

## **Block Intersection Polynomials and their Applications to Graphs and Block Designs**

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**Date :** 13 January 2009 (Tuesday)  
**Time :** 10.30 am – 11.30 am  
**Venue:** SPMS-Executive Classroom 1, MAS-03-06  
School of Physical and Mathematical Sciences

Certain integer linear equations involving binomial coefficients arise naturally in both the studies of edge-regular graphs and  $t$ -designs, and the non-negative integer solution vectors to these equations provide information about these graphs and designs. One method of studying these equations (from both a practical and theoretical point of view) uses the block intersection polynomials introduced by Peter Cameron and the speaker. In this talk, I shall define block intersection polynomials, briefly discuss their theory, and then give new applications of these polynomials to the studies of graphs and block designs. I shall discuss a new method of bounding the size of a clique in an edge-regular graph with given parameters and a new method for studying the possibility of a graph with given vertex-degree sequence being an induced subgraph of a strongly regular graph with given parameters. I shall also discuss results about the intersection sizes of pairs of blocks in a  $t$ -design with given parameters.

### **Speaker Biography**

Leonard Soicher received his BSc in 1978 and MCompSci in 1981 from Concordia University, Montreal, Canada, and his PhD in 1985 from the University of Cambridge, UK. He is currently a Professor of Mathematics at Queen Mary, University of London, UK, where he has worked since 1987. His research interests include algebraic graph theory, combinatorial design theory, group theory and computation. In addition to his research publications, he is the author of the GAP package GRAPE for constructing and analysing graphs related to groups, finite geometries and designs, and the GAP package DESIGN for constructing, classifying, partitioning and studying block designs. He is co-author with Cheryl Praeger of the book "Low Rank Representations and Graphs for Sporadic Groups", and was Principal Investigator in the EPSRC funded project which produced the DesignTheory.org website of on-line resources for combinatorial, statistical and computational design theory.

Host: Prof. Dmitrii Pasechnik, Division of Mathematical Sciences, School of Physical and Mathematical Sciences

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