FACULTY CONTRIBUTED PAPERS SESSION - ABSTRACTS

Delaware Valley University
14 November 2015

Locations: LFSC 201 & LFSC 202

LFSC 201 – 1:10pm **Michael Yatauro,** Penn State University, Brandywine

TITLE: *The Unreliability of Paths and Related Graphs in the Neighbor Component Order Edge Connectivity Network Model*

ABSTRACT: Let G be a finite simple graph. Consider a model in which edges of G fail independently, and when an edge fails we remove it from G along with the incident vertices. We say that a set of edges F is a *failure set* of G if after all edges of F fail, the components of the induced subgraph all contain at most $k-1$ vertices, for some prescribed $k > 0$. If the edges fail with probability ρ, then the *unreliability* of G, denoted $U_k(G, \rho)$, is the probability that a randomly selected set of edges is a failure set. Let P_n be the path on n vertices. We will prove a general recursive formula on n for $U_k(P_n, \rho)$ that holds for any fixed k and ρ. Finally, we solve this recursion when $k = 1$ to get a closed form expression for $U_1(P_n, \rho)$, and also $U_1(G, \rho)$ for some related graphs G.

LFSC 201 – 1:30pm **Jakub Jasinski,** University of Scranton

TITLE: *Contracting Maps and Fixed Point Theorems*

ABSTRACT: For a metric space X, a map $f : X \to X$ is contractive if there exists a $0 \leq \lambda < 1$ such that $d(f(x), f(y)) \leq \lambda d(x, y)$ whenever $x, y \in X$. Nearly 100 years ago Banach proved the Contracting Mapping Principle stating that if f is contractive and X is a complete then f has a fixed point, i.e. $f(x) = x$ for some $x \in X$. We will discuss some generalizations of the CMP by Edelstein (1962) for compact spaces, by Hu/Kirk (1978) and Jungck (1982) for rectifiably path connected spaces and by Ciesielski/Jasinski (2015) for connected metric spaces. Remarks on Periodic point theorems will be made and a connection of the CMP with the minimal dynamical systems will be explained.

LFSC 201 – 1:50pm **Michael N. Tabachnick,** Delaware Valley University

TITLE: *Relativity and Rotation of Axes*

ABSTRACT: The Einstein-Lorentz transformation equations for Special Relativity bear a striking resemblance to the rotation of axes transformation equations. If this holds true, traveling at the speed of light is equivalent to a 45 degree rotation. Could this lead to the ability to go backward in time?

LFSC 201 – 2:10pm **Wing Hong Tony Wong,** Kutztown University

TITLE: *Playing "Flow Free" on Different Boards*

ABSTRACT: This project is motivated by a smart phone game called "Flow Free". The objective of the game is to connect matching colored dots with pipes to create a flow, so that the pipes cover the entire board. However, to avoid leakage, pipes cannot cross or overlap. In this talk, we will extend the game from rectangular boards to L-shaped boards, as well as tori and higher dimensional tori. We will discuss some sufficient conditions to configure the colored dots on these boards so that there is a flow between them. This project is joint work with Brian Kronenthal.

LFSC 202 – 1:10pm **Baoling Ma,** Millersville University

TITLE: *A mathematical model for the interaction of frog population dynamics with Batrachochytrium dendrobatidis, Janthinobacterium lividum and its implication for chytridiomycosis management*

ABSTRACT: Chytridiomycosis is an emerging disease caused by the fungal pathogen {Batrachochytrium dendrobatidis (Bd)} that poses a serious threat to frog populations worldwide. Several studies have shown that inoculation of bacterial species {Janthinobacterium lividum (Jl)} can mitigate the impact of the disease. However, there are many questions regarding this interaction. A mathematical model of a frog population infected with chytridiomycosis is developed to investigate how the inoculation of {Jl} could reduce the impact of {Bd} disease on frogs. The model also illustrates the important role of temperature in disease dynamics. The model simulation results suggest possible control strategies for {Jl} to limit the impact of {Bd} in various scenarios. However, a better knowledge of {Jl} life cycle is needed to fully understand the interactions of {Jl}, {Bd}, temperature and frogs.

LFSC 202 – 1:30pm **Tyler Gaspich,** Saint Joseph's University

TITLE: *Move Over Ben Franklin: Using Educreations in a 21st Century Classroom*

ABSTRACT: The current status of many mathematics classrooms can be summarized with one idea: if Benjamin Franklin was a student in our class today, he would feel very comfortable. The current trends in math education push for students to think more abstractly, problem solve to a much higher degree, and collaborate effectively to achieve a common goal. The question arises: does an older pedagogical model of instruction reflect these 21st century needs? This talk will unravel the benefits and challenges of a flipped classroom instructional model using the website Educreations in a high school and college math classroom. Highlights of this talk will feature baseline data on student attitude toward flipped math classrooms, as well as a brief introduction to Educreations for any individual interested in flipping their classroom to some degree.

LFSC 202 – 1:50pm **Kevin S. Robinson,** Millersville University

TITLE: *An Interesting Mixture: Incorporating Statistical History into a History of Mathematics Course*

ABSTRACT: This presentation will discuss a recent endeavor to integrate a unit on the historical development of Statistics into a History of Mathematics course. The presenter, a statistical educator, was invited to visit History of Mathematics courses in Fall 2014 and Spring 2015 in order to present a unit entitled: DATA, DECISIONS, UNCERTAINTY - A HISTORY. Reflections and ponderings about this endeavor will be shared, as well as student feedback. Topics to be addressed will include: preliminary student assignments, activity-learning within the classroom, class presentation, and follow-up student assignments.