Topics in Number Theory for the Elementary and Middle School Teacher

MATH 316-1 (CRN 10488)

Instructor Information

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In-Person Office Hours:
Tue., Wed., & Thu. 11:00am – 12:15pm, also by appointment

Virtual Office Hours by Appointment:
https://bsu.zoom.us/j/95031497430

Instructor Bio:

You may refer to me as Dr. Austin, Prof. Austin, Mr. Austin, or just Chris. I have taught math courses for teachers since about 2010, but I always look forward to starting another great semester of interactions with future teachers! I usually read and respond to emails within about 24 hours on weekdays, or 48 hours over the weekend. If you want to meet outside of class to talk about questions related to our course we can meet in my office or on Zoom during the Office Hours listed above, and I am happy to work with you to arrange a different day/time to meet if needed. For anyone interested in meeting on Zoom, email me to schedule a meeting day/time and I will send the Zoom link with an email confirmation.

Course Information

Course Description

The study of a collection of topics from the theory of numbers that have specific applications in the elementary and middle school curriculum.

Prerequisites

MATH 202 with a C- or better grade, or permission of the department chair.

Course Materials

Any course readings and other required resources will be provided by your instructor.

Course Content and Objectives

This course is designed to prepare students to become more effective teachers of mathematics in the elementary and middle school. As a result of investigating important topics and problems, both historical and contemporary, in the theory of numbers, they will become better informed and prepared to make instructional decisions as teachers. Specifically, in this course preservice elementary and middle school mathematics teachers will be able to:

- form and test conjectures related to number theory
- recognize and use several forms of mathematical proofs (e.g., induction, contradiction)
- investigate the theory behind various procedures in number theory that are found in the elementary and middle school mathematics curriculum
- recognize famous problems and theorems that are important in the history and development of number theory
- explore famous unsolved problems in number theory

Topics in number theory which are included are:

- numeration systems
- figurate numbers
- magic squares
- prime and composite numbers
- the fundamental factorization theorem
- factors and divisors
- greatest common factors and least common multiples
- Euclid's algorithm
- Pythagorean triples
- theory of congruences
- clock arithmetic

Course Modality/Structure

This course will be taught using a variety of methods, including lectures, class discussions, readings, problem sets, and/or other formats appropriate to the content and goals of the course. Information will be delivered through an asynchronous online format. Generally speaking, assignments will be due at the beginning of class on their respective due dates. Additional information on assignments can be found below. This course will meet in-person at the assigned meeting times.

Course Rationale

Elementary and middle school teachers need both breadth and depth of knowledge of number development, number systems, and number theory, beyond the base ten numeration system and fundamental number theory they will teach in the classroom. Such breadth and depth of knowledge better enables them to teach for conceptual understanding rather than just for procedural understanding.

Consistent with the recommendations of the National Council of Teachers of Mathematics, the Conference Board of Mathematical Sciences, the Mathematical Association of America, and other national and state agencies, this course seeks to develop a deep understanding of worthwhile mathematical content knowledge and its related pedagogies and technologies. To achieve this goal, mathematical content knowledge, pedagogical knowledge, and technological knowledge are approached in an integrated manner using a variety of information, modeling, and human resources. The course content, assignments, and assessments are designed to emphasize the significance of the mathematical, pedagogical, and technological connections and to promote critical thinking and effective communication.

Course Assignments and Grading Policies

Assignment details, including instructions, relevant readings, due dates, and grading criteria/rubrics will be posted and updated on Canvas. Please check Canvas regularly to stay informed and on track.

Course Assignments:

- <u>Homework/Participation</u>: Your participation in class activities and discussions is very important, not only for your own learning but also for the learning of others. You are expected to attend class and to be a collaborative participant in the work of the class.

  Approximately half of your Homework/Participation grade will come from weekly assignments that you will turn in for feedback (this is the “Homework” portion). The other half of the grade will be a daily grade based on completion of additional homework problems, occasional presentations of assigned problems from that homework, and engagement with the course activities (this is the “Participation” grade).

  - 5 pts: Attends class and participates fully in small group and whole group discussions, including presenting any required homework problems
  - Up to 4 pts*: Absent from class and contacts instructor; submits missed class activities (e.g. selected problems from slides) and homework by next class meeting
  - 0 pts: Absent from class; does not submit missed class activities (e.g. selected problems from slides) and homework by next class meeting

  *One or more points may be deducted for arriving late, leaving early, failure to communicate about an absence, and/or not participating in class activities.

- <u>Quizzes</u>: Quizzes will be given periodically (3 per exam period), usually as in-class assignments. In-class quizzes will be announced 2 class periods in advance. Take-home quizzes may be given instead, in which case they may be announced later. The quizzes are meant to help you organize your thoughts and solidify and demonstrate your mathematical understanding. In-class quizzes are "closed book," so you will not be able to use notes or other resources to complete these. Your lowest quiz score will be dropped at the end of the semester.

- Exams: Exams are designed to serve as culminating experiences, opportunities for you to demonstrate the results of your extensive efforts to make sense of mathematical concepts and principles and to write mathematical explanations. A Midterm Exam covering content from the first half of the course will be given on Tuesday, October 14. A comprehensive Final Exam will be given during our pre-scheduled Final Exam time, Thursday, December 10 from 12:00 – 2:00 PM. All exams will be taken in class, and you will be allowed to create and use a note card (provided) during each exam.

- Number Theory Project: As part of your work for this course, you will identify a topic within number theory and create a poster about your topic to share with your classmates. In most cases, your posters will provide an overview of the topic/concept and a task or other prompt that will engage learners in exploring your topic. In addition to this final poster, you will submit an initial draft/outline for your topic, and a paper in which you summarize and reflect on 3 of your classmates' posters. Altogether, the project will be worth 15% of your course grade (2% for the draft, 10% for the poster, 3% for the reflection). A complete assignment description, along with a list of suggested topics, will be provided a few weeks into the semester.

Selected Due Dates

Assignment	Due Date
Midterm Exam	Tuesday 10/14
Number Theory Project - Poster	Tuesday 11/25
Final Exam	Thursday 12/11, 12:00 – 2:00 PM

Course Weights and Grading Scale

Assignments are weighted by points, and corresponding percentages are provided below. The Grading Scale for final course grades also follows.

Assignments	Percent
Homework/Participation	20%
Quizzes (x6, drop lowest score)	20%
Midterm Exam	20%
Final Exam	25%
Number Theory Project	15%

Course Grade	Percent Cutoff	Course Grade	Percent Cutoff	Course Grade	Percent Cutoff
A	94%	B-	80%	D+	67%
A-	90%	C+	77%	D	64%
B+	87%	C	74%	D-	60%
B	84%	C-	70%	F	<60%

Course Statements and Policies

Feedback Policy

- I always try to respond to email from your official Ball State email address within 24 hours during the work/school week (Monday-Friday) and 48 hours on the weekend. Feel free to second a second email if I miss one of these windows.
- I will read every discussion post but I will not always personally comment on posts.
- I always plan to grade assignments and discussions within 1 week of submission.
- Contact me directly with questions or concerns about your performance in class.

Course Expectations

Students in MATH 316 should –

- Come to class every day.
- Come to class on time.
- Participate in class activities and discussions.
- Put away your cell phones (and other distractions) so you can participate fully.
- Be prepared to think and learn mathematics in new ways.
- Be committed to continue your thinking and learning outside the classroom.

In addition, Students in MATH 316 are expected to –

- Build new knowledge from prior knowledge
- Engage in productive struggle
- Demonstrate persistence in problem solving
- Treat mistakes as opportunities for learning
- Make sense of mathematics
- Represent your mathematical ideas with drawings, words, and symbols
- Collaborate with your classmates
- Talk about mathematics
- Provide explanations and justifications
- Listen carefully to your classmates' ideas
- Engage in reflective thought

Late Work Policy

All assignments are due by the beginning of class on their respective due dates unless otherwise noted. Late work will be accepted at the instructor's discretion. Unless there are extenuating circumstances or prior arrangements have been made, a **10% per day** grade deduction will be applied for late assignments. With the exception of the Final Exam, course assignments will not be accepted after 11:59 pm ET on the final day of classes, Monday, December 8.

Taking quizzes and exams at the scheduled time is an important part of being responsibile for your own success. Make-up quizzes and exams will be given only in the event of a documented illness or emergency, and you must notify me **before** the quiz or exam.

Course Withdrawal

The course withdrawal period ends **Monday, October 27**. Before this date, students can elect to receive a "W" for the course by completing and submitting the proper form. The instructor's permission is not required. For details, see https://www.bsu.edu/about/administrativeoffices/registrar/registration-activities/withdraw-from-classes as well as Degree Requirements and Time Limits in the current Undergraduate Catalog OR Withdrawal Procedures in the current graduate catalog.

Assignment Submission Policy

- Written assignments should be submitted as .pdf documents unless otherwise indicated in the assignment description. If you take pictures of handwritten work, please paste these into a Word document and either *print*, *export*, or *download* your file as a pdf. Alternatively, there are several free tools for scanning your work as a pdf with your phone, and I'm happy to provide suggestions and support as needed.
- Assignments should be submitted using the assignment links in Canvas**.**

Grading Policy

Appropriate evaluation of your academic performance is an integral part of your learning experience. In the absence of mistake, fraud, bad faith, or incompetence, I will be the key decision-maker on the assignment of grades. For information concerning grade appeals, consult the Ball State website.

University Policies

University Statement

We are committed to ensuring that all members of the community are welcome, through valuing the various experiences and worldviews represented at Ball State and among those we serve. We promote a culture of respect and civil discourse. If you need course adaptations or accommodations because of a disability, please contact the instructor of record as soon as possible. Ball State's **Disability Services** office coordinates services for students with disabilities; documentation of a disability needs to be on file in that office before any accommodations can be provided. Disability Services can be contacted at 765-285-5293 or **dsd@bsu.edu**.

Freedom of Expression

In this course, we are committed to fostering a learning environment that values intellectual diversity, encourages free expression, and promotes open inquiry. As members of the Ball State Community, we treat each person in the Ball State community with civility, courtesy, compassion, and dignity and respect and learn from differences in people, ideas, and opinions. Please review Ball State University's Statement on Freedom of Expression, the resources on Ball State's Freedom of Expression webpage, and Ball State's Beneficence Pledge.

Attendance

Your participation in class activities and discussions is very important, not only for your own learning but also for the learning of others. You are expected to attend class and to be a collaborative participant in the work of the class. If you cannot attend class, you are expected to notify your instructor as soon as possible before you are absent. See above for details about associated grading.

Ball State Academic Ethics

Honesty, trust, and personal responsibility are fundamental attributes of the university community. Academic dishonesty and other forms of academic misconduct threaten the foundation of an institution dedicated to the pursuit of knowledge and will not be tolerated. To maintain its credibility and reputation, and to equitably assign evaluations of scholastic and creative performance, Ball State University is committed to maintaining a climate that upholds and values the highest standards of academic integrity. Visit the complete Student Academic Ethics Policy.

Students are expected to read, understand, and adhere to the community standards found in Ball State's Code of Student Rights and Responsibilities.

Plagiarism Policy

Plagiarism is not acceptable, unless otherwise indicated for all assignments, you must work independently by yourself. Sharing of files is not permitted for any reason.

Potential Violations

Examples of academic integrity violations include but are not limited to:

- Working with another person on any assignment other than authorized group projects.
- Sharing or allowing others to access your files, whether done with permission or not.
- Use or possession of a file created by someone else.

- Reusing work from another semester, course, or section.
- Fraudulent submission of work.
- Using unauthorized materials during Exams.
- Impersonating someone else or having them impersonate you.
- Making fraudulent or dishonest statements regarding your work.
- Soliciting others, including AI tools, to complete work for you.
- Posting course files and resources on study or content sharing websites.

Canvas and Student Privacy

Canvas Accessibility

Canvas provides a user experience that is easy, simple, and intuitive. Special attention has been paid to making Canvas screen-readable. The Rich Content Editor encourages users to create accessible content pages (i.e. text formatting is accomplished using styles). Canvas is designed to allow limited customization of colors and schemes to be accessible for all users. The National Federation of the Blind granted Canvas the Gold Level Web Certification in 2010.

Find more information by visiting the Canvas Voluntary Product Accessibility Template (VPAT).

FERPA and Privacy

As a student, your educational records are considered confidential. Under FERPA (Family Educational Rights and Privacy Act), your records are confidential and protected. Under most circumstances, your records will not be released without your written and signed consent. However, some directory information may be released to third parties without your prior consent unless a written request to restrict this is on file. You can learn more about student rights to privacy by reading Ball State's FERPA and Privacy and Protection.

Academic Support Services

The Learning Center

The Learning Center offers free Tutoring and Academic Coaching for many courses at Ball State. Students can make appointments for online (Zoom) or in-person (NQ 350) appointments. To make an appointment, visit myballstate.bsu.edu and click on “Navigate” in the Academic Tools section, or just go directly to bsu.navigate.eab.com.

Testing accommodations for students with disabilities are available for students who have received the appropriate documentation from Disability Services. Tests may be administered in the Learning Center. For more information about Learning Center programming, visit bsu.edu/learningcenter or call 765-285-1006. Follow us on Instagram: BallStateLC.

The Writing Center

All writers improve with practice and feedback, so as a student in this course, you are encouraged to use the Writing Center (in Robert Bell 295 during weekdays, Bracken Library First Floor West in the evenings, or online during any of our regularly scheduled hours) to get additional feedback on your writing.

The Writing Center offers free planning, feedback, and accountability sessions (in person and online) to all students composing essays, reports, reflections, research projects, web content, lesson plans, slideshows, poster presentations, resumes, and other digital or print texts. To schedule a free appointment to discuss your writing, go to **http://www.bsu.edu/writingcenter**. Online and in-person appointments are available; however, plan ahead because appointments book quickly!

The Basic Needs Hub

If you are having difficulty affording enough food, do not have a safe and reliable place to sleep, and/or experiencing an emergency or crisis, help is available through the **Basic Needs Hub**. The Basic Needs Hub has information, resources, and provides individualized support to students. To talk with a supportive staff member about your experience, receive one on one assistance, or learn more about resources, you can submit a **Basic Needs Assistance Form**.

The Counseling Center

The Ball State University Counseling Center offers free and confidential services to all students. The Counseling Center is located in Lucina Hall, Room 320. To schedule an appointment, you can contact us at 765-285-1736. Ball State also offers a 24/7 Crisis Line, which can be reached at 765-285-HOPE (4673). The Crisis Line is a mental health resource for those who are struggling with any mental health concerns, including thoughts of self-harm and/or suicide.

At the Ball State Counseling Center, we see students for a variety of reasons, some of which include homesickness, relationship concerns, anxiety, and depression. At your first appointment, you will work with a therapist to create a plan that will connect you with resources that best fit your needs. We assist students with getting connected to therapy at our Center as well as connecting students to self-help resources, other on-campus resources, and community-based resources. All Ball State students also have access to several on-demand, self-help resources through a variety of different platforms. All of these resources, including a direct link to our website, can be found here.

Subject to Change Statement

This syllabus and schedule are subject to change in the event of extenuating circumstances.

Syllabus updated 8/17/2025, CAA