

Xavier University

## Exhibit

---

Education Syllabi Spring 2019

Education Syllabi 2019

---

2019

### EDEL 554 Number Theory

Debora Kuchey  
kuchey@xavier.edu

Follow this and additional works at: [https://www.exhibit.xavier.edu/education\\_syllabi\\_spring\\_2019](https://www.exhibit.xavier.edu/education_syllabi_spring_2019)

---

#### Recommended Citation

Kuchey, Debora, "EDEL 554 Number Theory" (2019). *Education Syllabi Spring 2019*. 26.  
[https://www.exhibit.xavier.edu/education\\_syllabi\\_spring\\_2019/26](https://www.exhibit.xavier.edu/education_syllabi_spring_2019/26)

This Restricted-Access Syllabus is brought to you for free and open access by the Education Syllabi 2019 at Exhibit. It has been accepted for inclusion in Education Syllabi Spring 2019 by an authorized administrator of Exhibit. For more information, please contact [exhibit@xavier.edu](mailto:exhibit@xavier.edu).

**Xavier University**  
**Number Theory**  
**EDEL554**  
**Spring 2019**  
**(3 semester hours)**

**Debora Kuchey**  
[Kuchey@xavier.edu](mailto:Kuchey@xavier.edu);  
**Office: 513-745-3714**  
**Cell: 513-703-1806**

**School of Education Mission Statement:**

In keeping with the Jesuit tradition, our mission is to educate men and women to be articulate in work, critical in thought, and competent in the knowledge, skills, and dispositions of their academic disciplines and professional endeavors. As such, they excel in teaching, leading, and serving their respective communities.

This educational mission is furthered by an effective staff and administration, and by a faculty of excellent teachers, scholars, and leaders who serve the needs of the university and its diverse stakeholders. Accordingly, we provide curricula, instruction, and assessment procedures designed to meet the expectations of the specialized professional associations and the respective appropriate related state and national accrediting bodies.

**Childhood Education Department Mission Statement:**

Xavier University's Department of Childhood Education is dedicated to the pursuit of knowledge and to the orderly discussion of critical issues confronting educators in a free, inquiry-based environment committed to current and relevant scholarship and research related to our profession. Xavier University seeks to create awareness of social justice in all disciplines through its emphasis on living the Jesuit tradition of intellectual, moral, and spiritual preparation. The candidates in the Early Childhood, Middle Childhood, Montessori and Literacy programs, through their academic and professional training, are prepared to value the lives of children regardless of racial, linguistic, socio-economic, religious, or ethnic background and to work with and value family and school structures in both urban, rural, and suburban settings. Special attention is given to developmentally effective practices and advocacy for all children, with ethical issues and values as expressed through the Jesuit tradition. Thus, the Childhood Education and Literacy preparation at Xavier University strives to send out into the education community candidates who are morally sensitive to the academic and social needs of our time, foster an appreciation for human diversity, reason critically, and think creatively. Candidates in the Childhood Education and Literacy Department are encouraged to develop and maintain a disposition toward lifelong learning in the profession of education and to the service of their students and their students' families and communities.

**Course Description:**

This course introduces teachers to the branch of mathematics known as number theory, in which one studies properties of positive integers with respect to the operations of multiplication and division. Emphasis in this course is placed on the mathematical content of number theory and on how number theory is taught in grades K-8, with particular attention to student learning of number theory in these grades. Topics include the division algorithm, properties of prime and composite numbers, the sieve of Eratosthenes as a way of understanding distributions of primes

and composites, the infinitude of primes, the fundamental theorem of arithmetic, properties of the greatest common factor and methods of computing the greatest common factor including the Euclidean algorithm, properties of least common multiples, use of base ten and expanded notation, writing numbers and computing in different bases, and arithmetic progressions.

**Goals:** As a result of this course participants will:

- Explore patterns and relationships among counting numbers
- Develop deeper understanding of our base ten number system
- Appreciate importance of “number play” (e.g., exploring numbers and patterns) as adult learners and as elementary teachers.
- Investigate research on the challenges students encounter as they develop their understanding of our number system.
- Enrich K - 8 learning opportunities and problem solving based on a deeper understanding of number theory.
- Examine number theory concepts from the perspective of the K-8 classroom, become familiar with the Ohio Learning Standards for Mathematics, and demonstrate an understanding of how the concepts associated with this strand of mathematics develop across the grades.
- Discuss strategies for teaching number theory concepts to students K-8.

**Learning Outcomes:**

- **Properties of positive integers with respect to multiplication. & division.**  
Prime & composite numbers; factoring of integers; factor diagrams; the sieve of Eratosthenes; Fundamental Theorem of Arithmetic; relatively prime numbers; greatest common factor; least common multiple; least common denominator; division algorithm; Euclidean algorithm; divisibility rules; connections among prime numbers; GCF, LCM, and work with fractions; linear functions, slope, and factorization.

**Objectives:** Teachers will:

- determine whether a positive integer is prime or composite.
- implement the Sieve of Erasthosenes.
- determine the prime factorization of a number through multiple representations such as factor diagrams, ordered pairs of factors, factor trees, division algorithm.
- generate and apply the Fundamental Theorem of Arithmetic; express positive integers as the unique product of primes.
- determine whether two positive integers are relatively prime.
- identify the factors and multiples of any positive integer.
- use multiple representations to determine the GCF and LCM of a pair of positive integers.
- understand and implement the division algorithm to obtain a unique quotient and remainder when dividing an integer by a positive integer.
- generate and informally prove rules for divisibility and apply understanding of divisibility rules to real life situations.
- use prime factorization to reduce fractions to lowest terms.
- express the GCF and LCM in function notation and graph the functions.

- **Number Systems:** Use of base 10 & expanded notation, scientific notation, writing & computing in different bases to strengthen understanding of base ten system, positional and non-positional systems; history of number systems.

**Objectives:** Teachers will:

- determine properties of integers that depend on expanded notation.
  - compute in different bases (+ \_ ×).
  - translate numbers between bases.
  - express numbers in other bases using pictorial models & exponential notation.
  - differentiate between positional and non-positional number systems
- **Counting Problems and Arithmetic Progressions:** Combinations & permutations, arithmetic progressions, Gauss' formula
- Objectives:** Teachers will:
- recognize situations that are involve counting problems/arithmetic progressions.
  - use a variety of representations and strategies to solve counting/arithmetic progression problems.

### **Text book and Resources**

1. Gross, Kenneth & Gross, Herbert (1999-2018). *Number theory a course for Elementary and middle school teachers*. Vermont Mathematics Initiative.
2. Ohio Department of Education, (2011). *The Ohio Learning Standards in Mathematics, 2017*. Available online. <http://education.ohio.gov/getattachment/Topics/Learning-in-Ohio/Mathematics/Ohio-s-Learning-Standards-in-Mathematics/MATH-Standards-2017.pdf.aspx>

### **COURSE POLICIES:**

**Professionalism:** Professional behavior is that which is expected of all teachers and is what you have come to expect of your students. Students are required to demonstrate behavior consistent with a professional career. In particular, students are expected to adhere to the following guidelines:

**Academic Honesty:** The Childhood Education and Literacy Department values academic honesty. It is expected that each student will submit original work. Where others' works and ideas are used, citations must be included. Please refer to the *Xavier University Catalog* for the official statement and consequences.

**Attendance:** Arrive to class on time and stay for the entire time. The Xavier University catalogue states "In order to earn credit in any course for which he/she is registered, the student is required to attend classroom and laboratory exercises regularly and promptly. Lack of reasonable attendance as determined by the individual faculty member is reason for denial of credit for a course and possible course failure." Full attendance is required for credit. Special consideration will only be given to unexpected extreme situations.

**Class Participation:** All participants are expected to be actively engaged in classroom activities. Participants must contribute to class discussions, share ideas and questions, help other participants when possible and share solutions to class and homework problems.

**Teamwork:** Help others and participate in discussions groups and homework groups.

**Attitude:** Maintain a positive attitude. If you are feeling frustrated with some aspect of the course, it is your responsibility to discuss this with Debbie or Sheila.

**Course Homework/Assignments and Reflective Portfolio:** You are expected to work diligently on homework, to complete all assignments to the best of your ability or ask for help from an instructor if the work is challenging for you. Show all your work on your homework solutions, put effort into making sure it is legible. You will keep a working portfolio and will complete a reflective portfolio of your final versions of selected in-class assignments.

**Growth/Effort:** You are expected to show growth in mathematics, relative to where you were when you came into the program. Not everyone will be at the same place mathematically when they come into the course or at the end of the course, but everyone should make gains. If you feel that you are not making progress, it is your responsibility to make arrangements for additional learning experiences or one-on-one tutoring from Xavier's Math Lab, or individual meetings with one of the instructors.

**Post Inventory Tests:** If the post inventory test indicates areas that have not been mastered you will be given an incomplete for the class and will need to sign a revision contract.

*The post inventory test score will factor into your final grade.*

### **Student Evaluation/Assessment**

Grading will be based on the following expectations:

- Completing all problems and practice sets.
- Completing required readings, responses, and preparation for discussions prior to class meeting.
- Completing all assignments by the due date.
- Archiving all solutions to problems, in class presentations of solutions, and class notes in their working course portfolio. Participants will choose three to five problems to include in their Reflective Portfolio.
- Attending all classes, participating fully in class discussions and presentations of solutions, and being helpful to colleagues in learning from one another.

### **Work Products and Grades:**

#### **Homework (50%)**

Daily homework rubric and end of the course homework packet.

#### **Presentations and Participation (15%)**

Throughout the course activities will be presented to the class for discussion and response. Participants will be expected to respond appropriately and effectively, orally and in writing, based on content knowledge

#### **Final Course Reflective Portfolio (15%)**

Each participant will be required to submit a reflective portfolio containing revised copies of five problems that had an impact on their learning during this course. The revised problems should show multiple ways of solving the problem along with a written reflection of the impact this particular problem had on the participant.

#### **Daily Quizzes (10%)**

## Post Inventory Test/Final Improvement (10%)

**Grade Scale:** Because this is a graduate course, students must receive a B- or better for credit.

	A	93-100	A-	90-92	
B+	88-89	B	83-87	B-	80-82

## Mental Health Services

### Graduate

Life in graduate school can get very complicated. Students sometimes feel overwhelmed, experience anxiety or depression, and struggle with relationships or family responsibilities. McGrath Counseling Services helps students cope with difficult emotions and life stressors. The office is staffed by experienced, professional psychologists, social workers and counselors, who are attuned to the diverse needs of all types of college students. The services are free and completely confidential. Learn more at <http://www.xavier.edu/health-wellness/counseling/index.cfm> or call (513) 745-3022.

### Writing Center

The Writing Center offers free one-on-one tutoring on writing assignments for all Xavier students. Students can contact the Center at 745-2875 to set up an appointment. The Writing Center is located in the Conaton Learning Commons room 400. <http://www.xavier.edu/writingcenter/>

### Mathematics Tutoring Lab

The Mathematics Tutoring Lab offers mathematics tutoring for all Xavier students. Students can contact the Lab at (513) 745-3069 to set up an appointment. The Mathematics Tutoring Lab is located in the Conaton Learning Commons room 419.

<http://www.xavier.edu/mathematics/Math-Lab.cfm>

### University Library

The [University Library](#) provides research support for all Xavier students. Find books at our library or in OhioLINK. Check out materials and laptops and find a librarian for research help at the Connection Center - 3<sup>rd</sup> floor Conaton Learning Commons (CLC). Request research help at [Ask a Librarian](#).

Use [Search@XU](#) on the Library Home page or one of our many [Databases](#) to start your research. Find tutorials in [XU Tutor](#) for information about using library resources. Visit the [Makerspace](#) in McDonald Library for any creative assignments.

**We are Xavier Musketeers-All for One and One for all.** As members of the Xavier University community, the Jesuit value of Cura Personalis invites us care for others recognizing the uniqueness and wholeness of each person and their situation. As such, we each share a personal responsibility to express concern for one another and to ensure that this classroom and the campus community remains a healthy and safe environment for learning.

To that end, as a student, you may experience a range of challenges that can interfere with learning, such as strained relationships, physical or mental health issues, death of a loved one, increased anxiety, substance use, feeling down, difficulty concentrating/or lack of motivation, food or housing insecurity, etc. These concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. Resources and services are available at Xavier and are listed below.

You may also find yourself in a situation in which you come across a fellow classmate whose personal behavior concerns or worries you, either for the classmate's well-being or yours. When either situation is the case, I encourage you to share this information with me for resource information and potential accommodations. You are also encouraged to report this information via Xavier's Student of Concern form: <https://one.xavier.edu/students/>. The form is on the Student Hub and is in the middle of the page next to Events.

For any student who facing challenges securing food or housing and believes this may affect their performance in the course, you are urged to contact Angie Kneflin, Care Management Coordinator in the Dean of Students Office, or Cindy Stieby, X-PATH Coordinator through the e-mail [thestore@xavier.edu](mailto:thestore@xavier.edu). This will enable you to utilize *The Store, Xavier's Food Pantry* on campus. The store is open on Fridays in gazebo area of the Village apartments from 3pm-5pm or by appointment through Cindy or Angie. Furthermore, please notify me if you are comfortable doing so. This will enable me to provide additional resource information and discuss potential accommodations.

### **Xavier Student Wellness Support Resources:**

#### **McGrath Health and Wellness Counseling Services:**

513-745-3022 ext. 2

<http://www.xavier.edu/health-wellness/>

McGrath provides both counseling and psychotherapeutic treatment by clinical counselors, psychologists, social workers and counseling interns. Services are free for Xavier students (undergraduate and graduate). If you need an immediate crisis appointment please let the staff answering the phone know this. Additionally, crisis counselors are available 24/7 by calling Xavier University Police (513-745-1000) and asking to talk to the counselor on call. Additionally, McGrath counseling services also offers support groups, health coaching and mindfulness workshops)

#### **McGrath Health and Wellness-Health Services:**

513-745-3022 ext. 3

McGrath provides high quality and accessible medical treatment, prevention and education to students.

#### **Psychological Services Center:**

513-745-3531

<http://www.xavier.edu/psychologicalservices/welcome.cfm>

PSC provides a wide range of psychological services to all graduate and undergraduate students free of charge.

#### **Advocacy and Prevention Coordinator:**

513-904-9013 (M-Fri. 9am to 5pm)

<http://www.xavier.edu/advocate/survivor-resources.cfm>

**The Xavier Advocacy Coordinator** provides confidential support, information and advocacy for those affected by harassment, discrimination, relationship violence,

sexual assault, rape and stalking during business hours. After hours, Women Helping Women (513-381-5610) provides advocacy services to all Xavier students and will connect students to the Advocacy Coordinator.

**Kate Lawson, Chief Title IX Officer:**

513-745-3046

<http://www.xavier.edu/titleix/index.cfm>

**The Title IX Office** investigates reports of sex discrimination, including, but not limited to, sexual harassment, sexual violence, dating violence and stalking, as well as facilitates a prompt, equitable process to resolve those complaints.

**On Campus Crisis Numbers**

XUPD will assist with crisis intervention in all situations.

Xavier University Police Department Emergency Line: 513-745-1000

Xavier University Police Department Non-Emergency Line: 513-745-2000

**Other Wellness Support Campus Resources**

**Bias Advisory Response Team (BART):** BART is an advisory group that plays an important role in developing proactive and educational initiatives that will minimize the occurrence of bias incidents on campus in addition to ensuring consistent approaches to incident responses. To report an incident contact the Dean of Students at 513-745-3166, contact XUPD at 513-745-1000 or submit a report online at <http://www.xavier.edu/dean-of-students/>

**Xavier Action and Care Team (X-ACT):**

X-ACT is an advisory group that provides support and assistance to students who may be experiencing emotional distress and exhibiting at-risk or threatening behaviors. If you would like to report a fellow student of concern, please submit an online referral through the Student Hub (student Concern report) or the Dean of Students website: <http://www.xavier.edu/dean-of-students/> or contact the Dean of Students at 513-745-3166. If there is an immediate threat or danger to yourself or the student of concern, please call Xavier Police immediately at 513-745-1000.

**Dean of Students, Care Management:**

513-745-4391

<https://www.xavier.edu/dean-of-students/>

The area of Care Management in the Dean of Students Office is area is to support students through challenges, connect them to appropriate campus and community resources, promote growth in self-advocacy, and empower students to navigate toward their own solutions and shape their own lives. The Care Manager works collaboratively across the institution to develop support plans that provide a caring and seamless student learning experience. Additionally the Care Manager at Xavier operates in a non-clinical capacity and is not able to provide counseling or therapy to students, though would quickly connect students to those resources if appropriate.

**Office of Disability Services:**

513-745-3280

<http://www.xavier.edu/disability-services/index.cfm>

The Disability Services staff ensure all students with disabilities can freely and actively participate in all facets of university life. This office provides and coordinates support services to maximize students' educational potential and develop their independence to the fullest extent possible.

**Center for Diversity & Inclusion:**

513-745-3110

<http://www.xavier.edu/diversity-inclusion/index.cfm>

The Center for Diversity and Inclusion is committed to advising, developing, educating, and empowering students at Xavier to make the most of their diverse interactions across a wide range of social identities.

**Office of Residence Life:**

513-745-3203

<http://www.xavier.edu/residence-life/index.cfm>

The Residence Life staff (including Hall Directors and Resident Assistants) support students in their personal growth while challenging them to successfully achieve their academic goals. HDs and RAs are often a student's most direct connection to University resources. If you live on campus, contact the main office or your Hall Director or Area Coordinator for any needs.

**Student Success Center:**

513-745-3141

<https://www.xavier.edu/success/#services>

Provides academic and adjustment support, success coaching, goal setting, and advising.

**TRiO:**

513-745-3758

<https://www.xavier.edu/sss/index.cfm>

Provides academic, professional, financial and personal support for primarily first-generation, lower-income or students with disabilities. With a wide range of resources, individual services, cultural activities, plus scholarships and technological support to successfully navigate through college.

**Off Campus Local & National Websites: & Hotlines:**

- Cincinnati Talbert House Text Line: 839863
- National Suicide Prevention Hotline: 1-800-273-8255
- The Trevor Project: 1-866-488-7386 Text 'Trevor to 1-202-304-1200

<http://www.thetrevorproject.org/>

- Active Minds: <http://www.activeminds.org/>
- American Foundation for Suicide Prevention: [afsp.org](http://afsp.org)
- Cincinnati Linder Center of Hope: 513-536-4673

<http://lindnercenterofhope.org/>

**Good Samaritan Hospital Behavioral Health Care:** 513-862-2850

<https://www.trihealth.com/institutes-and-services/behavioral-health-services/>

- National Alliance on Mental Health (NAMI): <http://nami.org/>
- Shelterhouse

<http://www.shelterhousecincy.org/>

**David & Rebecca Barron Center for Men**

Barron Center for Men  
411 Gest Street  
Cincinnati, OH 45203  
513-721-0643

**Esther Marie Hatton Center for Women**

2499 Reading Road  
Cincinnati, Ohio 45202  
513-562-1980

**Free Store Food Bank:** 513-241-1064

<https://freestorefoodbank.org/>

112 East Liberty Street  
8am-3pm M-F

**EDEL 554 Number Theory**

**Course Calendar**

<b>DATE</b>	<b>TOPIC</b>	<b>ASSIGNMENT</b>
<b>Week One 1/15</b>	<ul style="list-style-type: none"> <li>• Number Theory Pre-Inventory</li> <li>• Divisors, primes and composites</li> <li>• Sieve of Eratosthenes and prime number testing</li> <li>• Factor trees and GCDs</li> <li>• Venn Diagrams, GCDs, and LCMs</li> </ul>	Complete assigned homework given in class
<b>Week Two 1/22</b>	<ul style="list-style-type: none"> <li>• Factor diagrams</li> <li>• “Working Together” problem</li> <li>• Trading Coins Activity</li> <li>• Introduction to number bases</li> </ul>	Complete assigned homework given in class
<b>Week Three 1/29</b>	<ul style="list-style-type: none"> <li>• Thousandaire</li> <li>• The Division Algorithm</li> <li>• Modular or Clock Arithmetic</li> <li>• Brokem Rock Problem</li> </ul>	Complete assigned homework given in class
<b>Week Four 2/5</b>	<ul style="list-style-type: none"> <li>• GCF through functions</li> <li>• Sam and Etta Earn Money</li> <li>• Matrix: the Double Cross</li> <li>• Divisibility rules</li> </ul>	Complete assigned homework given in class
<b>Week Five 2/12</b>	<ul style="list-style-type: none"> <li>• Caesar Cipher</li> <li>• Finger Multiplication</li> <li>• Russian Peasant Multiplication</li> <li>• Letter Arrangements and Counting Problems</li> </ul>	Complete assigned homework given in class
<b>Week Six 2/19</b>	<ul style="list-style-type: none"> <li>• Slope and Equivalent Fractions</li> <li>• Orange Juice- rates and ratios</li> <li>• Egyptian Fractions</li> <li>• Ancient Number Systems</li> </ul>	
<b>Week Seven 2/26</b>	<b>Finish Course Material</b>	Finish Course Material
<b>Week Eight 3/5</b>	<b>Finish Course Material</b>	Assign: End of course homework assignment and Reflective Portfolio

<b>Week Nine</b> <b>3/12</b>	<b>Xavier Spring Break</b>	<b>No Class Meeting</b>
<b>Week Ten</b> <b>3/19</b>	<ul style="list-style-type: none"> <li>• <b>FINAL</b></li> </ul>	<b>Reflective Portfolio Due: End of Course Homework</b>

*The instructor reserves the right to make changes in the syllabus and/or calendar if circumstance so dictates.*