DEPARTMENT OF MATHEMATICS
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VISAYAS STATE UNIVERSITY

OUTCOMES-BASED EDUCATION (OBE) COURSE SYLLABUS
Math 134n: Abstract Algebra
1st Semester, A.Y. 2021-2022

I. UNIVERSITY INFORMATION

1. Vision of the University

   A globally competitive university for science, technology, and environmental conservation

2. Mission of the University

   Development of a highly competitive human resource, cutting-edge scientific knowledge, and innovative technologies for sustainable communities and environment.

3. VSU Quality Policy Statement

The Visayas State University (VSU), a globally competitive university of science and technology and environmental conservation, is created by law to develop highly competitive human resource, cutting- edge scientific knowledge and innovative technologies for sustainable communities and environment.

Towards this end, we, at the Visayas State University, commit to:

- Produce highly competent, quality and world-class manpower in science and technology, especially for agriculture, environmental management and industry who are proficient in communication skills, critical thinking and analytical abilities;

- Generate and disseminate relevant knowledge and technologies that lead to improved productivity, profitability and sustainability in agriculture, environment and industry; and

- Satisfy the needs and applicable requirements of the industry, the community and government sectors who are in need of quality graduates and technology ready for commercialization through the establishment, operation, maintenance and continual improvement of a Quality Management System (QMS) which is aligned with the requirements of ISO 9001:2015.

It shall be the policy of the university that the quality policies and procedures are communicated to and understood by all faculty, staff, students and other stakeholders and that the system be continually improved for its relevance and effectiveness.

EDGARDO E. TULIN
President
v0 07-16-2019

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4. Quality Goals of the College of Arts and Sciences

a) To produce quality manpower and graduates in biology, biotechnology, chemistry, English, liberal arts and behavioral sciences, mathematics, physics, and statistics to serve the development needs of the region.
b) To uplift the economic well-being of the region through relevant R and D and extension programs.
c) Enhance regional development of the Visayas for global competitiveness.

5. Quality Objectives of the Department of Mathematics

The Department of Mathematics commits to:

a) Offer courses in mathematics aimed at developing students' intellectual curiosity, problem-solving skills, critical thinking, and analytical abilities;
b) Offer baccalaureate and graduate degrees in mathematics to produce quality graduates, who satisfy the needs of the industry, the community, and the government sector;
c) Provide opportunities for students and faculty to conduct and/or participate in research projects in mathematics and allied fields that lead to the generation of relevant knowledge and technology; and
d) Conduct extension projects designed to train professionals in the education of mathematics at all levels.

II.   PROGRAM INFORMATION

1.	Name of the Program	Bachelor of Secondary Education (Major in Mathematics)
2.	CHED CMO Reference	CMO No. 75, s. 2017
3.	BOR Approval	BOR Resolution No. 68, s. 2018

4.   Program Educational Objectives and Relationship to Institution Mission

Program Educational Objectives	Mission*		
	a	b	c
1. Develop among prospective teachers' strong commitment to teaching and a real concern for the welfare and development of the learners.	√		√
2. Produce graduates equipped with professional, pedagogical, and critical thinking skills	√	√	√
3. Provide students the opportunity to formulate and conduct research on relevant areas and undertake community outreach projects.	√	√	√

*a - development of a highly competitive human resource, b - cutting-edge scientific
knowledge, c - innovative technologies for sustainable communities and environment

III. COURSE INFORMATION

1. Course Code	Math 134n
2. Course Title	Abstract Algebra
3. Pre-requisite	Math 116n – Logic and Set Theory
4. Co-requisite	None
5. Credit	3.0 units
6. Semester Offered	First Semester
7. Number of hours	3 hours lecture
8. Course Description	This course is a study of basic algebraic structures such as groups,

rings, integral domains, and fields. It provides a basic understanding of relations focusing on isomorphism. It aims to enhance students' skills in constructing mathematical proofs and develop their symbolic thinking and appreciation of mathematical structures.

9. Program Outcomes and Relationship to Program Educational Objectives

	Program Outcomes (POs)	Program Educational Objectives		
		1	2	3
a	Articulate and discuss the latest developments in the specific field of practice. (PQF level 6 descriptor)	√	√	√
b	Effectively communicate in English and Filipino, both orally and in writing.	√	√	√
c	Work effectively and collaboratively with a substantial degree of independence in multi-disciplinary and multi-cultural terms. (PQF level 6 descriptor)	√	√	√
d	Act in recognition of professional, social, and ethical responsibility.	√	√	√
e	Preserve and promote "*Filipino historical and cultural heritage*" (based on RA7722).	√	√	√
f	Articulate the rootedness of education in philosophical, socio-cultural, historical, psychological, and political contexts.	√	√	√
g	Demonstrate mastery of subject matter/discipline.	√	√	√
h	Facilitate learning using a wide range of teaching methodologies and delivery modes appropriate to specific learners and their environments.	√	√	√
i	Develop innovative curricula, instructional plans, teaching approaches, and resources for diverse learners.	√	√	√
j	Apply skills in the development and utilization of ICT to promote quality, relevant, and sustainable educational practices.	√	√	√
k	Demonstrate a variety of thinking skills in planning, monitoring, assessing, and reporting learning processes and outcomes.	√	√	√
l	Practice professional and ethical teaching standards sensitive to the local, national, and global realities.	√	√	√
m	Pursue lifelong learning for personal and professional growth through varied experiential and field-based opportunities.	√	√	√
n	Exhibit competence in mathematical concepts and procedures.	√	√	√
o	Exhibit proficiency in relating mathematics to other curricular areas.	√	√	√
p	Manifest meaningful and comprehensive pedagogical content knowledge (PCK) of mathematics.	√	√	√
q	Demonstrate competence in designing, constructing, and utilizing different forms of assessment in mathematics.	√	√	√
r	Demonstrate proficiency in problem-solving by solving and creating routine and non-routine problems with different levels of complexity.	√	√	√
s	Use effectively appropriate approaches, methods, and techniques in teaching mathematics including technological tools.	√	√	√
t	Appreciate mathematics as an opportunity for creative work, moments of enlightenment, discovery, and gaining insights into the world.	√	√	√

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

After completing this course, the student must be able to perform the following	Program Outcomes Code																			
	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t

COs:																			
CO 1: Display mastery of the preliminary concepts of Abstract Algebra.	E	D	E				D	I	I	E	I			D	I	D	E	D	I	E
CO 2: Determine if a given set with given operation/s is a group, a subgroup, and discuss the properties of a group or subgroup.	E	D	E				D	I	I	E	I			D	I	D	E	D	I	E
CO 3: Recall the definition and basic properties of permutation groups.	E	D	E				D	I	I	E	I			D	I	D	E	E	I	E
CO 4: Discuss the properties and results of cyclic groups and cosets.	E	D	E				D	I	I	E	I			D	I	D	E	E	I	E
CO 5: Discuss the properties and results of cosets, Lagrange Theorem, and factor groups.	E	D	E				D	I	I	E	I			D	I	D	E	D	I	E
CO 6: Discuss the properties of homomorphisms and isomorphisms of groups.	E	D	E				D	I	I	E	I			D	I	D	E	E	I	E
CO 7: Display mastery of the introductory concepts and results of Ring theory.	E	D	E				D	I	I	E	I			D	I	D	E	E	I	E

Legend: I – Introductory, E – Enabling, D – Demonstrative
Each letter indicates the expected level of competency that each CO should provide for each PO.

11. Course Content and Plan					
Week	**Topics**	**Learning Outcomes**	**Teaching and Learning Activities**		**Assessment Tasks**
			Teaching Activities	**Learning Activities**	
Class Orientation					
1	OBE Course Syllabus VSU Vision Mission, and Quality Policy Statement Class Policies	1. State the basic information regarding the course offering. 2. State the VSU	**Online Mode:** Initiate virtual meeting	**Online Mode:** Participation in a virtual	Quiz No. 1 (Essay)

				meeting	
	Requirements Grading System and Activities Learning Guide / Instructional Workbook / Laboratory Manual Submission of requirements Values Integration: Open-mindedness and proper netiquette	Vision, Mission, and Quality Policy. 3. Identify the class requirements. 4. Convey his/her expectation of the course 5. Discuss the course policies.	Conduct online orientation Answer students questions and clarifications **Offline Mode:** Incorporate the topics in the Learning Guide	Familiarization of the virtual classroom Asking of questions Setting of expectations Class interaction Sharing of Ideas Feedbacks **Offline Mode:** Independent study of the materials uploaded at VSUEE	
CO 1: Display mastery of the preliminary concepts of Abstract Algebra.					
1-3	**Module 1: Preliminaries** Lesson 1.1: Review of Sets and Methods of Proof Lesson 1.2: Properties of Integers Lesson 1.3: Equivalence Relation Lesson 1.4: Functions Values Integration:	1. Recall the different methods of proof. 2. Recall the definitions and properties related to the notion of sets. 3. Recall the properties of integers. 4. State and prove the Division Algorithm. 5. Perform modular	**Online Mode:** Upload learning modules to the VSUEE/VC Give supplementary materials in the virtual classroom	**Online Mode:** Participation in the virtual meeting Asking of questions Class interaction Sharing of Ideas	Problem Set (Computation, problem-solving, analysis, and proving) Quiz 2 (Objective Type) Long Exam 1

				Feedbacks	
	Appreciation of prior knowledge and learning	arithmetic operations. 6. Define equivalence relation, equivalence class, and partition. 7. Determine whether a relation on a given set is an equivalence relation. 8. Determine the equivalence classes of a particular equivalence relation. 9. Define a function, onto function, one-to-one function, and bijection. 10. Determine whether a function is one-to-one and or onto. 11. Recall the properties of a function.	Give quizzes, problem sets, and exams	**Online/Offline Mode:** Self-study Individual inquiry Do learning tasks for Module 1	

CO 2: Determine if a given set with given operation/s is a group, a subgroup, and discuss the properties of a group or subgroup.

4-6	**Module 2: Groups and Subgroups** Lesson 2.1: Binary Operations and Isomorphic Binary Structures Lesson 2.2: Groups Lesson 2.3: Subgroups Values Integration: Open-mindedness and	1. Define a binary operation on a given set. 2. Determine whether a function defines a binary operation on a given set. 3. Define isomorphism. 4. Distinguish structural properties from nonstructural	**Online Mode:** Upload learning modules to the VSUEE/VC Give supplementary materials in the virtual classroom	**Online Mode:** Participation in the virtual meeting Asking of questions Class interaction Sharing of Ideas	Problem Set(Computation, problem-solving, analysis, and proving) Quiz 3 (Objective type) Group Project Long Exam 2

teachability		properties. 5. Define group and other terms associated with this concept. 6. Discuss the different properties of groups. 7. Construct a Cayley table for a finite group. 8. Define a subgroup. 9. State the subgroup tests. 10. Determine whether a subset of a given group is a subgroup.	Give quizzes, problem sets, and exams	Feedbacks **Online/Offline Mode:** Self-study Individual inquiry Do learning tasks for Module 2	
CO 3: Recall the definition and basic properties of permutation groups.					
7-8	**Module 3:** **Cyclic Groups** **Lesson 3.1:** Properties of Cyclic Groups **Lesson 3.2:** Classification of Subgroups of Cyclic Groups Values Integration: Open-mindedness and teachability	1. State the definition of a cyclic group. 2. Determine the order of an element of a group. 3. Discuss the structure and properties of cyclic groups. 4. Classify subgroups of a cyclic group. 5. State the Fundamental Theorem of Cyclic Groups.	**Online Mode:** Upload learning modules to the VSUEE/VC Give supplementary materials in the virtual classroom Give quizzes, problem sets, and exams	**Online Mode:** Participation in the virtual meeting Asking of questions Class interaction Sharing of Ideas Feedbacks **Online/Offline Mode:** Self-study Individual	Problem Set (Computation, problem-solving, analysis, and proving) Quiz 4 (Objective type)

				inquiry Do learning tasks for Module 3	
9	**Midterm Examination Week**				
CO 4: Discuss the properties and results of cyclic groups and cosets.					
10-11	**Module 4:** **Dihedral and Permutation Groups** **Lesson 4.1:** Dihedral Groups **Lesson 4.2:** Permutation Groups Values Integration: Open-mindedness and teachability	1. Define dihedral group. 2. Discuss the properties of dihedral groups. 3. Define permutation group. 4. Write permutation using different notations. 5. Perform operations involving permutations. 6. Discuss the properties of permutation groups.	**Online Mode:** Upload learning modules to the VSUEE/VC Give supplementary materials in the virtual classroom Give quizzes, problem sets, and exams	**Online Mode:** Participation in the virtual meeting Asking of questions Class interaction Sharing of Ideas Feedbacks **Online/Offline Mode:** Self-study Individual inquiry Do learning tasks for Module 4	Problem Set (Computation, problem-solving, analysis, and proving) Quiz 5 (Objective type) Group Project Long Exam 3 (Modules 3 & 4)
CO 5: Discuss the properties and results of cosets, Lagrange Theorem, and factor groups.					
12-13	**Module 5:** **Cosets, Lagrange Theorem, and Factor Groups** **Lesson 5.1:** Properties of Cosets **Lesson 5.2:**	1. Define cosets. 2. Discuss the properties of cosets. 3. State and prove the Lagrange Theorem.	**Online Mode:** Upload learning modules to the VSUEE/V	**Online Mode:** Participation in the virtual meeting Asking of	Problem Set 5 (Computation, problem-solving, analysis, and proving)

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			C	questions	Quiz 6 (Objective type)
	Lagrange Theorem and Consequences **Lesson 5.3:** Normal Subgroups and Factor Groups Values Integration: Open-mindedness and teachability	4. Discuss the consequences of the Lagrange Theorem. 5. State the definition of normal subgroup, quotient group, and homomorphism. 6. Determine whether or not a given subgroup of a group is a normal subgroup using the normal subgroup test. 7. Construct quotient groups.	Give supplementary materials in the virtual classroom Give quizzes, problem sets, and exams	Class interaction Sharing of Ideas Feedbacks **Online/Offline Mode:** Self-study Individual inquiry Do learning tasks for Module 4	

CO 6: Discuss the properties of homomorphisms and isomorphisms of groups.

14-15	**Module 6: Homomorphisms and Isomorphisms of Groups** **Lesson 6.1:** Definition and Properties of Homomorphisms **Lesson 6.2:** Definition and Properties of Isomorphisms **Lesson 6.3:** Isomorphism Theorems Values Integration: Open-mindedness and teachability	1. State the definition of group homomorphisms. 2. Discuss and apply the basic properties of homomorphisms. 3. State the isomorphism theorems. 4. Use the isomorphism theorems to show that two groups are isomorphic. 5. Apply definitions and theorems to prove properties that are satisfied by	**Online Mode:** Upload learning modules to the VSUEE/VC Give supplementary materials in the virtual classroom Give quizzes, problem sets, and exams	**Online Mode:** Participation in the virtual meeting Asking of questions Class interaction Sharing of Ideas Feedbacks **Online/Offline Mode:** Self-study	Problem Set 6 (Computation, problem-solving, analysis, and proving) Quiz 7 (Objective type) Long Exam 4 (Modules 5 & 6)

			all groups and subgroups.		Individual inquiry Do learning tasks for Module 6	

CO 7: Display mastery of the introductory concepts and results of Ring theory.

Week	Module/Lessons	Learning Outcomes			Assessment
16-17	**Module 7:** **Introduction to Rings** **Lesson 7.1:** Basic Properties **Lesson 7.2:** Integral Domains **Lesson 7.3:** Ideals and Factor Rings Values Integration: Open-mindedness and teachability	1. State with precision the definition of ring, subring, unit of a ring, ideal, and quotient ring. 2. Discuss the basic properties of rings. 3. Determine whether or not a given set with indicated operations is a ring. 4. Use the subring test to determine whether or not a subset of a ring is a subring. 5. Determine the group of units of a ring. 6. Determine whether or not a subring is ideal. 7. Construct quotient rings. 8. Apply definitions and theorems to prove properties that are satisfied by all rings and subrings.	**Online Mode:** Upload learning modules to the VSUEE/VC Give supplementary materials in the virtual classroom Give quizzes, problem sets, and exams	**Online Mode:** Participation in the virtual meeting Asking of questions Class interaction Sharing of Ideas Feedbacks **Online/Offline Mode:** Self-study Individual inquiry Do learning tasks for Module 6	Problem Set 7(Computation, problem-solving, analysis, and proving) Quiz 8 (Objective type) Long Exam 5
18	**Final Examination Week**				

* VSUEE/VC – VSU E-Learning Environment/ Virtual Classroom

12. Life-long Learning Opportunities

In this subject, students will learn the value of hard work, dedication, patience, and independence as they progress in acquiring knowledge and skills in solving individually various mathematical concepts, principles, and applications inside and outside the classroom. They will also learn the importance of independence and individual inquiry as they continue to learn with minimal faculty supervision. The gained knowledge, skills, and attitudes from this subject will become a catalyst of success in their future endeavors. In particular, the students will develop 21st-century skills in becoming performing, effective and efficient teachers.

13. Contribution of Course to Meeting the Professional Component (%)

General Education: 0%
Basic Education *(Foundation):* 0%
Professional Education (*Major Field):* 0%
Major Course: 100%

14. References and Other Learning Resources

A. Textbook(s)/ E-Books
   None
B. Other Learning Resources

Beachy, John A. and William D. Blair (2019). Abstract Algebra, (4th ed.) Waveland Pr Inc

Fraleigh, J. B., & Katz, h. n. (2003). *A First Course in Abstract Algebra* (7th ed.). USA: Pearson Education, Inc.

Gallian, J. (2015). *Contemporary Abstract Algebra* (9th ed.). Belmont, CA, USA: Brooks/Cole, Cengage Learning.

Gallian, J. (2010). *Contemporary Abstract Algebra* (7th ed.). Belmont, CA, USA: Brooks/Cole, Cengage Learning.

Herstein, I. (1990). *Abstract Algebra* (2nd ed.). Collier Macmillan.

Hungerford, T. (1993). *Abstract Algebra, an Introduction* (2nd ed.). Saunders College.

Judson, T. W. (2013). *Abstract Algebra: Theory and Applications.* Austin State University. Retrieved from abstract.pugetsound.edu.

Judson, T. W., & Beezer, R. E. (2020). *Abstract Algebra: Theory and Applications.* Stephen F. Austin State University. Retrieved August 2020, from http://abstract.ups.edu/download/aata-20200730.pdf

Malik, D. S., Mordeson, J. N., & Sen, M. (2007). *Introduction to Abstract Algebra.* USA: Department of Mathematics, Creighton University.

15. Course Assessment and Evaluation

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

___50___% Midterm + ___50___% Final Term = 100% (Overall Final)

Item No,	Assessment Tasks	Percentage Contribution (1)	No. of Times in the Semester (2)	Individual Task % Contribution (1/2)
1	Problem Sets (PS)	15%	7	2.14%/PE
3	Quizzes	15%	8	1.875%/Q

4	Long Examinations (LE)	35%	5	7%/LE
5	Major Examinations	30%	2	15%/M
6	Group Project (P)	5%	1	5%/P
		100%		

COs	Assessment Tasks	Weight in Percent	Minimum Average for Satisfactory Rating	Target and Standards
CO 1	PS 1	2.14%	60 %	At least 70% of the students have at least a 60% score
	Quiz 1	1.875%		
	LE 1	7%		
CO 2	PS 2	2.14%	60 %	
	Quiz 2	1.875%		
	LE 2	7%		
CO 3	PS 3	2.14%	60 %	
	Quiz 3	1.875%		
CO 4	PS 3	2.14%	60 %	
	Group Project	5%		
	Quiz 4	1.875%		
	LE 3 (For COs 3 and 4)	7%		
Midtem Examination		15%	60%	
CO 5	PS 5	2.14%	60 %	
	Quiz 5	1.875%		
CO 6	PS 6	2.14%	60 %	
	Quiz 6	1.875%		
	LE 4 (For COs 5 and 6)	7%		
CO 7	PS 7	2.14%	60 %	
	Quiz 7	1.875%		
	LE 5	7%		
Final Examination		15%	60 %	
TOTAL		**100%**	60%	

Grading System (Passing: 60%)

Range	Grade	Range	Grade
96-100	1.00	68 - 71	2.50
92-95	1.25	64 - 67	2.75
88-91	1.50	60 - 63	3.00
84-87	1.75	50 - 59	3.25
80-83	2.00	40 - 49	3.50
76-79	2.25	30 - 39	4.00
72-75	2.50	01 - 29	5.00

16. Course Policies

a. The official virtual classroom is VSU E-Learning Portal (https://elearning.vsu.edu.ph). A class orientation will be done concerning the use and navigation of the platform.

b. ZOOM or Google Meet will be used for web-conferencing and real-time class meetings. The username and password link will be posted in VSU E-Learning Portal or emailed to your respective email addresses.

c. Attending the virtual meeting is highly encouraged but not compulsory. If you cannot

attend due to internet connection limitations, there is no problem. Just keep up with the lessons by watching the online class recording and doing all the necessary exercises that are required of you.

d. The virtual meeting is our avenue for synchronous learning. Class interaction and participation are encouraged; sharing ideas, giving feedback on your outputs, and other related concerns will be done during this time.

e. All written outputs should be submitted in pdf format and sent through the VSU E-Learning Portal.

f. Quizzes are set on VSU E-Learning Portal. All quizzes are announced and will open and close on the agreed schedule. The schedule of quizzes will be announced in advance by the faculty.

g. In the submission of activities, ON-TIME submission is encouraged. At least one week will be given for you to work on your exercises.

h. Long examinations and term examinations are required and will be done through the VSU E-Learning Portal.

i. If you have any inquiries/clarifications, you may contact the course instructor during the official class schedule; or the official online consultation schedule (9:00 – 11:00 AM, MWF).

j. All students are reminded to observe all policies, regulations, and rules of the university and other related laws of the land and are advised to read, understand, and practice the provisions of the VSU Student Manual.

k. Lastly, as we embark on this "new normal," let us have an open mind and heart as we adjust to this new way of delivering the teaching-learning process and still aim for quality education.

This class policy serves as our written agreement for the whole semester. If there are any changes to enhance the class learning opportunity within the semester, they will be communicated accordingly.

17. Course Materials and Facilities Available

Virtual Classroom which contains learning materials, learning resources, learning tasks, assessment tasks, etc.

18. Revision History

Revision number	Date of Revision	Date of implementation	Highlights of Revision
00		October 5, 2020	
01		August 23, 2021	Updated information regarding the department and college. Updated timeline and grading system.

19. Preparation

Prepared by	Name	Signature	Date Signed
	EUSEBIO R. LINA, JR.		

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III. INSTRUCTOR/PROFESSOR INFORMATION

1. Name of Instructor/Professor	Eusebio R. Lina, Jr.
2. Office and Department	Department of Mathematics
3. Telephone/Mobile Numbers	09293697060
4. Email Address	eusebio.lina@vsu.edu.ph
5. Consultation Time	9:00 – 11:00 MWF

20. Department Instructional Materials Review Committee:

Committee	Name	Signature	Date Signed
Member:	**JORGE S. VALENZONA**		
Member:	**RAYMUND M. IGCASAMA**		
Member:	**LEOMARICH F. CASINILLO**		
Chairperson:	**DIVINA L. VALENZONA**		

	Name	Signature	Date Signed
Verified by:	**MA. THERESA P. LORETO** Dean, CAS		
Validated by:	**NANCY D. ABUNDA** Head, OIMD		

Note:
1) The number of POs will depend on each degree program offered
2) COs and Relationship to POs
   a. (I) - **Introductory** – an Introductory Course to an outcome
   b. (E) - **Enabling** – an Enabling Course or a course that strengthens the outcome
   c. (D) - **Demonstrated** – a Demonstrative Course or a course demonstrating an outcome.

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Distribution of copies: OIMD, College, Department, Faculty, and ODQA

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