

# Paul Pollack

## Curriculum Vitae<sup>1</sup>

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University of Georgia

Mathematics Department

Boyd Graduate Studies Research Center

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### POSITIONS HELD

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#### University of Illinois

J. L. Doob Research Assistant Professor/NSF Postdoctoral Fellow      Fall 2008–Spring 2011

#### Institute for Advanced Study

Member of the School of Mathematics      Fall 2009

#### Dartmouth College

Visiting Research Scholar      Spring 2010

#### University of British Columbia/Simon Fraser University

Postdoctoral Fellow      July 2011–April 2012

#### University of Georgia

Assistant Professor      Fall 2012–Summer 2016

Associate Professor      Fall 2016–

### EDUCATION

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#### University of Georgia

Bachelor of Science, Mathematics      Spring 2003

#### Princeton University

Fall 2003 – Winter 2005

#### Dartmouth College

Master of Arts, Mathematics      June 2007

Ph.D., Mathematics      June 2008

Thesis: *Prime polynomials over finite fields*

### HONORS AND AWARDS

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**Sandy Beaver Excellence in Teaching Award**      2018

Annual award honoring UGA Franklin College faculty members showing “sustained commitment to high-quality instruction”.

**NSF Algebra and Number Theory Award DMS-1402268**      2014–2017

Statistical problems in elementary, analytic, and algebraic number theory (award amount \$130,925)

**NSF Algebra and Number Theory Award DMS-1502336**

(co-PI w/ L. Thompson, R. Rumely, and G. Yu)      Summer 2015

Conference grant for “Elementary, analytic, and algorithmic number theory: Research inspired by the mathematics of Carl Pomerance” (award amount \$19,728)

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<sup>1</sup>Last updated: February 15, 2018

**NSA Conference Award**

(co-PI w/ L. Thompson, R. Rumely, and G. Yu)

Summer 2015

“Carl Pomerance 70th birthday conference” (award amount \$15,788)

**RECENT INVITED ADDRESSES** 

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**American Institute of Mathematics****workshop on arithmetic statistics over finite fields and function fields** January 30, 2014

‘On the distribution of irreducible polynomials vs. the distribution of rational primes’

**2014 Illinois Number Theory conference****in memory of the Batemans and Heini Halberstam**

June 6, 2014

‘Solved and unsolved problems in elementary number theory’

**American Institute of Mathematics****workshop on gaps between primes**

November 19, 2014

‘Big doings with small gaps’

**CRM workshop on “New approaches in probabilistic and multiplicative number theory”**

December 12, 2014

‘Statistics associated with reductions of elliptic curves modulo  $p$ ’**American Association for the Advancement of Science Annual Meeting****panelist for special session on gaps between primes**

February 16, 2015

‘Big doings with small gaps’

**Math Honors Day, Mercer University**

March 19, 2015

‘Summing divisors: A status report on the first 2000 years’

**Spring 2015 Southeastern Sectional Meeting of the AMS**

March 27, 2015

‘Big doings with small gaps’ (one of 4 plenary talks)

**2015 Illinois Number Theory conference**

August 14, 2015

‘Anatomy of torsion in the CM case’

**2016 Gainesville International Number Theory conference**

March 19, 2016

‘Phi-nomenology and torsion subgroups of CM elliptic curves’

**Analytic Number Theory workshop in Oberwolfach, Germany**

November 12, 2016

‘Torsion subgroups of CM elliptic curves’

**2017 National Joint Meetings of the AMS and MAA; AMS special session on “Discrete Structures in Number Theory”**

January 5, 2017

‘Torsion subgroups of CM elliptic curves’

**MSRI workshop on “Recent developments in Analytic Number Theory”**

May 5, 2017

‘Arithmetic functions: something old, something new’

**XII International Congress of Scientific Research, Dominican Republic**

June 8, 2017

‘Arithmetic functions: something old, something new’

**60th Anniversary Ross Mathematics Program reunion conference**

June 18, 2017

‘Summing divisors: a status report on the first 2000 years’

**Invited address at Spring 2018 KYMAA meeting**

April 6, 2018

‘Summing divisors: a status report on the first 2000 years’

## ACCEPTED PAPERS

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1. **An explicit approach to Hypothesis H for polynomials over a finite field** 2008  
*The anatomy of integers*. Proceedings of a conference on the anatomy of integers, Montreal, March 13th-17th, 2006. Editors: J.M. de Koninck, A. Granville and F. Luca, pp. 259–273
  2. **On a conjecture of Beard, O’Connell and West concerning perfect polynomials** 2008  
(joint with L. Gallardo and O. Rahavandrainy)  
*Finite Fields and their Applications* **14**, 242–249
  3. **A polynomial analogue of the twin prime conjecture** 2008  
*Proc. Amer. Math. Soc.* **136**, 3775–3784
  4. **Simultaneous prime specializations of polynomials over finite fields** 2008  
*Proc. London Math. Soc.* **97**, 545–567
  5. **Arithmetic properties of polynomial specializations over finite fields** 2009  
*Acta Arith.* **136**, 57-79
  6. **On the distribution of sociable numbers** (w/ M. Kobayashi and C. Pomerance) 2009  
*J. Number Theory* **129**, 1990-2009
  7. **A remark on sociable numbers of odd order** 2010  
*J. Number Theory* **130**, 1732–1736
  8. **Revisiting Gauss’s analogue of the prime number theorem for polynomials over a finite field** 2010  
*Finite Fields and their Applications* **16**, 290-299
  9. **Hypothesis H and an impossibility theorem of Ram Murty** 2010  
*Rend. Sem. Mat. Univ. Pol. Torino* **68**, 183–197
  10. **Multiperfect numbers with identical digits** (joint with F. Luca) 2011  
*J. Number Theory* **131**, 260–284
  11. **On polynomial rings with a Goldbach property** 2011  
*Amer. Math. Monthly* **118**, 71–77
  12. **On Dickson’s theorem concerning odd perfect numbers** 2011  
*Amer. Math. Monthly* **118**, 161–164
  13. **Long gaps between deficient numbers** 2011  
*Acta Arith.* **146**, 33–42
  14. **On Hilbert’s solution of Waring’s problem** 2011  
*Cent. Eur. J. Math.* **9**, 294–301
  15. **Powerful amicable numbers** 2011  
*Colloq. Math.* **122**, 103–123
  16. **Values of the Euler and Carmichael functions which are sums of three squares** 2011  
*Integers* **11**, article A13, 16 pages (electronic)
  17. **On some friends of the sociable numbers** 2011  
*Monatsh. Math.* **162**, 321–327
  18. **The greatest common divisor of a number and its sum of divisors** 2011  
*Michigan Math. J.* **60**, 199–214

19. **Perfect numbers with identical digits** 2011  
*Integers* **11A**. Proceedings of the Integers Conference 2009. Article 18, 11 pages (electronic)
20. **Quasi-amicable numbers are rare** 2011  
*J. Integer Sequences* **14**, article 11.5.2, 13 pages (electronic)
21. **The exceptional set in the polynomial Goldbach problem** 2011  
*Int. J. Number Theory* **7**, 579–591
22. **The Möbius transform and the infinitude of primes** 2011  
*Elem. Math.* **66**, 118–120
23. **Remarks on a paper of Ballot and Luca concerning prime divisors of  $a^{f(n)} - 1$**  2011  
*New York J. Math* **17**, 553–567
24. **On common values of  $\phi(n)$  and  $\sigma(m)$ , I** (joint with K. Ford) 2011  
*Acta Math. Hungarica* **133**, 251–271
25. **Two remarks on iterates of Euler’s totient function** 2011  
*Arch. Math.* **97**, 443–452
26. **An arithmetic function arising from Carmichael’s conjecture** (w/ F. Luca) 2011  
*J. Théor. Nombres Bordeaux* **23**, 697–714
27. **The average least quadratic nonresidue modulo  $m$  and other variations on a theme of Erdős** 2012  
*J. Number Theory* **132**, 1185–1202
28. **On the parity of the number of multiplicative partitions and related problems** 2012  
*Proc. Amer. Math. Soc.* **140**, 3793–3803
29. **On perfect and near-perfect numbers** (joint with V. Shevelev) 2012  
*J. Number Theory* **132**, 3037–3046
30. **Prime-perfect numbers** (joint with C. Pomerance) 2012  
*Integers* **12A**/special issue in memory of J. L. Selfridge, article A14, 19 pages
31. **Finiteness theorems for perfect numbers and their kin** 2012  
*American Math. Monthly* **119**, 670–681
32. **How many primes can divide the values of a polynomial?** (joint with F. Luca) 2012  
*Acta Arith.* **156**, 19–27
33. **On congruences of the form  $\sigma(n) \equiv a \pmod{n}$**  (with A. Anavi and C. Pomerance) 2012  
*Int. J. Number Theory* **9**, 115–124
34. **On common values of  $\phi(n)$  and  $\sigma(m)$ , II** (joint with K. Ford) 2012  
*Algebra Number Theory* **6**, 1669–1696
35. **The average least character nonresidue and further variations on a theme of Erdős** (joint with G. Martin) 2013  
*J. London Math. Soc.* **87**, 22–42
36. **On the degrees of divisors of  $T^n - 1$**  (joint with L. Thompson) 2013  
*New York J. Math* **19**, 91–116
37. **Irreducible polynomials with several prescribed coefficients** 2013  
*Finite Fields and their Applications* **22**, 70–78

38. **Practical pretenders** (joint with L. Thompson) 2013  
*Publ. Math. Debrecen* **82**, 651–667
39. **Sets of monotonicity for Euler’s totient function** (w/ C. Pomerance and E. Treviño) 2013  
*Ramanujan J.* **30**, 379–398
40. **On Mertens’ theorem or Beurling primes** 2013  
*Canad. Math. Bull.* **56**, 829–843
41. **On the distribution of some integers related to perfect and amicable numbers** (joint with C. Pomerance) 2013  
*Colloq. Math.* **30**, 169–182
42. **The smallest inert prime in a cyclic number field of prime degree** 2013  
*Math. Res. Lett.* **20**, 163–179
43. **Paul Erdős and the rise of statistical thinking in elementary number theory** (joint with C. Pomerance) 2013  
*Erdős Centennial*, L. Lovász, I. Z. Ruzsa, and V. T. Sós, eds., János Bolyai Math. Soc. and Springer-Verlag, Hungary, 2013, pp. 515–523
44. **Uncertainty principles connected with the Möbius inversion formula** (with C. Sanna) 2013  
*Bull. Aust. Math. Soc.* **88**, 460–472
45. **Equidistribution mod  $q$  of abundant and deficient numbers** 2014  
*Uniform Distribution Theory* **9**, 99–114
46. **A remark on prime divisors of partition functions** 2014  
*Int. J. Number Theory* **10**, 125–131
47. **The error term in the count of abundant numbers** (joint with M. Kobayashi) 2014  
*Mathematika* **60**, 43–65
48. **The smallest prime that splits completely in an abelian number field** 2014  
*Proc. Amer. Math. Soc.* **142**, 1925–1934
49. **Square values of Euler’s function** (joint with C. Pomerance) 2014  
*Bull. London Math. Soc.* **46**, 403–414
50. **The primes that Euclid forgot** (joint with E. Treviño) 2014  
*Amer. Math. Monthly* **121**, 433–437
51. **Variations on a theorem of Davenport concerning abundant numbers** (w/ E. Jennings and L. Thompson) 2014  
*Bull. Aust. Math. Soc.* **89**, 437–450
52. **Prime splitting in abelian number fields and linear combinations of Dirichlet characters** 2014  
*Int. J. Number Theory* **10**, 885–903
53. **Averages of the number of points on elliptic curves** (w/ G. Martin and E. Smith) 2014  
*Algebra Number Theory* **8**, 813–836
54. **Bounded gaps between primes with a given primitive root** 2014  
*Algebra Number Theory* **8**, 1769–1786

55. **Some arithmetic properties of the sum of proper divisors and the sum of prime divisors** 2014  
*Illinois J. Math* **58**, 125–147
56. **Euler and the partial sums of the prime harmonic series** 2015  
*Elem. Math.* **70**, 13–20
57. **Bounded gaps between primes in number fields and function fields** (with A. Castillo, C. Hall, R. Lemke Oliver, and L. Thompson) 2015  
*Proc. Amer. Math. Soc.* **143**, 2841–2856
58. **An easy generalization of Euler’s theorem on the series of prime reciprocals** 2015  
*American Math. Monthly* **122**, 159–163
59. **Some normal numbers generated by arithmetic functions** (with J. Vandehey) 2015  
*Canad. Math. Bull.* **58**, 160–173
60. **The truth about torsion in the CM case** (with P. L. Clark) 2015  
*C. R. Math. Acad. Sci. Paris* **353**, 683–688
61. **Palindromic sums of proper divisors** 2015  
*Integers* **15A**/Proceedings of the Erdős Centennial Conference, article A13 (electronic), 12 pages
62. **Harmonious pairs** (joint with M. Kozek, F. Luca, and C. Pomerance) 2015  
*Int. J. Number Theory* **11**, 1633–1651
63. **Arithmetic functions at consecutive shifted primes** (with L. Thompson) 2015  
*Int. J. Number Theory* **11**, 1477–1498
64. **The length spectra of arithmetic hyperbolic 3-manifolds and their totally geodesic surfaces** (with B. Linowitz and J. S. Meyer) 2015  
*New York J. Math* **21**, 955–972
65. **Besicovitch, bisection, and the normality of  $0.1491625\dots$**  (with J. Vandehey) 2015  
*American Math. Monthly* **122**, 757–765
66. **Remarks on fibers of the sum-of-divisors function** 2015  
in *Analytic Number Theory: In Honor of Helmut Maier’s 60th Birthday*, M. Rassias and C. Pomerance, eds., Springer, 305–320
67. **On relatively prime amicable pairs** 2015  
*Mosc. J. Comb. Number Theory* **5**, 36–51
68. **The average of the first invariant factor for reductions of CM elliptic curves mod  $p$**  (with T. Freiberg) 2015  
*Int. Math. Res. Notices* **2015**, no. 21, 11333–11350
69. **Some problems of Erdős on the sum-of-divisors function** (joint with C. Pomerance) 2016  
*Trans. Amer. Math. Soc. Ser. B.* **3**, 1–26
70. **A Titchmarsh divisor problem for elliptic curves** 2016  
*Math. Proc. Cambridge Philos. Soc.* **160**, 167–189
71. **A remark on divisor weighted sums** 2016  
*Ramanujan J.* **40**, 63–69
72. **Bounded gaps between primes with a given primitive root, II** (w/ R. C. Baker) 2016  
*Forum Mathematicum* **28**, 675–687

73. **Digitally delicate primes** (w/ J. Hopper) 2016  
*J. Number Theory* **168**, 247–256
74. **The representation function for sums of three squares along arithmetic progressions** 2016  
*Proc. Japan Acad., Ser. A Math. Sci.* **92**, 96–99
75. **An elemental Erdős–Kac theorem for algebraic number fields** 2017  
*Proc. Amer. Math. Soc.* **145**, 971–987
76. **Extremal primes for elliptic curves with complex multiplication** (w/ K. James) 2017  
*J. Number Theory* **172**, 383–391
77. **Anatomy of torsion in the CM case** (with A. Bourdon and P.L. Clark) 2017  
*Math. Z.* **285**, 795–820
78. **Bounds for the first several prime character nonresidues** 2017  
*Proc. Amer. Math. Soc.* **145**, 2815–2826
79. **A simple proof of a theorem of Hajdu–Jarden–Narkiewicz** 2017  
*Colloq. Math.* **147**, 217–220
80. **Two problems concerning irreducible elements in rings of integers of number fields** (w/ L. Troupe) 2017  
*Bull. Aust. Math. Soc.* **96**, 44–58
81. **Counting perfect polynomials** (w/ U. Caner Cengiz and E. Treviño) 2017  
*Finite Fields and their Applications* **47**, 242–255
82. **Clustering of linear combinations of multiplicative functions** (w/ N. Lebowitz-Lockard) 2017  
*J. Number Theory* **180**, 660–672
83. **Subgroup avoidance for primes dividing the values of a polynomial** 2017  
*Rocky Mountain J. Math* **47**, 2043–2050
84. **Numbers divisible by a large shifted prime and large torsion subgroups of CM elliptic curves** (w/ N. McNew and C. Pomerance) 2017  
*Int. Math. Res. Notices* **2017**, 5525–5553
85. **Torsion subgroups of CM elliptic curves over odd degree number fields** (w/ A. Bourdon) 2017  
*Int. Math. Res. Notices* **2017**, 4923–4961
86. **Clusters of primes with square-free translates** (w/ R. C. Baker) 2017  
*Revista Mat. Iberoam.* **33**, 809–829
87. **Bounded gaps between primes and the length spectra of arithmetic hyperbolic 3-orbifolds** (w/ B. Linowitz, D. B. McReynolds, and L. Thompson) 2017  
*C. R. Math. Acad. Sci. Paris* **355**, 1121–1126
88. **The number of atoms in a primefree atomic domain** (w/ P.L. Clark and S. Gosavi) 2017  
*Comm. Algebra* **45**, 5431–5442
89. **Eigenvalues of the Laplacian on domains with fractal boundary** (w/ C. Pomerance) 2018+  
Horizons of Fractal Geometry and Complex Dimensions,, San Luis Obispo, June, 2016, R. G. Niemeyer, E. P. J. Pearse, J. A. Rock, and T. Samuel, eds. (to appear)

90. **Systoles of arithmetic hyperbolic surfaces and 3-manifolds** (w/ B. Linowitz, D. B. McReynolds, and L. Thompson) 2018+  
*Math. Res. Lett.* (to appear)
91. **The truth about torsion in the CM case, II** (w/ P. L. Clark) 2018+  
*Quart. J. Math.* (to appear)
92. **Refinements of Lagrange's four-square theorem** (w/ L. Goldmakher) 2018+  
*Amer. Math. Monthly* (to appear)
93. **Thue's lemma in  $\mathbb{Z}[i]$  and Lagrange's four-square theorem** 2018+  
*Elem. Math.* (to appear)
94. **Divisor-sum fibers** (w/ C. Pomerance and L. Thompson) 2018+  
*Mathematika* (to appear)
95. **Finding the four squares in Lagrange's theorem** (w/ E. Treviño) 2018+  
*Integers* (to appear)
96. **Dirichlet's proof of the three-square theorem: an algorithmic perspective** (w/ P. Schorn) 2018+  
*Math. Comp.* (to appear)
97. **Pursuing polynomial bounds on torsion** (w/ P. L. Clark) 2018+  
*Israel J. Math.* (to appear)
98. **A note on Golomb topologies** (w/ N. Lebowitz Lockard and P. L. Clark) 2018+  
*Quaestiones Math.* (to appear)
99. **The least prime quadratic nonresidue in a prescribed residue class mod 4** 2018+  
*J. Number Theory* (to appear)
100. **A remark on the number field analogue of Waring's constant  $g(k)$**  2018+  
*Math. Nachr.* (to appear)

## SUBMITTED PAPERS

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**Counting and effective rigidity in algebra and geometry**

(joint with B. Linowitz, D. B. McReynolds, and L. Thompson)

**A note on the least prime that splits completely in a nonabelian Galois number field**

(w/ Z. Ge and M. Milinovich)

**Typically bounding torsion** (w/ P. L. Clark and M. Milosevic)

**Waring's problem for integral quaternions**

**Small prime  $k$ th power residues for  $k = 2, 3, 4$ : a reciprocity laws approach** (w/ K. Benli)

**Nonnegative multiplicative functions on sifted sets, and the square roots of  $-1$  modulo shifted primes**

## BOOKS

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**Not always buried deep: A second course in elementary number theory** 2009  
 American Mathematical Society

**A conversational introduction to algebraic number theory** 2017  
 American Mathematical Society



## SYNERGISTIC ACTIVITIES

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### Editorial positions

Associate Editor for the American Mathematical Monthly (2016 – 2022).

Editor for the International Journal of Number Theory (2017–2019).

### Refereeing

Have refereed for Acta Arith., Algebra Number Theory, Amer. Math. Monthly, Bol. Soc. Mat. Mexicana, Bull. Aust. Math. Soc., Bull. Brazilian Math. Soc., Bull. Korean Math. Soc., Canad. Math. Bull., Canad. J. Math., Exp. Math., Integers, Int. J. Number Theory, Int. Math. Res. Notices, J. Integer Sequences, J. Logical and Algebraic Methods in Programming, J. Number Theory, J. Combinatorics and Number Theory, Math. Comp., Mathematika, and the Handbook of Finite Fields.

Have refereed grant proposals for the National Security Administration. Served on National Science Foundation grant panels in 2015 and 2017.

### Special session organizer

Co-organized (with L. Goldmakher, M. Milinovich, J. Kish) a special session at the 2012 AMS/MAA Joint Meetings titled “New perspectives on multiplicative number theory.” This was a special session following up on an NSF-sponsored Mathematics Research Communities workshop (“The pretentious view of analytic number theory”).

For the 2014 Joint Meetings, co-organized (with C. Pomerance) an MAA Invited Paper Session titled “The continuing influence of Paul Erdős in number theory”.

Organized the special session “Elementary methods in analytic number theory” at the Spring 2015 Southeastern AMS Sectional Meeting in Huntsville, AL (March 27–29, 2015).

Organized (with R. Lemke Oliver and F. Thorne) a special session for the 2017 AMS/MAA Joint Meetings titled “Analytic number theory and arithmetic” (January 7, 2017).

### Work with junior mathematicians

Since 2001, the University of Georgia has organized a high school math tournament for students in Georgia and neighboring states. Since 2012, I have served as one of the primary contest organizers. In addition, in the summers of 2013, 2014, and 2016, I was a faculty mentor for the week-long UGA MathCamp organized by Angela Gibney and Danny Krashen. (There was no camp in 2015 or 2017.)

Served on a Young Mathematicians’ Network panel at the 2016 AMS/MAA Joint Meetings. The subject was “Finding a thesis topic and advisor.” Co-panelist with Allison Henrich of Seattle University.

Was one of 11 speakers at the 60th anniversary Ross Program reunion conference in June 2017. The Ross Program is a residential summer camp where high school students are immersed in the process of mathematical discovery for six weeks.

Will be co-running the Ross Math Asia Program in China, Summer 2018 (jointly with Enrique Treviño, Lake Forest College).

### Teaching in developing countries

Taught a one-week course in Manila in July, 2013 for a summer school on algebraic curves. The summer school was sponsored by CIMPA (International Centre for Pure and Applied Mathematics) and ICTP (the Abdus Salam International Centre for Theoretical Physics); both of these are organizations aiming to promote scientific education in the developing world.

Taught a minicourse titled “Vistas in Number Theory”, June 5–7, 2017, at the Universidad Autónoma de Santo Domingo in the Dominican Republic. This was one of four minicourses offered at UASD as a lead-in to an international scientific congress held later that week. The course introduced students and local faculty to central topics in elementary number theory.

## MENTORING

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### Postdoctoral mentor

Lola Thompson (2012–2013)  
Joseph Vandehey (2013–2016)

### Thesis supervisor

Emily Jennings (M.A., 2014)  
Lee Troupe (Ph.D., Spring 2016)  
Kubra Benli (Ph.D., in progress)  
Noah Lebowitz-Lockard (Ph.D., in progress)

### Undergraduate research supervisor (through UGA's Center for Undergraduate Research Opportunities)

Jackson Douglas Hopper (Spring 2015–present); Jackson received a \$1000 CURO research assistantship in Spring 2015 and a \$3000 CURO summer fellowship in Summer 2015. Our work on “digitally delicate” primes appeared in the Journal of Number Theory (paper #73 above).

## UGA TEACHING EXPERIENCE

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<i>Math 2260: Calculus II for science and engineering</i>	Fall 2012
<i>Math 3220: Advanced problem solving</i>	Fall 2012
<i>Math 3100: Sequences and series</i>	Spring 2013
<i>Math 4400/6400: Elementary number theory</i>	Spring 2013
<i>Math 3220: Advanced problem solving</i>	Fall 2013
<i>Math 8440: Advanced topics in elementary number theory</i>	Fall 2013
<i>Math 3100: Sequences and series</i>	Spring 2014
<i>Math 3220: Advanced problem solving</i>	Fall 2014
<i>Math 4150: Complex variables</i>	Fall 2014
<i>Math 3100H: Sequences and series (Honors)</i>	Spring 2015
<i>Math 3220: Advanced problem solving</i>	Fall 2015
<i>Math 4000: Modern algebra and geometry I</i>	Fall 2015
<i>Math 8850: Introduction to mathematical research (joint w/ P. L. Clark)</i>	Fall 2015
<i>Math 3100H: Sequences and series (Honors)</i>	Spring 2016
<i>Math 8400: Algebraic number theory</i>	Spring 2016
<i>Math 8850: Introduction to mathematical research (joint w/ P. L. Clark)</i>	Spring 2016
<i>Math 3220: Advanced problem solving</i>	Fall 2016
<i>Math 4000: Modern algebra and geometry I</i>	Fall 2016
<i>Math 3100H: Sequences and series (Honors)</i>	Spring 2017
<i>Math 4400/6400: Elementary number theory</i>	Spring 2017
<i>Math 3100: Sequences and series</i>	Fall 2017
<i>Math 3220: Advanced problem solving</i>	Fall 2017
<i>Math 8400: Algebraic number theory</i>	Fall 2017
<i>Math 3220: Advanced problem solving</i>	Fall 2017
<i>Math 8400: Algebraic number theory</i>	Fall 2017
<i>Math 4000: Modern algebra and geometry I</i>	Spring 2018