Professor Sergio R. López-Permouth

Ohio University, USA

Visiting Atlantic Algebra Centre

March 30 - April 4, 2009

Sergio R. López-Permouth received a Ph.D. from North Carolina State University before joining the faculty of the Department of Mathematics at Ohio University in 1986. He is currently a Full Professor of Mathematics and was Department Chair during 1996-1999. His research focuses on Ring and Module Theory as well as on Coding and Information Theory.

He has authored and co-authored more than 50 papers in these areas and has co-edited several research volumes for some of the many conferences and

special session that he has organized. He edited several books published by Springer-Verlag and by AMS.

Dr. López-Permouth has lectured at conferences and seminars in places as diverse as Brazil, Canada, Costa Rica, France, Germany, Guatemala, Israel, Japan, Korea, Mexico, Russia, Spain, Thailand, Uruguay and Vietnam.

He is a founding executive editor for the "Journal of Algebra and its Applications", a founding editor for the Journal "Advances in the Mathematics of Communication", and a member of the editorial board of both "Revista de Matemáticas" and of the "East-West Journal of Mathematics".

Dr. López-Permouth has advised seven Ph.D. students in Ring Theory and Coding Theory.

We are looking forward to his mini course at Atlantic Algebra Centre during his visit of Memorial University of Newfoundland, March 30 - April 3, 2009.

****

AAC Mini Course

Algebraic Coding Theory

Lesson I

Things you (think) you already know: Polynomial rings over integers modulo p^m.

We survey several results about polynomials over finite chain rings with particular focus on rings of integers modulo p^m where p is a prime and $m \in \mathbb{Z}^+$. The reason for doing this is that, just as in the case of codes over finite fields, cyclic codes over a finite ring R are best understood as ideals of a quotient ring of the ring of polynomials $R[x]$. The theory of polynomial rings over finite chain rings contrasts with the theory of polynomials over fields in many ways. Our lecture concludes with a summary of what is known about the algebraic structure that underpins the theory of cyclic codes over finite chain rings.

Lesson II

Non-commutativity happens: Something funny happened on the way to cyclic convolutional codes.

In this lesson we introduce Convolutional Codes as an alternate to Block Codes. We see how a naïve approach to the study of cyclic convolutional codes fails to render any new codes and focus on a very natural approach to the problem which forces us into introducing some non-commutativity into the design. Then we analyze the extent of non-commutativity that is necessary.

Lesson III

Toward an abstract theory of Codes over Finite Rings and Modules.

As Algebraic Coding Theory employ increasingly fancier tools from the algebraist's toolbox, a consensus is growing that Coding Theory itself should be put into an appropriate axiomatic frame not unlike that of the algebraic structures it utilizes. In this lesson we will survey some of the progress obtained in the direction and will focus on some success stories along the way. In particular, we highlight a characterization of finite Frobenius rings due to Jay Wood where they are characterized in terms of the permissible equivalences among the codes that have them as alphabets.

****

Everyone is invited! A limited support is available for the mathematics students in Atlantic Canada. Please provide a recommendation letter from your supervisor. Apply at aac at mun.ca before March 15, 2009.