PSYC3010 – Advanced Statistics for Psychology

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<th>Unit of Study Code:</th>
<th>PSYC3010</th>
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| Coordinators:       | **ANOVA SECTION**  
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**REGRESSION SECTION**  
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**Senior Tutor:**  
Ms Lisa Kim  
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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: | PSYC2012 (or PSYC2112) plus one other Intermediate Psychology Unit from  
PSYC 2011 (or PSYC2111), PSYC2013 (or PSYC2113), PSYC 2014 (or PSYC2114). |
| Assessment: Classwork: | **ANOVA SECTION**  
*Tutorial test*, 10% of the total mark of the unit  
Week 5, 25th - 29th August  
*Assignment* (1,000 words), 15% of the total mark of the unit  
Due: 4pm, Friday 19th September  
**REGRESSION SECTION**  
2 x *Tutorial Tests*, 20% of the total mark of the unit  
Week 11, 13th - 17th October  
Week 13, 27th October - 31st October  
*Final Examination*:  
55% of the total mark of the unit (25% for Section 1 and 30% for Section 2)  
Combination of multiple choice and short answer questions |

*Completion of these assessments is compulsory to pass this unit. Students who fail to complete any of these components will receive an Absent Fail, regardless of their marks in other assessments.*

NB It is very important that you read the general administrative guidelines for submission of written work, penalties for late work, assessment criteria, procedures for applying for extensions and special consideration in the Undergraduate Student Guide available on eLearning or via the link below:  
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Unit of study general description

This unit covers advanced statistics for psychology. The course is divided into two sections. The first section covers the design and analysis of experiments in psychology for which some form of analysis of variance is appropriate. The second section covers multiple regression and path analyses. Tutorials for both parts will involve the use of statistical packages on a computer as well as hand calculations. Students should bring a calculator to all tutorials.

Specific 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, tutorials, and assessments.

1: Advanced understanding of techniques of statistical inference in psychology

As an advanced course, students are expected to develop a thorough understanding of techniques of statistical inference used in psychological research. This includes the ability to conduct and interpret analyses.

Student learning outcomes:
(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 an 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 time points.
(vi) Perform computer-based analyses and interpret ANOVA and contrasts
(vii) Calculate and interpret multiple regression (MR) and related methods.
(viii) Evaluate different types of MR and choose the analysis appropriately for a given research question.
(ix) Carry out computer-based analyses for MR and interpret the results appropriately.
(x) Evaluate how matters of the reliability of psychological test items affect research and data analyses.
(xi) Use spreadsheet and data analysis programs, including Excel and SPSS.
(xii) Have basic understanding of the AMOS program.

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 and/or 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; learn data analysis techniques; analyse data and interpret results appropriately; and write interpretations and research reports.
3: Critical Thinking Skills in Advanced Statistics for Psychology

Use critical thinking to solve problems related to psychological inquiry.

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 and animal behaviour.
(vi) Recognise and defend against erroneous 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 approach to critically analysing human behaviour

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 of statistical tests effectively using relevant terminology and formats (e.g., assignment, tutorial tests)
(ii) Learn to communicate the results of statistical tests 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) 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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<tr>
<th>WEEK</th>
<th>LECTURES</th>
<th>TUTORIALS</th>
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<tr>
<td>1 (28 July)</td>
<td>One-way ANOVA</td>
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<td>2 (4 Aug)</td>
<td>Contrasts: Formulation and Testing</td>
<td>One-way ANOVA</td>
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<tr>
<td>3 (11 Aug)</td>
<td>Contrasts: the problem of multiple comparisons</td>
<td>Contrasts</td>
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<tr>
<td>4 (18 Aug)</td>
<td>Two-way ANOVA</td>
<td>Contrasts</td>
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<tr>
<td>5 (25 Aug)</td>
<td>Contrasts for 2-way ANOVA designs</td>
<td><strong>Quiz</strong> Contrasts</td>
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<tr>
<td>6 (1 Sep)</td>
<td>Repeated measures data</td>
<td>Multifactor ANOVA</td>
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<td>7 (8 Sep)</td>
<td>Repeated measures / Introduction to Linear Regression</td>
<td>Repeated measures</td>
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<tr>
<td>8 (15 Sep)</td>
<td>Multiple Regression (MR)</td>
<td>NO TUTORIAL (ANOVA assignment due 4pm, Fri 19th September)</td>
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<tr>
<td>9 (22 Sep)</td>
<td>Multiple Regression: more details</td>
<td>Revision: Simple Regression</td>
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<td>Categorical Variables in Multiple Regression I</td>
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<td>Mid-Semester Break (29 Sep – 3 Oct)</td>
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<tr>
<td>10 (6 Oct)</td>
<td>No Lecture Monday 6 October due to Public Holiday</td>
<td>MR: Two Variables</td>
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<td></td>
<td>Categorical Variables in Multiple Regression II</td>
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<tr>
<td>11 (13 Oct)</td>
<td>Continuous Variables: Interaction and Curves</td>
<td><strong>MR Test 1</strong> MR: Different Types of MR</td>
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<tr>
<td>12 (20 Oct)</td>
<td>Test reliability and its estimation</td>
<td>MR: Categorical and Continuous Variables</td>
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<tr>
<td>13 (27 Oct)</td>
<td>Path Analysis/Revision</td>
<td><strong>MR Test 2</strong> MR: Assumptions</td>
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TEXTBOOKS

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.
# PSYC3010 Assessment Summary

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<tr>
<th>What?</th>
<th>When?</th>
<th>When Returned?</th>
<th>% Assessment</th>
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<tbody>
<tr>
<td>ANOVA Quiz</td>
<td>Week 5 (25-29th August) in tutorials – you must attend your allocated tutorial</td>
<td>Marks returned in the tutorial the following week</td>
<td>10%</td>
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<tr>
<td>Assignment Compulsory</td>
<td>Online before 4pm on Friday 19th September</td>
<td>On-time submissions returned 4PM Friday 17th October*</td>
<td>15%</td>
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<tr>
<td>MR Test 1 Compulsory</td>
<td>Week 11 (13-17th October) in tutorials – you must attend your allocated tutorial</td>
<td>Marks returned in the tutorial the following week</td>
<td>10%</td>
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<tr>
<td>MR Test 1 Compulsory</td>
<td>Week 13 (27-31st October) in tutorials – you must attend your allocated tutorial</td>
<td>Marks returned in the tutorial the following week</td>
<td>10%</td>
</tr>
<tr>
<td>Exam Compulsory</td>
<td>During exam period at the end of semester</td>
<td>University Final Results Release Date</td>
<td>55%</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>100%</strong></td>
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