

## Math 571 Analytic Number Theory II Spring 2023, Syllabus

Class #:26178      Class ID:029708  
Instructor:      Bob Vaughan  
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Web:              <http://www.personal.psu.edu/rcv4>  
Office Hours:    Meetings can be arranged as convenient.  
Class:             3:35-4:25pm MWF 113 Sackett  
The intent is to follow the notes at <http://www.personal.psu.edu/rcv4/571s23.html>  
The following give useful background:  
H. L. Montgomery & R. C. Vaughan, Multiplicative Number Theory I.  
Classical Theory, Cambridge University Press, xii + 516pp, 2006.  
Harold Davenport, Multiplicative Number Theory,  
third edition revised by Hugh Montgomery, Springer-Verlag, 2000.  
Gérald Tenenbaum, Introduction to Analytic and Probabilistic  
Number Theory, Cambridge University Press, 1995, ISBN 0521412617.  
R. C. Vaughan, The Hardy-Littlewood Method, second edition,  
Cambridge University Press, 1997.  
Homework:        Due every Monday, except when Monday is a holiday, when due Wednesday.  
Grading:         Based on Homework.

### Topics

There have been several recent sensational developments in analytic number theory.

1. Zhang, Maynard and Tao, following Goldston, Pintz and Yıldırım showed that there are bounded gaps between primes.
2. Green and Tao have shown that there are arbitrarily long arithmetic progressions in the primes.
3. Helfgott has shown that every odd  $n > 5$  is the sum of three prime numbers.
4. Matomäki and Radziwiłł have proved interesting new results about multiplicative function.
5. There have been breakthroughs on the Vinogradov Mean Value Theorem by Wooley, Bourgain and others.

This course is largely self-contained and will cover the large and Selberg sieves, Bombieri's theorem on primes in a.p., which says that the Generalised Riemann Hypothesis is true on average, and the Zhang-Maynard-Tao theorems on bounded prime gaps. Otherwise I am open to suggestions. Any of the above are possible. We could also discuss work on the distribution of the zeros of the Riemann zeta function or some of the fairly recent work on Waring's problem.

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(<http://studentaffairs.psu.edu/counseling/>): 814-863-0395

Counseling and Psychological Services at Commonwealth Campuses

(<https://senate.psu.edu/faculty/counseling-services-at-commonwealth-campuses/>)

Penn State Crisis Line (24 hours/7 days/week): 877-229-6400. Crisis Text Line (24 hours/7 days/week): Text LIONS to 741741

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