

**Title (Units):** **COMP1016 Mathematical Methods for Business Computing (3,1,2)**

**Course Aims:** This course aims to provide students with the fundamental skills in applying mathematical methods in business. Emphasis will be placed on the applications of the mathematical concepts in probability and statistics in business using software. Topics include applications of mathematical methods in business, data, descriptive statistics, inferential statistics, probability distribution and nonparametric methods used in business. Students are required to explore how business applies the mathematical methods to sustain their growth and development.

**Prerequisite:** MATH1026 Probability and Statistics with Software

**Course Intended Learning Outcomes (CILOs):**

Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
	<b>Knowledge</b>
1	Describe how the mathematical concepts can be applied in business
2	Identify what, how, when and why certain mathematical methods are being applied to business applications
3	Interpret the mathematical results in business context
	<b>Professional Skill</b>
4	Use appropriate computer software and function(s) to solve business problems
5	Apply relevant mathematical methods to conduct data analysis with computer software

**Calendar Description:** This course aims to provide students with the necessary skills in applying mathematical methods in business. Emphasis will be placed on the applications of the mathematical concepts in probability and statistics in business using computer software. Topics include applications of mathematical methods in business, data, descriptive statistics, inferential statistics, probability distribution and nonparametric methods used in business. Students are required to explore how business apply the mathematical methods to sustain their growth and development.

**Teaching and Learning Activities (TLAs):**

CILOs	Type of TLA
1-4	Lectures
3-5	Laboratory and tutorial classes
2-5	Assignments, such as exercises, written assignments and mini-project

**Assessment:**

No.	Assessment Methods	Weighting	CILOs to be addressed	Description of Assessment Tasks
1	Exercises	15%	3-5	Exercises are designed to assess the students' mastery of the techniques and applications of mathematical concepts with computer software and are related mainly to learning outcomes 3, 4 and 5.
2	Written Assignments	20%	2-4	Written assignments are designed to assess the students' ability in identifying mathematical methods that can and/or cannot be applied and interpreting the mathematical results in a given business context and are related mainly to learning outcomes 2, 3, and 4.
3	Mini-project	25%	2-5	The mini-project is designed to achieve learning outcomes 2, 3, 4 and 5 by requiring students to work well individually or in a team environment to

				implement creative solutions through application of the knowledge and skills learned.
4	Examination	40%	1-4	The final examination is designed to measure the extent to which the students have reached all of the four learning outcomes. Students are required to have a good mastery of the concepts, techniques, methodologies, and applications of mathematical concepts to business situations and problems.

**Assessment Rubrics:**

- Excellent (A)**
- Achieves all four CILOs, demonstrating a good mastery of both the theoretical and practical aspects of the knowledge and skills associated with mathematical concepts for business computing
  - Demonstrates a thorough understanding and solid knowledge of mathematic used in business computing concepts and methodologies
  - Able to draw on a variety of techniques and relevant knowledge and appropriately apply them to different situations and problems
  - Able to interpret the mathematical results generated at all-time effectively
- Good (B)**
- Achieves all four CILOs, demonstrating a good understanding of the associated concepts and underlying applications
  - Demonstrates a competent level of knowledge of mathematic use in business computing concepts and methodologies
  - Ability to make use of appropriate techniques and knowledge and apply them to familiar situations and problems
  - Ability to interpret the mathematical results generated in most of the time effectively
- Satisfactory (C)**
- Achieves most of the four CILOs, demonstrating a basic level of understanding of the associated concepts and underlying applications
  - Demonstrates an adequate level of knowledge of mathematic use in business computing situations
  - Ability to make use of some techniques and knowledge and apply them to familiar situations
  - Ability to interpret the mathematical results generated sometime only
- Marginal Pass (D)**
- Achieves most of the four CILOs, with minimal understanding of the associated concepts and underlying applications
  - Demonstrates a basic level of knowledge of mathematic use in business computing situations
  - Ability to apply some techniques and knowledge to a limited number of typical situations
  - Ability to interpret the mathematical results generated very rare
- Fail (F)**
- Achieves less than three of the four CILOs, with little understanding of the associated concepts and underlying applications
  - Knowledge of mathematic use in business computing falling below the basic minimum level
  - Unable to apply techniques and knowledge to situations or problems
  - Unable to interpret the mathematical results generated sometime only

**Course Content and CILOs Mapping:**

Content		CILO No.
I	Applications of Mathematical Methods in Business	1
II	Mathematical Data Analysis using Computer Software - Part 1 : Data and Descriptive Statistics	2-5
III	Mathematical Data Analysis using Computer Software - Part 2 : Probability Distribution	2-5
IV	Mathematical Data Analysis using Computer Software - Part 3 : Inferential Statistics	2-5

V	Mathematical Data Analysis using Computer Software - Part 4 : Nonparametric Methods	2-5
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**References:**

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- Farrell, P., Funetes, A., Kolhe, A.S., and Nguyen, Q. The Statistics and Calculus with Python Workshop: A Comprehensive Introduction to Mathematics in Python for Artificial Intelligence Applications, Packt Publishing, 2020.
- Saha, A. Doing Math with Python: Using Programming to Explore Algebra, Statistics, Calculus, and More! First Edition, No Starch Press, 2015.
- Schwarz, J.S., Chapman, C., Feit, E.M. Python for Marketing Research and Analytics, 1st Edition, Springer, 2020.
- Heiss, F., and Brunner, D. Using Python for Introductory Econometrics, Independently published, 2020.
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- Berenson, M., Levine, D., Szabat, K., Stephan, D. Basic Business Statistics (What's New in Business Statistics), 14th Edition, Pearson, 2018.
- Winston, W. Microsoft Excel 2019 Data Analysis and Business Modeling (Business Skills), 6th Edition, Microsoft Press, 2019.
- McFedries, P. Microsoft Excel 2019 Formulas and Functions (Business Skills), 1st Edition, Microsoft Press, 2019.

**Course Content:**

**Topic**

- I. Applications of Mathematical Methods in Business
  
- II. Mathematical Data Analysis using Computer Software - Part 1 : Data and Descriptive Statistics  
**PART 1: Data and Descriptive Statistics**  
Data and its Source
  - Elements, variables, and observations
  - Scales of measurement
  - Categorical and quantitative data
  - Cross-sectional and time series data  
Descriptive Statistics
  - Sample, population and experiment
  - Exploratory data analysis
  - Graphical and tabular representations of data sets
  
- III. Mathematical Data Analysis using Computer Software - Part 2 : Probability Distribution  
Use of Probability Distributions
  - Discrete probability distributions
  - Continuous probability distributions
  - Sampling and sampling distributions  
Interval Estimation  
  
Hypothesis Testing
  - Basic concepts
  - Power and sample size
  - Test about means, proportions and difference of means
  - Test about variances

- IV. Mathematical Data Analysis using Computer Software - Part 3 :  
Inferential Statistics  
Statistical Inference
- Inferences about means and proportions with two populations
  - Inference about population variances
  - Test of goodness of fit, independence, and multiple proportions
  - Experimental design and analysis of variance
  - Correlation
  - Regression analysis: model building
- V. Mathematical Data Analysis using Computer Software - Part 4 :  
Nonparametric Methods  
Nonparametric Methods
- Sign test
  - Wilcoxon Signed-ranked test
  - Mann-Whitney rank-sum test
  - Kruskal-Wallis test
  - Spearman rank-correlation
  - Runs test