“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 through 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?

- The contact information for your Professor is below. Both I and our Teaching Assistant (TA) encourage you to come to us for individualized help if needed.

<table>
<thead>
<tr>
<th>Name</th>
<th>E-mail</th>
<th>Office</th>
<th>Office hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dan Knopf (he/him/his)</td>
<td><a href="mailto:danknopf@math.utexas.edu">danknopf@math.utexas.edu</a></td>
<td>PMA (RLM) 9.152</td>
<td>11:30–1:30 Mondays</td>
</tr>
</tbody>
</table>

- This course uses Canvas. This syllabus, class announcements, lecture PowerPoint summaries, assignments, answer guides, and any 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. To learn more about PLUS, please visit: utexas.edu/ugs/slc/support/plus.

Did you know that more than half of UT undergraduate students use the Sanger Learning Center each year to improve their academic performance? All students are welcome to take advantage of the Sanger Center’s classes and workshops, private learning specialist appointments, peer academic coaching, and tutoring for more than 70 courses in 15 different subject areas. For more information, please visit utexas.edu/ugs/slc or call 512.471.3614.

This syllabus is intended as a broad outline of the course. Details 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:

- *How to Think Straight about Psychology*, Keith E. Stanovich (pages 73–98).

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:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-</td>
<td>51–55</td>
</tr>
<tr>
<td>D</td>
<td>56–63</td>
</tr>
<tr>
<td>D+</td>
<td>64–65</td>
</tr>
<tr>
<td>C-</td>
<td>66–75</td>
</tr>
<tr>
<td>C</td>
<td>76–77</td>
</tr>
<tr>
<td>C+</td>
<td>78–79</td>
</tr>
<tr>
<td>B-</td>
<td>80–87</td>
</tr>
<tr>
<td>B</td>
<td>88–89</td>
</tr>
<tr>
<td>B+</td>
<td>90–91</td>
</tr>
<tr>
<td>A-</td>
<td>92–100</td>
</tr>
</tbody>
</table>

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 29** Certainty versus Uncertainty.

**Tuesday, September 3** Certainty versus Uncertainty. **PLUS facilitator applications due at 9:00 AM.**

**Thursday, September 5** Certainty versus Uncertainty.
Tuesday, September 10  Certainty versus Uncertainty.  
Assignment 1 due.

Thursday, September 12  Certainty versus Uncertainty.

Friday, September 13  Last day to drop for a possible refund.

Tuesday, September 17  Certainty versus Uncertainty.  
Assignment 2 due.

Thursday, September 19  Symmetry.

Tuesday, September 24  Exam I.

Thursday, September 26  Symmetry.

Tuesday, October 1  Symmetry.  
Assignment 3 due.

Thursday, October 3  Symmetry.

Tuesday, October 8  Symmetry.  
Assignment 4 due.

Thursday, October 10  Symmetry.

Tuesday, October 15  Modeling and Optimality.

Thursday, October 17  Modeling and Optimality.

Tuesday, October 22  Exam II.

Thursday, October 24  Modeling and Optimality.

Tuesday, October 29  Modeling and Optimality.  
Assignment 5 due.

Thursday, October 31  Modeling and Optimality.  
Last day to switch to/from pass/fail.

Tuesday, November 5  Modeling and Optimality.

Thursday, November 7  Pattern and Abstraction.  
Assignment 6 due.

Tuesday, November 12  Exam III.

Thursday, November 14  Pattern and Abstraction.

Tuesday, November 19  Pattern and Abstraction.  
Assignment 7 due.

Thursday, November 21  Pattern and Abstraction.

Tuesday, November 26  Pattern and Abstraction.

Thursday, November 28  Thanksgiving Holiday — no class.

Tuesday, December 3  Pattern and Abstraction.  
Assignment 8 due.

Thursday, December 5  Exam IV.
Other resources for students

**Inclusivity:** The University of Texas at Austin and the College of Natural Sciences are committed to maintaining a diverse, equitable, inclusive, and welcoming campus. To learn more about ongoing efforts in the College, visit cns.utexas.edu/diversity.

**Counseling and mental health:** All of us can benefit from help during times of stress. The Counseling and Mental Health Center (CMHC) offers a variety of resources to enhance students' well-being. To learn more, visit cmhc.utexas.edu. In especially difficult situations, you may wish to consult Student Emergency Services; learn more at deansofstudents.utexas.edu/emergency/.

**Campus safety and security:** It is important to look out for one another. Be Vocal is a University initiative to promote bystander intervention and prevent high-risk behaviors and harm. Learn more at wellnessnetwork.utexas.edu/BeVocal/.

If you become concerned about another individual's behavior, call the Behavior Concerns Advice Line (BCAL) at 512.232.5050 or visit besafe.utexas.edu/behavior-concerns-advice-line.

Policies

**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 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, and no later than one week prior to the first exam.

**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.

**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 deansofstudents.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.
- For further information, see utexas.edu/emergency or contact the Office of Campus Safety and Security, utexas.edu/safety/ at 512.471.5767.