“Equations are just the boring part of mathematics.” — Stephen Hawking

Where am I?

You are in the M310P Plan II Mathematics course Through the Lens of Mathematics. Your instructor is Professor Dan Knopf. Lectures meet 9:30–10:45 Tuesdays and Thursdays in CMA 3.114.

Why am I here?

Think of this as a “music appreciation” course — except for math, not music. You are here to explore what insights can be gained by looking at the world though the lens of mathematics. We will use examples from nature, art, and architecture, as well as other sources, to explore four broad themes:

1. Certainty versus Uncertainty: how mathematics helps us make better decisions when examining evidence, and update our opinions when we acquire new facts. We will encounter concepts from probability and statistics.

2. Symmetry: how mathematics can help us discover a rich structure behind the natural or human-made symmetries that we find in the world around us. We will encounter the mathematical concept of group theory.

3. Modeling and Optimality: how mathematical models help us find the best solutions to problems. Mathematical topics that we will encounter include modeling, the calculus of variations, and graph theory.

4. Pattern and Abstraction: what mathematics can teach us about repeating patterns in nature and art. Mathematical concepts that we will encounter include self-similarity, dimensional analysis, fractals, and tiling theory.

We will avoid equations and computations as much as possible. Instead, we will focus on exploring “big ideas” of mathematics: principles and themes that can enrich and illuminate how everyone — not just mathematicians! — views natural and human-made parts of our world.

How can I get extra help?

- My contact information is below. I encourage you to come to me or your Teaching Assistant for individualized help if needed.

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<thead>
<tr>
<th>Name</th>
<th>E-mail</th>
<th>Office</th>
<th>Office hours</th>
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<tbody>
<tr>
<td>Dan Knopf</td>
<td><a href="mailto:danknopf@mail.utexas.edu">danknopf@mail.utexas.edu</a></td>
<td>PMA (RLM) 9.152</td>
<td>11:30–1:30 Mondays</td>
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- This course uses CANVAS. This syllabus, class announcements, lecture PowerPoint summaries, assignments, answer guides, and and supplementary learning materials will be posted there. The University encourages you to access Canvas and all other campus resources through the portal my.utexas.edu.

- This course is supported by PLUS (Peer-Led Undergraduate Studying). PLUS study groups provide opportunities to collaboratively practice skills and apply knowledge you need for success in the course. Attending study groups regularly is a great way to ensure you are keeping up with the material so that you don’t fall behind. Feel free to attend any study group at any point in the semester; more
information on times and locations will be available through Canvas and also announced in class. For more on Plus, please see

www.utexas.edu/ugs/slc/support/plus

- The syllabus may be updated during the semester for pedagogical reasons. A current version will always be available under the Syllabus tab on Canvas, as well as through a link from my home page:

www.ma.utexas.edu/users/danknopf

What course materials will I need?

Our main source will be a custom course packet, available from the University Co-op. The packet contains readings that are excerpted from the following texts:

- The Signal and the Noise, Nate Silver (pages 1–17, 232–261).
- How to Think Straight about Psychology, Keith E. Stanovich (pages 73–98).
- The Parsimonious Universe: Shape and Form in the Natural World, Stefan Hildebrandt and Anthony Tromba (pages 64–71, 146–211).

The readings complement classroom discussions and help you do better on homework and exams.

How will the course be graded?

Regular attendance and active participation are vital to success in this course!

Your final grade will be based on the following components:

- Four in-class exams, each worth 20% of your total grade. (See schedule below.)

- Eight homework assignments, collectively worth 15% of your grade. (See schedule below.) Homework will be accepted one day late with a 20% penalty off what it would have received, had it been on time. Homework more than one day late will not be accepted (i.e., loses 100% of its value).

- Class participation, worth 5% of your grade. In addition to participating in class discussions and activities, you will complete daily “minute papers” — brief paragraphs written to ask questions about class or respond to questions raised during class. You will receive points for completing these but will not be judged on their content.

There will be no final exam.

Your overall grade will be computed using a scale at least as generous as this:

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<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>D-</td>
<td>51–55</td>
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<td>D</td>
<td>56–63</td>
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<tr>
<td>D+</td>
<td>64–65</td>
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<td>C-</td>
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<td>C+</td>
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<td>B</td>
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<td>B+</td>
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<td>A-</td>
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<td>A</td>
<td>92–100</td>
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This course may be used to fulfill the Mathematics component (Core Component 020) of the UT core curriculum. The course addresses the following core objectives established by the Texas Higher Education Coordinating Board: communication skills, critical thinking skills, and empirical and quantitative skills.

This course also carries a Quantitative Reasoning (QR) flag. Quantitative Reasoning courses are designed to equip you with skills that are necessary for understanding the types of quantitative arguments you will regularly encounter in your adult and professional life. You should therefore expect a substantial portion of your grade to come from your use of quantitative skills to analyze real-world problems.
Can you give me some tips for the course?

- **Attend lectures.** Even though the lecture PowerPoint summaries will be available on CANVAS after each class, your ability to learn — and enjoy! — the material will be greatly enhanced by regular attendance and active participation. We will frequently use large- and small-group activities within class to help you explore concepts as they are introduced.

- **Ask questions** — in lecture and office hours, and/or using the CANVAS Discussions tab.

- **Plan to devote a reasonable amount of time to the homework.** Although the homework assignments are not designed to be lengthy, many will contain concepts and ways of thinking about mathematics that are almost surely different than what you have seen before. Give yourself a little time to learn and explore these new paradigms.

- **Do the supplemental reading.** To get the most benefit from the course, you should follow along with the readings as they are assigned.

- **Come to office hours.** Office hours offer valuable opportunities to reinforce concepts, clarify confusing issues, work more examples, and get individualized feedback. Both your TA and I are happy to see students in our office hours.

- **Study together.** You are encouraged to study together with your peers enrolled in the class. Get to know your classmates, and make arrangements to share notes in case you miss class due to illness. Take advantage of the organized collaborative learning opportunities provided by PLUS.

- **Be honest.** Any academic dishonesty will be severely penalized. Your assignments should be your own work, and must not be plagiarized. Any online or printed sources must be properly cited. No books, notes, computers, or mobile phones, are allowed during exams.

What is the lecture schedule?

The following lecture schedule may be altered for pedagogical reasons. **It is your responsibility to be aware of any changes announced in class.**

**Thursday, August 30** Certainty versus Uncertainty.

**Tuesday, September 4** Certainty versus Uncertainty.

**Thursday, September 6** Certainty versus Uncertainty.

**Tuesday, September 11** Certainty versus Uncertainty. *Assignment 1 due.*

**Thursday, September 13** Certainty versus Uncertainty.

**Friday, September 14** *Last day to drop for a possible refund.*

**Tuesday, September 18** Certainty versus Uncertainty. *Assignment 2 due.*

**Thursday, September 20** Symmetry.

**Tuesday, September 25** *Exam I.*

**Thursday, September 27** Symmetry.

**Tuesday, October 2** Symmetry. *Assignment 3 due.*

**Thursday, October 4** Symmetry.
Tuesday, October 9  Symmetry.  
Thursday, October 11  Symmetry.  

Tuesday, October 16  Modeling and Optimality.  
Thursday, October 18  Modeling and Optimality.  

Tuesday, October 23  \textit{Exam II}.  
Thursday, October 25  Modeling and Optimality.  

Friday, October 26  \textit{Last day for pass/fail}.  

Tuesday, October 30  Modeling and Optimality.  
Thursday, November 1  Modeling and Optimality.  

Tuesday, November 6  Modeling and Optimality.  
Thursday, November 8  Pattern and Abstraction.  

Tuesday, November 13  \textit{Exam III}.  
Thursday, November 15  Pattern and Abstraction.  

Tuesday, November 20  Pattern and Abstraction.  
Thursday, November 22  \textit{Thanksgiving Holiday — no class}  

Tuesday, November 27  Pattern and Abstraction.  
Thursday, November 29  Pattern and Abstraction.  

Tuesday, December 4  Pattern and Abstraction.  
Thursday, December 6  \textit{Exam IV}.  

\textbf{Policies}

\textbf{Accommodations} The University of Texas at Austin provides, upon request, appropriate academic accommodations for qualified students with disabilities. For more information, contact the Division of Diversity and Community Engagement, Services for Students with Disabilities (phone 512.471.6259, video phone 866.329.3986). For more information, please see \texttt{ddce.utexas.edu/disability/}.

If you fall under the University’s Learning Disability Policy, it is your responsibility to deliver the SSD certification of that fact to me as early in the semester as possible, \textit{and no later than one week prior to the first exam}.  

\textbf{Religious holidays} By UT-Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holiday. If you must miss a class, an assignment, a quiz, or an examination in order to observe a religious holiday, you will be given an opportunity to complete the missed work within a reasonable time after the absence.  

\textbf{Academic integrity} As noted above, academic dishonesty will be severely penalized. Your assignments, quizzes, and exams must be your own work. Any print or online resources must be properly cited. For more information on academic integrity, see \texttt{deanofstudents.utexas.edu/conduct/academicintegrity.php}.  

Title IX reporting Title IX is a federal law that protects against sex- and gender-based discrimination, sexual harassment, sexual assault, sexual misconduct, dating/domestic violence and stalking at federally funded educational institutions. UT-Austin is committed to fostering a learning and working environment free from discrimination in all its forms. When sexual misconduct occurs in our community, the university can: (1) intervene to prevent harmful behavior from continuing or escalating; (2) provide support and remedies to students and employees who have experienced harm or have become involved in a Title IX investigation; and (3) investigate and discipline violations of the university’s relevant policies: titleix.utexas.edu/relevant-policies/. Faculty members and certain staff members are considered Responsible Employees (equivalently, Mandatory Reporters), which means that they are required to report violations of Title IX to the Title IX Coordinator. Your Professor and Teaching Assistant are both Responsible Employees, and must report any Title IX related incidents that are disclosed in writing, discussion, or one-on-one. Before talking with a faculty or staff member about a Title IX related incident, be sure to ask whether they are a responsible employee. If you want to speak with someone for support or remedies without making an official report to the university, email advocate@austin.utexas.edu. For more information about reporting options and resources, visit titleix.utexas.edu or contact the Title IX Office at titleix@austin.utexas.edu.

Safety recommendations Please note the following guidelines:

- Occupants of buildings on the University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and reassembling outside.
- If you require assistance in evacuation, please inform me of this fact in writing during the first week of class.
- Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
- In the event of an evacuation, follow the instruction of faculty or instructors.
- Do not re-enter a building unless given instructions by one the following: Austin Fire Department, the University of Texas at Austin Police Department, or a Fire Prevention Services officer.
- If you have concerns about your own stress levels or a classmate’s behaviors, you are encouraged to contact the university’s Behavior Concerns Advice Line at 512.232.5050.
- For further information, see utexas.edu/emergency or contact the Office of Campus Safety and Security, utexas.edu/safety/ at 512.471.5767.