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 10 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:

REGRESSION SECTION
In-class Test 1* Week 5, 24th - 28th August (12.5% of the total mark)
In-class Test 2* Week 7, 7th – 11th September (12.5% of the total mark)

ANOVA SECTION
Statistics Report 10% of the total mark of the unit
Due: Before 4pm, Friday 9th October (Week 10)

In-class practical* Week 13, 26th – 30th October (15% of the total mark)

NOTE: IT IS YOUR RESPONSIBILITY TO ATTEND THE TUTORIAL YOU ARE
ENROLLED IN TO BE MARKED AS PRESENT FOR ALL IN-CLASS ASSESSMENTS. i.e.
Tutors cannot be expected to notify other tutors to confirm your attendance if
you do not attend your enrolled prac.

FINAL EXAMINATION* 50% of the total mark of the unit (25% for Section1 and 25% 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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following the end of the formal examination period. Later dates for replacement assessments may be considered where the
application is supported by appropriate documentation and provided that adequate resources are available to
accommodate any later date.
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) Write effective psychological reports that cover both ANOVA and MR analyses.
(xii) Use spreadsheet and data analysis programs, including Excel and SPSS.
(xiii) 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. 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

Section 2. 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.
- Repeated measures or within-subject variables. Differing approaches to the analysis of repeated measures data. Planned contrasts for designs involving repeated measures data.
- Mixed Designs (between-groups and within-subjects)
## TIMETABLE

<table>
<thead>
<tr>
<th>WEEK</th>
<th>LECTURES</th>
<th>TUTORIALS</th>
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<tbody>
<tr>
<td>W1 (27/07/2015)</td>
<td>1. Introduction to Linear</td>
<td>NO TUTORIALS</td>
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<td>2. Regression Multiple Regression (MR)</td>
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<td>W2 (03/08/2015)</td>
<td>3. Regression Multiple Regression (MR)</td>
<td>T1. Simple Linear Regression</td>
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<td>4. Multiple Regression: more details</td>
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<td>W3 (10/08/2015)</td>
<td>5. Categorical Variables in Multiple Regression I</td>
<td>T2. Multiple Linear Regression</td>
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<td>6. Categorical Variables in Multiple Regression II</td>
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<td>W4 (17/08/2015)</td>
<td>7. Continuous Variables: Interaction and Curves</td>
<td>T3 Multiple Linear Regression II</td>
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<td>8. Continuous Variables: Interaction and Curves</td>
<td>Categorical Variables I</td>
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<tr>
<td>W5 (24/08/2015)</td>
<td>9. Test reliability and its estimation</td>
<td>T4. In-class Test 1 (12.5%)</td>
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<td>10. Test reliability and its estimation</td>
<td>MR with Categorical Variables II</td>
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<td>W6 (31/08/2015)</td>
<td>11. Path Analysis</td>
<td>NO TUTORIALS</td>
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<td>12. Path Analysis</td>
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<td>W7 (07/09/2015)</td>
<td>13. MLR</td>
<td>T5. In-class Test 2 (12.5%)</td>
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<td>14. GLM and ANOVA</td>
<td>Assumptions in MR</td>
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<td>W8 (14/09/2015)</td>
<td>15. Contrasts: Formulation and Testing</td>
<td>NO TUTORIALS</td>
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<td>16. Contrasts: Orthogonality and Trend Analysis</td>
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<td>9W (21/09/2015)</td>
<td>17. Contrasts: Adjusting for Type 1 Errors</td>
<td>T6. ANOVA and Contrasts</td>
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<td>18. Two-way ANOVA Model I</td>
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<td>MID-SEMESTER BREAK</td>
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<td>W10 (06/10/2015)</td>
<td>NO LECTURE; PUBLIC HOLIDAY (5/10/15)</td>
<td>T7. Contrasts</td>
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<td>19. Two-way ANOVA Model II</td>
<td>Assignment (10%) Due: 4pm Friday 9th October, 2015</td>
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<td>21. Repeated measures I</td>
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<td>23. Contrasts for 2-way ANOVA designs</td>
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<td>W13 (26/10/2015)</td>
<td>24. Mixed Designs I</td>
<td>T10. In-class Practical (15%)</td>
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<td>25. Mixed Designs II and Extensions</td>
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TEXTBOOKS

Section 1. Multiple Regression and Beyond (weeks 1-7)

Other References

Section 2. ANOVA & Contrasts (weeks 7-13).
There is no set text for the ANOVA & Contrasts section, but if students wish to purchase a book, the following would be useful:
• Field, A. (2013). Discovering Statistics Using IBM SPSS Statistics, 4th Edition. Sage Publications, Inc. (will be used on 4th year also)

Other References
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<tr>
<th>What?</th>
<th>When?</th>
<th>When Returned?</th>
<th>% Assessment</th>
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<tr>
<td>MR Test 1</td>
<td>Week 5 (24-28th August) in tutorials – you must attend your allocated tutorial</td>
<td>Marks returned by week 10</td>
<td>12.5%</td>
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<td>Compulsory</td>
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<tr>
<td>MR Test 2</td>
<td>Week 7 (7-11st September) in tutorials – you must attend your allocated tutorial</td>
<td>Marks returned in the following week</td>
<td>12.5%</td>
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<td>Compulsory</td>
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<td>ANOVA Assignment</td>
<td>Online before 4pm on Friday 9th October</td>
<td>On-time submissions returned 4PM Wednesday 21st October*</td>
<td>10%</td>
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<td>*NB – this is the last possible date and time for submission of the assignment with or without extensions</td>
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<tr>
<td>Practical</td>
<td>Week 13 (26-30th October) in tutorials – you must attend your allocated tutorial</td>
<td>Marks returned in the following week</td>
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<td>Exam</td>
<td>During exam period at the end of semester</td>
<td>University Final Results Release Date</td>
<td>50%</td>
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<td><strong>Total</strong></td>
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