NES/MAA

NORTHEASTERN SECTION OF THE MATHEMATICAL ASSOCIATION OF AMERICA

Spring sectional Meeting 2018

University of New Haven

June 1-2, 2018

NES/MAA Spring Meeting
Friday, June 1, 2018

11.30 am - 6 pm	**Registration**	Bartel's Campus Center, Lobby
12 - 12.30 pm	**Section NEXT Lunch**	Bartel's Student Dining Room
12.30—3 pm	**IBL Workshop**	Bartel's Student Dining Room
1.30 - 3 pm	**Ex. Committee Meeting**	Gehring Hall 301
1.30 - 3 pm	**Refreshments**	Gehring Hall 301
3.30 - 4.30 pm	**Stabilizing Discrete Event Systems and Scheduling with Tropical Mathematics** *Catherine Buell, Fitchburg State University*	Gehring Hall 301
4.45 - 5.45 pm	**Math Circle Activity** *Hema Gopalakrishnan, Sacred Heart Univ.*	Maxcy Hall 126
6 - 6.30 pm	**Social Hour (Cash Bar)**	Bartel's Campus Center, Alumni Lounge
6.30 - 7.30 pm	**Dinner**	Bartel's Campus Center, Alumni Lounge
7. 30 - 8.30 pm	**Finding Exoplanets with Linear Algebra** *Daniel Schultheis, Smith College*	Bartel's Campus Center, Alumni Lounge

Notes

Notes

NES/MAA Spring Meeting
Saturday, June 2, 2018

8 m - Noon	**Registration**	Bartel's Campus Center, Lobby
8 - 9 am	**Breakfast Snacks**	Bartel's Student Dining Room
9 - 10 am	**Explaining Google Searches from NFL Games to Animal Behavior** *E. Cabral Balreira, Trinity University*	Gehring Hall 301
10 - 10.30 am	**Membership/Business Meeting**	Gehring Hall 301
10.30 - 11 am	**Coffee Break**	Bartel's Campus Center, Lobby
11 - Noon	**Teaching Idea Hour**	Gehring Hall 301
Noon - 1 pm	**Lunch**	Bartel's Student Dining Room
1 - 2 pm	**Contributed Talks**	Maxcy Hall 126, 226, 203
2 - 3 pm	**Out of the Mouths of Babes and Sucklings: Teaching Practices That Enhance Students' Learning Experiences** *Fabiana Cardetti, U. of Connecticut*	Gehring Hall 301

NES/MAA Section NExT Program

The Northeastern Section is continuing a Section NExT program for new and relatively new colleagues on Friday just prior to this year's spring meeting. By providing talks and workshops on issues of interest, opportunities to meet and share ideas with other new colleagues, and an introduction into Section activities, we hope to assist new faculty in their transition from graduate school to professional academic life. We welcome all untenured full time faculty, both those who have and have not been National NExT fellows.

11:30 AM   Registration, Section NExT participants
                Bartel's Campus Center, Lobby

12 - 12.30 PM   Lunch for Project NExT participants
                Bartel's Campus Center, Student Dining Room

12:30 - 3 PM   Inquiry Based Learning Workshop
                Bartel's Campus Center, Student Dining Room
                Phil Hotchkiss,   Westfield State University
                Jane Cushman, Buffalo State College

Abstract: Implementing IBL can be a daunting prospect; not only is there a continuum of IBL styles from which to choose, but letting go of complete control of the classroom can be scary. In this workshop we will look at ways of designing activities and managing student discussions in an IBL classroom. We encourage participants to bring in ideas or materials from classes in which they would like to use IBL.

Acknowledgements

Contributed Talks   Maxcy Hall 203

Title: Uniting *Computing and Pure Mathematics in a Upper-class Elective*   1:40 - 2:00 PM

Speaker: Jillian McLeod*, U.S. Coast Guard Academy
Dana Dougherty, US Coast Guard Academy

Abstract: Our department is small (14 faculty) and our major is Operations Research and Computer Analysis. We are always seeking opportunities to expand our curriculum to include more foundational and computational areas of mathematics. This spring, we offered an elective in Mathematical Cryptology to nineteen 2/c and 1/c cadets in the ORCA major. We used the course to introduce topics from number theory, abstract algebra, and elliptic curves. The course was equal parts theory and computer programming (in Python). This presentation highlights some of our pedagogical choices and summarizes the beneficial outcomes of our approach.

WiFi Information:

ChargerGuest, login on browser

If you have problems with computers or audio-visual equipment, notify your session chair, who will seek out one of the U. of New Haven (UNH) technicians.

The number for the Campus Police is 203-932-7014.

Jane Cushman: Jane started as a high school teacher in Texas. While working on her Masters in Mathematics at Texas State University in San Marcos, Jane decided that working at the college level seemed more rewarding. She applied and attended The University of Texas in Austin, where she taught many classes for the UTeach program. The UTeach classes were problem-based and inquiry-based. Since then, the classes that she has taught to pre-service teachers have been problem-based and inquiry-based. In Summer of 2009, Jane attended an IBL-Prep workshop lead by Michael Starbird and Carol Schumacher to develop an inquiry approach to Modern Geometry (the first non-pre-service course she would teach). Since then, she has been involved with the Upstate New York IBL Consortium and most recently, PRODUCT.

Phil Hotchkiss: Phil is a Professor of Mathematics at Westfield State University where he has been since 1998. His most formative mathematical experiences as a student came when working in small groups where he really discovered his love for mathematics and teaching. These small groups helped foster his mathematical curiosity and helped form the basis for his belief in Inquiry-Based Learning (IBL). Through his involvement in Project NExT, and work with colleagues at previous institutions and at Westfield he has learned more about IBL and now uses it in all his classes.
 He is a member of the Discovering the Art of Mathematics (DAoM) project and PRODUCT. Philip earned his B.S. in Mathematics from Union College and his M.A. and Ph.D. from The University at Albany, the State University of New York. He taught at Lafayette College in Easton, Pennsylvania; Rhodes College in Memphis, TN; and at The University of St. Thomas in St. Paul, MN before coming to Westfield.

Invited Talks

Title: *Stabilizing Discrete Event Systems and Scheduling with Tropical Mathematics*

Speaker: Catherine Buell, Fitchburg State University

Abstract: Tropical mathematics describes both max-plus and min-plus algebras. These algebras provide a language through which we elegantly describe everyday phenomena such as the long-term behavior of discrete event systems and scheduling. Extending the notion of tropical arithmetic to matrices and vectors, we find that determining eigenvalues and associated eigenvectors, allows us to construct event systems that behave predictably and stably. It can also aid in industrial scheduling and routines. First, we explore the graph theory associated with tropical mathematics through the lens of eigenvalues and scheduling. Then, we then look at how some current algorithms associated with this topic including computing eigenvalues, conjectures of necessary conditions for a stabilizing eigenvalue-vector for a system, and some experiments with best-ordering of tasks. Throughout the talk, we will touch on interesting questions and projects for students at all levels.

Catherine Buell: Catherine is an Associate Professor of Mathematics at Fitchburg State University in Fitchburg, MA. After completing her Ph.D. in algebraic group theory at North Carolina State University, she has published in algebra, number theory, computer science, philosophy, and the scholarship of teaching and learning. Beyond her passion for all mathematical inquiry, she also works to bring social justice, ethics, and social responsibility into the curriculum at all levels and is currently co-editing a special issue of PRIMUS on intertwining mathematics and social justice in the classroom. She enjoys many wonderful collaborations with students, peers, and colleagues in other disciplines on topics of teaching and research.

Title: *Explaining Google Searches from NFL Games to Animal Behavior*

Speaker: E. Cabral Balreira, Trinity University

Abstract: We will discuss the mathematics behind rankings algorithms and how to use Linear Algebra to understand how Google's PageRank algorithm works. We introduce a new

Contributed Talks   Maxcy Hall 203

Title: *Design and Implementation of Corequisite Model in a Freshman Level Quantitative Reasoning Course*   1:00 - 1:15 PM

Speaker: Upasana Kashyap*, Regis College
Santhosh Mathew, Regis College

Abstract: Many colleges and universities are increasingly seeking to alter the existing remedial education with co-requisite model in which students enroll simultaneously in a credit-bearing course and a course that provides remediation. In this talk, we present design, implementation, and discuss how we facilitated this model in a freshman level Quantitative Reasoning course. We provide evidence of the success of this approach using data that compare student performance under co-requisite model with the more traditional prerequisite model. Our study concludes that student performance and perceptions were significantly higher when they completed the course under co-requisite model compared to the prerequisite model.

Title: *Math Placement at the Coast Guard Academy*   1:20 - 1:35 PM

Speaker: Eric C. Johnson, U.S. Coast Guard Academy

Abstract: Prior internal studies at the Coast Guard Academy (CGA) concluded that how cadets perform in their freshman fall math course is the best predictor of not only whether those cadets successfully complete their first year, but also whether they graduate at the end of four years. The CGA Department of Mathematics has developed our own Math Placement Program in an effort to maximize each incoming student's chances for success by making sure s/he is placed in the most appropriate initial math course. Having served as the Math Placement Program coordinator for eight years, in this talk I'll explain our Math Placement process, present a longitudinal comparison of our two placement models, a comparison of entering students' AP Calculus scores vs. our validation exam scores, and discuss the overall effectiveness of our Math Placement Program.

Contributed Talks   Maxcy Hall 226

Title: *Is 1 + 2 + 3 + . . . = -1/12?*   1:00 - 1.15 PM

Speaker: Ryan Tully-Doyle, University of New Haven

Abstract: In 2014, a popular math channel on YouTube posted an (incorrect) argument that the sum of the natural numbers is -1/12. What did they mean? How can this possibly be true? We will show why their argument was wrong, but also in what sense their result is correct. We will look at the story behind this claim, which involves work of Euler, Weierstrass, Chebyshev, and Riemann, and fuses ideas from number theory, infinite series, real and complex analysis, and some of the fundamental special functions. The talk is intended to be accessible to undergraduates.

Title: *Bounding the Magic Number for K_n*   1:20 - 1:35 PM

Speaker: Addie Armstrong*, Norwich University

Jacob Smith, University of Rhode Island

Abstract: An edge-magic total labeling of a graph $G = (V,E)$ is an assignment of integers 1, 2, 3, . . . , $|V|+|E|$ to the vertices and edges of the graph so that the sum of the labels of any edge uv and the labels on vertices u and v is constant. It is known that the class of complete graphs on n vertices, K_n, are not edge-magic for any $6 < n$. The edge magic number $ME(K_n)$ is defined to be the minimum number t of isolated vertices such that $K_n \cup tK_1$ is edge-magic. In this talk, we will explore the first proven upper bound on the edge magic number for complete graphs.

Title: *A free boundary problem arising from Ductal Carcinoma in Situ model*   1:40 - 2:00 PM

Speaker: Heng Li, Hartwick College

Abstract: Ductal carcinoma in situ -- a special cancer that is confined within the breast ductal only. We derive the mathematical ductal carcinoma in situ model in a form of a nonlinear parabolic equation with initial, boundary, and free boundary conditions. Well-posed theorems of the problem are proved. Algorithm and illustrative examples are included to demonstrate the validity and applicability of the technique.

ranking method, the Oracle method to rank teams in the NFL and show that the Oracle method predict game outcomes better than other well-known methods. As an application, we will see how ranking methods can be used in mathematical biology to determine hierarchy in the population of Green Anoles (Anolis carolinensis) as well as discovering which traits contribute to their hierarchy.

E Cabral Balreira: Cabral is a Professor of Mathematics at Trinity University in San Antonio, TX. He received his Ph.D. in differential topology from the University of Notre Dame and his current scholarly interests are in discrete dynamical systems and sports analytics.

Title: *Out of the Mouths of Babes and Sucklings: Teaching Practices That Enhance Students' Learning Experiences*

Speaker: Fabiana Cardetti, University of Connecticut

Abstract: In this presentation, we will explore the results of joint work with Joe McKenna focused on the common learning experiences across many different sections of the same mathematics course. Our findings are based on students' journal reflections kept during a full semester and collected over five years. The analyses of the students' writings have rendered surprising results on their perspectives about the different aspects that help or hinder our students' mathematics educational experience. We have found recurring patterns regarding students' motivations, learning strategies, and academic lives that may help us enhance our teaching and their learning experiences. I will share these findings and discuss recommendations for teaching practices that promote mathematics learning at the college level.

Fabiana Cardetti: Fabiana is associate professor of mathematics and graduate director for instructional development at the University of Connecticut. She holds a PhD in mathematics from Louisiana State University specializing in control theory on Lie groups. Her current area of research is mathematics education with a focus on the teaching and learning of argumentation and proof at the K-16 levels. She leads and co-leads several interdisciplinary initiatives for the professional development of teachers and for the improvement of STEM teaching and learning using the lens of intercultural communicative competence.

Title: *Finding Exoplanets with Linear Algebra*

Speaker: Daniel Schultheis, Smith College

Abstract: The search for planets in other solar systems is an exciting and ongoing program in astronomy. These planets are almost unimaginably far away, so how could we hope to detect them? In this talk, we'll explore the radial velocity method, a clever approach which makes use of the Doppler effect. We will also see how a few key concepts from linear algebra aid in the process, helping find planets still at large.

Daniel Schultheis: Dan received his PhD from UC San Diego in 2012, originally studying algebraic geometry. Since then he has branched out to math education and pedagogy, working for several years with the Math Center for Educational Programs at the University of Minnesota. Daniel joined Smith College to help coordinate the calculus sequence and works with several initiatives to ease the transition to college for students in various STEM fields. He is currently co-writing a book of math enrichment activities for younger audiences introduced through games and playful activities.

Teaching Idea Hour

Speakers: E. Cabral Balreira   Braxton Carrigan

Jennifer Beichman   Matteo Carrabba

Contributed Talks Maxcy Hall 126

Title: *Printing Costa's Minimal Surface*   1:00 - 1:15 PM

Speaker: Joe Fields, Southern Connecticut State U.

Abstract: I'll discuss the processes that were needed to develop a printable model of a Costa surface. The Costa surface, also known as the Hoffman-Meeks surface is a minimal surface, a family of surfaces that were thought to be completely understood until a new one - the Costa surface - was discovered in the 1980's. Fully understanding the geometry of a Costa surface is tricky, indeed visualizing the Costa surface was one of the first major successes in the early days of computer-aided visualization. A physical model is surely even more comprehensible! The path to realizing a 3-d printed physical model was convoluted and passed through some very interesting mathematics!

Title: *SSTEM report: what we learned, issues, successes and recommendations*   1:20 - 1:35 PM

Speaker: James Quinlan, University of New England

Abstract: University of New England received an award from the NSF DUE to establish programs that would retain STEM students to graduation. In this presentation, we outline and describe these programs and report the results, in particular lessons learned from the program. SSTEM funds are still available through the NSF and a brief discussion on the requirements will be presented.

Title: *Flipping Statistics: How I Incorporated Technology to Teach Technology*   1:40 - 2:00 PM

Speaker: Susan Bell, University of New England

Abstract: In my experience, teaching students how to use technology poses a far greater challenge than teaching the content, especially when students are absent from class and require private tutoring to learn the technology. In an attempt to minimize the stress level associated with teaching a statistical analysis software package, I created video lectures demonstrating the use of the program and shared them with my students. My talk will focus on why I chose to flip my Statistics class, how I made it happen, how I ensured that students watched the videos, and the aftermath -- the good, the bad, and the ugly.