



OUTCOMES-BASED EDUCATION (OBE) COURSE SYLLABUS

Stat 121
Mathematical Statistics I

Quality Goals of the Faculty of Natural and Mathematical Sciences

1. Provide quality instruction, research, extension, and innovation for global competitiveness;
2. Develop knowledgeable, skilled, and innovative individuals who value and pursue the advancement of scientific knowledge for the betterment of society; and
3. Produce future-proof graduates and workforce in biology, biotechnology, chemistry, mathematics, meteorology, physics, and statistics.

Quality Objectives of the Department Statistics

1. Produce highly trained graduates in Statistics;
2. Undertake quality instruction, research, and extension activities in statistics and allied fields;
3. Actively promote the appropriate utilization of statistics among scientists, technologists, and development workers; and
4. Maintain productive linkages and cooperation with statistical units and agencies locally and internationally.

I. PROGRAM INFORMATION

1. Name of the Program	Bachelor of Science in Statistics
2. CHED CMO Reference	CMO No. 42 s2017
3. BOR Approval	BOR Resolution No. 61 s2018

4. Program Educational Objectives and Relationship to Institution Mission

Program Educational Objectives	Mission*		
	a	b	c
1. A number of graduates hold key statistical positions in government line agencies.	✓	✓	✓
2. Some of the graduates become regular instructors in High School.	✓	✓	✓
3. The top-ranking graduates are teaching in HEIs with at least an MS degree.	✓	✓	✓
4. A fraction of the graduates are employed as statisticians and/or researchers in research centers and private companies with research units.	✓	✓	✓
5. Some of the graduates are engaged in consultancy services in market research and project monitoring, and evaluation work.	✓	✓	✓

*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 121
2. Course Title	Mathematical Statistics I
3. Pre-requisite	Math 112s (<i>Set Theory/Logic</i>) Math 114s (<i>Calculus 1</i>)
4. Co-requisite	None
5. Credit	4 units
6. Semester Offered	1st semester
7. Number of hours	4 hrs. lecture per week
8. Course Description	Elements of probability; random variables; discrete and continuous random variables; probability distributions; special distributions; mathematical expectations; multivariate probability distributions
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 and Relationship to Program Educational Objectives						
Program Outcomes (POs)		Program Educational Objectives				
		1	2	3	4	5
Common to All Baccalaureate Programs						
a	Articulate and discuss the latest developments in the practice of Statistics (PQF Level 6 descriptor)			✓	✓	✓
b	Effectively communicate orally and in writing using both the English and Filipino languages.	✓		✓	✓	✓
c	Work effectively and independently in multi-disciplinary and multi-cultural teams (PQF Level 6 descriptor)	✓		✓	✓	✓
d	Demonstrate professional, social, and ethical responsibility, especially in practicing intellectual property rights and sustainable development.	✓		✓	✓	✓
e	Preserve and promote " <i>Filipino historical and cultural heritage</i> " (based on RA 7722)					
Common to the Science and Mathematics Programs						
f	Demonstrate broad and coherent knowledge and understanding in the core areas of the physical and natural sciences and mathematics					
g	Apply critical and problem solving skills using the scientific method	✓		✓	✓	✓
h	Interpret scientific data and make judgments that include reflection on relevant scientific and ethical issues	✓		✓	✓	✓
i	Carry out basic mathematical and statistical computations and use appropriate technologies in the analysis of data	✓		✓	✓	✓
j	Communicate information, ideas, problems, and solutions, both orally and in writing, to other scientists, decision-makers, and the public	✓		✓	✓	✓
k	Relate science and mathematics to the other disciplines			✓	✓	✓

l	Design and perform safe and responsible techniques and procedures in laboratory or field practices	✓		✓	✓	✓
m	Critically evaluate inputs from others	✓		✓	✓	✓
n	Appreciate the limitations and implications of science in everyday life	✓		✓	✓	✓
o	Commit to the integrity of data	✓		✓	✓	✓
Specific to the BS Statistics Program						
p	Demonstrate broad and coherent knowledge and understanding in the core areas of statistics, computing, and mathematics	✓	✓	✓	✓	✓
q	Generate information involving the conceptualization of a strategy for generating timely and accurate/reliable data, organizing a process for putting together or compiling the needed data, and transforming available data into relevant and useful forms	✓		✓	✓	✓
r	Translate real-life problems into statistical problems	✓		✓	✓	✓
s	Identify appropriate statistical tests and methods and use these properly for the given problems, select optimal solutions to problems, and make decisions in the face of uncertainty	✓		✓	✓	✓

13. Course Outcomes (COs) and Relationship to Program Outcomes (POs)																				
Program Outcomes Addressed by the Course Outcomes By the end of the course, the students must be able to:	Program Outcomes																			
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	
CO 1: Compute the probability of events	L	P				L	L	P	L	O	O			L		L	P	P	L	
CO 2: Evaluate the distributional properties of discrete random variables	L	P				L	L	P	L	O	O			L		L	P	P	L	
CO 3: Evaluate the distributional properties of continuous random variables	L	P				L	L	P	L	O	O			L		L	P	P	L	
CO 4: Derive properties of multivariable distributions	L	P				L	L	P	L	O	O			L		L	P	P	L	

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	

Vision: A global green university providing progressive leadership in agriculture, science & technology, education and allied fields for societal transformation.

Mission: To produce graduates equipped with advanced knowledge and lifelong learning skills with ethical standards through high quality instruction, innovative research, and impactful community engagements.

			Teaching Activities	Learning Activities	Assessment Tasks
1	Class Orientation <ul style="list-style-type: none"> 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 	<ol style="list-style-type: none"> State the VSU Vision, Mission and Quality Policy. Describe and explain the important features of the course Apply proper netiquette during virtual classes 	<ul style="list-style-type: none"> Conduct virtual classes/ meetings Solicit question, and feedback from students 	<ul style="list-style-type: none"> Asking questions about the course Sharing of expectations 	Quiz No. 0 (warm up essay-type quiz)
CO 1: Compute probability of events					
2-5	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	<ol style="list-style-type: none"> Explain what is probability, Differentiate the ways of assigning probabilities to events, Explain the difference between permutation and combination, Apply permutation and combination in assigning probabilities to events, Explain the idea and compute of conditional probability, Apply the multiplication rule of probability, Determine if two or more events are independent, Compute the probability of the intersection of two or more independent events, and Articulate and apply Bayes' Theorem to find the conditional probability. 	<ul style="list-style-type: none"> Lectures Demonstrations Proving and deriving statistical results Classroom exercises and assessment tasks 	<ul style="list-style-type: none"> Solving Learning Tasks Solving Assessment Tasks Asking questions and clarifications on solutions to class exercises and problem sets 	<ul style="list-style-type: none"> Problem Set 1 Problem Set 2 Quiz No. 1 Quiz No. 2 First Long Exam
CO 2: Evaluate the distributional properties of discrete random variables					
6-10	Module 2. Discrete Random Variables and	<ol style="list-style-type: none"> Explain the intuitive and formal definition 	<ul style="list-style-type: none"> Lectures Demonstrations 	<ul style="list-style-type: none"> Solving Learning Tasks 	<ul style="list-style-type: none"> Problem Set 3 Problem

	Their Probability Distribution Lesson 2.1 Random Variables and Their Probability Distribution Lesson 2.2 Mathematical Expectation Lesson 2.3 Moment Generating Functions Lesson 2.4 The Binomial Distribution Lesson 2.5 The Geometric and Negative Binomial Distributions Lesson 2.6 The Hypergeometric Distribution Lesson 2.7 The Poisson Distribution	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. Determine the moment generating function (mgf) of a discrete random variable, 6. Apply the mgf in finding the mean and variance of a discrete random variable, 7. Familiarize with common discrete probability distributions, 8. Derive the mean and variance of discrete probability distributions, and 9. Solve problems associated with discrete probability distributions.	<ul style="list-style-type: none"> • Proving and deriving statistical results • Classroom exercises and assessment tasks 	<ul style="list-style-type: none"> • Solving Assessment Tasks • Asking questions and clarifications on solutions to class exercises and problem sets 	Set 4 <ul style="list-style-type: none"> • Quiz No. 3 • Quiz No. 4 • Second Long Exam
CO 3: Evaluate the distributional properties of continuous random variables					
11-15	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	1. Explain the definition of probability density function (pdf) and 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 expected value of	<ul style="list-style-type: none"> • Lectures • Demonstrations • Proving and deriving statistical results • Classroom exercises and assessment tasks 	<ul style="list-style-type: none"> • Solving Learning Tasks • Solving Assessment Tasks • Asking questions and clarifications on solutions to class exercises and problem sets 	<ul style="list-style-type: none"> • Problem Set 5 • Problem Set 6 • Quiz No. 5 • Quiz No. 6 • Third Long Exam

	Lesson 3.3 The Uniform Distribution Lesson 3.4 The Normal Distribution Lesson 3.5 The Gamma Distribution Lesson 3.6 The Exponential Distribution Lesson 3.7 The Chi-Square Distribution Lesson 3.8 The Beta Distribution	a discrete random variable, 5. Determine the moment generating function (mgf) of a continuous random variable 6. Familiarize with common discrete probability distributions, 7. Derive the mean and variance of discrete probability distributions, and 8. Solve problems associated with discrete probability distributions.			
CO 4: Derive properties of multivariable distributions					
16-18	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 • 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
15. Life-long Learning Opportunities Students will be encouraged to practice solving additional probability problems in other textbooks so that they will become more proficient and prepared when they enrol in Mathematical Statistics II.					
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. Mendenhall, W., Scheaffer, R. L., and Wackerly, D. D. (2008). *Mathematical Statistics with Applications*, 7th ed. Brooks/Cole, Cengage Learning.
2. Hogg, R. V., Tanis, E. A., and Zimmerman, D. L. (2015). *Probability and Statistical Inference*, 9th ed. Pearson Education, Inc.
3. Hogg, R.V. and Craig, A. T. (2004). *Introduction to Mathematical Statistics*, Fifth Edition, Macmillan Publishing Co., Inc., N.Y.
4. Ramachandran, K. M. and Tsokos, C. P. (2009). *Mathematical Statistics with Applications*. Elsevier Inc.
5. Miller, I. and Miller, M. (1999). John E. Freund's *Mathematical Statistics*. 6th ed. Prentice-Hall Int'l., Inc. New Jersey.
6. Mood, Graybill, and Boes. 1974. *Introduction to the Theory of Statistics*. Third Edition. International Student Edition. McGraw-Hill Kogakusha, Ltd.

B. Learning Guide

1. Milla, N. E. (2021). Student Learning Guide in Stat 121 (Mathematical Statistics 1)

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	8	1.875/Q
2	Problem Sets (PS)	25	8	3.125/PS
3	Long Examinations (LE)	60	4	15/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	25-31	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 (<https://github.com/bertmilla76/Stat-121-Mathematical-Statistics-I>). 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
7	August 7, 2025	1 st Sem., AY 2025-2026	<ul style="list-style-type: none"> 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.

Vision: A global green university providing progressive leadership in agriculture, science & technology, education and allied fields for societal transformation.

Mission: To produce graduates equipped with advanced knowledge and lifelong learning skills with ethical standards through high quality instruction, innovative research, and impactful community engagements.

6	August 8, 2023	1 st Sem., AY 2023-2024	<ul style="list-style-type: none"> Revised the teaching and learning activities and the classroom assessment (including grading requirements) to fit face-to-face classes. 	Norberto E. Milla, Jr.
5	July 2021	1 st Sem., SY 2020-2021	<ul style="list-style-type: none"> Revised and simplified the course policies particularly on the submission of student output. 	Norberto E. Milla, Jr.
4	January 2021	1 st Sem., SY 2020-2021	<ul style="list-style-type: none"> Revised to conform with form TP-IMD-08 v3 	Norberto E. Milla, Jr.
3	July 2020	1 st Sem., SY 2020-2021	<ul style="list-style-type: none"> Revised based on the self-learning modules prepared for flexible learning due to COVID-19 pandemic 	Norberto E. Milla, Jr.
2	July 2019	1 st Sem., SY 2019-2020	<ul style="list-style-type: none"> Updating the course content and course outcomes. 	Norberto E. Milla, Jr.
1	July 2018	1 st Sem., SY 2018-2019	<ul style="list-style-type: none"> Updating of the VSU's vision and mission, the references, and course policies. 	Norberto E. Milla, Jr.
0	July 2017		<ul style="list-style-type: none"> Original OBEdized syllabus in Mathematical Statistics I incorporating the topics indicated in the CMO for BS Statistics. 	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	

Vision: A global green university providing progressive leadership in agriculture, science & technology, education and allied fields for societal transformation.

Mission: To produce graduates equipped with advanced knowledge and lifelong learning skills with ethical standards through high quality instruction, innovative research, and impactful community engagements.

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		