes will be developed through lectures, tutorial and assessment activities in particular. They will be assessed primarily in the tutorial test, written assignment, tutorial prac and in the final examination.

1: Knowledge and Understanding of Advanced Statistics for Psychology

Display advanced knowledge, conceptual and applied, of statistical tools most often used in psychological research, whether experimental or survey based.

Student learning outcomes:
At the end of this course, students will be able to:
(i) Critically analyse empirical studies
(ii) Calculate and interpret a one-way analysis of variance, including tests of contrasts.
(iii) Calculate, analyse and interpret data from factorial designs including ANOVA and contrasts.
(iv) Demonstrate a deep understanding of the problem of multiple comparisons and control of the Type I error rate.
(v) Demonstrate understanding of issues involved in the treatment of data involving repeated measurements.
(vi) Perform computer-based analyses for ANOVA and contrast testing, and interpret the results appropriately.
(vii) Calculate and interpret multiple regression (MR) and related methods.
(viii) Evaluate different types of MR and choose the analysis appropriately for a research question.
(ix) Carry out computer-based analyses for MR and to interpret the results appropriately.
(x) Evaluate how matters of the reliability of psychological test items affect research and data analyses.
(xi) Write effectively psychological reports that cover both ANOVA and MR analyses.
(xii) Use spreadsheet and data analysis programs, focusing on SPSS.
(xiii) Have basic understanding of the AMOS programme.

2: Research Methods in Advanced Statistics for Psychology

Understand, apply and evaluate research methods in Psychology, including research design, advanced data analysis and interpretations, and the appropriate use of terminology.

Student learning outcomes:
(i) To develop a critical understanding of the major methods of research in psychology and how they relate to psychology as science.
(ii) Ability to distinguish and evaluate research studies that focus on finding causality or/and prediction.
(iii) Demonstrate an understanding of the conceptual link between ANOVA and MR analyses.
(iv) Undertake statistical analysis appropriately.
(v) Interpret statistical analyses correctly and competently depending on the research design and the postulated hypotheses.
(vi) Develop the ability to describe the key principles for designing and evaluating research focusing on behaviour change.
(vii) Evaluate and use relevant statistical terminology appropriately in psychological research.
(viii) Design basic studies to address psychological questions: frame research questions; formulate hypotheses; operationalise variables; choose an appropriate methodology and data analysis technique; analyse data and interpret results appropriately; and write interpretations and research reports.
3: Critical Thinking Skills in Advanced Statistics for Psychology
Respect and use critical and creative thinking, sceptical inquiry, and the scientific approach to solve problems related to thought and behaviour.

**Student learning outcomes:**
(i) Demonstrate an attitude of critical thinking that includes persistence, open-mindedness, and intellectual engagement.
(ii) Evaluate the quality of information, including differentiating empirical evidence from speculation.
(iii) Evaluate issues of causality versus prediction using different theoretical and methodological approaches.
(iv) Use reasoning and evidence to recognise, develop, defend, and criticise arguments based on research design and statistical analyses.
(v) Demonstrate a capacity for higher-order analysis, including the capacity to identify patterns in human behaviour.
(vi) Recognise and defend against the major fallacies of research design and data analyses.
(vii) Demonstrate creative and pragmatic problem solving.

4: Values in Advanced Statistics for Psychology
Value empirical evidence; act ethically and professionally.

**Student learning outcomes:**
(i) Promote evidence-based approaches to understanding behaviour.
(ii) Be able to recognise problems associated with biased sampling methods
(iii) Evaluate how matters of the reliability of psychological test items affect results.
(iv) Recognise the limitations of psychological research methods.
(v) Exhibit a scientific attitude in critically thinking about, and learning about, human behaviour, and in creative and pragmatic problem solving.

5: Communication Skills in Advanced Statistics for Psychology
Communicate effectively in a variety of formats and in a variety of contexts.

**Student learning outcomes:**
(i) Interpret the results effectively using relevant terminology and formats (e.g., assignment, tutorial prac)
(ii) Learn to communicate the results effectively for a variety of purposes (e.g., scientific report; to inform lay audience).

6: Learning and the Application of Advanced Statistics for Psychology
Understand and apply psychological principles to personal and social issues.

**Student learning outcomes:**
(i) To develop an awareness of the applications of the statistical theory and research design in psychology.
(ii) Apply psychological research design to examine problems in everyday life and in society.
(iii) Understand major issues involved in debates about research design in psychology.
(iv) Demonstrate a capacity for independent learning to sustain personal and professional development in the changing world of the science and practice of psychology.
SYLLABUS

Section 1. Anova and Contrasts.

The one way fixed effects ANOVA model: partitioning variation and degrees of freedom. Expected mean squares and the formation of F ratios.

Asking focused questions: testing contrasts. Planned orthogonal contrasts. Trend analysis.

Controlling the Type I error rate with multiple comparisons: the Scheffé procedure and the Bonferroni procedure.

Factorial designs: The two way ANOVA model with fixed effects. Partitioning between-group variation into main effects and interaction effects. Main effect and interaction contrasts for a two way ANOVA design.

Decision-wise vs family-wise control of Type I errors.

Repeated measures or within-subject variables. Differing approaches to the analysis of repeated measures data. Planned contrasts for designs involving repeated measures data.

Section 2. Multiple Regression and Beyond.

Multiple Regression: Revision of Simple Linear Regression model and Introduction to Multiple Linear Regression.

Multiple Regression: Multiple independent variables, the assumptions, the estimates, the SPSS output. Prediction and Explanation. Different types of Multiple Regression.

Categorical Variables in Multiple Regression: Dummy Variables.


Beyond Multiple Regression: Path analysis. Introduction to AMOS.

Test reliability, its estimation, effects of unreliability
## TIMETABLE

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<thead>
<tr>
<th>WEEK</th>
<th>LECTURES</th>
<th>TUTORIALS</th>
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<tbody>
<tr>
<td>1 (30 July)</td>
<td>One-way ANOVA</td>
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<td>2 (6 Aug)</td>
<td>Contrasts: Formulation and Testing</td>
<td>One-way ANOVA</td>
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<td>3 (13 Aug)</td>
<td>Contrasts: the problem of multiple comparisons</td>
<td>Contrasts</td>
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<tr>
<td>4 (20 Aug)</td>
<td>Two-way ANOVA</td>
<td>Contrasts</td>
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<td>5 (27 Aug)</td>
<td>Contrasts for 2-way ANOVA designs</td>
<td>**Test; Contrasts</td>
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<td>6 (3 Sep)</td>
<td>Repeated measures data</td>
<td>Multifactor ANOVA</td>
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<tr>
<td>7 (10 Sep)</td>
<td>Repeated measures / Introduction to Linear Regression</td>
<td><strong>NO TUTORIAL</strong> (ANOVA assignment due Wed 12 September)</td>
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<tr>
<td>8 (17 Sep)</td>
<td>Multiple Regression (MR)</td>
<td>Repeated measures</td>
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Mid-Semester Break (24 Sep – 28 Sep)

| 9 (1 Oct) | N.B. Monday 1 October – Public Holiday | Revision: Simple Regression |
| 10 (8 Oct) | Categorical Variables in Multiple Regression | MR: Two Variables |
| 11 (15 Oct) | Continuous Variables: Interaction and Curves | **Test 1 MR: Different Types of MR |
| 12 (22 Oct) | Test reliability and its estimation | MR: Categorical and Continuous Variables |
| 13 (29 Oct) | Path Analysis/Revision | **Test 2 MR: Assumptions |

## TEXT

There is no set text for the Anova & Contrasts section, but if students wish to purchase a book, the following would be useful:


For the Multiple Regression and Beyond part (weeks 7-13) the text is:


## OTHER REFERENCES

### Section 1. Anova & Contrasts.


### Section 2. Multiple Regression and Beyond.


STUDENTS’ FEEDBACK

The Advanced Statistics (PSYC3010) course was first offered and evaluated in 2006. In 2006, one of the lowest ratings was given for the question “Feedback from assessment was useful in helping me to learn” (2.48 out of 5). In response to these comments, in 2008, a large bank of questions with extensive immediate feedback became available via our eLearning website in the format of a set of formative quizzes in both parts of the course. We lovingly call them Stats-mIQ (Statistical Metacognitive Instrumentation Quizzes).

Two Unit of Study Evaluations were conducted in 2008 and 2010. On all 11 questions in common with the previous evaluation (2006), there were statistically significant increases in ratings in 2008 and these gains increased even more in 2010. The largest improvements were associated with the questions “Feedback from assessment was useful in helping me to learn” and “It was clear to me that the staff in this unit of study were responsive to student feedback”. Overall satisfaction with the quality of the unit of study increased from 3.25 to 4.07 (2008) and 4.14 (2010).

Students’ comments about whether they were motivated to engage with the learning activities included ‘quizzes kept me up to date and motivated’, ‘online quizzes provided a sense of mastery that was really worth the extra effort’, ‘online quizzes were fantastic’. On the question of feedback from assessment being useful, comments included ‘feedback from online quizzes ... was great’, ‘the quizzes were particularly helpful in highlighting understanding for each topic as they were presented’. On the question of computer-based resources comments included ‘quizzes are great’, ‘fabulous’, ‘very very useful’, ‘nice work with the quizzes!!!!!!!’, ‘very helpful in learning information and understanding concepts’, ‘an excellent resource that provided week-by-week feedback on how I was grasping the material’.

The two most frequent subsequent requests were: 1) to make some quizzes be a part of summative (marked) assessment for this unit; and 2) to make access to the quizzes easier via iPod or iPad platforms so that you can do them anywhere, including on your way home/Uni rather than in front of computers.

As a response to these comments, in 2011 one in-class test was introduced in week 13 based on a material covered in quizzes. In 2012 there will be another such test (in week 11). You will receive a feedback on your performance in a following week.

We are currently working on accommodating the second request. The first pilot on iStats-mIQ app is hoped to be done as early as this year! As far as we know, we’d be the first unit of study in stats offering such teaching tool. But maybe we are just dreaming. Let us know if you find any other such teaching tools for ANOVA and MR material.

We hope you’ll enjoy PSYC3010 course and our teaching tools. And please do let us know! We appreciate your feedback. Enjoy ☺ Sabina (course coordinator)

Acknowledgements

The developments of this teaching tool and research we conduct on it have been partially supported by two Small Teaching Improvement and Equipment Scheme Grants (Science Faculty) and School of Psychology Research Infrastructure Block Grants (The University of Sydney).

Special thanks due to Margaret Charles (PhD) who retired this year and will be missed very much by teaching staff and students. Special thanks also due to staff and a team of tutors involved in creating a pool of items, especially, Dan Costa (PhD), Lisa Karlov (PhD), Carolyn MacCann (PhD), and much loved senior tutor Alex Russell. Special thanks to our IT team, especially Yohans Bastian who has been invaluable with all computerization matters involved in the quizzes. This has been a HUGE joint effort. We hope you’ll reap the benefits.
Academic Dishonesty and Plagiarism

1. It is your responsibility to know what academic dishonesty and plagiarism are.

   Here is the link to the University’s policy:


   Make sure that you understand what counts as academic dishonesty and the various types of plagiarism. The Library's http://www.library.usyd.edu.au/skills/ ‘Plagiarism and Academic Honesty’ program will help.

2. Note that:

   i) the School of Psychology will penalise all submitted work that is plagiarised.

   ii) Students should note that all assignments (including group projects) will be run through similarity detecting software. This software detects similarities between (a) your assignment and both print and online sources, and (b) assignments submitted by other students, from both current and previous years. If similarities are found, they will be investigated so as to determine the nature of the plagiarism. See Part 5 of the University’s policy.

Avoiding plagiarism – key points

• Plagiarism is a serious offence and may result in failure in the course. Even where students are completing an exercise together, each student must submit separate written work. Incorporation of any material from another student’s assignment is regarded as plagiarism.

• In writing essays or reports to meet coursework requirements, you should use your own words. In some contexts (e.g., theoretical research) it is appropriate to use an occasional quotation. This should be indicated in the conventional way by enclosing the passage within quotation marks and by providing a precise (page number) reference for the source of the quote. In many contexts, especially reports of empirical work, quotations are best avoided.

• “Using your own words” means that you should not borrow from the writing of others – whether from fellow students or published authors. For example, it is not acceptable to base an essay on text from various sources that you have then edited to some degree – even if you cite these sources. First of all, there is the ethical issue arising from the dishonesty of presenting as your own work something which is essentially the work of others. In addition, there are good educational reasons for avoiding this, even where you feel that someone else has expressed some idea far more clearly than you could. One reason is that you must learn to express yourself clearly in writing; like most other skills, this only comes with practice. Another, is the failure to understand information or ideas at all thoroughly if all you have done is reproduce (with some editing) what someone else has written about the topic.

• When you express in your own words what you have learned from various sources, you should cite each source. The standard convention for most written work in psychology is to list references at the end of your essay or report, rather than, for example, to use footnotes. To express some idea without giving a citation implies

• University of Sydney – Syllabus of Senior Psychology 3, 2012 page 6that it is your own idea. Therefore, if it is in fact an idea obtained from someone else, this needs to be acknowledged. Listing a set of sources implies that you have read them all. Therefore, you should list as references only those you have actually read. If you are depending on a secondary source, then make this clear, e.g., ... salivary conditioning (Pavlov, 1927; cited in Mazur, 1998).

• The points made here also apply to non-textual material. For example, graphs or tables of data included in a report should be your own work and not copied from others. Very occasionally you may need to ‘quote’ a figure from some other source; if you do so, you should make its origin quite clear.

• In general, avoid letting other students use your work for any kind of assessment. On the rare occasion where this may be appropriate, make sure that the other student acknowledges your contribution as the original author.
• In some cultures, students show their respect for a teacher by copying what the teacher has said or written. In Australian University education, copying a teacher (even if paraphrasing) is plagiarism if the source is not cited.

Research and resource support for Psychology students
The University of Sydney Library has 12 libraries in different locations, on different subjects with different facilities. Fisher Library is where you will find the physical collection of most relevance to your Psychology studies. Fisher Library is located on Eastern Ave, Camperdown campus. We also have loads available online – find us at sydney.edu.au/library/

Matthew Davis is the Faculty Liaison Librarian for Psychology. Matthew is available to help you find and use library resources for your assignments or research. You can email him at library.psychology@sydney.edu.au or phone on 9351 3629. The Psychology Librarian is located at Badham Library, level 1, Badham Building, Science Rd, Camperdown Campus.

Psychology books in high demand
The 2 hour collection is located on Level 3 of Fisher Library. Most of your required and recommended items from the reading lists will be here. You can find a list of your required readings in the catalogue by searching under your Unit of Study code. Some material in the list is also available to read online.

http://opac.library.usyd.edu.au/search/r

Psychology subject guide
There is a comprehensive subject guide that includes links to psychology databases, internet resources, information on tests and measurements and more. Take a look at http://libguides.library.usyd.edu.au/psychology
You can also enrol in free research, database and EndNote training classes on this site.

Need a refresher after vacation?
Watch and listen to these online learning objects and get back up to speed with information literacy skills on topics such as research, essay writing and referencing. http://www.library.usyd.edu.au/skills/