澳門理工大學
Universidade Politécnica de Macau
Macao Polytechnic University

FACULTY OF BUSINESS

BACHELOR OF MANAGEMENT

LEARNING MODULE OUTLINE

Academic Year	2023 / 2024	Semester	2
Module Code	MATH2110-223		
Learning Module	Business Statistics		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45
Instructor	Natalie, Pang Weng Sun	Email	wspang@mpu.edu.mo
Office	M524, Meng Tak Building	Office Phone	85993324

MODULE DESCRIPTION

This module is designed to introduce basic statistical principles, and techniques for data analysis in the context of solving business problems. Students will learn how to perform statistical analysis on various inferential real-life situations. Topics include organizing data, descriptive statistics, probability theory, discrete distributions, normal distribution, sampling and sampling distributions, estimation, hypothesis testing, correlation and regression analysis.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Describe the role of statistical analysis in business.
M2.	Identify the types of data and the various summary measures used to describe data.
M3.	Describe data in tables and graphs.
M4.	Apply the binomial, Poisson and normal distributions as a model for data.
M5.	Apply confidence intervals and test hypotheses for population means and proportions.
M6.	Use correct data presentation and analysis methods based on problem type and data type.
M7.	Justify decisions based on statistical significance when faced with variability in data.
M8.	Analyze relationships between two continuous variables and determine valid prediction models using simple linear regression and correlation.

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**

P1. Integrate contemporary Management theories and business disciplines relevant to general business practices.	✓							
P2. Apply critical thinking and logical analysis skills and techniques to resolve management issues.	✓	✓	✓	✓	✓	✓	✓	✓
P3. Utilize appropriate written and spoken forms to communicate effectively and professionally with stakeholders in various cultural environments.								
P4. Demonstrate leadership in a team and respecting the rights of others irrespective of their cultural background, race or gender in order to solve unpredictable problems in the field.								
P5. With the help of mathematical and statistical skills, utilize the latest empirical findings and academic studies to support the recommendation of business projects or reports.	✓	✓	✓	✓	✓	✓	✓	✓
P6. Recommend an appropriate course of action by ethically examining economic, environmental, political, legal and regulatory contexts of global business practices.								
P7. Interpret and utilize Management information or business software for internal control, planning, performance evaluation, and coordination to improve efficiency and effectiveness in the business process.								

MODULE SCHEDULE AND COVERAGE

Week	Content Coverage	Contact Hours
1	1. The Nature of Statistics 1.1 Two Kinds of Statistics 1.2 Simple Random Sampling	1.5
1	2. Organizing Data 2.1 Variables and Data 2.2 Organizing Qualitative Data 2.3 Organizing Quantitative Data 2.4 Distribution Shapes	3
3	3. Descriptive Measures 3.1 Measures of Center 3.2 Measures of Variation 3.3 The Five-Number Summary; Boxplots	4.5

	3.4 Descriptive Measures for Populations; Use of Samples	
4	4. Probability Concepts 4.1 Probability Basics 4.2 Events 4.3 Some Rules of Probability 4.8 Counting Rules	3
5	5. Discrete Random Variables 5.1 Discrete Random Variables and Probability Distributions 5.2 The Mean and Standard Deviation of a Discrete Random Variable 5.3 The Binomial Distribution 5.4 The Poisson Distribution	3
6	6. The Normal Distribution 6.1 Introducing Normally Distributed Variables 6.2 Areas under the Standard Normal Curve 6.3 Working with Normally Distributed Variables 6.4 Assessing Normality; Normal Probability Plots 6.5 Normal Approximation to the Binomial Distribution	4.5
8	Test	3
9	7. The Sampling Distribution of the Sample Mean 7.1 Sampling Error; the Need for Sampling Distributions 7.2 The Mean and Standard Deviation of the Sample Mean 7.3 The Sampling Distribution of the Sample Mean	3
10	8. Confidence Intervals for one Population Mean 8.1 Estimating a Population Mean 8.2 Confidence Intervals for One Population Mean When σ is Known 8.3 Confidence Intervals for One Population Mean When σ is Unknown	3
11	9. Hypothesis Tests for One Population Mean 9.1 The Nature of Hypothesis Testing 9.2 Critical-Value Approach to Hypothesis Testing 9.3 *P*-Value Approach to Hypothesis Testing 9.4 Hypothesis Tests for One Population Mean When σ is Known 9.6 Hypothesis Tests for One Population Mean When σ is Unknown	4.5
12	10. Inferences for Two Population Means 10.1 The Sampling Distribution of the Difference between Two Sample Means for Independent Samples 10.3 Inferences for Two Population Means, Using Independent Samples: Standard Deviations Not Assumed Equal 10.5 Inferences for Two Population Means, Using Paired Samples	3
13	12 Inferences for Population Proportions 12.1 Confidence Intervals for One Population Proportion 12.2 Hypothesis Tests for One Population Proportion 12.3 Inferences for Two Population Proportions, Using Independent Samples	3

14	14. Descriptive Methods in Regression and Correlation 14.1 Linear Equations with One Independent Variable 14.2 The Regression Equation 14.3 The Coefficient of Determination 14.4 Linear Correlation	3
15	Final Exam	3

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	M1	M2	M3	M4	M5
T1. Lecture	✓	✓	✓	✓	✓
T2. Classwork exercises	✓	✓	✓	✓	✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	ILOs to be Assessed
A1. Classwork exercises	20%	M1 ☐ M5
A2. Test	30%	M1 ☐ M5
A3. Final examination	50%	M1 ☐ M5

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

MARKING SCHEME

The University Grading System:

Letter Grade	Mark Ranges	Grade Point	Grade Definition
A A-	93 ☐☐100 88 ☐☐92	4.0 3.7	Excellent
B+	83 ☐☐87	3.3	Very Good
B B-	78 ☐☐82 73 ☐☐77	3.0 2.7	Good

C+ C C-	68 □□72 63 □□67 58 □□62	2.3 2.0 1.7	Satisfactory
D+ D-	53 □□57 50 □□52	1.3 1.0	Pass
F	0 □□49	0	Fail

REQUIRED READINGS

TEXTBOOK

Barnett, R.A., Ziegler, M. R., Byleen, K. E., & Stocker, C. J. (2019). *College Mathematics for Business, Economics, Life Sciences and Social Sciences*, 14th Edition. Pearson Education.

STUDENT FEEDBACK

At the end of every semester, students are invited to provide feedback on the learning module and the teaching arrangement through questionnaires. Your feedback is valuable for instructors to enhance the module and its delivery for future students. The instructor and programme coordinators will consider all feedback and respond with actions formally in the annual programme review.

ACADEMIC INTEGRITY

The Macao Polytechnic University requires students to have full commitment to academic integrity when engaging in research and academic activities. Violations of academic integrity, which include but are not limited to plagiarism, collusion, fabrication or falsification, repeated use of assignments and cheating in examinations, are considered as serious academic offenses and may lead to disciplinary actions. Students should read the relevant regulations and guidelines in the Student Handbook which is distributed upon the admission into the University, a copy of which can also be found at www.mpu.edu.mo/student_handbook/.

FACULTY OF BUSINESS

BACHELOR OF MANAGEMENT

LEARNING MODULE OUTLINE

Academic Year	2023 / 2024	Semester	2
Module Code	MATH2110-225		
Learning Module	Business Statistics		
Pre-requisite(s)	Nil		
Medium of Instruction	English		
Credits	3	Contact Hours	45
Instructor	Prof. Victor, Chan Ka Yin	Email	vkychan@mpu.edu.mo
Office	M549, Meng Tak Building	Office Phone	8599-3322

MODULE DESCRIPTION

This course is designed to introduce basic statistical principles, and techniques for data analysis in the context of solving business problems. Students will learn how to perform statistical analysis on various inferential real life situations. Topics include: organizing data; descriptive statistics; probability; discrete distributions; normal distribution; sampling and sampling distributions; estimation; hypothesis testing; correlation and regression analysis.

MODULE INTENDED LEARNING OUTCOMES (ILOS)

On completion of this learning module, students will be able to:

M1.	Describe the role of statistical analysis in business.
M2.	Identify the types of data and the various summary measures used to describe data.
M3.	Describe data in tables and graphs.
M4.	Apply the binomial, Poisson and normal distributions as a model for data.
M5.	Apply confidence intervals and test hypotheses for population means and proportions.
M6.	Use correct data presentation and analysis methods based on problem type and data type.
M7.	Justify decisions based on statistical significance when faced with variability in data.
M8.	Analyze relationships between two continuous variables and determine valid prediction models using simple linear regression and correlation.

These ILOs aims to enable students to attain the following Programme Intended Learning Outcomes (PILOs):

PILOs of Marketing Program	M1	M2	M3	M4	M5	M6	M7	M8
P1. Explain the core concepts, values and Skills Students are able to apply the marketing principles, concepts, theories in analyzing the changing business environment.								
P2. Apply appropriate Tools and technologies Students are able to demonstrate using related tools, technology and skills to generate proposals and solutions.	✓	✓	✓	✓	✓	✓	✓	✓
P3. Proceed Lifelong learning Students are able to apply self and independent learning to leverage learned knowledge in practical life.	✓	✓	✓	✓	✓	✓	✓	✓
P4. Adopt Leadership approaches Students are able to develop collaborative groups, synergy teams in achieving objectives and shared goals.								
P5. Demonstrate and practice Legal and Ethical Values Students are able to identify professional ethics from broad business practices.								
P6. Effective Communication Skills Students are able to communicate and present ideas effectively.	✓					✓		
P7. Critical Thinking Students are able to apply self-understanding and analysis of critical perspectives to issues in broad conditions for problem solving.	✓	✓	✓	✓	✓	✓	✓	✓
P8. Intercultural Competence Students are competent to associate in a diversified social and global community.	✓					✓		

PILOs of Management Program	M1	M2	M3	M4	M5	M6	M7	M8
P1. Integrate contemporary management theories and business disciplines relevant to general business practices.	✓							
P2. Apply critical thinking and logical analysis skills and techniques to resolve management issues.	✓	✓	✓	✓	✓	✓	✓	✓
P3. Utilize appropriate written and spoken forms to communicate effectively and professionally with stakeholders in various cultural environments.								
P4. Demonstrate leadership in a team and respecting the rights of others irrespective of their cultural background, race or gender in order to solve unpredictable problems in the field.								

P5. With the help of mathematical and statistical skills, utilize the latest empirical findings and academic studies to support the recommendation of business projects or reports.	✓	✓	✓	✓	✓	✓	✓	✓
P6. Recommend an appropriate course of action by ethically examining economic, environmental, political, legal and regulatory contexts of global business practices.								
P7. Interpret and utilize management information or business software for internal control, planning, performance evaluation, and coordination to improve efficiency and effectiveness in the business process.								

PILOs of Accounting Program	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**
P1. Integrate the contemporary theories, principles of accounting and business disciplines relevant to general business practice.	✓							
P2. Assess general business scenarios with mathematical and statistical skills.	✓	✓	✓	✓	✓	✓	✓	✓
P3. Apply critical thinking and logical analysis skills and techniques to solve business problems.	✓	✓	✓	✓	✓	✓	✓	✓
P4. Interpret and analyze accounting information for internal control, planning, performance evaluation, and coordination to continuously improve business process.								
P5. Apply accounting or business software for business analysis.								
P6. Develop queries to assess management information from database to improve efficiency and effectiveness.								
P7. Synthesize the latest requirement of international accounting and auditing standards in preparing financial statements and auditing reports.								
P8. Utilize appropriate written and spoken forms to communicate effectively with stakeholders in various cultural environment.								
P9. Recommend an appropriate course of action by ethically examining the economic, environmental, political, legal and regulatory contexts of global business practice.								
P10. Utilize the latest empirical findings and academic studies to support the recommendation of business projects.								

PILOs of E-Commerce Program	M1	M2	M3	M4	M5	M6	M7	M8
P1. Demonstrate an understanding of the business processes and operations and the skilful realization of information technologies required to practice electronic commerce;								
P2. Apply knowledge in business, mathematics, programming, computing, web development, and database to address complex problems in the context of electronic commerce;	✓	✓	✓	✓	✓	✓	✓	✓
P3. Analyze critically the effect of web technology use on organizational performance and develop electronic commerce strategies that fit organizational objectives;								
P4. Select and apply tools and technologies to effectively implement electronic commerce systems in business intelligence, enterprise resources planning, supply chain management, and customer relationship management;	✓	✓	✓	✓	✓	✓	✓	✓
P5. Develop relationships, motivate others, manage conflicts, lead changes, and work across differences in multi-disciplinary electronic commerce projects;								
P6. Communicate and work effectively using written and spoken word, non- verbal language, and electronic tools with fellow professionals and different stakeholders in the electronic commerce industry;								
P7. Demonstrate a global electronic commerce perspective as evidenced by an understanding of foreign languages and the role of Macau as an interface between the East and the West;								
P8. Cope with and manage contemporary advancement related to electronic commerce development and demonstrate lifelong learning attitudes and abilities;								
P9. Conduct research and devise innovative electronic commerce models to exploit business opportunities; and	✓	✓	✓	✓	✓	✓	✓	✓
P10. Reflect on professional responsibilities and keep up with the latest electronic commerce issues on legal, environmental, ethical, and societal considerations to benefit society comprehensively.								

MODULE SCHEDULE, COVERAGE AND STUDY LOAD

Week	Content Coverage	Contact Hours
1	1 The Nature of Statistics 1.1 Two Kinds of Statistics 1.2 Simple Random Sampling *(Describe various kinds of statistics and sampling methods.)*	1.5 hrs
1, 2	2 Organizing Data 2.1 Variables and Data 2.2 Organizing Qualitative Data 2.3 Organizing Quantitative Data 2.4 Distribution Shapes *(Describe major ways to organize collected data.)*	3 hrs
2, 3	3 Descriptive Measures 3.1 Measures of Center 3.2 Measures of Variation 3.4 The Five-Number Summary; Boxplots 3.5 Descriptive Measures for Populations; Use of Samples *(Describe several measurements used in statistics.)*	4.5 hrs
4	4 Probability Concepts 4.1 Probability Basics 4.2 Events 4.3 Some Rules of Probability 4.8 Counting Rules *(Explain fundamental concepts of probability.)*	3 hrs
5	5 Discrete Random Variables 5.1 Discrete Random Variables and Probability Distributions 5.2 The Mean and Standard Deviation of a Discrete Random Variable 5.3 The Binomial Distribution 5.4 The Poisson Distribution *(Describe various kinds of discrete probability distributions.)*	3 hrs
6, 7	6 The Normal Distribution 6.1 Introducing Normally Distributed Variables 6.2 Areas under the Standard Normal Curve 6.3 Working with Normally Distributed Variables 6.4 Assessing Normality; Normal Probability Plots 6.5 Normal Approximation to the Binomial Distribution *(Identify the normal distribution.)*	4.5 hrs
7, 8	7 The Sampling Distribution of the Sample Mean 7.1 Sampling Error; the Need for Sampling Distributions 7.2 The Mean and Standard Deviation of the Sample Mean 7.3 The Sampling Distribution of the Sample Mean *(Identify the properties of sample mean and sampling distribution.)*	3 hrs
9	**Test(Tentative)**	3 hrs
8, 10	8 Confidence Intervals for one Population Mean 8.1 Estimating a Population Mean	3 hrs

	8.2 Confidence Intervals for One Population Mean When σ is Known 8.3 Confidence Intervals for One Population Mean When σ is Unknown *(Apply the knowledge of sample mean and sampling distribution to construct confidence intervals for population mean.)*	
10, 11	9 Hypothesis Tests for One Population Mean 9.1 The Nature of Hypothesis Testing 9.2 Critical-Value Approach to Hypothesis Testing 9.3 *P*-Value Approach to Hypothesis Testing 9.4 Hypothesis Tests for One Population Mean When σ is Known 9.5 Hypothesis Tests for One Population Mean When σ is Unknown *(Apply the knowledge of sample mean and sampling distribution to test hypotheses for population mean.)*	4.5 hrs
12	10 Inferences for Two Population Means 10.1 The Sampling Distribution of the Difference between Two Sample Means for Independent Samples 10.3 Inferences for Two Population Means, Using Independent Samples: Standard Deviations Not Assumed Equal 10.5 Inferences for Two Population Means, Using Paired Samples *(Apply the knowledge of sample mean and sampling distribution to the two-population-means cases.)*	3 hrs
13	12 Inferences for Population Proportions 12.1 Confidence Intervals for One Population Proportion 12.2 Hypothesis Tests for One Population Proportion 12.3 Inferences for Two Population Proportions, Using Independent Samples *(Apply the knowledge of sample mean and sampling distribution to the population proportion cases.)*	3 hrs
14	14 Descriptive Methods in Regression and Correlation 14.1 Linear Equations with One Independent Variable 14.2 The Regression Equation 14.3 The Coefficient of Determination 14.4 Linear Correlation *(Apply mathematical techniques to find regression equations and various coefficients in regression and correlation analyses.)*	3 hrs
	Final Examination	3 hrs
	Total:	45 hrs

TEACHING AND LEARNING ACTIVITIES

In this learning module, students will work towards attaining the ILOs through the following teaching and learning activities:

Teaching and Learning Activities	M1	M2	M3	M4	M5	M6	M7	M8
T1. Lecture	✓	✓	✓	✓	✓	✓	✓	✓
T2. Classwork (exercises/assignments)	✓	✓	✓	✓	✓	✓	✓	✓

ATTENDANCE

Attendance requirements are governed by the Academic Regulations Governing Bachelor's Degree Programmes of the Macao Polytechnic University. Students who do not meet the attendance requirements for the learning module shall be awarded an 'F' grade.

ASSESSMENT

In this learning module, students are required to complete the following assessment activities:

Assessment Activities	Weighting (%)	ILOs to be Assessed
A1. Classwork exercises/assignments (graded)	20%	M1 – M8
A2. Test (graded)	30%	M1 – M8
A3. Final examination (graded)	50%	M1 – M8
Total	100%	

The assessment will be conducted following the University's Assessment Strategy (see www.mpu.edu.mo/teaching_learning/en/assessment_strategy.php). Passing this learning module indicates that students will have attained the ILOs of this learning module and thus acquired its credits.

MARKING SCHEME

	Assessment Task	Criterion	Excellent	Very Good, Good	Satisfactory	Pass	Fail
			A, A-	B+, B, B-	C+, C, C-	D+, D	F
			88% - 100%	73% - 87%	58% - 72%	50% - 57%	0 – 49%

1.	Classwork (exercises/assignments)	Demonstrate the understanding of the subjects, practice and improve problem solving skills.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2.	Test	Demonstrate the understanding of the subjects and the ability to apply the methods learnt in problem solving.					
3.	Final Exam / Re-sit Exam	Demonstrate the understanding of the subjects and the ability to apply the methods learnt in problem solving.					

REQUIRED READINGS

Neil A. Weiss, 2016, *Introductory Statistics*, 10th Edition (Global Edition), Pearson.

STUDENT FEEDBACK

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