

DEREE COLLEGE SYLLABUS FOR: MA 2025 APPLIED STATISTICS FOR SCIENCES										
(Previously: MA 2025 APPLIED STATISTICS FOR SCIENCES – LEVEL 4)  (Updated Spring 2024)		US CR: 3/1/3								
PREREQUISITES:	None									
CATALOG DESCRIPTION:	A comprehensive introduction of statistics for the natural and physical sciences. Organizing and summarizing data. Descriptive and inferential statistics. Test for independence of two qualitative/categorical variables. Test of differences for related/ unrelated samples using parametric or non-parametric tests. Analysis of variance (ANOVA) and linear regression analysis. Consider applications in the sciences using software.									
RATIONALE:	This course provides the elementary foundations in statistics and its application to the sciences, aiming primarily to focus on how statistics is integrated into modern scientific practice in biomedicine and other related areas. The students learn to summarize and describe data, construct confidence intervals, and perform basic tests of hypotheses as well as linear regression, analysis of variance.									
LEARNING OUTCOMES:	As a result of taking this course, the student should be able to:  1. Develop the necessary statistical skills to describe population or sample data and estimate the probability of random events using probability distributions. 2. Identify appropriate statistical tests to draw inference about the population mean(s) from one or more samples. 3. Apply appropriate statistical procedures for qualitative/ categorical data. 4. Apply regression techniques for prediction. 5. Utilize open-source data analysis tools to illustrate applications for the life sciences. 6. Utilize statistical software for data presentation and data analysis.									
METHOD OF TEACHING AND LEARNING:	In congruence with the teaching and learning strategy of the college, the following tools are used: <ul style="list-style-type: none"><li>• Lectures and class discussions.</li><li>• Homework assignments.</li><li>• Office hours held by the instructor to provide further assistance to students.</li><li>• Use of library facilities for further study and preparation for the exams</li><li>• Use of the Blackboard course management platform to further support communication, by posting lecture notes, assignment instruction, timely announcements, formative quizzes and online submission of assignments.</li></ul>									
ASSESSMENT:	<table><tr><td colspan="2">Summative:</td></tr><tr><td>1<sup>st</sup> assessment: Midterm examination (written assessment, 1 hour)</td><td>30%</td></tr><tr><td>2<sup>nd</sup> assessment: Portfolio of projects (individual work)</td><td>20%</td></tr><tr><td>Final assessment: Final examination (written assessment, 2 hours)</td><td>50%</td></tr></table>		Summative:		1 <sup>st</sup> assessment: Midterm examination (written assessment, 1 hour)	30%	2 <sup>nd</sup> assessment: Portfolio of projects (individual work)	20%	Final assessment: Final examination (written assessment, 2 hours)	50%
Summative:										
1 <sup>st</sup> assessment: Midterm examination (written assessment, 1 hour)	30%									
2 <sup>nd</sup> assessment: Portfolio of projects (individual work)	20%									
Final assessment: Final examination (written assessment, 2 hours)	50%									

	<p><b>Formative:</b></p> <table border="1" data-bbox="608 136 1465 210"> <tr> <td data-bbox="608 136 1385 210">Multiple diagnostic numerical problems/ questions using statistical output for the first and the final assessment.</td><td data-bbox="1385 136 1465 210"><b>0%</b></td></tr> </table> <ul style="list-style-type: none"> <li>• The first assessment tests Learning Outcomes 1, 2, 6.</li> <li>• The second assessment tests applications relating to Learning Outcomes 1, 2, 4, 5, 6. A report is produced based on the data supplied and results should be presented in a comprehensive way.</li> <li>• The final assessment tests Learning Outcomes 1, 2, 3, 4, 6 with emphasis on 3 and 4.</li> <li>• The formative assessment aims to prepare students for the summative assessments.</li> </ul> <p>The final grade for this module will be determined by averaging all summative assessment grades, based on the predetermined weights for each assessment. Students are not required to resit failed assessments in this module. Failure to pass the module results in module repeat.</p>	Multiple diagnostic numerical problems/ questions using statistical output for the first and the final assessment.	<b>0%</b>
Multiple diagnostic numerical problems/ questions using statistical output for the first and the final assessment.	<b>0%</b>		
<p><b>INDICATIVE READING:</b></p>	<p><b>REQUIRED READING:</b> Samuels, M.L., Witmer, J.A. &amp; Schaffner, A (2015) Statistics for the Life sciences (5<sup>th</sup> Ed.), Pearson.</p> <p><b>RECOMMENDED READING:</b></p> <ul style="list-style-type: none"> <li>• Ekstrom, C.T. &amp; Sorensen, H. (2014) Introduction to Statistical Data Analysis for the Life Sciences, (2<sup>nd</sup> Ed.), Chapman and Hall, CRC.</li> <li>• Hawkins, D (2019) Biomeasurement: A student's guide to Biostatistics (4<sup>th</sup> Ed.), Oxford University Press.</li> <li>• Holmes, S. &amp; Huber, W. (2019) Modern Statistics for Biology, Stanford edu. <a href="#">online</a></li> <li>• Ennos, R. &amp; Johnson M.L. (2018) Statistical data and handling skills in Biology (4<sup>th</sup> Ed.) Pearson Education Ltd.</li> <li>• Field A. (2017). <i>Discovering statistics with SPSS</i> (5th Ed.). London, UK: Sage Publications.</li> <li>• Irizarry, R.A. &amp; Love, M.I. (2016) Data analysis for the life sciences with R (1<sup>st</sup> Ed.). Chapman and Hall/CRC</li> <li>• George, D. &amp; Mallery, G (2016). <i>IBM SPSS Statistics 23 Step by Step: A Simple Guide and Reference</i> (14th Ed.). New York, NY: Routledge.</li> <li>• Hinton, P.R. (2014). <i>Statistics Explained</i> (3rd Ed.). Statistics Explained. New York, NY: Routledge.</li> <li>• Leech, N. L., Barrett, K. C. &amp; Morgan, G. A. (2008). <i>SPSS for Intermediate Statistics</i> (3rd Ed). New York, USA: Taylor &amp; Francis Group.</li> </ul>		
<p><b>INDICATIVE MATERIAL:</b> (e.g. audiovisual, digital material, etc.)</p>	<p><b>REQUIRED MATERIAL:</b> N/A</p> <p><b>RECOMMENDED MATERIAL</b></p> <ul style="list-style-type: none"> <li>• Journal of Applied Statistics</li> <li>• Journal of the American Statistical Association</li> <li>• Journal of the Royal Statistical Society Series C (Applied Statistics)</li> <li>• PLoS (Public Library of Science) One</li> <li>• Proceedings of the National Academy of Sciences of the United States of America</li> </ul>		

<b>COMMUNICATION REQUIREMENTS:</b>	Assignments presented in Microsoft Word. Use of proper English, both oral and written.
<b>SOFTWARE REQUIREMENTS:</b>	MS Office and Blackboard CMS. Excel and/or SPSS or other statistical software (e.g. R and Bioconductor).
<b>WWW RESOURCES:</b>	<a href="http://www.wolframalpha.com">www.wolframalpha.com</a> <a href="http://www.quickmath.com">www.quickmath.com</a> <a href="https://www.biostars.org">https://www.biostars.org</a> <a href="https://www.itl.nist.gov/div898/handbook/">https://www.itl.nist.gov/div898/handbook/</a> <a href="https://www.significancemagazine.com">https://www.significancemagazine.com</a> <a href="https://www.rstudio.com">https://www.rstudio.com</a> <a href="https://www.knime.com">https://www.knime.com</a>  APA style resources available from: <a href="http://www.psychwww.com/resource/apacrib.html">http://www.psychwww.com/resource/apacrib.html</a> <a href="http://www.wooster.edu/psychology/apa---crib.html">http://www.wooster.edu/psychology/apa---crib.html</a> <a href="http://owl.english.purdue.edu/workshops/hypertext/apa/index.html">http://owl.english.purdue.edu/workshops/hypertext/apa/index.html</a>
<b>INDICATIVE CONTENT:</b>	<ol style="list-style-type: none"> <li>1. Descriptive statistics               <ol style="list-style-type: none"> <li>a. Location measures</li> <li>b. Dispersion measures</li> <li>c. Frequency distributions</li> <li>d. Graphical representation</li> </ol> </li> <li>2. Probability distributions/ Sampling distributions               <ol style="list-style-type: none"> <li>a. Basic probability concepts</li> <li>b. Binomial distribution</li> <li>c. Normal distribution</li> <li>d. Sample mean and variance</li> <li>e. Central limit theorem</li> </ol> </li> <li>3. Confidence intervals               <ol style="list-style-type: none"> <li>a. Confidence interval for one mean</li> </ol> </li> <li>4. Comparison of independent/dependent samples               <ol style="list-style-type: none"> <li>a. Parametric and non-parametric tests</li> </ol> </li> <li>5. Chi-square tests for categorical data               <ol style="list-style-type: none"> <li>a. One-sample distributions</li> <li>b. Chi-square test for independence</li> </ol> </li> <li>6. Comparing the means of more than two samples               <ol style="list-style-type: none"> <li>a. One-way analysis of variance (ANOVA)</li> </ol> </li> <li>7. Linear regression and correlation               <ol style="list-style-type: none"> <li>a. The correlation coefficient, the coefficient of determination and the test of linear relationship between two variables.</li> <li>b. Use linear regression as a prediction tool.</li> </ol> </li> <li>8. [Optional as time permits] Generalised linear modelling: An introduction.</li> </ol>