

**STATISTICAL ANALYSIS OF ENGINEERING UNDERGRADUATES'
PERFORMANCE ACROSS FORMATIVE AND SUMMATIVE ASSESSMENTS IN
CALCULUS MODULE**

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A collection of 199 undergraduates from the Faculty of Engineering, General Sir John Kotelawala Defence University (KDU), was selected for the study using convenience sampling. The calculus module for engineering undergraduates is designed with various essential and complex concepts for advanced engineering problems and is offered in the second academic semester. To fulfil the formative assessment category, five in-class assignments were conducted to cover all learning outcomes. For the analysis, the weighted average marks of the formative assessments were considered, and the end-semester examination was considered as the summative assessment. A descriptive analysis was performed to identify the relationship between the summative assessment marks of the calculus module and the formative assessment marks. The significant gap between the weighted average of formative and summative assessment marks suggests that end-semester examinations are considerably more challenging than continuous assessments. Shapiro-Wilk normality test results indicated that the formative assignment marks slightly differ from normality, and the end-semester examination marks are normally distributed. Pearson and Spearman Rank correlation tests were performed in the analysis. Statistically significant moderate positive correlations indicate that students who perform well in formative assessment tend to perform better in summative assessment in the calculus module. A simple linear regression model was fitted to strengthen the results, revealing that formative assessment marks significantly predict summative assessment performance ($R^2 = 0.327$). The residual analysis shows that the model's error terms are normally distributed with relatively constant variance across the range of predicted values. Although, the correlation improved slightly upon the removal of influential outliers, the fundamental relationship between the assessments remained consistent with the regression model, explaining approximately 33% of the variance in summative assessment performance.

Keywords: Calculus, Engineering education, Formative and summative assessment