ATENEO DE MANILA UNIVERSITY
Loyola Schools

SYLLABUS FOR MATH 10
MATHEMATICS IN THE MODERN WORLD

A. COURSE INFORMATION

COURSE NUMBER	MATH 10			**NO. OF UNITS**	3
COURSE TITLE	Mathematics in the Modern World				
PREREQUISITE/S	None				
DEPARTMENT/ PROGRAM	Mathematics			**SCHOOL**	Science and Engineering
SCHOOL YEAR	2023-2024			**SEMESTER**	Second
INSTRUCTOR/S	Durwin C. Santos				
VENUE	SEC-A210 Fully Onsite	**SECTION**	M3	**SCHEDULE**	TF 1230 - 2 PM

B. COURSE DESCRIPTION

MATH 10 is a course that exposes the students to various aspects of human life in which mathematics is used as a tool for analysis, decision-making, and design creation.

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 bunch 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.

WHERE IS THE COURSE SITUATED WITHIN THE FORMATION STAGES IN THE FRAMEWORK OF THE LOYOLA SCHOOLS CURRICULA	
✔	FOUNDATIONS: Exploring and Equipping the Self
	ROOTEDNESS: Investigating and Knowing the World
	DEEPENING: Defining the Self in the World
	LEADERSHIP: Engaging and Transforming the World

C. CORE CORRICULUM LEARNING OUTCOMES (CCLOs)

LEGEND:	
CCLO 1	Demonstrate effective communication skills (listening and speaking, reading and writing) in English and Filipino.
CCLO 2	Evaluate information and issues in various spheres of life using mathematical reasoning and statistical tools to process and manage data.
CCLO 3	Propose ways to address pressing social and ecological problems using appropriate critical approaches and scientific thinking
CCLO 4	Develop a creative and moral imagination that is responsive to contemporary global realities and challenges, but also deeply rooted in local histories, conditions, norms, and institutions.
CCLO 5	Internalize the significance and value of her/ his unique existence and purpose in life in light of Christian faith.
CCLO 6	Discern life choices with a keen awareness of ethical dilemmas and considerations.
CCLO 7	Exemplify a commitment to enhancing human life and dignity, especially those who are excluded and in greatest need.
CCLO 8	Practice a vision of leadership and committed citizenship rooted in Christian humanism.

Alignment of Program to the Core Curriculum Learning Outcomes

The Ideal Ateneo Graduate: A Person of Conscience Competence Compassion Commitment							
CCLO 1	CCLO 2	CCLO 3	CCLO 4	CCLO 5	CCLO 6	CCLO 7	CCLO 8
✔	✔	✔					

D. COURSE LEARNING OUTCOMES

Alignment of the Course to the Core Curriculum Learning Outcomes

The Ideal Ateneo Graduate: A Person of Conscience Competence Compassion Commitment							
CCLO 1	CCLO 2	CCLO 3	CCLO 4	CCLO 5	CCLO 6	CCLO 7	CCLO 8
CLO1, CLO2, CLO3, CLO4a	CLO2, CLO4a, CLO4b	CLO2, CLO4a, CLO4b, CLO4c					

By the end of this course, students should be able to:

COURSE LEARNING OUTCOMES	
CLO1:	Discuss and argue about the nature of mathematics, what it is, how it is expressed, represented, and used;
CLO2:	Know and use different types of reasoning to justify statements and arguments made about mathematics and mathematical concepts;
CLO3:	Discuss the language and symbols of mathematics;
CLO4a: CLO4b: CLO4c:	Discuss and identify the usefulness and strengths, as well as the weaknesses and limitations, of using statistical tools to analyze data Use a variety of statistical tools to process and manage numerical data Generate reports that use a variety of statistical tools and convey accurate information

E. COURSE OUTLINE AND LEARNING HOURS

Course Outline	Topics	CLOs	Estimated Learning Hours
MODULE 1: Mathematics in the World This module highlights the ubiquity and usefulness of mathematics. This is carried out by discussing mathematical patterns or concepts both in nature and in human history. At the end of this module, students should be able to ● Identify patterns in nature and regularities in the world ● Articulate the importance of mathematics in one's life ● Express appreciation for mathematics as a human endeavor **Assessments:** Individual Project, Discussion Forum	- Nature of Math - History and Development of Math - Applications of Math	CLO1	10
MODULE 2: Mathematical Language and Symbols This module highlights the nature of mathematics as a language. This is carried out by comparing and contrasting mathematical language with other languages and also expounding on the conventions used in certain mathematics topics. At the end of the module, students should be able to ● Discuss the language, symbols and conventions of mathematics ● Convey ideas precisely and accurately using fundamental language and symbols of mathematics ● Compare and contrast mathematical language with other languages (e.g., English)	- Math as a Language - Propositions - Negation, Conjunction, Disjunction - De Morgan's Laws - Conditionals, Related Statements - Quantifiers	CLO1, CLO2, CLO3	15

● Acknowledge that mathematics is a useful language **Assessments:** Quiz, Discussion, Activity			
MODULE 3: Problem Solving and Reasoning This module highlights the mathematical processes of problem solving and reasoning. This is carried out by discussing different types of reasoning and methods in problem solving. More importantly, students will be engaged in the processes involved. At the end of the module, students should be able to ● Use different types of reasoning to justify mathematical statements and arguments ● Demonstrate a method for carrying out problem solving (e.g., Polya's model) ● Demonstrate appropriate mindset and attitude towards problem solving **Assessments:** Quiz, Problem Set, Discussion, Activity	- Inductive and Deductive Reasoning - Exercises vs. Problems - Polya's Problem Solving Method - Heuristics vs. Algorithms	CLO1, CLO2, CLO3	25
MODULE 4: Data Management This module highlights how statistical methods can be used to process and manage data. This is carried out by discussing various statistical tools and their proper use. Students will also be engaged in the practice of managing and presenting data. At the end of this module, students should be able to ● Use a variety of statistical tools to process and manage numerical data ● Generate reports that use a variety of statistical tools and convey accurate information ● Use mathematics in other areas like the social and managerial sciences ● Advocate the use of statistical data in making important decisions **Assessments:** Group Project, Discussion, Activity	- Branches of Statistics - Statistical Variables - Population, Sample; Sampling Methods - Data Presentation - Measures of Central Tendency (MCTs) - Measures of Variability (MVs) - Effects of Outliers on MCTs and MVs - Measures of Relative Position - Shape of Data and the Normal Distribution - Linear Regression, Linear Correlation Coefficient	CLO4a, CLO4b, CLO4c	25
MODULE 5: Applications (Making Social Choices) This module discusses different voting methods focusing on voter's preferences. Weighted voting systems will also be covered to introduce students to voting based on weights or shares that the voters have. The concept of apportionment will also be discussed for students to learn methods of allocation of resources. At the end of the module, students should be able to • Use mathematical concepts and tools in voting and apportionment	- Voting Systems - Weighted Voting System - Apportionment	CLO5	15

• Determine the most appropriate voting method in a given situation • Produce a valid and fair apportionment Apply the concepts of voting and apportionment in real life situations. **Assessments:** Quiz, Discussion, Activity			

See section M for a more detailed timetable, including assessment due dates.

F. ASSESSMENTS AND RUBRICS

Assessment Tasks	Assessment Weight	CLOs
Written Output (Module 1) Discussion boards are designed to engage students more meaningfully in the learning process. Participating in the discussion forum is an opportunity for students to discuss and communicate their ideas and learning and will be required.	**5%** (25 points)	CLO1, CLO4a
Individual Project (Module 1) Projects enable students to work on authentic tasks.	**5%** (25 points)	CLO1
Quizzes In Modules 2, 3 and 5, quizzes will be administered to measure the students' learning progress. The quizzes will be held during class time and will be **Zoom-proctored**.	**50%** (250 points)	CLO2, CLO3, CLO4a, CLO4b
Group Project (Module 3) Projects enable students to work on authentic tasks. When carried out in groups, students are also able to learn with and from their peers.	**20%** (100 points)	CLO1, CLO4b, CLO4c
Online Activities (Modules 2,3,4,5) There will be several online activities including, but not limited to, assignments, practice exercises and discussion boards. This also includes general student participation both in Canvas and in synchronous sessions. These are designed to engage students more meaningfully in the learning process. Participating in the discussion forum is an opportunity for students to discuss and communicate their ideas and learning and will be required.	**5%** (25 points**)**	CLO1, CLO2, CLO3, CLO4a
Problem Set (Module 3)	**15%** (75 points)	

Refer to Section M (Course Timetable) for the schedule of submission of the course requirements.

RUBRICS:

Discussion Forum

Content. Evidence of having read the reading, watched the video, or picked up ideas from discussions in class	30%
Understanding. Correct interpretation/understanding of ideas	30%
Contribution. Additional thoughts to the core idea(s)	20%
Mechanics. Language and coherence, adherence to instructions, etc.	20%
TOTAL	**100%**

Quizzes, Homework, Problem Set

Completeness and Substantial Attempt. All the required parts of the question were answered. There was evidence of substantial attempt(s) to solve the task. Even attempts that do not seem to work or lead to dead-ends can be written down.	25%
Sound and Appropriate Strategy. The strategies used in attempting to solve the task were appropriate. The mathematics was sound.	35%
Communication and Explanation of Work. The attempts or solutions were completely and clearly explained. The presentation was legible and well-organized.	35%
Correct Answer. The final answer is correct.	5%
TOTAL	**100%**

Project

Content. Data or information are presented in a clear and accurate manner. The required elements are present.	40%
Organization and Mechanics. Report content is well-organized, where the information and recommendations are based on the data presented. Sources are cited properly and there are no typographical or grammatical errors.	30%
Aesthetic Value. Visual and auditory elements meaningfully contribute to conveying the information in the presentation.	15%
Insight. A good amount of insight is drawn, and correct interpretations are made from the data. Discussion is not limited to only quantitative aspects but also includes interdisciplinary factors wherever possible.	15%
TOTAL	**100%**

Online Activities

Comprehension. Participation reflects a clear understanding of the topic.	40%
Contribution. Contributions in activities are insightful and relevant.	45%
Correct Answer. The final answer is correct.	5%
Community. Participation elicits productive participation from others and demonstrates a respect for diverse views.	10%
TOTAL	**100%**

G. TEACHING AND LEARNING METHODS

TEACHING & LEARNING METHODS and ACTIVITIES	CLOs
Asynchronous Online Lectures The course will be delivered mainly through Canvas. It contains various created or curated materials put together to deliver the lessons. These materials include: ● Handouts ● Websites ● Video lectures or video clips ● Tutorials for using related technological tools	CLOs 1 – 4
Synchronous Lectures The course is mainly synchronous onsite. The synchronous lectures will not be repetitions of the asynchronous lectures, instead they will be enrichment sessions which can cover solving new problems or discussing different aspects of the lesson.	CLOs 1 – 4
Online Discussions Discussion forums are integrated in the asynchronous online lectures. These provide students opportunities to share comments or insights about the lesson. More importantly, they are venues where students can interact and learn from each other.	CLOs 1 – 4
Exercises There are exercises integrated in the asynchronous online lectures. Other exercises from the textbook or other materials may also be assigned separately. Frequent and timely exercises will hone students' skills on the subject and it will enable them to check on their own understanding.	CLOs 1 – 4
Readings There are some readings that will be assigned for students to read. These readings aim to enrich one's understanding and appreciation of mathematics.	CLOs 1 – 4
Various Assessment Tasks As enumerated in Section F, there are a variety of assessment tasks for this course. These are also by themselves activities to activate student learning.	CLOs 1 – 4

H. REQUIRED READINGS

- **Textbook:** Garces, I. L., De Lara-Tuprio, E. P., Garciano, A. D., Buot, J. C., Sarmiento, J. F., & Bataller, R. T. (2019). *Mathematical Ideas and Tools for the Modern World*. Quezon City: Vibal Group.
- **Other Readings:**

[1] Aufmann, R., Lockwood, J., Nation, R., & Clegg, D. (2018). **Mathematical excursions** (4th ed.). Cengage.
[2] Burns, C. JVF. (n.d.). The language of mathematics. In **Cat-on-swing** (pp. 1–12). http://www.onemathematicalcat.org/cat_book.htm
[3] Devlin, K. (2000). Prologue: What is mathematics? In *The language of mathematics: Making the invisible visible* (pp. 1–12). W.H. Freeman and Co.
[4] *How numbers work: Discover the strange and beautiful world of mathematics*. (2018). Boston, MA: Nicholas Brealey Publishing.
[5] Levin, O. (2016). *Discrete Mathematics: An Open Introduction*. 12th Media Services.
[6] Orlin, B. (2018). *Math with Bad Drawings: Ideas Stick Figures = Enlightenment*. Hachette Books.

I. SUGGESTED READINGS

[1] Baber, R. L. (2011). *The language of mathematics: Utilizing math in practice*. Hoboken, NJ: Wiley.
[2] Bellos, A. (2017). *Can you solve my problems?: A casebook of ingenious, perplexing and totally satisfying puzzles*. London: Guardian Books.
[3] Beveridge, C. (2016). *Cracking mathematics: You, this book and 4,000 years of theories*. London: Cassell Illustrated.
[4] Darling, D., & Banerjee, A. (2018). *Weird math*. Basic Books.
[5] Devlin, K. (2000). *The language of mathematics: Making the invisible visible*. W.H. Freeman and Co.
[6] Devlin, K. (2012). *Introduction to mathematical thinking*.
[7] Ellenberg, J. (2014). *How not to be wrong, the power of mathematical thinking*. Penguin Books.
[8] Epp, S. S. (2019). *Discrete mathematics with applications*. Boston, MA: Cengage Learning.
[9] Hugo, B. (2014). *Foolproof and other mathematical meditations*. MIT University Press.
[10] Khare, A., & Lachowska, A. (2015). *Beautiful, simple, exact, crazy mathematics in the real world*. Yale University Press.
[11] Posamentier, A. (2015). *Problem solving in mathematics and beyond*. World Scientific.
[12] Posamentier, A., & Krulik, S. (1998). *Problem-solving strategies for efficient and elegant solutions*. Corwin Press.
[13] Posamentier, A. S., Geretschläger, R., Li, C., & Spreitzer, C. (2017). *The joy of mathematics marvels, novelties, and neglected gems that are rarely taught in math class*. Amherst, NY: Prometheus Books.
[14] Rosen, K. H. (2019). *Discrete mathematics and its applications*. New York, NY: McGraw-Hill.
[15] Scheinerman, E. (2017). *The mathematics lover's companion*. Yale University Press.
[16] Sobecki, D., & Bluman, A. (2015). *Math in our world* (3rd ed.). McGraw Hill.
[17] Stewart, I. (1995). *Nature's numbers*. Basic Books.
[18] Stewart, I. (2010). *Professor Stewart's cabinet of mathematical curiosities*. London: Profile Books.
[19] Stewart, I. (2017). *The beauty of numbers in nature*. MIT University Press.
[20] Strogatz, S. H. (2014). *The joy of x: A guided tour of math, from one to infinity*. London: Atlantic Books.
[21] Tannenbaum, P. (2018). *Excursions in modern mathematics* (9th ed.). Pearson.

J. GRADING SYSTEM

Each assessment task listed in Section F will be individually marked. Using the assessment weights indicated, the weighted average of the scores will be computed. This will be the numeric grade for the course. The conversion table on the right will be used to determine the corresponding letter grade.

Final Grade Conversion	
92 – 100	A
86 – 91	B+
77 – 85	B
69 – 76	C+
60 – 68	C
50 – 59	D
Below 50	F

3 Quizzes	250 points
Individual Project	25 points
Group Project	100 points
Discussion, Assignments, Other Activities	50 points
Problem Set	75 points
TOTAL	500 points

$$\boldsymbol{Final\ Grade} = \frac{\boldsymbol{Total\ Raw\ Score}}{\mathbf{500}} \times \mathbf{100}$$

K. CLASS POLICIES

1. **Learning Platform.** This course will be conducted primarily through onsite sessions with the materials accessible through the Ateneo Canvas platform, with some online sessions to be held via Zoom. The student's Canvas account should bear the student's full name. The student's recent picture should be used as profile photo. Thus, students will need to have good enough Internet connection to participate according to the original intent of the course. However, students who may have limited or no internet connection may request for a portable learning packet (PLP) through LS One (www.ateneo.edu/lsone).

2. **Course Materials.** All materials in the course modules and recordings of online sessions should not be posted in any social media platform nor shared with individuals who are not enrolled in the class. Infringements may result in disciplinary actions.

3. **Course Announcements and Other Communications.** The instructor will communicate with the students via announcements on Canvas or via their OBF e-mails. Students are expected to check Canvas and their OBF accounts regularly. Students who wish to contact the teacher should do so only through email or Canvas. Students should refrain from sending emails outside office hours (Mon-Fri, 8:00am – 5:00pm).

4. **Textbook.** Students are encouraged to have a copy of the textbook as a reference for lectures and practice exercises. You may buy a copy either from the LS bookstore or direct from the publisher.

5. **Computing Tools.** Students may have a standard scientific calculator at their disposal for this course. Students will also benefit from the use MS Excel in some modules.

6. **On-site and Online Synchronous Sessions.** The entire course will be mostly synchronous onsite sessions. Online synchronous sessions, if any, will be held via Zoom and will be recorded. The recordings will be made available to the class. For days without a synchronous session, students are expected to accomplish tasks even without meeting the teacher. See tentative calendar below.

7. **Attendance.** Attendance will be checked. The maximum number of absences allowed is six (6). A student who exceeds this number will automatically get a W (Withdrawal) for this course.

8. **Graded Assessments.** Long tests, quizzes, group activities will be administered **ONSITE,** and will be timed.
    - Penalties (e.g. a zero in that graded requirement) will be imposed on submissions that are either completed after the deadline or are not compliant to the guidelines set by the teacher.
    - Should there be any mistake in the checking of any graded requirement, a student has two days after the said requirement is returned to report the oversight to the teacher. . Any late requests will not be entertained.
    - Failure to submit at least one major requirement will entail a grade of INC.

8. **Makeup Assessments**. A make-up long test or quiz will be given only if the student has a valid reason for missing it. To procure approval, the student must write a letter of request to the teacher within two days after the missed assessment. This should include the reason for missing the long test. Other supporting documents (if any) may be emailed with the letter. Makeup long tests will be onsite, and is usually more challenging than the regular long test.

9. **Course Grades.** Grades computed by the Canvas platform are not official. Students should keep a record of their scores and know how to compute for their grades as indicated in this syllabus. The official grade of the student in the course is the grade that is posted by the Registrar and reflected in the student's AISIS account.

10. **Consultations.** Onsite and online consultations with the teacher are to be scheduled only during official consultation hours. Requests for consultation outside class hours are subject to the approval of the teacher. In an online consultation, there should be at least three people (including the teacher) in the meeting room. In this instance, the third person in the meeting room cannot be a relative of the student.

11. **Academic Integrity.** Students are expected to exercise the highest level of academic integrity. Cheating or plagiarism will not be tolerated and will be treated as a grave offense. Disciplinary action will be pursued, following the process set by the university. Cheating during any graded activity includes, but is not limited to, posting of answers or hints related to any graded work in any online (e.g. social networking sites, chats) or offline (e.g. text messages) platform.

12. **Academic Conduct and the Loyola Schools (LS) Gender Policy.** Students are expected to treat their peers and teacher with respect at all times even in an online environment. Committing any form of discourtesy or misbehavior may lead to disciplinary action. In addition, Ateneo de Manila University does not discriminate on the basis of sex, gender, marital or parental status, sexual orientation, or gender identity or expression.

13. **Provisions to Convert to a Fully Online Class**. If, due to unforeseen events (e.g. health emergency) this course is converted to a fully online class, then all affected onsite sessions will automatically be online synchronous sessions held via Zoom. Attendance will still be monitored based on the Reports setting in Zoom. Moreover, all affected assessments will be taken online. The Math Department Proctoring Protocol for Fully Online Students will be strictly implemented.

14. **Covid-19 Exposure Protocol.** Students who are symptomatic or tested positive for COVID 19 should report the information directly to the Office of Health Services for verification (email : healthservices.ls@ateneo.edu; contact numbers 09189445997 or local 5110). In addition, notify your instructor if you are symptomatic, tested positive for COVID 19, or have been identified as a close contact of someone who tested positive for COVID 19.

L. CONSULTATION HOURS

NAME OF FACULTY	EMAIL	DAY/S	TIME
Durwin C. Santos	dsantos@ateneo.edu	TF	730 – 8am 11am – 1230pm

M. COURSE TIMETABLE

MONDAY	TUESDAY	WED	THURSDAY	FRIDAY
Jan 15	Jan 16 Class Orientation; ONLINE	Jan 17	Jan 18	Jan 19 Module 1 lecture ONLINE
Jan 22	Jan 23 Module 1 lecture	Jan 24	Jan 25	Jan 26 Module 1 lecture
Jan 29	Jan 30 Due Individual Project	Jan 31 MATH10 Plenary Talks Leong Hall 9:30am – 12nn and 1:30pm-4pm	Feb 1	Feb 2 Module 1 Assessment Deadline
Feb 5 President's Day	Feb 6 Module 2 lecture	Feb 7	Feb 8	Feb 9 Module 2 lecture
Feb 12	Feb 13 Module 2 lecture	Feb 14	Feb 15	Feb 16 Module 2 lecture
Feb 19	Feb 20 Module 2 lecture	Feb 21	Feb 22	Feb 23 QUIZ 1 Module 2
Feb 26	Feb 27 Module 3 lecture	Feb 28	Feb 29	Mar 1 Module 3 lecture Release of Problem Set
Mar 4	Mar 5 Module 3 lecture	Mar 6	Mar 7	Mar 8 Module 3 lecture
Mar 11	Mar 12 QUIZ 2 Module 3	Mar 13	Mar 14	Mar 15 Due Problem Set
Mar 18	Mar 19 Module 4 lecture	Mar 20	Mar 21	Mar 22 Module 4 lecture
Mar 25 Holy Week break	Mar 26 Holy Week break	Mar 27 Holy Week break	Mar 28 Holy Week break	Mar 29 Holy Week break
Apr 1	Apr 2 Module 4 lecture	Apr 3	Apr 4	Apr 5 Module 4 lecture
Apr 8	Apr 9	Apr 10	Apr 11	Apr 12

	Araw ng Kagitingan			Due Newsletter Partial Results
Apr 15	Apr 16 Module 4 lecture	Apr 17	Apr 18	Apr 19 Module 4 lecture
Apr 22	Apr 23 Module 5 lecture	Apr 24	Apr 25	Apr 26 Due Group Project Module 5 lecture
Apr 29	Apr 30 Module 5 lecture	May 1 Labor Day	May 2	May 3 Module 5 lecture
May 6	May 7 QUIZ 3 Module 5	May 8	May 9 Study Day	May 10 Study Day
May 13	May 14	May 15	May 16	May 17

N. SOME ANNOUNCEMENTS

1. **First Synchronous Session**

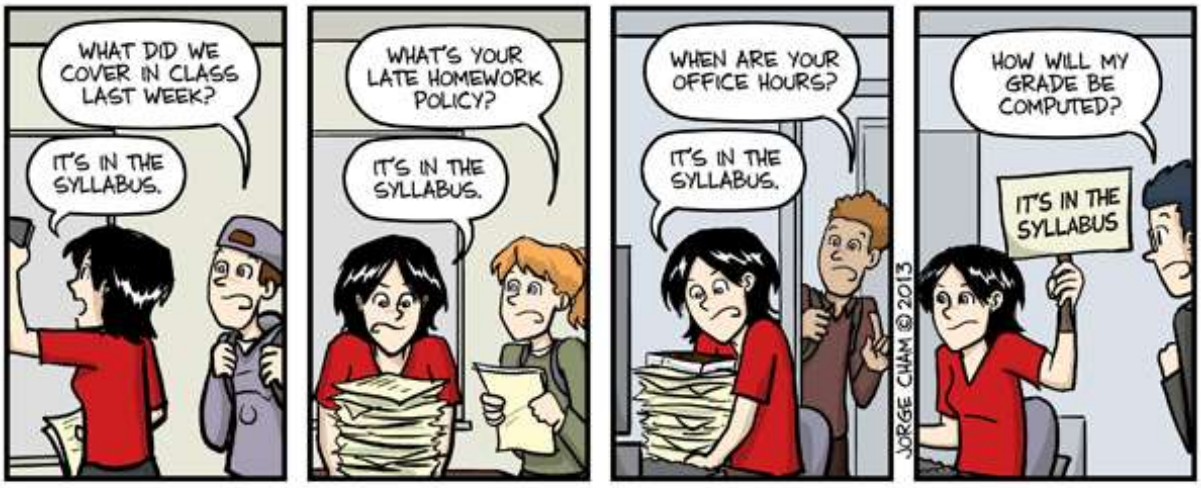
   Our first synchronous session will be held ONLINE via Zoom on January 16, 2024, Tuesday, class time. I encourage you to attend our first synchronous session so you could ask questions about the syllabus and the course in general.

2. **Zoom details:**

   Meeting ID: 369 430 2494
   Passcode: 073304

3. **How to purchase the textbook**

   a) via the Vibal Group, Inc. website: https://shop.vibalgroup.com/products/mathematical-ideas-and-tools-for-the-modern-world-college
   b) via the Loyola Schools Bookstore (email address: bookstore.ls@ateneo.edu)



IT'S IN THE SYLLABUS

This message brought to you by every instructor that ever lived.

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