OUTCOMES-BASED EDUCATION (OBE) COURSE SYLLABUS

Stat 113
Introduction to Mathematical Statistics

Quality Goals of the Faculty of Management and Economics

1. Produce graduates in management and economics with excellent analytical, critical thinking, communication skills, and ethical behavior.
2. Conduct trans-disciplinary research, extension, and innovative programs addressing relevant issues in social, ecological, and economic development; tourism and hospitality; and agribusiness management.
3. Foster and sustain local and global partnerships and networks for excellent delivery of academic, research, and extension services.
4. Promote an academic culture that nurtures human resources to become globally competitive professionals in their fields of specialization.

Quality Objectives of the Department of Economics

a. Produce highly competent manpower in economics and agricultural economics to serve the development needs of the region.
b. Conduct economic analysis and assessment of various technologies, programs, and projects to enhance the transfer of agro-industrial technologies for sustainable development.
c. Assist and promote awareness and policy advocacy on relevant socio-economic issues.
d. Promote sustainable development-oriented and viable income-generating projects as models for instruction and income generation.
e. Strengthen the physical and manpower capability of the unit for efficient and effective delivery of instruction, research, extension, and income generation activities.

I. PROGRAM INFORMATION

1. Name of the Program	Bachelor of Science in Agricultural Economics
2. CHED CMO Reference	CMO No. 32 s2017
3. BOR Approval	BOR Resolution No. 95, s2005 (to offer BS Economics) BOR Resolution No. 59, s2018 (CHED Memo 32, s2017)

4. Program Educational Objectives and Relationship to Institution Mission

Program Educational Objectives	Mission*		
	a	b	c
1. Can be employed in jobs requiring research and analytical skills in the public or corporate sectors	✓	✓	✓

2. Pursue advanced graduate studies in economics as well as law, management, finance, international relations, and other related fields	✓	✓	✓
3. Can engage in entrepreneurial activities, teaching, creative, and other innovative efforts in economics and allied fields.	✓	✓	✓
4. Participate in community affairs as leaders in their field of expertise and activities that support economic and social development.	✓	✓	✓
5. Conduct themselves in a responsible, professional, and ethical manner.	✓	✓	✓

**a - produce graduates equipped with advanced knowledge and lifelong learning skills, b - ethical standards through high-quality instruction and innovative research, c – impactful community engagements*

III. COURSE INFORMATION

1. Course Code	STAT 113
2. Course Title	Introduction to Mathematical Statistics
3. Pre-requisite	Math 101 (Calculus I)
4. Co-requisite	None
5. Credit	3 units
6. Semester Offered	1st semester
7. Number of hours	3 hours of lecture per week
8. Course Description	Probability concepts and operations; discrete and continuous random variables and their probability distributions; estimation; hypothesis testing
9. Sustainable Development Goals	SDG 4 – Ensure Inclusive and Equitable Quality Education and Promote Lifelong Learning Opportunities for All
10. 4th Industrial Revolution (4IR)	Artificial Intelligence (AI) -- Gemini
11. Education 5.0	Collaborative Learning, Technology at its Core, and Lifelong Learning.

12. Program Outcomes (POs) in relation to the Program Educational Objectives (PEOs)

Program Outcomes (POs)		Program Educational Objectives				
		1	2	3	4	5
Common to all programs in all types of schools						
a	The ability to engage in lifelong learning and being cognizant of the need to keep abreast of developments in the specific field of practice (PQF level 6 descriptor)	✓	✓	✓	✓	✓
b	The ability to effectively communicate orally and in writing using both English and Filipino	✓	✓	✓	✓	✓
c	The ability to work effectively and independently in multi-disciplinary and multi-cultural teams (PQF level 6 descriptor)	✓	✓	✓	✓	✓
d	A recognition of professional, social, environment, and ethical responsibility	✓	✓	✓	✓	✓
e	An appreciation of “Filipino historical and cultural heritage” (based on RA 7722)	✓	✓	✓	✓	✓
Common to Social Sciences						
f	Understand and apply social science concepts and theories to the analysis of social issues	✓	✓	✓	✓	✓
g	Design and execute social research using appropriate approaches and methods	✓	✓	✓	✓	✓

h	Practice professional and ethical standards in the fields of social sciences and communication	✓	✓	✓	✓	✓
Specific to the Bachelor of Science in Economics Program						
i	Demonstrate knowledge of economic theory and the standard methods used in economic research	✓	✓	✓	✓	✓
j	Demonstrate the ability to diagnose economic problems using appropriate theories and methodologies	✓	✓	✓	✓	✓
k	Communicate affectively economic arguments and research results	✓	✓	✓	✓	✓
l	Appreciate and practice good citizenship	✓	✓	✓	✓	✓
m	Demonstrate a deep commitment to maintain high ethical standards, especially in constituting, analyzing, and interpreting economic data and results	✓	✓	✓	✓	✓
Common to a horizontal type (CMO No. 46 s.2012) for universities						
n	Participate in the generation of new knowledge or in research and development projects	✓	✓	✓	✓	✓
Additional for graduates of state universities and colleges						
o	Must have competencies to support national, regional, and local development plans	✓	✓	✓	✓	✓
DoEcon's mission-related program outcomes						
p	Participate in the department's innovative effort in strengthening the program offerings, research and extension activities, scholarships, and facilities improvement	✓	✓	✓	✓	✓

13. Course Outcomes (COs) and Relationship to Program Outcomes (POs)

After completing this course, the student must be able to perform the following COs:	**Program Outcomes**															
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
CO1: Compute the probability of events		***P***	***P***	***P***		***P***	***L***		***L***	***L***	***L***		***L***	***L***	***O***	***O***
CO2: Evaluate the distributional properties of discrete random variables		***P***	***P***	***P***		***P***	***L***		***L***	***L***	***L***		***L***	***L***	***O***	***O***
CO3: Evaluate the distributional properties of continuous random variables		***P***	***P***	***P***		***P***	***L***		***L***	***L***	***L***		***L***	***L***	***O***	***O***
CO4: Derive properties of multivariable distributions		***P***	***P***	***P***		***P***	***L***		***L***	***L***	***L***		***L***	***L***	***O***	***O***
CO5: Derive point and interval estimates of population parameters		***P***	***P***	***P***		***P***	***L***		***L***	***L***	***L***		***L***	***L***	***O***	***O***
CO6: Test hypothesis about population parameters		***P***	***P***	***P***		***P***	***L***		***L***	***L***	***L***		***L***	***L***	***O***	***O***

Level: ***L****: facilitates learning of competency*
P*: allows student to practice competency (no input, but competency is evaluated)*
O*: opportunity for development (no input or evaluation, but competency is practiced)*

14. OBTL Course Content and Plan

Week	Topics	Learning Outcomes	Teaching and Learning Activities		Assess-ment Tasks
			Teaching Activities	Learning Activities	
1	**Class Orientation** • VSU Vision Mission, and Quality Policy Statement • OBE Course Syllabus (Course Content, Class Policies, Requirements, Grading System, etc.) • Values Integration: Open-mindedness and proper netiquette	1. State the VSU Vision, Mission and Quality Policy. 2. Describe and explain the important features of the course 3. Apply proper netiquette during virtual classes	• Conduct virtual classes/ meetings • Solicit question, and feedback from students	• Asking questions about the course • Sharing of expectations	Quiz No. 0 (warm up essay-type quiz)
CO 1: **Compute** probability of events					
2-3	**Module 1. Introduction to Probability** Lesson 1.1 Properties of Probability Lesson 1.2 Counting Methods Lesson 1.3 Conditional Probability Lesson 1.4 Independent Events Lesson 1.5 Law of Total Probability and Bayes' Theorem	1. Explain probability, 2. Differentiate the ways of assigning probabilities to events, 3. Explain the difference between permutation and combination, 4. Apply permutations and combinations in assigning probabilities to events, 5. Explain the idea and compute of conditional probability, 6. Apply the multiplication rule of probability, 7. Determine if two or more events are independent, 8. Compute the probability of	• Lectures • Demonstrations • Proving and deriving statistical results • Classroom exercises and assessment tasks	• Solving Learning Tasks in pairs • Solving Assessment Tasks • Asking questions and clarifications on solutions to class exercises and problem sets	• Problem Set 1 • Problem Set 2 • Quiz No. 1 • Quiz No. 2 • First Long Exam

		the intersection of two or more independent events, and 9. Articulate and apply Bayes' Theorem to find the conditional probability.			
CO 2: **Evaluate** the distributional properties of discrete random variables					
4-6	**Module 2** **Discrete Random Variables and Their Probability Distribution** Lesson 2.1 Random Variables and Their Probability Distribution Lesson 2.2 Mathematical Expectation Lesson 2.3 The Binomial Distribution Lesson 2.4 The Geometric and Negative Binomial Distributions Lesson 2.5 The Hypergeometric Distribution Lesson 2.6 The Poisson Distribution	1. Explain the intuitive and formal definition of a random variable, 2. Construct the probability mass function and cumulative distribution function of a discrete random variable 3. Articulate the meaning and properties of mathematical expectation, 4. Determine expected value of a discrete random variable, 5. Apply the mgf in finding the mean and variance of a discrete random variable, 6. Familiarize with common discrete probability distributions, 7. Derive the mean and	• Lectures • Demonstrations • Proving and deriving statistical results • Classroom exercises and assessment tasks	• Solving Learning Tasks in pairs • Solving Assessment Tasks • Asking questions and clarifications on solutions to class exercises and problem sets	• Problem Set 3 • Problem Set 4 • Quiz No. 3 • Quiz No. 4 • Second Long Exam

		variance of discrete probability distributions, and 8. Solve problems associated with discrete probability distributions.			
CO3: Evaluate the distributional properties of continuous random variables					
7-9	**Module 3** **Continuous Random Variables and Their Probability Distribution** Lesson 3.1 Probability Density Function and Cumulative Distribution Function of Continuous Random Variables Lesson 3.2 Mathematical Expectation for Continuous Random Variables Lesson 3.3 The Uniform Distribution Lesson 3.4 The Normal Distribution Lesson 3.5 The Gamma Family of Distributions Lesson 3.6 The Beta Distribution	1. Explain the definition of the probability density function (pdf) and the cumulative distribution function (CDF) of continuous random variables, 2. Derive the pdf from the CDF and vice versa, 3. Compute probabilities associated with a continuous random variable using either its pdf or CDF, 4. Determine the expected value of a continuous random variable, 5. Familiarize with common continuous probability distributions, 6. Derive the mean and variance of continuous probability	• Lectures • Demonstrations • Proving and deriving statistical results • Classroom exercises and assessment tasks	• Solving Learning Tasks in pairs • Solving Assessment Tasks • Asking questions and clarifications on solutions to class exercises and problem sets	• Problem Set 5 • Problem Set 6 • Quiz No. 5 • Quiz No. 6 • Third Long Exam

		distributions, and 7. Solve problems associated with continuous probability distributions.			
CO 4: **Derive** properties of multivariable distributions					
10-13	**Module 4 Multivariate Distributions** Lesson 4.1 Joint Probability Distribution Lesson 4.2 Marginal Probability Distribution Lesson 4.3 Conditional Probability Distribution Lesson 4.4 Independent Random Variables	1. Describe joint and marginal distributions of discrete and continuous random variables; 2. Derive joint and marginal distributions of discrete and continuous random variables, and conditional distributions; 3. Derive conditional distributions of discrete and continuous random variables; and 4. Explain the concept of independent random variables.	• Lectures • Demonstrations • Proving and deriving statistical results • Classroom exercises and assessment tasks	• Solving Learning Tasks in pairs • Solving Assessment Tasks • Asking questions and clarifications on solutions to class exercises and problem sets	• Problem Set 7 • Problem Set 8 • Quiz No. 7 • Quiz No. 8 • Fourth Long Exam
CO5: Derive point and interval estimates of population parameters					
14-15	**Module 5. Estimation** Lesson 5.1 Methods of Estimation Lesson 5.2 Point Estimation Lesson 5.3 Interval Estimation Lesson 5.4 Properties of Estimators	1. Derive estimators of parameters using the method of moments and maximum likelihood 2. Obtain point and interval estimates of common population parameters 3. Articulate the	• Lectures • Demonstrations • Proving and deriving statistical results • Classroom exercises and assessment tasks	• Solving Learning Tasks in pairs • Solving Assessment Tasks • Asking questions and clarifications on solutions to class exercises	• Problem Set 9 • Problem Set 10 • Quiz No. 9 • Quiz No. 10 • Fifth Long Exam

		good properties of estimators		and problem sets	
CO6: Test hypothesis about population parameters					
16-18	**Module 6. Hypothesis Testing** Lesson 6.1 Introduction to Hypothesis Testing Lesson 6.2 Testing Hypothesis about a Population Parameter Lesson 6.3 Testing Hypothesis about the Parameters of Two Populations Lesson 6.4 Test of Hypotheses about the Parameters of Three or More Populations	• Explain the concepts of statistical hypothesis testing • Test hypotheses about population parameters using R/RStudio and JASP • Interpret results of tests of hypotheses.	• Lectures • Demonstrations • Proving and deriving statistical results • Classroom exercises and assessment tasks	• Solving Learning Tasks in pairs • Solving Assessment Tasks • Asking questions and clarifications on solutions to class exercises and problem sets	• Problem Set 11 • Problem Set 12 • Quiz No. 11 • Quiz No. 12 • Sixth Long Exam

15. Life-long Learning Opportunities

Students are expected to apply the concepts of probability and statistics to real-life problems in economics.

16. Contribution of Course to Meeting the Professional Component

General Education: 0 %
Mathematical Component: 40%
Statistical Component: 60%

17. References and Other Learning Resources

A. Textbooks

1. Hansen, B. E. (2022). Probability and Statistics for Economists. Princeton University Press
2. Hogg, R. V., McKean, J. W., and Craig, A. T. (2019). Introduction to Mathematical Statistics, 8th Edition. Pearson Education Inc.
3. Larsen, R. J. and Marx, M. L. (2018). An Introduction to Mathematical Statistics and Its Application, 6th Edition. Pearson Education Inc.
4. Mittelhammer, R. C. (2013). Mathematical Statistics for Economics and Business, 2nd Edition. Springer Science- Business Media.

B. Learning Guide

1. Milla, N. E. (2024). Student Learning Guide in Stat 113 (Introduction to Mathematical Statistics)

C. Other Learning Resources *(Journals, Videos, Websites, Webinars, Open Educational Resources, etc.)*

1. https://online.stat.psu.edu/stat414/

18. Course Assessment and Evaluation

The performance of students will be assessed and evaluated based on the following:

Item No,	Assessment Tasks	Percentage Contribution (1)	No. of Times in the Semester (2)	Individual Task % Contribution (1/2)
1	Quizzes (Q)	15	12	1.25/Q
2	Problem Sets (PS)	25	12	2.08/PS
3	Long Examinations (LE)	60	6	10/LE

Grading System (60% Passing)

Range	Grade	Range	Grade
98-100	1.00	53-59	3.25
95-97	1.25	46-52	3.50
90-94	1.50	39-45	3.75
85-89	1.75	32-38	4.00
80-84	2.00	25-21	4.25
75-79	2.25	18-24	4.50
70-74	2.50	11-17	4.75
65-69	2.75	0-10	5.0
60-64	3.00		

19. Course Policies

A. Instructional materials such as lecture guides and assessment tasks are made available to all students via GitHub (*).* Students are encouraged to read the lecture guides before coming to class.

B. Classes are conducted **face-to-face**, but under rare circumstances, class sessions may be delivered virtually using either ZOOM or Google Meet. The FB Messenger Chat Group will be used for easy and faster communication and consultations.

C. **Submission of Course Requirements**. Quizzes, problem sets, and long examinations are administered during face-to-face class sessions. Instructions on how to submit the answers to quizzes, problem sets, and long examinations are provided in each course requirement.

D. **Queries and Clarifications**. For queries, clarifications, or urgent questions, a student may contact the course instructor during the official class schedule, Monday to Friday only, using the contact information given at the last part of this document or via the FB Messenger Group Chat.

E. All students are reminded to observe all policies, regulations, and rules of the university (particularly on attendance and cheating) and other related laws of the land and are advised to read, understand, and practice the provisions of the VSU Student Manual.

F. **NO REMOVAL EXAMINATION!** INC mark shall be given to students per BOR-Approved Policies.

These class policies shall serve as our written agreement for the whole semester. The students will be informed immediately of any changes to these policies that may arise for reasons of improving the delivery of the quality of instruction for the betterment of the Teaching and Learning process.
20. Course Materials and Facilities Available
Student Learning Guide (online via GitHub) Facebook Messenger Group Chat Statistics Computing Laboratory

21. Revision History

Revision number	Date of Revision	Date of implementation	Highlights of Revision	Revised by
2	August 8, 2025	1st Sem., AY 2025-2026	• Updated VSU's vision and mission, the course content, the references, and adjusted the class policies to suit flexible learning • Revised the grading scheme • Updated to conform with form TP-IMD-08 v04 01-23-2025	Norberto E. Milla, Jr.
1	August 18, 2023	1st Semester, AY 2023-2024	• Revised the course outcome and learning outcomes as well as the course content	Sweet Charish G. Godinez
0	February 2023	1st Semester, AY 2022-2023	• Original OBE Syllabus	Norberto E. Milla, Jr.

22. Preparation

Prepared by	Name	Signature	Date Signed
	NORBERTO E. MILLA, JR.		

IV. INSTRUCTOR/PROFESSOR INFORMATION

1. Name of Instructor/Professor	NORBERTO E. MILLA, JR.
2. Office and Department	Faculty Room No.1 (Annex), Department of Statistics
3. Telephone/Mobile Numbers	+63 9473941899
4. Email Address	bertmilla@vsu.edu.ph
5. Consultation Time	

23. Department Instructional Materials Review Committee:

Committee	Name	Signature	Date Signed
Member:	VIRGELIO M. ALAO		
Member:	NORBERTO E. MILLA, JR.		
Chairperson:	DONNA C. CUYNO		

	Name	Signature	Date Signed
Noted by:	REV RHIZZA L. AURE Dean, FNMS		
Verified by:	MARK GIL A. VEGA Head, IMDO		
Validated by:	MA. RACHEL KIM L. AURE Director, IEO		