OUTCOMES-BASED EDUCATION (OBE) COURSE SYLLABUS

Stat 141
Experimental Designs 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 141	
2. Course Title	Experimental Designs I	
3. Pre-requisite	Stat 134 (Regression Analysis)	
4. Co-requisite	None	
5. Credit	3 units	
6. Semester Offered	1st semester	
7. Number of hours	2 hours. lecture & 3 hours laboratory per week	
8. Course Description	Principle of experimentation; completely randomized design; randomized complete block design; Latin square design; factorial experiments; split-plot designs; treatment mean comparison; and analysis of covariance	
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 "*Filipino historical and cultural heritage*" (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			✓	✓	✓

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Page 2 of 9
TP-IMD-08
V04 01-23-2025
No.

		1	2	3	4	5
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
CO1: **Explain** the principles of experimental designs	L	P	P	P		L	L	P	L	P	O	L		L	L	L	L	L	L
CO2: **Design** experiments for statistical analysis	L	P	P	P		L	L	P	L	P	O	L		L	L	L	L	L	L
CO3: **Analyze** statistically designed experiments	L	P	P	P		L	L	P	L	P	O	L		L	L	L	L	L	L
CO4: **Use** statistical software for analyzing statistically designed experiments	L	P	P	P		L	L	P	L	P	O	L		L	L	L	L	L	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		Assessment 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)
CO1: **Explain** the principles of designing experiments for statistical analysis. CO2: **Design** experiments for statistical analysis. CO3: **Analyze** statistically designed experiments. CO4: **Use** statistical software for analyzing statistically designed experiments.					
2-5	• Basic principles of experimental designs • Completely randomized design (CRD) • Assumptions of analysis of variance (ANOVA)	• Explain the three basic principles in designing statistically sound experiments, • Describe the conditions under which CRD is appropriate to use • Discuss the concept of ANOVA and its assumptions • Analyze data from an experiment in CRD using freeware • Interpret results of ANOVA for CRD	• Weekly virtual lectures • Weekly (f2f) laboratory class	• Answering quizzes • Doing the laboratory exercises in pairs	• Quiz No. 1 • Quiz No. 2 • Lab Exercise No. 1 • Lab Exercise No. 2 • First Long Exam
CO2: **Design** experiments for statistical analysis. CO3: **Analyze** statistically designed experiments. CO4: **Use** statistical software for analyzing statistically designed experiments.					
6-10	• Multiple comparison procedures • Randomized complete block design (RCBD)	1. Explain the principles of multiple comparison procedures 2. Apply various multiple	• Weekly virtual lectures • Weekly (f2f)	• Answering quizzes • Doing the laborator	• Quiz No. 3 • Quiz No. 4 • Lab

		comparison tests	laboratory class	y exercises	Exercise No. 3
	• Latin square design and other block designs	3. Describe the conditions where blocked designs are appropriate to use 4. Discuss the ANOVA for blocked designs 5. Analyze data from blocked designs using freeware 6. Interpret results of ANOVA for blocked designs			• Lab Exercise No. 4 • Lab Exercise No. 5 • Second Long Exam

CO2: **Design** experiments for statistical analysis.
CO3: **Analyze** statistically designed experiments.
CO4: **Use** statistical software for analyzing statistically designed experiments.

| 11-15 | • Factorial experiments
• Experiments with nested factors
• Split-plot experiments | 1. Describe the elements of factorial experiments
2. Differentiate experiments with crossed factors (factorial experiments) and experiments with nested factors
3. Describe the conditions where split-plot experiments are appropriate to use
4. Explain the ANOVA for multi-factor experiments (factorial experiments, experiments with nested factors, and | • Weekly virtual lectures

• Weekly (f2f) laboratory class | • Answering quizzes

• Doing the laboratory exercises | • Quiz No. 5

• Quiz No. 6

• Quiz No. 7

• Lab Exercise No. 6

• Lab Exercise No. 7

• Lab Exercise No. 8

• Third Long Exam |

		split-plot experiments) 5. Analyze data from multi-factor experiments using freeware 6. Interpret results of ANOVA for multifactor experiments			

CO2: **Design** experiments for statistical analysis.
CO3: **Analyze** statistically designed experiments.
CO4: **Use** statistical software for analyzing statistically designed experiments.

16-18	• Analysis of covariance (ANCOVA) in CRD • ANCOVA in RCBD • Experiments with repeated measurements	1. Explain the concept of covariance analysis 2. Perform ANCOVA using freeware 3. Interpret results of ANCOVA 4. Describe experiments with repeat measurements 5. Perform and interpret results of repeated-measures ANOVA	• Weekly virtual lectures • Weekly (f2f) laboratory class	• Answering quizzes • Doing the laboratory exercises	• Quiz No. 8 • Quiz No. 9 • Lab Exercise Set 9 • Lab Exercise Set 10 • Fourth Long Exam

15. Life-long Learning Opportunities

Students will be encouraged to apply the knowledge they gained in the course by accepting requests of assistance for design and analysis of experiments of undergraduate students doing thesis.

16. Contribution of Course to Meeting the Professional Component

General Education: 0 %
Mathematical Component: 0%
Statistical Component: 100%

17. References and Other Learning Resources

A. Textbooks

1. Montgomery, D. C. (2019). *Design and Analysis of Experiments*, 10th Edition. John Wiley & Sons.

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Page 6 of 9
TP-IMD-08
V04 01-23-2025
No.

2. Hinkelmann, K. and Kempthorne, O. (2008). Design and Analysis of Experiments (Vol. 1: Introduction to experimental designs), 2nd Ed. John Wiley & Sons.
3. Dean, A., Voss, D., and Draguljić, D. (2017). Design and Analysis of Experiments, 2nd Ed. Springer International Publishing AG.
4. Box, G., Hunter, J., and Hunter, W. (2005). Statistics for Experimenters: Design, Innovation, and Discovery, 2nd Ed. John Wiley & Sons.

B. Learning Guide
1. Milla, N. E. (2025). Student Learning Guide in Stat 141 (Experimental Designs I)

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

1. https://online.stat.psu.edu/stat503/

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	Laboratory Exercises (Lab)	25	10	2.5/Lab
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	25-21	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 (*https://github.com/bertmilla76/Stat-141-Experimental-Designs-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.

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Page 7 of 9
TP-IMD-08
V04 01-23-2025
No.

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
1	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.
0	September 2, 2022	1st Sem., AY 2022-2023	• Original OBEdized syllabus in Stat 141 (Experimental Designs 1) 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.		

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Page 8 of 9
TP-IMD-08
V04 01-23-2025
No.

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		

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Page 9 of 9
TP-IMD-08
V04 01-23-2025
No.