



College of Arts and Sciences

NEUST VISION

NEUST is a locally responsive and internationally relevant and recognized University of Science and Technology.

NEUST MISSION

To develop new knowledge and technologies and transform human resources into productive citizenry to bring about development impact to local and international communities.

CAS MISSION

To facilitate the holistic development of an individual and enable him to effect changes in himself and his environment to realize fullness in human life.

CAS GOALS

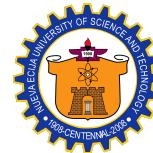
(a) To provide quality education and training in the arts and sciences so that every student is able to view and understand human nature in a wider and a more balanced perspective; and (b) to prepare the student for an advanced scholarly study and to maintain high intellectual standards in the arts and sciences.

MATHEMATICS AND PHYSICS DEPARTMENT OBJECTIVES

1. To develop amongst students (a) an appreciation of the practical, intellectual, and aesthetic dimensions of the nature of mathematics and (b) a proficiency in the application of mathematical tools to daily life;
2. To illustrate to students (a) the interactions between science and technology, and (b) the pivotal role that physics play in the scientific and technological developments in the modern world; and
3. To cultivate values that are inherent in science and scientific investigation such as honesty, team work, perseverance, industry, and hard work.

Course Title: Mathematics in the Modern World	Date Effective: 2nd Semester AY 2022-2023	Date Revised: August 2, 2022	Prepared by: CAS Mathematics and Science Department (MSD)	Approved by:  ROEL S. ANG, PhD Chairman, MSD  MARIO M. ABESAMIS, Jr., Dean, CAS	Page 1 of 13
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NEUST-AAF-F002
Rev. 01 (06.17.2019)



College of Arts and Sciences

SYLLABUS IN MATHEMATICS IN THE MODERN WORLD

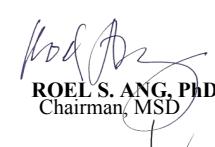
1. Course Code : MMW
2. Course Title : Mathematics in the Modern World
3. Pre-requisite : None
4. Credit Units : 3 units
5. Time Duration : 3 hours/week, 18 weeks/semester, a total of 54 hours for a semester

6. Course Description:

This course deals with nature of mathematics, appreciation of its practical, intellectual, and aesthetic dimensions, and application of mathematical tools in daily life.

The course begins with an introduction to the nature of mathematics as an exploration of patterns (in nature and the environment) and as an application of inductive and deductive reasoning. By exploring these topics, students are encouraged to go beyond the typical understanding of mathematics as merely a set of formulas but as a source of aesthetics in patterns of nature, for example, and a rich language in itself (and of science) governed by logic and reasoning.

The course then proceeds to survey ways in which mathematics provides a tool for understanding and dealing with various aspects of present-day living, such as managing personal finances, making social choices, appreciating geometric designs, understanding codes used in data transmission and security, and dividing limited resources fairly. These aspects will provide opportunities for actually doing mathematics in a broad range of exercises that bring out the various dimensions of mathematics as a way of knowing, and test the students' understanding and capacity. (CMO No. 20, series of 2013)

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College of Arts and Sciences

7. Learning Outcomes

At the end of the course, the students would be able to:	
Knowledge	
1.	Discuss and argue about the nature of mathematics, what it is, how it is expressed, represented, and used.
2.	Use different types of reasoning to justify statements and arguments made about mathematics and mathematical concepts.
3.	Discuss the language and symbols of mathematics.
Skills	
1.	Use a variety of statistical tools to process and manage numerical data.
2.	Analyze codes and coding schemes used for identification, privacy, and security purposes.
3.	Use mathematics in other areas such as finance, voting, health and medicine, business, environment, arts and design, and recreation.
Values	
1.	Appreciate the nature and uses of mathematics in everyday life.
2.	Affirm honesty and integrity in the application of mathematics to various human endeavors.

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NEUST-AAF-F002
Rev. 01 (06.17.2019)



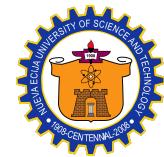
8. GE Learning Outcomes

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GE Learning Outcomes			Mathematics in the Modern World		
Knowledge (Intellectual Competencies)			O	P	L
1. Analyze “texts” (written, visual, oral, etc.) critically					
2. Demonstrate proficient and effective communication (writing, speaking, and use of new technologies)					
3. Use basic concepts across the domains of knowledge					
4. Demonstrate critical, analytical, and creative thinking					
5. Apply different analytical models in problem solving					
Values (Personal and Civic Responsibility)			O	P	L
1. Appreciate the complexity of the human condition					
2. Interpret the human experience from various perspectives					
3. Examine the contemporary world from both Philippine and global perspectives					
4. Take responsibility for knowing and being Filipino					

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NEUST-AAF-F002
Rev. 01 (06.17.2019)



5. Reflect critically on shared concerns

College of Arts and Sciences

6. Generate innovative practices and solutions guided by ethical standards

7. Make decisions based on moral norms and imperatives

8. Appreciate various art forms

9. Contribute to aesthetics

10. Advocate respect for human rights

11. Contribute personally and meaningfully to the country's development

Skills (Practical Skills)

O P L

1. Work effectively in a group

2. Apply computing tools to process information effectively

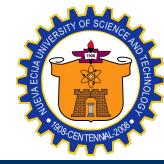
3. Use current technology to assist and facilitate learning and research

4. Negotiate the world of technology responsively

5. Create solutions to problems in various fields

6. Manage one's knowledge, skills, and values for responsible and productive living

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7. Organize one's self for lifelong learning

College of Arts and Sciences

Legend: L-Learned P-Practiced O-Opportunity to learn

9. Course Content

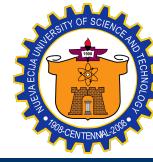
Time Allotment	Learning Outcomes	Contents	Methodology	Resources	Assessment
Week 1-3 8 hours	At the end of the unit the students must be able to: 1. Identify patterns in nature and regularities in the world (K) 2. Articulate the importance of mathematics in one's life (V) 3. Argue about the nature of	Section 1. The Nature of Mathematics I. Mathematics in our World Core Idea: Mathematics is a useful way to think about nature and our world. 1. Patterns and Numbers in Nature and the World: the snowflake and honeycomb; tiger's stripes and hyena's spots; the sunflower; the snail's	Activities: a. Video watching b. Pair-sharing or small group sharing c. Journal writing d. Whole class discussion Questions to Pose: a. What is mathematics? b. Where is mathematics? c. What role does mathematics play in your	Required: a. Nature's Numbers by Ian Stewart b. Mathematics in Nature: Modeling Patterns in the Natural World by John A. Adam c. A Mathematical Nature Walk by John A. Adam	Evaluation Requirements: a. Vlogging (Nature Pattern) b. Short-response/ essay writing What new ideas about mathematics did you learn? What is it about mathematics that might have changed your thoughts about it?

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	mathematics, what it is, how it is expressed, represented, and used (K) 4. Express appreciation for mathematics as a human endeavor (V)	shell, flower petals; the world's population; the weather, etc. 2. The Fibonacci Sequence 3. Mathematics helps organize patterns and regularities in the world. 4. Mathematics helps predict the behavior of nature and phenomena in the world. 5. Mathematics helps control nature and occurrences in the world for our own ends. 6. Mathematics has numerous applications in the world, making it indispensable.	College of Arts and Sciences World Some ideas to elicit and encourage: a. Patterns and occurrences exist in nature, in our world, in our life. Mathematics helps makes sense of these patterns and occurrences b. Mathematics is a tool to quantify, organize, and control our world, predict phenomena, and make life easier for us. Some ideas to discourage or debunk or disprove: a. Mathematics is just for the books, confined in the classroom.	https://vimeo.com/9953368 Recommended: a. Day's Adventure in Math Wonderland by Akiyama and Ruiz b. The Number Devil by Enzensberger	What is most useful about mathematics for humankind? c. Two-to-three-page synthesis paper focusing on one of the following aspects of mathematics: Mathematics helps organize patterns and regularities in the world. Mathematics helps predict the behavior of nature and phenomena in the world. Mathematics helps control nature and occurrences in the world for our own ends.

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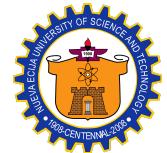


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Mathematics has a place in my life.

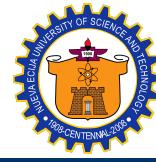
Weeks 3-5 6 hours	At the end of the unit, the students must be able to:	II. Mathematical Language and Symbols Core Idea: Like any language, mathematics has its own symbols, syntax and rules. 1. Discuss the language, symbols, and conventions of mathematics (K) 2. Explain the nature of mathematics as a language (K) 3. Perform operations on mathematical expressions correctly (S) 4. Acknowledge that mathematics is a useful language (V)	Activities: a. Individual or small group exercises including games (see exercises in The Language of Mathematics from One Mathematical Cat, Please! By Carol Burns Fisher) b. Whole class discussions of the comparisons between the English language and Mathematical language c. Compilation of mathematical symbols and notations and their meanings	Required for Instructors: a. Jamison, R. E. (2000). Learning the language of mathematics. Language and Learning across the Discipline, 4(1), 45-54. Required for Students: a. The language of Mathematics (from One Mathematical Cat, Please! By Carol Burns Fisher b. The Language and	Evaluation Requirements: a. Writing exercise sets b. Quiz

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Mathematics in the Modern World	2nd Semester AY 2022-2023	August 2, 2022	CAS Mathematics and Science Department (MSD)	 ROEL S. ANG, PhD Chairman, MSD  MARIO M. ABESAMIS, Jr., Dean, CAS	Page 8 of 13



		6. Formality	College of Arts and Sciences	Grammar of Mathematics	
			<p>Some ideas to elicit and encourage:</p> <ul style="list-style-type: none">a. Mathematics is a language in itself. Hence, it is useful in communicating important ideas.b. Mathematics as a language is clear and objective.c. Language conventions are necessary in mathematics for it to be understood by all. <p>Some ideas to discourage or debunk or disprove:</p> <ul style="list-style-type: none">a. Mathematics is not a language but a useless set of formal rules and alien symbols.		

Course Title: Mathematics in the Modern World	Date Effective: 2nd Semester AY 2022-2023	Date Revised: August 2, 2022	Prepared by: CAS Mathematics and Science Department (MSD)	Approved by:  ROEL S. ANG, PhD Chairman, MSD  MARIO M. ABESAMIS, Jr., Dean, CAS	Page 9 of 13
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College of Arts and Sciences

Mathematics courses

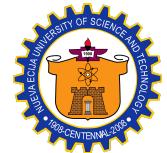
- a. Mathematics is concerned with the communication of concepts and ideas.
- c. Mathematics is full of unnecessary symbols, rules, and conventions.

MIDTERM EXAM

Submission of Midterm Project (Song Composition of MMW)

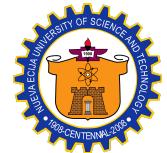
Weeks 6-9 10 hours	At the end of the unit, the students must be able to: <ol style="list-style-type: none"> 1. Use different types of reasoning to justify statements and arguments made about mathematics and mathematical concepts (K) 2. Write clear and logical proofs (K) 	III. Problem Solving and Reasoning Core Idea: Mathematics is not just about numbers; much of it is problem solving and reasoning. <ol style="list-style-type: none"> 1. Inductive and Deductive Reasoning 2. Intuition, proof, and certainty 3. Polya's 4-steps in Problem 	Activities: <ul style="list-style-type: none"> a. Reading and writing proofs b. Small-group problem solving c. Whole class discussions of key problems and solutions Some ideas to elicit and encourage:	Required: <ul style="list-style-type: none"> a. Mathematical Excursions (Ch. 1) by R. Aufmann et al.; What is mathematics Really? (Ch. 4 & 5) by R. Hersh Recommended: <ul style="list-style-type: none"> a. Mathematical 	Evaluation Requirements: <ul style="list-style-type: none"> a. One take-home problem set b. Quiz on proving using deductive or inductive reasoning
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	3. Solve problems	Solving	Mathematics requires not only facility with numbers but also the ability to critically think through situations, to reason and argue logically and to creatively solve problems	Excursions (Ch. 1)	
	involving patterns and recreational problems following Polya's four steps (S) 4. Organize one's method and approaches for proving and solving problems (V)	4. Problem solving strategies 5. Mathematical Problems involving Patterns 6. Recreational Problems using mathematics	not only facility with numbers but also the ability to critically think through situations, to reason and argue logically and to creatively solve problems b. Mathematics is an active human endeavor. We can create the mathematics we need to solve problems. c. Mathematics is for everyone who cares to learn it d. Mathematical problem solving takes time. Solutions are not always apparent to the solver. e. There may be more than	by R. Aufmann et al. b. Mathematics, a Practical Odyssey (Ch. 1) by Johnson & Mowry c. The Number Devil by Enzensberger d. Professor Stewart's Cabinet of Mathematical Curiosities by Ian Stewart e. Problem Solving Through Recreational Mathematics by Averbach and Chein	

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College of Arts and Sciences

One approach in solving mathematical problems.

Some ideas to discourage or debunk or disprove:

- a. One only needs to learn numbers and fractions to be mathematically proficient.
- b. Mathematics is a spectator sport. Mathematics is just out there to be discovered and appreciated.
- c. Mathematics is only for the gifted.
- d. One is dumb if he/she cannot solve a mathematical problem right away.
- e. There is only one way to

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College of Arts and Sciences

solve mathematical

problem.

Weeks 10-12 10 hours	At the end of the unit the student must be able to: 1. Use a variety of statistical tools to process and manage numerical data (S) 2. Use the methods of linear regression and correlations to predict the value of a variable given certain conditions (S) 3. Advocate the use of statistical data in making important decisions (V)	Section 2. Mathematics as a Tool (Part 1) I. Data Management Core Idea: Statistical tools derived from mathematics are useful in processing and managing numerical data in order to describe a phenomenon and predict values. 1. Data: Gathering and Organizing Data; Representing Data using graphs and Charts; Interpreting organized data 2. Measures of Central	Activities: a. Lectures b. Work with appropriate computer statistical software c. Class discussions d. Pseudo-proposal defense	Required: a. Mathematical Excursions, 3 rd Edition (International Edition) by Aufmann et al. (Ch. 13) Recommended: a. Mathematics, A Practical Odyssey by Johnson & Mowry (Ch. 4) b. Math in Our World by Sobecki, Bluman, & Schirck-	Evaluation Requirements: a. Quiz b. Test c. Problem set d. Proposal for a quantitative study to be orally proposed

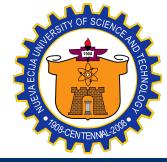
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College of Arts and Sciences

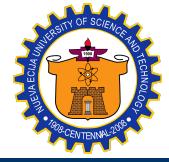
		Tendency: Mean, Median, Mode, Weighted Mean 3. Measures of Dispersion: Range, Standard Deviation and Variance 4. Measures of Relative Position: z-scores, Percentiles, Quartiles and Box-and-Whiskers Plots 5. Probabilities and Normal Distributions 6. Linear Regression and Correlation: Least-Squares Line, Linear Correlation Coefficient	Matthews	
Weeks 12-14 8 hours	At the end of the unit the student must be able to: 1. Apply geometric concepts, especially isometries in	Section 2. Mathematics as a Tool (Part 2) I. Geometric Designs Core Idea: Geometry can help enhance one's artistic prowess as well as enrich one's own	Activities: a. Small group or large class sharing of various indigenous designs found in one's home	Required: a. Geometry: Shapes, Patterns and designs (A) Evaluation Requirements: a. Problem set b. Long test c. Class exhibit created or collected

Course Title: Mathematics in the Modern World	Date Effective: 2nd Semester AY 2022-2023	Date Revised: August 2, 2022	Prepared by: CAS Mathematics and Science Department (MSD)	Approved by: ROEL S. ANG, PhD Chairman, MSD MARIO M. ABESAMIS, Jr., Dean, CAS	Page 14 of 13
--	--	-------------------------------------	--	---	---------------



		describing and creating designs (S) 2. Contribute to the enrichment of Filipino Culture and arts using concepts in Geometry (V)	culture. College of Arts and Sciences	chapter for the Recommended: a. Palaspas by Nochesada	indigenous designs (rubric and peer evaluation)
Weeks 15-16 6 hours	At the end of the unit the student must be able to: 1. Identify the different processes of voting and apportionment (K) 2. Solve problems related to voting and	II. Apportionment and Voting Core Idea: Mathematics can be a powerful tool in the process of voting and apportionment 1. Introduction to Apportionment 2. Introduction to Voting	Activities: a. Small group or large class sharing of experiences in voting in election processes b. Lectures c. Observation and interviews about elections and voting	Required: a. Mathematical Excursions (Ch. 4) by R. Aufmann et al.	Evaluation Requirements: a. Problem set b. Quiz c. Written Report on the student council election

Course Title: Mathematics in the Modern World	Date Effective: 2nd Semester AY 2022-2023	Date Revised: August 2, 2022	Prepared by: CAS Mathematics and Science Department (MSD)	Approved by: ROEL S. ANG, PhD Chairman, MSD MARIO M. ABESAMIS, Jr., Dean, CAS	Page 15 of 13
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	apportionment (S)	3. Weighted Voting System	College of Arts and Sciences		
	3. Observe proper rules and regulations in the election process (V)				
Week 17-18 6 hours	At the end of the unit, the student must be able to: 1. Identify the different kind graphs (K) 2. Solve problems using graphs (S) 3. Organize own schedule by mean of graphing (V)	III. Mathematics of Graphs Core Idea: Graphing can be used to solve problems encountered in real life situation such as in scheduling. 1. Graphs and Euler Circuits 2. Weighted Graphs 3. Euler's formula 4. Graph Coloring	Activities: a. Small group or large class discussions b. Lectures c. Individual and group activities in graphing	Required: a. Mathematical Excursions (Ch. 5) by R. Aufmann et al.	Evaluation Requirements: a. Problem set b. Quiz c. Project making on applications of graph coloring
FINAL EXAMINATION					
Performance of Song Composition (Finals' Project)					

10. References:

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Mathematics in the Modern World	2nd Semester AY 2022-2023	August 2, 2022	CAS Mathematics and Science Department (MSD)	 ROEL S. ANG, PhD Chairman, MSD  MARIO M. ABESAMIS, Jr., Dean, CAS	Page 16 of 13



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Adam, John A. Mathematics in Nature: Modelling Patterns in the Natural World

Adam, John A. A mathematical Nature Walk

Akiyama and Ruiz. A day's adventure in math Wonderland

Aufmann, R. et. Al. mathematical Excursions, 3rd Ed (International Edition)

Averbach and Chein. Problem Solving Through Recreational Mathematics

Enzensberger. The Number Devil

Fisher, Carol Burns. The Language of mathematics

Fisher, Carol Burns. The Language and grammar of mathematics

Hersh, R. What is mathematics really?

Jamison, R. E. Learning the Language of Mathematics

Johnson and Mowry. Mathematics, A Practical Odyssey

Sobecki, Bluman, and Schirck-Matthews. Math in Our World

Stewart, Ian. Nature's Numbers

Stewart, Ian. Professor Stewart's Cabinet of Mathematical Curiosities

Vistro-Yu, C. Geometry: Shapes, patterns and Designs

Video: <https://vimeo.com/9953368>

<http://www.exploratorium.edu/ronh/secret/secret.html>

College of Arts and Sciences

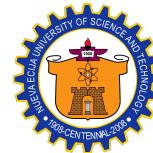
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Mathematics in the Modern World	2nd Semester AY 2022-2023	August 2, 2022	CAS Mathematics and Science Department (MSD)	 ROEL S. ANG, PhD Chairman, MSD MARIO M. ABESAMIS, Jr., Dean, CAS	Page 17 of 13

NEUST-AAF-F002
Rev. 01 (06.17.2019)



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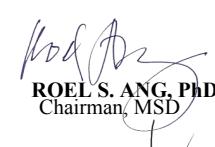
College of Arts and Sciences

11. Course Evaluation:

Students will be graded according to the following criteria:

Quizzes /Long Test/Recitation	-	35 %
Term Examinations	-	30 %
Exercises/Assignments/Problem Sets/Recitation	-	10 %
Projects (Song Composition(Midterm)/Song Performance (Finals)	-	25%
Total		100 %

Minimum passing score is 75%. The final grade is computed by multiplying the tentative grade by 2 plus the midterm grade, divided by 3. The highest grade is 1.00 and the lowest passing grade is 3.00. Failure to comply with one of the above criteria, the student gets a grade of 5.00 or incomplete.

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NEUST-AAF-F002
Rev. 01 (06.17.2019)



12. Grading System:

College of Arts and Sciences

The University Grading System is specified in the matrix below.

Numerical Value	Percentage / Descriptive Equivalent	Numerical Value	Percentage / Descriptive Equivalent	Numerical Value	Percentage / Descriptive Equivalent
1.00	97 - 100%	2.00	85 – 87%	3.00	75%
1.25	94 - 96%	2.25	82 – 84%	5.00	74% & below, Failed
1.50	91 – 93%	2.50	79 – 81%	Inc.	Incomplete
1.75	88 – 90%	2.75	76 – 78%	D	Dropped without Credit

13. Course Materials Made Available: Lectures (PowerPoint Files) / Video Resources/e-copy Book References

14. Committee Members:

CAS Mathematics and Physics Department Faculty, Roel S. Ang, Dr. Mario M. Abesamis Jr.

Course Title: Mathematics in the Modern World	Date Effective: 2nd Semester AY 2022-2023	Date Revised: August 2, 2022	Prepared by: CAS Mathematics and Science Department (MSD)	Approved by:  ROEL S. ANG, PhD Chairman, MSD  MARIO M. ABESAMIS, Jr., Dean, CAS	Page 19 of 13
--	--	-------------------------------------	--	---	---------------

NEUST-AAF-F002
Rev. 01 (06.17.2019)