Math Seminars

While Bailey Hall is napping this spring and the Union Undergraduate Math Seminar is on a COVID hiatus, active math seminars around the country (and the world) are opening their electronic doors to the world. To help navigate the seminar landscape, Edgar Costa and David Roe at MIT have developed a new website displaying online math seminars worldwide:

https://mathseminars.org/.

After registering on this website, users can select favorite seminars and talks and have them automatically exported to their own calendars.

While most of the seminars are graduate and research level, they still might be of interest to people wondering what this type of mathematics is about, or to those who simply want to see some talks by world-famous mathematicians. Just in this coming week, there are talks by some **Fields medalists**: **Edward Witten** is giving a talk on Monday, April 13 at 3:00pm (NY time) in the Western Hemisphere colloquium on geometry and physics entitled "Volume and random matrices," and **Terry Tao** is giving a talk in another seminar on "The Collatz conjecture" on Tuesday, April 14 at 6:00pm (NY time). Talks listed on this website generally require registration, after which you will receive an email with a Zoom link to the seminar.

Senior Writing and Pieces from Thesis

In this column this spring term, we will highlight and celebrate students who recently completed their Senior Writing requirement in the math department, either through the Senior Writing Seminar (Math 487) or via a thesis. Several such students will be writing articles sharing their experience and the math the learned with the newsletter readership. We hope you enjoy this feature.

Victoria Dafniotis *submitted the following article about her Senior Writing Experience.*

This past winter, I completed the Senior Writing Experience for my Mathematics major. Rather than taking the traditional route and satisfying this requirement through a thesis, I opted to take the Senior Writing Seminar (MTH 487) with Professor Brenda Johnson. This is akin to a thesis with the additional requirement of giving oral presentations to classmates.

The overall theme for the seminar was Abstract Algebra. After taking a few weeks to review the associated material, each student chose a single topic related to group theory to explore for the rest of the term. The topic I selected was Algebraic Coding Theory. At a high-level, data and information are of utmost importance in today's society. When this information is transmitted across channels, errors may occur due to noise. The goal is to encode and decode this information so that errors can be detected and even possibly corrected. While there are numerous encoding and decoding procedures, I focused my attention on block, linear codes. This type of code is the null space of a matrix and satisfies the properties of a group. It is encoded by multiplying the messages, which are in binary digit strings, by a standard generator matrix. In terms of decoding the received messages, there are two methods. The first method is to multiply the messages by a parity-check matrix. If this results in one of the columns of the parity-check matrix, an error occurred in the respective digit. The other method involves finding the cosets of the code. Block, linear codes are very useful since they have the ability to detect at most two errors and correct at most one error.

The entire process was extremely gratifying. All of the classes taken prior to the Senior Writing Experience are lecture-driven. However, MTH 487 enables students to learn how to not only read mathematics, but equally write it in a way that can be easily understood by the designated audience. Throughout the term, I learned how to find quality sources, why reading mathematics is different than reading other texts and what good mathematical writing incorporates all while gaining insight into coding theory. In addition, I was given the opportunity to practice communicating my research to my peers.

At the end of the term, Professor Johnson told me to reflect on what I had accomplished over the term. She pointed out the fact that just a few weeks prior, I had limited knowledge of my topic and now had completed a fifteen page paper on my topic. Although this was not an easy task, I was able to acquire skills and knowledge that I will undoubtedly use in the future. My advice to students is to find a topic that they are truly interested in as it makes the process enjoyable. More generally, I recommend taking advantage of everything the math department has to offer throughout their time at Union. Everything I have been able to accomplish is a testament to the support of the professors in the math department and the resources provided to students.

Recent Back Issues of the Math Newsletter Available Online

Interested in past math newsletter's "Problem of the Newsletter" or other features? Through the math department's homepage, one can access recent back issues of this publications. Simply go to https://www.union.edu/mathematics and follow the Activities link to Newsletters.

Problem of the Newsletter – April 13, 2020

Last week's problem: During usual times, solutions to the previous week's problem are posted on bulletin boards around Bailey Hall. Since this is not possible, when space permits, such solutions (or main ideas or hints) will be included in the newsletter. For last week's problem (check online for the problem), the flaw in the "proof" is in applying $\sqrt{xy} = \sqrt{x}\sqrt{y}$ when $x=y=-1$. Math 430 (Complex Analysis) students – did you catch this?

This week's problem: The Bridge to Enter Advanced Mathematics (BEAM) program, a wonderful program that works with talented middle school students who are interested in mathematics, recently sent some professors in the math department a lovely Pi Day greeting card. Included in the mailing is a fun problem displayed here that we will take as this week's Problem of the Newsletter. Have fun!

Professor Friedman (friedmap@union.edu) will accept solutions until noon on Friday, April 17.

Jarek is bored in class and starts putting numbers on his paper in the following pattern:

37	36	35	34	33	32	31
38	17	16	15	14	13	30
39	18	5	4	3	12	29
40	19	6	1	2	11	28
41	20	7	8	9	10	27
42	21	22	23	24	25	26
43	44	45	46	47	48	49

If he's really bored and keeps going with this pattern for a long time, what are the 8 numbers that will surround the square containing 1,000,000?

Bonus: What are the 8 numbers surrounding the square containing 1,000,010?

BEAM
Bridge to Enter Advanced Mathematics