



UNIVERSITY OF SOUTHERN MINDANAO					
Course Number	Math 212d	Course Title	Fundamental Concepts of Mathematics	Rev. No.	0
					Page 2 of 10

INSTITUTIONAL POLICIES	
Vision	Quality and relevant education for its clientele to be globally competitive, culture sensitive and morally responsive human resources for sustainable development.
Mission	Help accelerate socio-economic development ^{M₁} , promote harmony among the diverse cultures ^{M₂} and improve quality of life ^{M₃} through instruction, research, extension and resource generation in Southern Philippines.
Core Values	G-Goodness, R-Responsiveness, E-Excellence, A-Assertion of Right and Truth
USM Quality Policy Statement	<p>The University of Southern Mindanao, as a premier university, is committed to provide quality instruction, research development and extension services and resource generation that exceed stakeholders' expectations through the management of continual improvement efforts on the following initiatives.</p> <ol style="list-style-type: none">1. Establish key result areas and performance indicators across all mandated functions;2. Implement quality educational programs;3. Guarantee competent educational service providers;4. Spearhead need-based research outputs for commercialization, publication, patenting, and develop technologies for food security, climate change mitigation and improvement in the quality of life;5. Facilitate transfer of technologies generated from research to the community for sustainable development;6. Strengthen relationship with stakeholders;7. Sustain good governance and culture, sensitivity; and8. Comply with customer, regulatory and statutory requirements.
Goals of the College	<ol style="list-style-type: none">1. The College of Science and Mathematics of the University of Southern Mindanao is committed to the comprehensive preparation of the next generation of scientists and mathematicians in this part of the country.2. The College supplies a condition in which faculty can advance and support high-quality research programs in which students can collaborate and contribute to new knowledge that improves quality of life.3. The College aspires to be the center of excellence in Science and Mathematics in order to serve diverse students, preparing them for their future careers in line with the vision and mission of the University.4. The College serves the community and the industry as an impartial source of quality graduates in Science and Mathematics that provides education, literacy, innovation and solution generation to challenges.
Department Objectives	The Department of Mathematics and Statistics aims to: 1. produce students with mastery in the core areas of mathematics and statistics, including algebra, analysis, and geometry; 2. develop students' skills in pattern recognition, generalization, abstraction, critical analysis, synthesis, problem-solving and rigorous argument; 3. express an enhanced perception of the vitality and importance of mathematics in the modern world including inter-relationships within math and its connection to other disciplines; and 4. develop students' skills in creating and evaluating mathematical conjectures and arguments, and in validating their own mathematical thinking.



UNIVERSITY OF SOUTHERN MINDANAO					
Course Number	Math 212d	Course Title	Fundamental Concepts of Mathematics	Rev. No.	0
				Page 3 of 10	

PROGRAM INFORMATION					
Degree Program	Bachelor of Science In Applied Mathematics	CHED CMO Reference	48 series of 2017	BOR Approval	BOR Res. No. 24, s 2020

COURSE DETAILS					
Course Title	Fundamental Concepts in Mathematics				
Course Number	Math 212d	Curriculum Component		Major subject	
Credit (--Unit)	3 Units	LECTURE (Unit-Hours)	3 Units - 3 Hours	LABORATORY (Unit-Hours)	0 Units - 0 Hours
Prerequisites	None	Co-requisites	None	Year Level/Semester Offered	1st - Second Semester
Course Description	This course covers sets, principles of logic, methods of proof, relations, functions, integers, binary operations, complex numbers, matrices and matrix operations, and an introduction to mathematical systems				
Faculty in charge	Leonard M. Paleta, PhD				
Consultation Hours			Contact Information		

PROGRAM EDUCATIONAL OBJECTIVES (PEO)				MISSION		
In 3-5 years, the BS Applied Mathematics graduates of USM shall:				M ₁	M ₂	M ₃
PEO 1	Provide leadership in various development programs both public and private			✓		
PEO 2	Equip with technical, conceptual and human resource skills			✓		✓
PEO 3	Pursue entrepreneurial activities			✓		✓
PEO 4	Able to adapt to diverse culture				✓	
PEO 5	Pursue advanced studies in emerging related fields				✓	✓

NOTE: The PEO's are based on the professional, industry, local, national and international needs and requirements of the program identified through consultation with constituents and stakeholders.



UNIVERSITY OF SOUTHERN MINDANAO

Course Number	Math 212d	Course Title	Fundamental Concepts of Mathematics	Rev. No.	0	Page 4 of 10
---------------	-----------	--------------	-------------------------------------	----------	---	--------------

PROGRAM OUTCOMES (PO)

Upon graduation, the University of Southern Mindanao BS Applied Mathematics students must be able to:	PEO1	PEO2	PEO3	PEO4	PEO5	PEO6	PEO7	PEO8	PEO9	PEO10	...
a) Articulate and discuss the latest development in the specific field of practice.		✓									
b) Effectively communicate orally and in writing using both English and Filipino.		✓									
c) Work effectively and independently in multidisciplinary and multi-cultural teams.			✓	✓	✓						
d) Act in recognition of professional, social and ethical responsibility.	✓										
e) Preserve and promote "Filipino historical and cultural heritage".				✓							
f) Participate in the generation of new knowledge in research and development projects.		✓									
g.) Articulate the rootedness of education in philosophical, sociocultural, historical and psychological and political context.		✓									
h.) Demonstrate mastery of subject matter/discipline.		✓									
i.) Facilitate learning using wide range of teaching methodologies and delivery modes appropriate to specific learners and their environment.		✓	✓								
j.) Develop innovative curricula, instructional plans, teaching approaches and resources for diverse learners.		✓		✓							
k.) Apply skills in the development and utilization of ICT to promote quality, relevant and sustainable educational practices		✓									
l.) Demonstrate a variety of thinking skills in planning, monitoring, assessing and reporting learning processes and outcomes.		✓									
m.) Practice professional and ethical teaching standards sensitive to the local, national and global realities.	✓			✓							
n.) Pursue lifelong learning for personal and professional growth through varied experiential and field based opportunities					✓						
o.) Exhibit competence in mathematical concepts and procedures		✓									
p.) Exhibit proficiency in relating mathematics to other curricular areas		✓									
q.) Gain mastery in the cores areas of mathematics: algebra, analysis, and geometry.		✓									
r.) Demonstrate skills in pattern recognition, generalization, abstraction, critical analysis, synthesis, problem-solving and rigorous argument.		✓									
s.) Develop an enhanced perception of the vitality and importance of mathematics in the modern world including inter-relationships within math and its connection to other disciplines.		✓									
t.) Appreciate the concept and role of proof and reasoning and demonstrate knowledge in reading and writing mathematical proofs.		✓									
u.) Make and evaluate mathematical conjectures and arguments and validate their own mathematical thinking.		✓									
v.) Communicate mathematical ideas orally and in writing using clear and precise language.		✓									

NOTE: Minimum PO's shall come from the PSG/CMO of the program if applicable. Other additional PO's may come from consultations with constituents and stakeholders.



UNIVERSITY OF SOUTHERN MINDANAO

Course Number	Math 212d	Course Title	Fundamental Concepts of Mathematics	Rev. No.	0	Page 5 of 10
---------------	-----------	--------------	-------------------------------------	----------	---	--------------

COURSE OUTCOMES (CO)		POa	POb	POc	POd	POe	POf	POg	POh	POi	POj	POk	POl	POm	POn	POo	POp	POq	POr	POs	POt	POu	POv	POw	POx	POy	POz
Upon passing this course, the students must be able to:		Course Alignment to Program Outcomes																									
CO 1	Define and discuss the ideas of sets and its operations. Illustrate using Venn diagrams.	I	E	E	E	E	E	D	I	D	E	E	E	E	E	I	I	D	D	D	E	E					
CO 2	Discuss the concepts of logic, logical equivalences, its validity and constructing truth tables	I	E	E	E	E	E	E	E	E	E	E	E	E	E	I	I	D	D	D	E	E					
CO 3	Understanding proofs and constructing logical proofs like direct and indirect proof, proof by cases and counterexample, and Proof by Mathematical Induction	I	E	E	E	E	E	E	E	E	E	E	E	E	E	I	I	D	D	D	E	E					
CO 4	Discuss and evaluate concepts about relations, functions, integers and binary operations.	I	E	I	I	E	E	E	D	D	D	E	E	E	E	I	I	D	D	D	E	E					

* Level (follow the legend used in the most relevant PSG/CMO)

[I] = Introductory. This introduces the student to the Program Outcome (PO).

[E] = Enabling. This enables the student to attain the Program Outcome (PO).

[D] = Demonstrative. This demonstrates the student's attainment of the Program Outcome (PO).

COURSE LEARNING PLAN

Intended Learning Outcomes (ILO) By the end of the learning experience, students must be able to:	Aligned to CO:	Time Frame (Week)	Course Content (Topics)	Teaching & Learning Activities (TLA) Teaching Activities: Learning Activities:		Learning Materials:	Assessment Tasks (AT)	Suggested Readings
1.1 Explain the vision, mission, UQPS of the University 1.2 Explain the goals and objectives of the college. 1.3 Explain the Program Educational Objectives, Students Outcomes, and Course Outcomes.		1	Orientation on Classroom and University Policies as well as Grading System • Discussion on PEO, SO and CO	Orientation Lecture/Discussion	Reading; Assignment	Computer; Chalkboard	Recitation	[1]
1.1 Write and define the given sets using rosters and/or abstraction methods 1.2 Application of writing the given sets i.e Real numbers using	CO1	2	Sets and Elements • Basic definitions and notations • Rosters and set-builder notations • Famous sets • Abstraction	Lecture/Video Presentation/addressing students questions Zoom video conference Module	Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Task	Chalkboard/ Whiteboard Book/PDF Projector Laptop/PC	Assignments Quizzes Exams Reflective paper USM VLE Exercises	[2][3][4][5][6][7][8]

This document is a sole property of UNIVERSITY OF SOUTHERN MINDANAO. Any disclosure, unauthorized reproduction or use is strictly prohibited except with permission from USM. Only documents with standard signatories of USM are considered official.

USM-EDU-F05-Rev4.2020.2.18





UNIVERSITY OF SOUTHERN MINDANAO

Course Number

Math 212d

Course Title

Fundamental Concepts of Mathematics

Rev. No.

0

Page 6 of 10

Interval notation 1.3 Determine and list the power set and cardinality of finite sets			<ul style="list-style-type: none"> Power set Cardinality of a finite set and Infinite set 			Instructional Module		
1.1 Define equality and subsets and learn how to prove them 1.2 Familiarity of union, intersection, set-difference, complements of sets; sketch using Venn Diagrams 1.3 Construct and understand Cartesian product of two sets 1.4 Mastery of order of operation of sets 1.5 Familiarity and prove the algebra of set operations	CO1	3-4	Set Operations <ul style="list-style-type: none"> Subsets and Equality Union and Intersection Complements and Set Difference Cartesian Product of two sets Algebra of set operations Important properties of set operations 	Lecture/Video Presentation/addressing students questions Zoom video conference Module	Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Task	Chalkboard/ Whiteboard Book\PDF Projector Laptop/PC Instructional Module	Assignments Quizzes Exams Reflective paper USM VLE Exercises	[2][3][4][5][6][7][8]
1.1 Familiarize Venn Diagrams 1.2 Draw and Interpret Venn diagrams 1.3 Learn how to construct Venn Diagrams 1.4 Explore De Morgan's Law and Illustrate it visually using Venn Diagrams 1.5 Illustrating the operations on sets using Venn Diagrams 1.6 1.7 Draw Venn diagrams illustrating sets within and families of sets	CO1	5	Venn Diagram and De Morgan's Laws <ul style="list-style-type: none"> Constructing Venn Diagrams Operations on sets using Venn Diagram Equivalence classes De Morgan's Law 	Lecture/Video Presentation/addressing students questions Zoom video conference Module	Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Task	Chalkboard/ Whiteboard Book\PDF Projector Laptop/PC Instructional Module	Assignments Quizzes Exams Reflective paper USM VLE Exercises	[2][3][4][5][6][7][8]
1.1 Identify if a sentence is a proposition or not 1.2 Provide the truth value of a proposition 1.3 Show that a given string is a propositional form	CO2	6-7	Principles of Logic <ul style="list-style-type: none"> Statement\Propositions, Logical connectives Compound statements and logical operators Validity and Truth tables 	Lecture/ Video Presentation Zoom video conference Module	Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks	Chalkboard/ Whiteboard Book PDF Workbook Projector	Quizzes Exams Seatworks Reports/ Reflective paper USM VLE Exercises	[2][3][4][5][6][7][8]

This document is a sole property of UNIVERSITY OF SOUTHERN MINDANAO. Any disclosure, unauthorized reproduction or use is strictly prohibited except with permission from USM.
Only documents with standard signatories of USM are considered official.

USM-EDU-F05-Rev4.2020.2.18

MASTER COPY



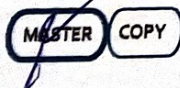
UNIVERSITY OF SOUTHERN MINDANAO

Course Number	Math 212d	Course Title	Fundamental Concepts of Mathematics	Rev. No.	0	Page 7 of 10
---------------	-----------	--------------	-------------------------------------	----------	---	--------------

1.4 Translate the given propositional form into words and vice versa 1.5 Construct the truth table of the given propositional form.			<ul style="list-style-type: none"> Propositional forms Quantifiers Interpreting propositional forms 			Laptop/PC		
1.1 Constructing truth tables for conjunction, disjunction, negation, implication and bi-conditional propositions 1.2 Constructing truth tables for Tautologies and Contradiction	CO2	8	Validity and Truth Tables <ul style="list-style-type: none"> Truth tables for conjunction, disjunction, negation, implication and bi-conditional propositions Tautologies and Contradiction Inverse, Converse and Contrapositive and their relationship 	Lecture/Video Presentation/addressing students questions Zoom video conference Module	Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Task	Chalkboard/ Whiteboard Book\PDF Projector Laptop/PC Instructional Module	Assignments Quizzes Exams Reflective paper USM VLE Exercises	[2][3][4][5][6][7][8]
All ILOs covered in Midterm		9	MIDTERM EXAMINATION					
1.1 Familiarity of proof methods and cite a basic example 1.2 Prove using different methods of proof 1.3 Write a paragraph of proofs for a given proposition 1.4 Determine the steps and techniques in proving direct or indirect methods 1.5 Determine the steps in proving by Mathematical Induction	CO3	10-11	Methods of Proof <ul style="list-style-type: none"> Direct Proof Indirect Proofs Using cases in proof Proof by counter example Principles of Mathematical Induction 	Lecture/Video Presentation/addressing students questions Zoom video conference Module	Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks	Chalkboard/ Whiteboard Book\PDF Projector Laptop/PC Instructional Module	Assignments Quizzes Exams Reflective paper USM VLE Exercises	[2][3][4][5][6][7][8]
1.1 Define a relation and give basic examples 1.2 Familiarize equivalence relations 1.3 Give examples of equivalence classes and partitioning 1.4 Define partial ordering and give basic examples	CO4	12-13	Relations <ul style="list-style-type: none"> Definition Equivalence Relations Equivalence classes and Partitioning Partial Ordering 	Lecture/Video Presentation/addressing students questions Zoom video conference Module	Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks	Chalkboard/ Whiteboard Book\PDF Projector Laptop/PC Instructional Module	Assignments Quizzes Exams Reflective paper USM VLE Exercises	[2][3][4][5][6][7][8]
1.1 Define what is a function 1.2 Familiarize and differentiate the			Functions <ul style="list-style-type: none"> Injection, Surjection, Bijection 	Lecture/Video Presentation/addressing	Discussion Board work	Chalkboard/	Assignments	[2][3][4][5][6][7][8]

This document is a sole property of UNIVERSITY OF SOUTHERN MINDANAO. Any disclosure, unauthorized reproduction or use is strictly prohibited except with permission from USM. Only documents with standard signatories of USM are considered official.

USM-EDU-F05-Rev4, 2020.2.18





UNIVERSITY OF SOUTHERN MINDANAO

Course Number	Math 212d	Course Title	Fundamental Concepts of Mathematics	Rev. No.	O	Page 8 of 10
---------------	-----------	--------------	-------------------------------------	----------	---	--------------

types of functions like injection, surjection and bijection 1.3 Given a function, determine its images, inverse images, range, domain and co-domain 1.4 Give the requirements for a function to be a one to one correspondence	CO4	14-15	<ul style="list-style-type: none"> One to one correspondence Image, Inverse Image Range, Domain and Co-domain Counting Principles Countable and uncountable sets 	students questions Zoom video conference Module	Seat work Group Reporting USM VLE/ MyOpenMath Tasks	Whiteboard Book\PDF Projector Laptop/PC Instructional Module	Quizzes Exams Reflective paper USM VLE Exercises	
1.1 Define what is an Integer 1.2 Define divisibility of an Integers 1.3 Mastery on division and Euclidean Algorithms 1.4 State and prove the Fundamental Theorem of Arithmetic	CO4	16	Integers <ul style="list-style-type: none"> Divisibility Division Algorithm, Euclidean Algorithm Fundamental Theorem of Arithmetic 	Lecture/Video Presentation/addressing students questions Zoom video conference Module	Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks	Chalkboard/ Whiteboard Book\PDF Projector Laptop/PC Instructional Module	Assignments Quizzes Exams Reflective paper USM VLE Exercises	[2][3][4][5][6][7][8]
1.1 Define a binary operation an modular operations. Give basic examples 1.2 Define a matrix and give basic examples 1.3 Define a complex number. Illustrate it in the xy-plane and give basic example 1.4 Familiarity of basic operations of matrices and complex numbers	CO4	17	Binary Operations <ul style="list-style-type: none"> Definition Modular operations Operations on Matrices Operations on Complex Numbers 	Lecture/Video Presentation/addressing students questions Zoom video conference Module	Discussion Board work Seat work Group Reporting USM VLE/ MyOpenMath Tasks	Chalkboard/ Whiteboard Book\PDF Projector Laptop/PC Instructional Module	Assignments Quizzes Exams Reflective paper USM VLE Exercises	[2][3][4][5][6][7][8]
All ILOs covered in the Course		18	FINAL EXAMINATION					

* any interaction, course, program, or other experience in which learning takes place (<https://www.edglossary.org/learning-experience/>)

Textbook/References

- [1] USM Student Manual
- [2] Chartrand, Polemeni and Zhang. 2013. Mathematical Proofs: A transition to advanced mathematics, 3rd Ed. Pearson, USA.
- [3] Gerstein, Garry. 2012. Introduction to Mathematical Structures and Proofs, 2nd ed. Springer, USA
- [4] Kurtz, David C. 1992. Foundation of Abstract Mathematics. McGraw-Hill College, USA.
- [5] Morash, Ronald P. 2010. Bridge to Abstract Mathematics. Random House, Inc. New York.

This document is a sole property of UNIVERSITY OF SOUTHERN MINDANAO. Any disclosure, unauthorized reproduction or use is strictly prohibited except with permission from USM. Only documents with standard signatories of USM are considered official.



UNIVERSITY OF SOUTHERN MINDANAO

Course Number	Math 212d	Course Title	Fundamental Concepts of Mathematics	Rev. No.	0	Page 9 of 10
---------------	-----------	--------------	-------------------------------------	----------	---	--------------

- [6] O'Leary, Michael L. 2016. A First Course in Mathematical Logic and Set Theory
[7] Rotman, Joseph J. 2007. Journey to Mathematics. Dover Publications, Inc. NY, USA.
[8] Sundstorm, Ted. 2020. Mathematical Reasoning-Writing and Proof. Grand Valley State University. (<https://LibreTexts.org>)

Life-long Learning Opportunity

Apply logic and set theory in daily discourse, logical reasoning and judicious decision making in daily lives. Apply the principles of logic to tell sound from unsound reasoning in everyday discourse, and apply appropriate set theoretic concepts, thinking processes, tools and technologies in the solution to various conceptual or real-world problems.

Course Evaluation

Course Outcomes (CO)

Assessment Task Addressing CO

Weight (%)

Satisfactory Rating

Target Standard

CO 1: Define and discuss the ideas of sets and its operations. Illustrate using Venn diagrams.	Quizzes/Assignments/Others	60	60	90% of the class obtained a satisfactory rating
	Major Exam	40		
CO 2: Discuss the concepts of logic, logical equivalences, its validity and constructing truth tables	Quizzes/Assignments/Others	60	60	90% of the class obtained a satisfactory rating
	Major Exam	40		
CO 3: Understanding proofs and constructing logical proofs like direct and indirect proofs, proof by cases and counterexample, and Proof by Mathematical Induction	Quizzes/Assignments/Others	60	60	90% of the class obtained a satisfactory rating
	Major Exam	40		
CO 4: Discuss and evaluate concepts about relations, functions, integers and binary operations.	Quizzes/Assignments/Others	60	60	90% of the class obtained a satisfactory rating
	Major Exam	40		



UNIVERSITY OF SOUTHERN MINDANAO				
Course Number	Math 212d	Course Title	Fundamental Concepts of Mathematics	Rev. No. 0
				Page 10 of 10

Midterm Grade

Quizzes-----	40%
Assignments/Others-----	30%
Midterm Exam-----	30%

Final Term Grade

Quizzes/Summative Exams-----	40%
Assignments/Others-----	30%
Final Exam-----	30%

Grading System

Final Grade

50% Midterm Grade+50% Final Term Grade

Passing Grade

60%

Classroom Policies

1. Come to class prepared for recitation, class discussions, or unannounced quizzes always. Demonstrate personal responsibility by obtaining notes and finding out any instructions/important announcements given on the class period missed.
2. Absence is not a right, nor a privilege. The University Code on absence and tardiness applies. 20% of the total class hours means you are DROPPED from the course. Absences can be excused only after presenting official documents.
3. All submissions must be your original work. Cite sources properly. Plagiarism and any form of academic cheating get a corresponding grade of 5.0 (Failed) and can be grounds for suspension or expulsion.
4. During online class, students are expected to:
 - a. Show up on a scheduled time and wait to be admitted into the class.
 - b. Be always respectful. If your video is on, avoid hand gestures or inappropriate language.
 - c. Stay on mute. Click a raise hand button if you have a question or something to share.
 - d. Stay focused and on task so you don't miss anything the speaker says.
 - e. Class participation is highly encouraged.
5. Consultation: You can approach your class mayor for your concerns so he/she will relay them once to your professor
6. All information and queries regarding our class will be posted in our official group chat or facebook group. Refrain from posting unrelated topics in these platforms as these will take up space in the messenger box and will make it difficult to backread important messages.
7. Observe proper decorum when sending messages to your professors.
8. Avoid sending messages online outside office hours or during evening.
9. All submissions must be in USM VLE. Submissions made outside VLE will not be accepted.