MATH-1250-MO1, Math Thinking in the Real World, Fall 2017

Course Information.

Course name:	Math Thinking in the Real World
Course Number:	MATH-1250
Course section:	MO-1
Meeting times:	MWF, 10:00-10:50
Semester:	Fall 2017
Credit hours:	3
Prerequisite(s):	Math-Index at least 750 or a grade of "C−" or better in MATH 1200 (College Algebra) or equivalent. (An understanding beyond MATH 0260 is needed.)

Instructor Information

Name: Ana Granados
Office hours: MTWF 12:00-12:50 and by appointment.
Math Office, Padre Arrupe Hall, 1st fl.
Contact: ana.granados@slu.edu
Biography: Terminal Degree: Ph.D.Mathematics (Universidad Autónoma de Madrid)

Course Objectives

This course is aimed at first and second-year students who *do not need to take* College Algebra but who do need a math course in order to satisfy the math core requirement.

We study some of the greatest ideas of mathematics used in our modern-day world that are often hidden from view in lower division courses.
The class is in seminar format - class time will be spent in discussion and group activities. An important component of the class is that it should be fun. The ideas discussed in the course are among the most beautiful and elegant of the ideas of humankind.
Although Math 1200 College Algebra is a stated prerequisite, the course does not require students to have mastered all the material of College Algebra. What it does require is an ability and commitment to think hard and logically about all kinds of interesting questions.

This course is appropriate for students majoring in the humanities and social sciences.

Course description:

The course emphasizes strategies of thought and analysis in examining topics ranging from electoral systems, to having secure email accounts (hackers), to understanding big numbers and homeopathy, to using graph theory to understand how vaccination works, to attempt to understand uncertainty and risk.

Learning outcomes:

On successful completion of the course the student will have the following abilities: Students will

- Be able to apply rigorous thought to several situations, including critically reading news.
- Understand the math behind electoral systems (plurality, Borda, antiplurality and beyond). D'Hont Law, Electoral College, Second round. Power indexes.
- Operate with the basics of modular arithmetic and understanding the basics of public key cryptography.
- Be able to grasp large numbers, prime numbers.
- Apply Pythagorean Theorem in real life situations; acknowledge the existence of non-Euclidean geometries and identify some in their daily routines.
- Know the basics of Graph Theory and apply it to social network, vaccinations, scheduling.
- Know the basics of probability and apply it to real world situations (*e.g.*, Sally Clark's trial)
- Know the basics concepts of statistics, differentiating among them, and using Excel to calculate them.
- Be able to grasp the notions of infinity, fractals and chaos.

Text book

Required reading: Edward B. Burger and Michael Starbird, ***The Heart of Mathematics (3rd edition),*** Key College Publishing, 2005. The text has a companion web site, which allows you to surf the book (download sample pages from each chapter in pdf format) and try some of the activities on the CD-ROM that comes with the text.

Required work

1) There will be three in-class exams. You will not be expected to memorize complex formulas or perform complicated math algebraic operations. The problems will stress interpretation.

2) There will be a common comprehensive final exam. It will stress problem solving and interpretation. The exam is cumulative. It will cover the **entire semester's material**, and will last two hours.

3) There will be *compulsory homework* and *recommended homework*. During the week, homework problems will be posted in blackboard to be solved in order to help you understand the material. The *recommended homework* will NOT be collected, even though it is strongly recommended that you solve all of the problems and I will be happy to assist you with any questions you might have. The **compulsory homework** will be randomly collected, and your homework grade will be based on success with these problems. You should come to class with the compulsory homework solved; you should expect your homework to be collected at least 8 times during the semester.

4) We will *read the newspaper through Mathematician's eyes*. Every three weeks, on Wed., you will be expected to bring some new you found in an English-written newspaper (on-line publications accepted) with a mathematical analysis of at least half page and at most a full page done.

Late work:

Make up exams are not given. If an exam is missed due to an excused absence (see paragraph below), a make up exam will be given *the same day of the final exam*. Exams that are missed illegitimately result in a score of 0 in the final grade. Missing more than one exam results in an F grade for the entire course.

Excused Absences:

Legitimate conflicts and excuses require written documentation and are limited to death or near death instances in the immediate family, a student's illness that requires immediate doctor's care (with the corresponding doctor's note), a University sponsored event (not club sports) and regularly scheduled religious obligations. The documentation must be presented on the day the student returns to the university. Excuses that will NOT be considered include personal travel arrangements, non-University sponsored events, a conflicting appointment, or an illness that does not prevent you from coming to the exam.
If an absence is unavoidable, it is the student's responsibility to find out what was covered in class and to secure notes from another student.

Attendance and punctuality:

Although not mandatory, I strongly urge you to attend all classes. On the other hand, you will be responsible for any announcements, information, problems or course changes that are made in all lectures. Students are expected to arrive on time to the lectures. Repeated lateness will not be tolerated. So, please, come to class on time and do not leave early. Anything else is rude and disruptive.

Grading system

Three in-class exams and a final exam will be given in this course. Grading will be a combination of your results on those exams, newspaper analysis and compulsory homework.

Compulsory homework	10%	..	Newspaper analysis	10%
In-class exams	55%	..	Final exam	25%

Evaluation:

- Compulsory homework: a list of problems will be presented every Friday. Some of these problems will be randomly collected on the Wednesday of the next week, graded, and returned to you. I will be available for help. A good presentation will be required.
- Newspaper analysis: taking stories that may not seem to involve math at all and demonstrating how mathematical naïveté can put readers at a distinct disadvantage, and even mislead them.
- In-class exams: 50 minutes exams consisting of some problems related to the material covered in class.
- Final exam: it is cumulative. It will cover the **entire semester's material**, will be a two hour exam, and will be similar in form to the in-class exams.

Participation:
Active participation during the lectures by asking interesting questions or bringing interesting material will have a positive impact on your final grade.

Important dates

- **September**:
  - 4 Mon: First day of classes.
  - 17 Sun: Last day to DROP a class without a grade of "W" and/or add a class.
  - 17 Sun: Last day to choose audit (AU), or Satisfactory/Unsatisfactory(S/U).
  - 27 Wed: First exam.
- **October:**
  - 12-13 Th-Fri: Holiday (University closed)
  - 15 Th: Last day to submit transfer application for Spring semester.
  - 25 Wed: Second exam.
  - 30 Mon: Last day to drop a class and receive a "W".
- **November:**
  - 1 Wed: Holiday (University closed)
  - 2 Th: Registration for Spring semester begins.
  - 9 Th: Holiday (University closed)
  - 20 Mon: Third exam.
- **December:**
  - 6 Wed: Holiday (University closed)
  - 8 Fri: Holiday (University closed)
  - 13 Wed: Final day of classes.
  - 15 Fri: Final Exam (8:30-11:30 am)

For other important dates, visit
http://www.slu.edu/madrid/academics/registrar/academic-calendar/fall-2017

Some important notes:

1. This course will be on a lecture-discussion type system, but it cannot happen unless you are willing to discuss and ask questions. Very imaginative and elegant ideas will be discussed here, and I expect the course to be fun and beautiful.
2. If you are having difficulty with the material, please feel free to see me during office hours or make an appointment. Please bring along your homework notebook so that I can be sure of what it is you do not understand.
3. Try to work daily on your material so that you do not lag behind.
4. Remember this is not going to be a traditional mathematics course. While you will learn how to think mathematically, we will not face complicated arithmetic or calculations. What is more important is that you understand the true nature of mathematics and how some of the greatest ideas in mathematics are used in our modern-day world. Do not be afraid of them.

I encourage you to contact me at anytime if you are having difficulties. Please do not wait until one week before the end of the term.

Things that you shouldn't do in this class:

1. Miss classes.
2. Be late to the lectures. Not only is disruptive and disrespectful to other students, but you would miss the most important part of the lecture, where I say what we are going to do and might do a short review of what we did in the previous class.
3. Use your phone during the lectures, unless it is part of an activity organized by me.
4. Get up and walk out of the class. If you are planning to get out to take care of some urgent issue, let me know in advance.

5. Think that by just coming to class you have all the work done. Practice is needed to learn the material.
6. Try to study everything two days before the test.
7. Skip homework or copy it from someone else. This is completely useless, since homework is given in order to help you learn.

Academic Honesty and Plagiarism:

Academic integrity is honest, truthful and responsible conduct in all academic endeavors. The mission of Saint Louis University is "the pursuit of truth for the greater glory of God and for the service of humanity." Accordingly, all acts of falsehood demean and compromise the corporate endeavors of teaching, research, health care and community service via which SLU embodies its mission. The University strives to prepare students for lives of personal and professional integrity, and therefore regards all breaches of academic integrity as matters of serious concern.

The governing University-level Academic Integrity Policy can be accessed on the Provost's Office website at: http://www.slu.edu/Documents/provost/academic_affairs/University-wide%20Academic%20Integrity%20Policy%20FINAL%20%206-26-15.pdf. Additionally, SLU-Madrid has posted its academic integrity policy online: http://www.slu.edu/madrid/academics. As a member of the University community, you are expected to know and abide by these policies, which detail definitions of violations, processes for reporting violations, sanctions and appeals. The professor will review these policies during the first weeks of the term: please direct questions about any facet of academic integrity to your professor, the chair of the department of your academic program or the Academic Dean of the Madrid Campus.

Only non-graphing scientific calculators may be used in tests or in the final examination. Other calculators and devices will be taken from students during the exam and students may have to start the exam again. Not following this regulation will be considered a violation of the academic honesty code.

Accomodation statement

In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. Students who think they might benefit from these resources can find out more about:

- Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
- University-level support (e.g., tutoring/writing services, Disability Services) by visiting the Academic Dean's Office (San Ignacio Hall) or by going to http://spain.slu.edu/academics/learning_resources.html.

Students with a documented disability who wish to request academic accommodations must contact Disability Services to discuss accommodation requests and eligibility requirements. Once successfully registered, the student also must notify the course instructor that they wish to access accommodations in the course. Please contact Disability Services at disabilityservices-madrid@slu.edu or +915 54 58 58, ext. 230 for an appointment. Confidentiality will be observed in all inquiries. Once approved, information about the student's eligibility for academic accommodations will be shared with course instructors via email from Disability Services. For more information about academic accommodations, see "Student Resources" on the SLU-Madrid webpage.

Note: Students who do not have a documented disability but who think they may have one are encouraged to contact to Disability Services.

Student Outcome Assessment:

In order to maintain quality academic offerings and to conform to accreditation requirements, SLU-Madrid regularly assesses its teaching, services and programs for evidence of student learning. For this purpose, SLU-Madrid keeps representative examples of student work from all courses and programs on file, including assignments, papers, exams, portfolios and results from student surveys, focus groups and reflective exercises. Copies of your work for this course may be kept on file for institutional research, assessment and accreditation purposes. If you prefer SLU-Madrid not to retain your work for this purpose, you must communicate this decision in writing to your professor.

Title IX

Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty member must notify SLU's Title IX deputy coordinator, Marta Maruri, whose office is located on the ground floor of Padre Rubio Hall, Avenida del Valle, 28 (mmaruri@slu.edu; 915-54-5858, ext. 213) and share the basic fact of your experience with her. The Title IX deputy coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.

If you wish to speak with a confidential source, you may contact the counselors at the SLU-Madrid's Counseling Services on the third floor of San Ignacio Hall (counselingcenter-madrid@slu.edu; 915-54-5858, ext. 230) or Sinews Multiple therapy Institute, the off-campus provider of counseling services for SLU-Madrid (www.sinews.es; 917-00-1979). To view SLU-Madrid's sexual misconduct policy and for resources, please visit the following web address:http://www.slu.edu/Documents/Madrid/campus-life/SLUMadridSexualMisconductPolicy.pdf.

Course outline

(Subject to change). Selected from:

Chapter 1. Fun and Games: An Introduction to Rigorous Thought.

Chapter 9. Deciding Wisely (Extra material will be provided to the students for a deeper study of the topics of this chapter will be carried). Electoral systems (Trump, Macron). Excel as a tool in mathematics.

Chapter 6. Graph theory. Applications to vaccination, social network, scheduling.

Chapter 8. Taming Uncertainty (Extra material and Excel as well).

Chapter 2. Number contemplation (emphasis in public key cryptography and large numbers). Homeopathy; security in Instagram, Snapchat, etc.; hacking emails.

Parts of Chapters 3, 4 or 5: Infinity; Pythagorean Theorem; non-Euclidean geometries; knots and links.