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 and numeracy in business. Emphasis will be placed on the applications of 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 elementary linear algebra. Students are required to explore how businesses 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)
	Knowledge
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
	Professional Skill
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 mathematical concepts in probability, statistics and elementary linear algebra in business using computer software. Topics include applications of mathematical methods in business, data, descriptive statistics, inferential statistics, probability distribution and elementary linear algebra. Students are required to explore how businesses 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 mathematics 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 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 mathematics in business computing concepts and methodologies • Able to make use of appropriate techniques and knowledge and apply them to familiar situations and problems • Able to interpret the mathematical results effectively in most cases
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 mathematics in business computing situations • Able to make use of mathematical techniques and knowledge and apply them to familiar situations • Show ability to interpret the mathematical results
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 mathematics in business computing situations • Able to apply some techniques and knowledge to a limited number of business situations • Show ability to interpret simple mathematical results barely
Fail (F)	• Achieves less than three of the four CILOs, with little understanding of the associated concepts and underlying applications • Knowledge of mathematics in business computing falling below the minimum level • Unable to apply techniques and knowledge to business problems • Unable to interpret the mathematical results

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 and Inferential Statistics	2-5
IV	Mathematical Data Analysis using Computer Software - Part 3 : Elementary Linear Algebra	2-5

References:

- Anderson, D.R., Sweeney, D.J., Williams, T.A., Camm, J.D., and Cochran, J.J. Essentials of Modern Business Statistics with Microsoft Excel (MindTap Course List), 8th Edition, Cengage Learning, 2021.
- 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.
- Berenson, M., Levine, D., Szabat, K., Stephan, D. Basic Business Statistics (What's New in Business Statistics), 14th Edition, Pearson, 2018.
- Lay, D., Lay, S. and MLinear Algebra and Its Applications, 5th Edition, Pearson, 2014
- Williams, G., Linear algebra with applications, 9th Edition, Jones and Bartlett Publisher, 2017.

Course Content:

Topic

I. Applications of Mathematical Methods in Business

II. Mathematical Data Analysis using Computer Software - Part 1 : Data and Descriptive Statistics

Data and its Source
- Elements, variables, and observations
- Categorical and quantitative data
- Cross-sectional and time series data
- Data structures in Python and Pandas

Descriptive Statistics
- Sample, population and experiment
- Exploratory data analysis
- Graphical and tabular representations of data sets in Python

III. Mathematical Data Analysis using Computer Software - Part 2 : Probability Distribution and Inferential Statistics
Use of probability distributions

- Sampling and sampling distributions- Interval Estimation and hypothesis testing
- Inferences about means and proportions with two populations
- Test of goodness of fit, independence, and multiple proportions
- Experimental design and analysis of variance
- Non-parametric methods
- Rank sum test and Kruskal Wallist test
- Regression analysis
- Problem solving using Python programming

IV. Mathematical Data Analysis using Computer Software - Part 3 : Elementary Linear Algebra
Linear algebra and its applications
- Systems of Linear equations
- Vectors and matrices
- Matrix operation and inverse of a matrixLinear algebra applications