Ken W. Smith
Professor of Mathematics

Personal information

Electronic mail address: Phone: (936) 294-4869
  KenWSmith@shsu.edu FAX: (936) 294-1882

Education

Ph.D. (Mathematics) Colorado State University, Fort Collins, Colorado, May 1985
M.S. (Mathematics) University of Illinois, Urbana, Illinois, May 1977
B.S. (Mathematics) Western Illinois University, Macomb, Illinois, May 1975

Professional Experience

August 2007 – present	Professor, Sam Houston State University
July 1994 – 2007	Professor, Central Michigan University
August 2005 – June 2006	Visiting Scholar, University of Richmond
Spring 1999	Visiting Professor, Colorado State University
October 1995 – August 1997	Assistant Vice-Provost for Institutional Research & Planning
August 1989 – July 1994	Associate Professor, Central Michigan University
May 1992 – July 1992	Technical Director, National Security Agency,
June 1990 – June 1991	Senior Cryptologic Mathematician, National Security Agency
April 1985 – August 1989	Assistant Professor, Central Michigan University
August 1984 – April 1985	Instructor, Central Michigan University
August 1980 – May 1984	Graduate Teaching Assistant, Colorado State University
August 1979 – May 1980	Graduate Teaching Assistant, University of Illinois
August 1978 – May 1979	Instructor, Millikin University, Decatur, Illinois
August 1975 – May 1978	Graduate Teaching Assistant, University of Illinois

Administrative Experience

Chair, Department of Mathematics and Statistics, Sam Houston State University, 2007 - 2008
Math Area Coordinator, Mathematics Department, Central Michigan University, 2000 - 2004
Mathematics Department Executive Committee, Central Michigan University, 2000 – 2004
Interim Assistant ViceProvost, Central Michigan University, 1995 - 1997
Graduate Coordinator, Mathematics Department, Central Michigan University, 1992-1995
Mathematics Department Executive Committee, Central Michigan University, 1992 – 1995
Executive Committee, University Graduate Council, Central Michigan University, 1993 – 1995
Academic Senate Executive Board, Central Michigan University, 1987 – 1988

Teaching Experience & Curricular Development

In addition to the standard entry-level undergraduate mathematics course (including honors classes in calculus and linear algebra) I have taught the following upper level and graduate classes at Central Michigan University and Sam Houston State University.

Upper undergraduate Level

Introduction to Analysis	Differential Equations
College Geometry	Discrete Structures
Elem. Statistical Analysis	The Theory of Numbers
Math of Cryptology	Modern Algebra
Modern Algebra II	Mathematical Logic
History of Mathematics	Applied Combinatorics

Masters Level

Advanced Calculus I & II	Abstract Algebra I & II
Coding Theory	Theory of Groups
Theory of Associative Rings	

Doctoral Level

Topics in Geometry (Non-Euclidean)	
History of Advanced Math (Calculus to the present)	
Combinatorics, II	Seminar in Coding Theory
Topics in Algebra	Topics in Combinatorics
Algebraic Number Theory	

I have directed four doctoral dissertations in combinatorial mathematics (Paul Becker, CMU 2000, Omar AbuGhneim, CMU 2005, Solomon Osifodunrin, CMU 2008, Jordan Webster, CMU 2009.

I have taught geometry and precalculus in CAMP (for gifted and talented high school students.) I created and taught an introductory statistics class on the internet (1995.)

I created (with Arnold Hammel, CMU) MTH 522, The Mathematics of Cryptology. I created (with Doug Lapp, CMU) MTH 261, Problem-based Algebra and Calculus for Secondary Teachers.

I have directed numerous masters theses and Plan B papers.

I have directed a variety of undergraduate students on projects in matrix analysis, graph theory and algebraic combinatorics, working with over thirty students in the last ten years.

Professional Growth Activities and Awards

Distinguished Alumnus, Colorado State University, November 2008.

Visiting Scholar (Sabbatical), University of Richmond, Fall 2005-Spring 2006.

Received President's Research Investment Fund (CMU grant) with Don Marks, Arnold Hammel, on Cryptography Toolkit, 2002 and coordinated, with Arnold Hammel (MTH) and Don Marks (CPS), The CrytptoTools student research group, 2002.

Co-coordinator and speaker in Tournament Matrix Seminar, 2001-2002.

Participant in McGraw-Hill Calculus Symposium, June 2001.

Director of the Graph Theory Seminar, 2000-2001.

Collaborated with CMU visiting professor, Robert Molina, on research in graph theory.

Received University Research Professor award, Spring 2000.

Sabbatical visit to Colorado State University, Spring 1999.

Director of the CMU Combinatorics Seminars.

Organized the Central Michigan problem solving group, *Nasha Komanda*.

Directed an interdisciplinary course in Cryptology and Number Theory with Neelima Shrikhande, chair of the Computer Science Department (1992 – 93).

Technical director for the National Security Agency; mentored undergraduate research projects with students in the NSA's summer program (Summer 1992).

Led a seminar on difference sets at the National Security Agency (1990 – 91).

Coordinated a two-semester class on Coding Theory, Information & Cryptanalysis (1989 – 90).

Regular contributor to the *Mathematical Reviews*. Referee for the *Journal of Combinatorial Mathematics and Combinatorial Computing*, the *Journal of Combinatorial Designs*. the *Journal of Designs, Codes and Cryptography* and other journals in combinatorics.

Creative and Scholarly Activity: External Grants funded

Co-PI NSF MCTP grant, approx. $1,500,000, 2007-2011 (This grant, on "Longterm Undergraduate Research Experiences", is a collaborative project with CMU, the University of Richmond, Coppin State University and Olin College.)

Co-PI NSF grant, $1,065,000 (PI: Doug Lapp & Azita Manouchehri), 2005-2009.

Co-PI NSF-REU grant, approx. $185,000 (with Sivaram Narayan), 2006-2008.

Co-PI REU grant for $165,000 from the NSF (with Sivaram Narayan), 2003-2005.

Received SUMMA seed grant of $5,000 for minority intervention in mathematics, 1996.

Received NSA grant of $17,700, summer 1995, for research on nonabelian difference sets.

Creative and Scholarly Activity: Refereed Publications

K. W. Smith, "The Representation Theory of Tactical Configurations", *Congressus Numerantium*, v. 60, 1987, 151-162.

K. W. Smith, "Flag Algebras of a Symmetric Design", *Journal of Combinatorial Theory*, Series A, v. 48, no. 2, 1988, 209-228.

K. W. Smith, "Teaching Number Theory with ZBASIC", *Proceedings of the Second Annual Conference on Technology in Collegiate Mathematics*, 1989, 294-297.

K. W. Smith, "In Search of a (495, 39, 3) Difference Set", *Congressus Numerantium*, v. 73, 1990, 77-88.

B. Manvel, A. Meyerowitz, A. J. Schwenk, K. W. Smith, P. K. Stockmeyer, "Reconstruction of Sequences", *Discrete Mathematics*, v. 94, 1991, 209-219.

R. A. Liebler, K. W. Smith, "On difference sets in certain 2 groups", in Coding Theory, Design Theory, Group Theory: *Proceedings of the Marshall Hall Conference*, ed. by D. Jungnickel, John Wiley & Sons, 1993.

J. A. Davis, K. W. Smith, "A construction of difference sets in high exponent 2 groups"*, Journal of Algebraic Combinatorics*, 1994.

K. W. Smith, "Nonabelian hadamard difference sets", *Journal of Combinatorial Theory*, Series A, v. 70, 1995, 144-156.

J. Iiams, R. Liebler, K. W. Smith, "Difference Sets in Nilpotent Groups with Large Frattini Quotient: Geometric Methods and (375, 34, 3)", *Proceedings of a Special Research Quarter at the Ohio State University, Spring 1993* (published by Walter de Gruyter, 1996.)

K. W. Smith, "Nonabelian difference sets", chapter IV.13 in *The CRC Handbook on Combinatorial Designs*, 1996.

K. Mackenzie Fleming, K. W. Smith, "(27, 13, 6) designs with automorphisms of order 3", Proceedings of the Ninth Midwest Conference on Combinatorics, Cryptography and Computing, special edition *of Journal of Combinatorial Mathematics and Combinatorial Computing*, 1996.

K. Mackenzie Fleming, K. W. Smith, "An infinite family on nonembeddable quasi-residual designs", *Journal of Statistical Planning and Inference*, v. 73, 1998.

H. Fleischner. R. Molina, K. W. Smith, D. West, "The Two-Path Conjecture", *Electronic Journal of Combinatorics*, 2002.

M. McNally, R. Molina, K. W. Smith, "Characterizing Randomly P_k Decomposable Graphs for $k \leq 9$", *Congressus Numerantium* 156, 2003, 211-221.

(In addition, I supervised the undergraduate research which led to the publication: Christine Berkesch, Jeff Ginn, Erin Haller, Erin Militzer. "A Survey of Relative Difference Sets", *Rose-Hulman Undergraduate Mathematics Journal*, v. 4, Fall 2003.)

S. Narayan, J. (Eustice) Russell, K. W. Smith, "The Subgraph Summability Number of a Biclique", *Congressus Numerantium* **171**, 2004, 3-11.

O. AbuGhneim, P. Becker, J. Mendez, K. W. Smith, "On Hadamard Difference Sets in groups of order $4p^2$", *Congressus Numerantium* 172, 2005, 97-121.

James A. Davis, J. Jedwab and K.W. Smith, "Proof of the Barker Array conjecture," *Proc. Amer. Math. Soc.*, 2006.

D. Jungnickel, A. Pott, K. W. Smith, "Difference sets", a chapter in *The CRC Handbook on Combinatorial Designs*, (2nd ed.) 2006.

O. AbuGhneim , K. W. Smith, "Tightening Turyn's Bound for Hadamard Difference Sets", *Journal of Algebraic Combinatorics*, 2007.

O. AbuGhneim, K. W. Smith, "Nonabelian Groups with (96,20,4) Difference Sets," *Electronic Journal of Combinatorics*, R8 in Volume 14, January 3, 2007,

Factoring (16,6,2) Hadamard Difference Sets", with C. Bhattacharya, *Electronic Journal of Combinatorics*, Aug 2008.

Lisa Demeyer, Michel D'Sa, Inessa Epstein, Amanda Geiser, "Semigroups and the zero divisor graph", *Bulletin of the Institute for Combinatorics and its Applications*, Sep 2009.

Beth Cory, K. W. Smith, "Delving into limits of sequences", *Mathematics Teacher*, to appear.

Other Papers
Roland Dreier, K. W. Smith, Exhaustive Determination of (1023, 511, 255)-Cyclic Difference Sets, 1994, unpublished preprint cited in other publications.

S. Narayan, K. W. Smith, "The NSF REU at Central Michigan University", Proceedings of the AMS/NSA conference on Promoting Undergraduate Research in Mathematics, 2006.

S. Adams, J. Davis, N. Eugene, K. Hoke, S. Narayan, K. W. Smith, "The Long-term Undergraduate Research (LURE) Model", Proceedings of the AMS/NSA conference on Promoting Undergraduate Research in Mathematics, 2006.

Recent Presentations (last 3 years)

Three undergraduate research problems in graph theory, Lamar State University, Nov. 2007.

Three undergraduate research problems in graph theory, Sul Ross State Univ, Jan. 2008.

Three undergraduate research problems in graph theory, Trinity University, Feb. 2008.

Three undergraduate research problems in graph theory, Univ. of North Texas, Feb. 2008.

Distinguished Alumnus presentation, Colorado State University, Nov. 2008.

Auto-correlation, difference sets and the equation $XX^{(-1)} = 36$, Colorado State University, Nov. 2008.

Rational Idempotents in the Integral Group Ring and their applications, CombinaTexas, Houston, TX, April 2009.

Storer's Conjecture and Nonabelian Hadamard Difference Sets, Dayton, OH, Oct. 2009.

Longterm Undergraduate Research Experiences in Texas, TUMC, Nov. 2009.

Storer's Conjecture and Nonabelian Hadamard Difference Sets, Fort Collins, CO, Nov. 2009.

Longterm Undergraduate Research -- Part 2, Nacogdoches, TX, Feb. 2010.

Partial Difference Sets in Groups of High Exponent" (joint work with Jessica Stuckey), Lewis, DE, March 2010.

Longterm Undergraduate Research -- Part 2, Houston, TX, April 2010.

Professional and Academic Affiliations

    Member, American Mathematics Society

    Associate Fellow, Institute of Combinatorics and its Applications

    Member, Mathematical Association of America