

# Rigoberto Flórez

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## Education

- Ph.D. Mathematics, *August 2005*  
State University of New York (SUNY) at Binghamton  
Adviser: Dr. Thomas Zaslavsky  
Thesis: *Four Studies in the Geometry of Biased Graph.*
- M.S. Mathematics, Universidad Nacional de Colombia *March 1999*
- B.A. Mathematics, Universidad de Antioquia, Colombia *November 1995*

## Recent Teaching Experience

- Associate Professor *August 2016–present*  
Department of Mathematics and Computer Science  
The Citadel.
- Assistant Professor *August 2012–May 2016*  
Department of Mathematics and Computer Science  
The Citadel.
- Associate Professor *August 2011–August 2012*  
Division of Science, Mathematics and Engineering  
University of South Carolina Sumter, Sumter SC.
- Assistant Professor *August 2005–May 2011*  
Division of Science, Mathematics and Engineering  
University of South Carolina Sumter, Sumter SC.

## Other Teaching Experience

- External consultant for developing math curriculum in Equatorial Guinea (Africa, 2009)
- Graduate Teaching Assistant (2000-2005), Head Teaching Assistant (2003-2004), Full Time Instructor (2000), Adjunct faculty (1993-1999), Graduate Research Assistant (1997-1998).

## Classes Taught and Related Topics

- Classes taught: Intermediate College Algebra, Calculus for Business and Management, Applied Calculus I and II, Finite Mathematics, Pre-calculus, Calculus I, II, and III, Differential Equations, Discrete Mathematics (undergraduate), Discrete Mathematics (graduate), Euclidian Geometry, Vector geometry, Linear Algebra, Abstract Algebra I and II, Modern Algebra (graduate), Senior Seminar in Mathematics (capstone), Senior Research Project and Junior Research Project.

## Students Research

- Adviser: undergraduate (honor) thesis and two Senior Research Project.
- Under my guidance several undergraduate and graduate students have published their work, papers or solution for open problems.
- Under my guidance several undergraduate and graduate students have presented their works (talks and posters). Most of their presentations have been awarded. Awards from: Walt and Susan Patterson Prize for outstanding undergraduate research (MAA), Citadel research conferences, Sigma XI, South Carolina Academy of Science.
- Working with undergraduate students at Rochester Institute of Technology I have several paper published or submitted. This work was supported by GRANTs from REU-NSF.

## Meetings Organizer

- 29th Midwest Conference on Combinatorics and Combinatorial Computing, October 17–19, 2015.
- A founder and an organizer of the Carolina Mathematics Seminar. Please visit the link <http://macs.citadel.edu/florez/seminar.html>

- An organizer of the International Conference on Algebra, Number Theory, Combinatorics and Applications, ALTELCOA-4 May 31–June 4, 2010.

## Teaching Projects

- Co-PI of the project *Connecting Real World Scientific Problems with Real World Local Issues*. A multidisciplinary group developed this project, 2008–2009 (SENCER).
- Awarded by a fellowship from Project ACCESS.

## Referee Experience

- Referee for: Discrete Math; Ann. Comb; Acta Mathematica Sinica; Bull. Inst. Combin. Appl; Int. J. Comb; Discussiones Mathematicae Graph Theory; International Journal of Combinatorics; SIAM Journal on Discrete Mathematics; Journal of Integer Sequences.
- External member of committees of two Ph.D's students defense and one ABD examination of a Ph.D student.
- External member of committees of mater thesis.
- Judge for the South Carolina Academy of Science (2007–2012).
- Reviewer of MathSciNet.
- A reviewer for the book *Fibonacci and Lucas Numbers with Applications Volume II* by T. Koshy .

## Honors and Awards

- *The Outstanding Faculty Scholarship Award 2010–2011*. Awarded by University of South Carolina Sumter and the Sumter Partnership of the USC Educational Foundation.
- *Fellowship Project ACCESS*. Awarded by American Mathematics Association of Two year colleges AMATYC, 2006–2007.
- *Dissertation Fellowship*, Dept. of Mathematical Sciences, SUNY Binghamton, Spring 2005.
- *Teaching Recognition Award*. Binghamton University, Graduate School's Doctoral program, Fall 2002.

- Graduate Research Assistant. Grants provided by *COLCIENCIAS*. (See teaching experience for more details). February 1997–June 1998.
- *Fellowship for Arts and Sciences*. Awarded by Mazda (Compañía Colombiana Automotriz), Spring 1996–Fall 1996.
- Award for *top student in Mathematics*, Universidad de Antioquia, Spring 1994.

## Grants

- Five Research Grants from The Citadel Foundation 2012–2017.
- Grant for *Connecting Real World Scientific Problems with Real World Local Issues*. Sponsored by Science Education for New Civic Engagements and Responsibilities 2008–2009. This is a multidisciplinary project. I was a co-PI.
- *Fellowship Project ACCESS*. Awarded by American Mathematics Association of Two year colleges AMATYC, 2006–2007.
- Graduate Research Assistant. Grants provided by *COLCIENCIAS*. (See teaching experience for more details). February 1997–June 1998.

## Research Interest

- My research is in combinatorics, with a focus on algebraically representable matroids, bias graphs and graph theory. I am also interested in elementary number theory.

## Publications:

### I. Papers

Undergraduate student co-author indicated by an \*.

1. R. Flórez, R. Higuera, and A. Mukherjee, *Geometric Interpretations in the Hosoya Triangle of some Fibonacci Identities*. Submitted.
2. R. Flórez, H. A. Newman\*, H. Miranda\* and D. Narayan, *Uniform Edge Betweenness Centrality*. Submitted.
3. R. Flórez and T. Zaslavsky, *The Projective Planarity Question for Matroids of 3-Nets and Biased Graphs*, Submitted.
4. R. Flórez and T. Zaslavsky, *Biased Graphs. VI. Synthetic Geometry*, Submitted.
5. R. Flórez and J. L. Ramírez, *Some Enumerations on Non-Decreasing Motzkin Paths*. Accepted for publication in The Australasian Journal of Combinatorics 2018.

6. R. Flórez and A. Mukherjee, *Introducing Students to Conjectures, Exploration and Visual Proofs using Experiments in Topology*. Accepted for publication in PRIMUS.
7. R. Flórez, O. Haynes\*, D. Narayan, and A. Strang\*, *Enumerating shortest paths and determining edge betweenness centrality in Cartesian products of paths and cycles*. Accepted for publication in the Bulletin of the Institute of Combinatorics and Its Applications
8. E. Czabarka, R. Flórez, L. Junes, J. L. Ramírez, *Enumerations of Peaks and Valleys on Non-decreasing Dyck Paths*. Accepted for publication in Discrete Mathematics.
9. R. Flórez, E. Carter\*, B. Ek, D. A. Gonzalez\*, and D. Narayan, *Intersecting Geodesics and Centrality Graphs*. *Involve -A journal of Mathematics*. **12.1** (2019), 31–43.
10. R. Flórez, R. Higuaita, and A. Mukherjee, *Star of David and other patterns in the Hosoya-like polynomials triangles*, *Journal of Integer Sequences*, Vol. 21 (2018), Article 18.4.6.
11. R. Flórez, N. McAnally\*, and A. Mukherjee, *Identities for the generalized Fibonacci polynomial*, *Integers*, **18B** (2018), Paper No. A2.
12. R. Flórez, R. Higuaita, and A. Mukherjee, *Characterization of the strong divisibility property for generalized Fibonacci polynomials*, *Integers*, **18** (2018), Paper No. A14.
13. R. Flórez, L. Junes, and J. L. Ramírez *Further Results on Paths in an n-Dimensional Cubic Lattice*. *Journal of Integer Sequences*, Vol. 21 (2018), Article 18.1.2.
14. R. Flórez, J. Lind, and D. Narayan, *Betweenness centrality in organizational Structures*. *Congr. Numer.* 228 (2017), 281-288.
15. R. Flórez, D. Narayan, A. Sharma\*, R. Vargas\*, and A. Waldron\*, *A Graph Theoretic Analysis of Leverage Centrality*. *AKCE Int. J. Graphs Comb.* 14 (2017), no. 3, 295–306.
16. R. Flórez and A. Mukherjee, *Solving open problems with students as a first research experience*, *Teaching mathematics and its applications*, **10** (2017), 1–7.
17. R. Flórez, R. López\*, D. Narayan, H. Wickus\*, and J. Worrell\*, *Towards a Characterization of Graphs with Distinct Betweenness Centrality*, *Australasian Journal of Combinatorics*, Volume 68 (part 2), 2017.
18. R. Flórez, D. Narayan, A. Sharma\*, R. Vargas\*, and A. Waldron\*, *Leverage centrality of knight's graphs and Cartesian products of regular graphs and path powers*. *Involve-A journal of Mathematics*. **10.4** (2017), 583–592.
19. B. Baker Swart, R. Flórez, D. Narayan, and G. Rudolph, *Extrema Property of the k-Ranking of Directed Paths and Cycles*. *AKCE International Journal of Graphs and Combinatorics* **13** (2016) 38–53.
20. R. Flórez and D. A. Narayan, *Maximizing the number of edges in optimal k-rankings*. *AKCE International Journal of Graphs and Combinatorics* **12.1** (2015) 1–8.

21. E. Czabarka, R. Flórez, and L. Junes, *A Discrete Convolution on the Generalized Hosoya Triangle*. Journal of Integer Sequences, **18.1** (2015), 1–22.
22. E. Czabarka, R. Flórez, and L. Junes, *Some Enumerations on Non-decreasing Dyck Paths*. The Electronics Journal of Combinatorics, **22.1** (2015) 1–22.
23. R. Flórez, R. Higuaita and A. Mukherjee, *Alternating sums in the Hosoya polynomial triangle*, Journal of Integer Sequences, **17.9** (2014), 1–17.
24. R. Flórez, R. Higuaita and L. Junes, *9-modularity and GCD Properties of Generalized Fibonacci Numbers*. Integers 14 (2014), 1–14.
25. R. Flórez, R. Higuaita and L. Junes, *GCD property of the Generalized Star of David in Generalized Hosoya Triangle*. Journal of Integer Sequences, **17.4** (2014) 1–17.
26. R. Flórez and L. Junes, *GCD properties in the Hosoya's Triangle*. The Fibonacci Quarterly **50.2** (2012), 163–174.
27. R. Flórez and L. Junes, *A Relation Between Triangular Numbers and Prime Numbers*. Integers 12 (2012), no. 1, 83–96.
28. R. Flórez and D. A. Narayan, *An optimal  $k$ -ranking characterization of oriented paths and cycles*, Bulletin of the Institute of Combinatorics and its Applications. 61 (2011) 97–108.
29. R. Flórez, *Harmonic conjugation in harmonic matroids*. Discrete Mathematics. 309 (2009), 2365–2372.
30. R. Flórez and D. Forge, *Minimal non-orientable matroids in a projective plane*, Journal of Combinatorial Theory Series A. 114 (2007), 175–183.
31. R. Flórez, *Lindström's conjecture on a class of algebraically non-representable matroids*. European Journal of Combinatorics, 27 (2006), 896–905.
32. R. Flórez, *Four studies in the geometry of biased graphs*. Thesis (Ph.D.)–State University of New York at Binghamton. 2005. 78 pp. ISBN: 978-0542-19217-3.
33. R. Flórez and J. Vélez, *Failure of splitting from module-finite extension rings*. Beiträge zur Algebra und Geometrie (contributions to algebra and geometry), 41 (2000), 345–357.

### Short Research Visits

- Seven short research visit to Binghamton University (SUNY).  
July 28–Aug 2 2017, June 25–30 2016, June 16–21 2015, May 22–27 2014, May 24–28 2012, May 21–25 2011, May 22–27 2010.
- Eight short research visit to Rochester Institute of Technology (RIT).  
July 9–14 2017, June 20–24 2016, June 22–26 2015, June 23–27, 2014, June 25–28 2013, May 20–23 2012, May 17–20 2011, May 18–21, 2010.
- Four short research visit to California University of Pennsylvania (Cal U).  
March 25–30 2017, May 6–10 2016, April 30–May 6 2013, Dec 10–15 2012.
- One short research visit to Universidad Nacional de Colombia.  
June 18–25, 2017.
- Three short research visit to Universidad Sergio Arboleda.  
August 1–6 2016, May 23–29 2015, June 16–20 2014.

### Papers Presented:

1. *Characterization of the strong divisibility property for generalized Fibonacci polynomials.* Carolina Math Seminar, Benedict College, Columbia SC, Nov 3, 2017.
2. *Projective Rectangles.* AMS Fall Central Sectional Meeting University of North Texas, Denton, TX, Sep 9, 2017.
3. *GCD Property of Generalized Fibonacci Polynomials and other identities.* INTEGERS Conference 2016, University of West Georgia, October 8, 2016.
4. *Una relación entre los caminos de Dyck y los números de Fibonacci.* Seminario de Redes Complejas y Combinatoria, Universidad Sergio Arboleda (Colombia), August 3, 2016.
5. *Algunos Conteos de los caminos no decrecientes de Dyck.* ALTENCOA 7-2016, Bucaramanga (Colombia), July 21, 2016.
6. *Una relación entre los caminos de Dyck y los números de Fibonacci.* Universidad de Antioquia (Medellin), seminario institucional, July 18, 2016.
7. *Non-decreasing Dyck paths and Fibonacci Numbers.* The Combinatorics Seminar, Binghamton University, Binghamton NY, June 28, 2016.
8. *Exploring Mathematics with Fibonacci Numbers and Hosoyas Triangle.* Rochester Institute of Technology (RIT), June 23, 2016.

9. *Projective Representation of Non-Representable Matroids (of Biased Graphs)*. Discrete Seminar, University of South Carolina Feb 12, 2016.
10. *Projective Representation of Non-Representable Matroids (of Biased Graphs)*. Discrete Math Seminar, Texas State University, San Marcos, Nov 20, 2015.
11. *Exploring Mathematics with Fibonacci Numbers and Hosoya's Triangle*. Sigma XI brown-bag lunch presentation, The Citadel, October 16, 2015.
12. *Experiments in Topology*. Rochester Institute of Technology (RIT), June 25, 2015.
13. *Explorando Matemáticas con Relaciones Recursivas de Segundo Orden en Arreglos Triangulares*. Foro departamento de Matemáticas de Universidad del Valle (Cali). Seminario institucional, May 29, 2015.
14. *Topología Experimental*. Universidad Sergio Arboleda (Bogotá). Conductor of a workshop, May 23, 2015.
15. *Explorando Matemáticas en el Triángulo de Hosoya*. Universidad de Antioquia (Medellin), seminario institucional, May 21, 2015.
16. *Explorando Matemáticas en el Triángulo de Hosoya*. Seminario Universidad EAFIT (Medellin), May 15, 2015.
17. *Some algebraic and geometric properties of Fibonacci polynomials in the Hosoya triangle*. American Mathematical Society (AMS) Joint Mathematics Meetings, San Antonio TX, January 11, 2015.
18. *Counting Non-Decreasing Dyck Paths*. Discrete Seminar, University of South Carolina Nov 21, 2014.
19. *A formal Power Series to Count non-decreasing Dyck Paths*. Colloquium, College of Charleston Sep 5, 2014.
20. *Using Fibonacci Numbers to Count Dyck Paths*. Sixteenth International Conference on Fibonacci Numbers and Their Applications, July 25, 2014.
21. *Topics in the Hosoya's Triangle*. Rochester Institute of Technology (RIT), June 25, 2014.
22. *Seminario en Matemática Elemental y Robótica*. Universidad Sergio Arboleda (Bogotá). Conductor of a workshop, June 17–19, 2014.
23. *Representación Projectiva de Matroids no representable (of Biased Graphs)*. Universidad de Antioquia (Medellin), seminario institucional, June 9, 2014.
24. *A Relation Between Triangular Numbers and Prime Numbers*. Rochester Institute of Technology (RIT), June 27, 2013.



25. *Using Hosoya's Triangle to Count Some Dyck Paths*. MAA, Southeastern Section, Winthrop University, March 16, 2013.
26. *Representability of frame matroid and lift Matroid in a Projective Plane*. Colloquium, College of Charleston Feb 15, 2013.
27. *Convolutions on the Geometry of Hosoya's Triangle*. American Mathematical Society (AMS) Joint Mathematics Meetings, San Diego CA, January 9, 2013.
28. *GCD Properties in Hosoya's Triangle*. MAA Southeastern Section Spring 2012 Meeting, Clayton State University, March 9–10, 2012.
29. *Projective Representation of Non-Representable Matroids (of Biased Graphs)*. The Combinatorics Seminar, Binghamton University, Binghamton NY, May 23, 2011.
30. *A representation of the bias matroid in a projective plane*. Combinatorics seminar, Dept of Mathematics, University of South Carolina, Columbia, April 20 2011.
31. *Some open questions*. Regional Campuses Mathematics Seminar, University of South Carolina Sumter, Sep 17, 2010.
32. *Harmonic Conjugation and Projective Rectangles*. The Combinatorics Seminar, Binghamton University, Binghamton NY, May 25, 2010 .
33. *A construction of a projective rectangle in a full algebraic matroid*. Spring Southeastern Sectional Meeting, University of Kentucky, Lexington, KY, March 28, 2010.
34. *Some topics in harmonic matroids*. Regional Campuses Mathematics Seminar, University of South Carolina Lancaster, October 30, 2009.
35. *A representation of the bias matroid in a projective plane*. Fortieth Southeastern International Conference on Combinatorics, Graph Theory and Computing, March 2–6, 2009. Florida Atlantic University, Boca Raton.
36. *Merging the Streams: Interdisciplinary Approaches to Improving Undergraduate Education and Civic Engagement*. SENCER Summer Institute, San Jose CA, August 10, 2008.
37. *A family of non-orientable matroids of rank three in a projective plane*. American Mathematical Society (AMS) Joint Mathematics Meetings, San Diego CA, January 6, 2008.
38. *What is a matroid?*. The Mathematical Association of America (MAA) MAA/SIAM-SE conference at Georgia Southern University in Statesboro, Georgia. March 16, 2007.
39. *A construction of a projective plane in a full algebraic matroids*. Combinatorics seminar, Dept of Mathematics, University of South Carolina, February 28, 2007.
40. *Minimal non-orientable matroids in projective planes*. The 28<sup>th</sup> Ohio State-Denison, Mathematics conference, Columbus Oh, May 21, 2006.

41. *A Construction of a projective plane in harmonic matroids.* American Mathematical Society (AMS) Joint Mathematics Meetings, San Antonio TX, January 13, 2006.
42. *Harmonic matroids as a tool to prove some conjectures in algebraic matroids .* Combinatorics seminar, Dept of Mathematics, University of South Carolina, Columbia, September 22, 2005.
43. *Introduction to matroids II.* Combinatorics seminar, Dept of Mathematics, University of South Carolina, Columbia, September 15, 2005.
44. *Introduction to matroids I .* Combinatorics seminar, Dept of Mathematics, University of South Carolina, Columbia, September 8, 2005.
45. *A conjecture of Lindström on a class of algebraically non-representable matroids.* Discrete Geometry & Combinatorics Seminar, Dept of mathematics, Cornell University, March 9, 2005.
46. *Harmonic matroids and a conjecture of Lindström's.* Mathematics Seminar, Scranton University, February 24, 2005.
47. *Harmonic Conjugation in Harmonic Matroids.* Combinatorics and Number Theory Seminar, Dept. of Mathematical Sciences, Binghamton University, February 17, 2005.
48. *How the harmonic conjugate works in the algebraic matroids to construct algebraically nonrepresentable matroids.* American Mathematical Society (AMS) Joint Mathematics Meetings, Atlanta GA, January 6, 2005.
49. *What is a matroid and what is it for?* Mathematical Association of America (MAA) Seaway Section at Canisius College, Buffalo, NY, November 6, 2004.
50. *Lindström's Conjecture on a Class of Algebraically Non-Representable Matroids.* Combinatorics and Number theory Seminar, Dept. of Mathematical Sciences, Binghamton University, October 1, 2004.
51. *Pseudomodularity and Full Algebraic Matroids.* Algebra Seminar, Dept. of Mathematical Sciences, Binghamton University, March 25, 2003.
52. *The Relationship Between Full Algebraic Matroids and Lattice Properties: Pseudomodularity and Double Circuits.* Combinatorics and Number Theory Seminar, Dept. of Mathematical Sciences, Binghamton University, March 24, 2003.
53. *Tutte-Grothendieck Invariance and the Chromatic and Characteristic Polynomials.* Combinatorics and Number Theory Seminar, Dept. of Mathematical Sciences, Binghamton University, March 6, 2002.
54. *Retracciones y extensiones modulo finito,* VII Encuentro de la Escuela Regional de Matemáticas, Universidad de Antioquia, August 25, 1999.

**Selected Meetings Attended:**

- AMS Fall Central Sectional Meeting University of North Texas, Denton, TX, Sep 9-10, 2017.
- INTEGERS Conference 2016, University of West Georgia, October 8-9, 2016.
- ALTENCOA 7-2016, Bucaramanga (Colombia), July 18-22, 2016 .
- American Mathematical Society (AMS) Joint Mathematics Meetings, San Antonio TX, January 10–13, 2015.
- Sixteenth International Conference on Fibonacci Numbers and Their Applications, Rochester Institute of Technology, Rochester, NY July 20–26, 2014.
- MAA, Southeastern Section Spring 2013 Meeting, Winthrop University, March 16, 2013.
- American Mathematical Society (AMS) Joint Mathematics Meetings, San Diego CA, Jan 9–12, 2013.
- MAA Southeastern Section Spring 2012 Meeting, Clayton State University, March 9–10, 2012.
- Spring Southeastern Sectional Meeting, University of Kentucky, Lexington KY, March 27–28, 2010.
- Carolina Math Seminar, all meetings attended.
- Fortieth Southeastern International Conference on Combinatorics, Graph Theory and Computing, Florida Atlantic University, Boca Raton, March 2–6, 2009.
- Brylawski Memorial Conference in Matroids, Chapel Hill NC, Oct 18–19, 2008.
- Science Education for New Civic Engagements and Responsibilities Summer Institute (SENCER), San Jose CA, Aug 8–11, 2008.
- American Mathematical Society (AMS) Joint Mathematics Meetings, San Diego CA, Jan 6–9, 2008.
- 33rd AMATYC Annual conference, Minneapolis, Minnesota, Nov 1–4, 2007.
- The Mathematical Association of America (MAA) Joint MAA/SIAM-SE conference at Georgia Southern University in Statesboro GA. March 16–17, 2007.
- The 28<sup>th</sup> Ohio State-Denison, Mathematics conference, Columbus Oh, May 19–21, 2006.

- American Mathematical Society (AMS) Joint Mathematics Meetings, San Antonio TX, Jan 12–15, 2006.
- American Mathematical Society (AMS) Joint Mathematics Meetings, Atlanta GA, Jan 5–8, 2005.
- Mathematical Association of America (MAA) Seaway Section at Canisius College, Buffalo NY, November 5–6, 2004.
- Mathematical Sciences Research Institute (MSRI) workshop: Combinatorial Aspects of Hyperplanes Arrangements, Berkley CA, Nov 1–5, 2004.
- Mathematical Sciences Research Institute (MSRI) workshop: Combinatorial and Discrete Geometry, Berkley CA, Nov 17–21, 2003.
- Eastern sectional American Mathematical Society (AMS) meeting, Binghamton NY, October 11–12, 2003.
- Discrete Math Day, University of Rhode Island, Feb. 6, 2003.
- Discrete Math Day, University of Massachusetts, Sep. 28, 2002.
- Matroid Structure Theory, Ohio State University, Columbus OH. July 1–5, 2002.
- Implementing Technology in the Classroom, Ithaca College, Ithaca NY, March 2001.