



UNIVERSITI TEKNOLOGI MARA

BIO610: EXPERIMENTAL BIOLOGY: DESIGN AND ANALYSIS

Course Name (English)	EXPERIMENTAL BIOLOGY: DESIGN AND ANALYSIS APPROVED
Course Code	BIO610
MQF Credit	1
Course Description	This is an introductory subject to provide a basic knowledge of experimental design and analysis. This knowledge is required by a science major student throughout his/her scientific career in order to plan the design of experiments, to present and analyze data that is obtained and to understand statistical analysis in scientific literature. The subject emphasizes the practical rather than the theoretical aspects of statistics.
Transferable Skills	1. Knowledge in specific area-content 2. Life-long learning 3. Managerial
Teaching Methodologies	Lectures, Lab Work
CLO	CLO1 Prepare report on different forms of data numerically and graphically in written form. CLO2 Explain statistical tests based on statistical distributions. CLO3 Integrate the experimental biology information/knowledge in lifelong learning.
Pre-Requisite Courses	No course recommendations
Topics	
1. Summarizing Data 1.1) Data types and analysis variables 1.2) Population and sample 1.3) Frequency distributions 1.4) Statistical methods	
2. Descriptive Statistics 2.1) Measures of Center – Mean, Medium, Mode 2.2) Measures of Spread – Standard deviation, variance, range 2.3) Measures of Relative Standing (Position) - Percentiles and quartile, Interquartile range	
3. Probability Distribution 3.1) Discrete probability distribution - Binomial distribution & Poisson distribution. 3.2) The Normal/Gaussian distribution. 3.3) Z-scores and Normality tests	
4. Statistical Inference 4.1) Sampling Distribution 4.2) Central Limit Theorem 4.3) Standard error of the mean 4.4) Confidence Interval 4.5) Hypothesis Testing 4.6) Degrees of Freedom 4.7) Errors	
5. The t-distribution and t-test 5.1) The t-distribution and its applicability 5.2) One and two sample data 5.3) The null hypothesis and significance 5.4) One sample t-test 5.5) Independent and paired sample t-tests	

6. Analysis of Variance (ANOVA) 6.1) Introduction of ANOVA 6.2) One-way ANOVA 6.3) Means squares and F-ratio 6.4) The Scheffe test and Tukey test 6.5) Two-way ANOVA
7. Correlation and Regression 7.1) Correlation 7.2) Regression 7.3) Confidence levels of the regression 7.4) Multiple regression
8. Chi-Square Distribution 8.1) Introduction of chi-square 8.2) Tests of Goodness-of-fit 8.3) Tests of Independence 8.4) Tests of Homogeneity 8.5) Fisher Exact Test
9. Non-parametric Tests 9.1) The Mann-Whitney Test (Wilcoxon Rank Sum Test). 9.2) The Wilcoxon Signed-Ranked Test. 9.3) The Kruskal-Wallis One Way Analysis of Variance by Ranks. 9.4) The Spearman Rank Correlation Coefficient.
10. Designing Experiments & Selecting Test 10.1) n/a

Assessment Breakdown	%
Continuous Assessment	50.00%
Final Assessment	50.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	one assignment	10%	CLO3
	Test	Test 1	20%	CLO1
	Test	Test 2	20%	CLO2

Reading List	Recommended Text	<ul style="list-style-type: none"> Allan G. Bluman. 2014, <i>Elementary Statistics. A Step by Step Approach.</i>, Ninth Ed. Ed., McGraw-Hill Int. Edition.
	Reference Book Resources	<ul style="list-style-type: none"> Samuels, W. 2003, <i>Statistics for the Life Sciences.</i>, 3rd Edition. Ed., Prentice Hall. Box, G.E.P., Hunter, W.G. and Hunter, J.S. 2005, <i>Statistics for Biologists.</i>, Cambridge University Press. Calvin Dytham. 2003, <i>Choosing and Using Statistics: A Biologist's Guide.</i>, 2nd Edition. Ed., Blackwell Publishing Co. Graeme D. Ruxton & Nick Colegrave 2003, <i>Experimental Design for the Life Sciences.</i>, 2nd Edition. Ed., Oxford Publishing.

Article/Paper List	This Course does not have any article/paper resources
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Other References	This Course does not have any other resources
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