Mayville State University

Math 435 Theory of Numbers (3 credits)

Associate Professor Mary Townsend

Online (34975)

Office Location: CB 108A **Office #:** (701) 788-4672 **Cell #:** (218) 779-2321

My preferred method of communication is e-mail at mary.townsend@mayvillestate.edu.

Campus mailing address: Mayville State University, 330 Third Street NE, Mayville ND 58257

Hours of Availability: By appointment

Instruction Mode: Online Asynchronous **Time Zone:** Central Standard Time (CST)

How to address your instructor: Ms. Townsend or Professor Townsend and pronouns: she/her.

Zoom Link: https://mayvillestate.zoom.us/j/88323668930

Course Description

This course covers some of the widely known theorems, conjectures, unsolved problems, and proofs of number theory. Students will use the internet to research real life applications of Number Theory and summarize their research in at least 3 short papers. Calculators will be used for computations.

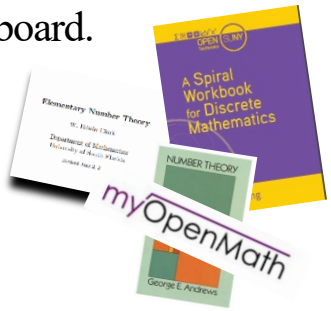
Pre-/Co-requisites:

Math 165 (Calculus I); IT Level 3

Purpose of the Course

Students will study deductive and inductive reasoning, math induction proofs, divisibility, divisors, greatest common divisors, least common multiples, linear congruences, Euler's phi function, d(n), σ(n), μ(n), prime factors, relatively prime numbers, the Chinese remainder theorem, Diophantine equations, permutations, combinations, unsolved number theory problems, and computer usage in number theory. Students will recognize and solve problems with figurate numbers, binomial coefficients, Pythagorean triplets, perfect numbers, Mersenne primes, Fermat primes, Germain primes, and Fibonacci numbers. Students will write a paper defining number theory with practical applications, a paper on solved and unsolved number theory problems, and a paper describing advances in number theory in the past 20 years.

Required Course Materials are available in PDF form online in Blackboard.



- myOpenMath (free software) with Course ID: 255773 and Enrollment Key: 435Townsend2025
- *Number Theory (*1994) by George E. Andrews. ISBN: 9780486682525
- OER: *Elementary Number Theory* by W. Edwin Clark (2002) at this link: http://shell.cas.usf.edu/~wclark/elem_num_th_book.pdf
- OER: *A Spiral Workbook for Discrete Mathematics* (2015) by Harris Kwong is an OER published by Open Suny Textbooks at this link: https://knightscholar.geneseo.edu/cgi/viewcontent.cgi?article=1010&context=oer-ost

Conceptual Framework

Learning occurs in many different situations including reading definitions and sample problems, solving problems, working independently and in groups, using technology, taking exams and quizzes, doing practice problems and graded homework, answering questions in journals and reflecting on mistakes made in the process of learning to solve problems algebraically.

Course Objectives

1. Students will learn to show through completion of assignments, in class quizzes, journals and exams that they can do problems related to the theory of numbers, proofs, and applications of number theory.
2. Students will reflect upon their progress based on feedback from the instructor to determine individual goals to gain mastery of the concepts prior to exams.
3. Students will learn to work independently and in groups as they learn to master problems related to number theory.

Instructional Technologies Utilized in this Course

- Blackboard
- Kahoot!
- Khan Academy
- Microsoft Office
- myOpenMath
- Wolfram Alpha
- YuJa
- Zoom

A graphing calculator and/or a scientific calculator with exponential functions will be utilized throughout the course. Computer software including Wolfram Alpha, and online statistical software and training resources including Atomic Learning and Khan Academy provide ways for students to utilize technology to understand and solve solutions to problems.

Instructional Strategies

The instructor will provide an overview of each topic and provide examples to help students solve the assigned practice exercises, graded homework, journal questions, quizzes and to prepare for exams. Students are expected to participate in class discussions, online discussion boards and in pairs and small groups as they communicate with peers to answer journal questions, to provide additional sources of practice problems, and to practice teaching one another to master elementary mathematical concepts.

- Practice problems are available in Blackboard to allow students to practice additional problems not included in the graded homework.
- Graded homework will be completed in Blackboard and myOpenMath to provide students several attempts to correctly solve each problem as they gain math mastery.
- Students will complete quizzes using Kahoot! and Blackboard to prepare for exam questions.
- Journal questions will be discussed in videos and on discussion boards. Students will journal regarding key concepts, their learning in the course and the plan to master content.
- The instructor will provide detailed feedback on journals, quizzes, exams, and submitted work.
- The instructor is available by scheduled appointments, via zoom, e-mail and phone.

Program Student Learning Outcomes (SLOs) Addressed in This Course

The Academic Program Student Learning Outcomes document can be found in your course shell. It contains all learning outcomes pertaining to Essential Studies courses and all majors and minors. The document has an index, so you can quickly find the degree you are pursuing.

SLO 1: Students will acquire content knowledge commensurate with career goals.
SLO 2: Students will communicate mathematical information both orally and in writing.
SLO 3: Students will apply mathematics in context including at least one experiential situation to solve problems.
SLO 4: Students will construct and critically analyze mathematical arguments.

As part of Mayville State's effort to demonstrate continuous improvement in achieving student learning outcomes, this course reinforces SLOs 1, 2, and 3 and demonstrates mastery for SLO 4 for mathematics majors, mathematics education majors, and mathematics minors. Students will be assessed on their ability to construct and analyze math induction proofs and other types of proofs during the fourth unit. As part of Mayville State's effort to demonstrate continuous improvement in achieving Essential Studies Learning Outcomes, this course will not assess essential studies learning outcomes.

Mathematics Education Course- ND ESPB Program Approval Standards Alignment

- **11010.1 Mathematical Practices and Processes**: The program requires the candidate to demonstrate the following: a. makes sense of problems and perseveres in solving them, b. reasons abstractly and quantitatively, c. constructs viable arguments and proofs, d. critiques the reasoning of others, e. uses mathematical models, f. attends to precision, g. identifies elements of structure, h. engages in mathematical communication
- **11010.2 Mathematical Connections**: The program requires the teacher candidate to demonstrate the interconnectedness of mathematical ideas and how they build on one another. The candidate recognizes and applies connections among mathematical ideas and across various content areas as well as real-world contexts, using the language of mathematics to express ideas precisely, both orally and in writing to multiple audiences
- **11010.3 Secondary School Content Knowledge**: The program requires the teacher candidate to demonstrate and applies knowledge of secondary mathematics concepts, algorithms, procedures, applications in varied contexts, and connections within and among mathematical domains (Complex Number System, Algebra, Geometry, Trigonometry, Statistics, Probability, Calculus, and Discrete Mathematics)

Course Expectations/Protocols

Becoming proficient in mathematics requires hard work and practice. Students are expected to take notes as they watch the PowerPoint presentations, to ask questions, to do practice problems, to solve graded homework problems, to thoughtfully write answers to journal questions, to discuss their journal answers in class and to submit professional answers to journal questions in Blackboard. Students are expected to communicate using proper mathematical notation and grammar in a legible manner as they show the steps used to determine solutions. Students will demonstrate mastery of concepts on scheduled exams and a proctored final exam.

Students are expected to display academic honesty and respect for themselves, their classmates, their instructor and the Mathematics department. For each unit, students should provide at least one discussion

board entry and respond to at least two discussion board questions provided by peers. Students will be required to journal about their learning plans before each exam.

Critical thinking and problem solving will be an important part of this course. Students will read text and articles carefully. Students will work problems by showing the computations between the solution steps before discussing topics in class. There will be opportunities to practice doing problems in each section before completing journals, graded homework, and online quizzes. Students are encouraged to collaborate together as they learn to master the concepts. There will be opportunities for students to discuss topics in class and online with classmates and to journal about their progress with the instructor as students reflect on their learning and their plans to master concepts.

Students will:

- Read text, do practice problems in Blackboard and myOpenMath, watch videos and PowerPoint presentations, write papers, and complete assigned activities including papers and presentations.
- Complete graded assignments including quizzes, journals, and homework by designated due dates.
- Ask questions and participate in class and in online discussions via Discussion Boards.
- Discuss and present how to connect real world experiences to applications of probability and statistics.
- Prepare for exams by practicing problems and completing assigned work.
- Analyze results of practice problems, assigned work, and exams to learn from mistakes and gain mastery of content.

Instructor/Student Communication

Students may submit questions or concerns by e-mail at mary.townsend@mayvillestate.eduto to the instructor or schedule a time to meet with the instructor in person or by Zoom. Students can expect a reply to their e-mailed questions within 48 hours during the week and 72 hours over the weekend. Grading of exams, journals and discussion boards will typically be completed within 7 days of submission. Please e-mail the instructor if you have not received feedback for a submission from your proctor or in Blackboard. If you have questions about points deducted or how to solve problems with points deducted, you are encouraged to contact the instructor.

Assignments/Assessments and Method of Evaluation/Grading

The higher score of Exam Averages or Weighted Grade will be used to determine the course grade. The Weighted Grade will be determined by Exams (60%), graded homework (25%) and quizzes (10%), and journal postings (5%). It is advantageous for students to do the homework, quizzes and journals for unit 1 to see how they do on the first exam.

Grading scale will be calculated as percentage of weighted averages:

A 90 -100% B 80 - 89.99% C 70 – 79.99% D 60 – 69.99% F 0-59.99%

- **Exams (60%):** Students will be graded on 4 unit exams each worth 100 points, and a comprehensive proctored final exam worth 200 points. The three required papers/presentations will count as 20 points towards exams 2, 3, and 4. The three papers will count as both homework and as part of the last three unit exam scores. Students may get feedback on papers from the writing center, instructor and peers before their final submission of papers. There may be essay questions on the final exam regarding information in the papers as well as problems from each of the unit exams.

- **Graded Homework (25%):** Students will have the opportunity to practice problems before completing graded homework. Most graded homework will be in myOpenMath with multiple attempts for students to complete. Students may use notes and calculators when doing homework. Students are encouraged to work with a peer on homework (this means to help one another to become successful learning the content of each lesson—not having one student do all the work).
  - Students will complete graded homework in myOpenMath and Blackboard. Students will do posts to discussion forums to show work on proofs, and some proofs will be submitted as graded homework in Blackboard.
  - Students will submit at least three papers and/or presentations to show how number theory is used in practical applications and how technology has impacted the theory of numbers.
- **Quizzes (10%):** Students have the opportunity to work online to complete quizzes in Blackboard. Kahoot quizzes will enable students to score their quizzes and submit their work to demonstrate mastery.
- **Journals (5%):** Students will be expected to set and achieve short-term goals throughout the course. Students will also journal about how they can connect real world experiences to applications of algebra and reflect upon the presentations of these connections. Students will communicate to one another via discussion boards asking and answering questions related to course objectives.

Proctor Notification

This course does not require a live proctor for online students, but a live proctor is an option for exams.

If students elect to continue to do proctored exams for units and the final exam, a proctor may be used if it is convenient for the student and the student's proctor. Students have the option of using Zoom with the instructor or YuJa proctoring, where they are video recorded as they take an exam using Blackboard or Lumen on their computer, or with a live proctor.

A proctor is an individual who will monitor you while taking an exam to ensure academic integrity. To be approved as a proctor, a proctor must be a disinterested professional with a valid business office, telephone, and email address (Yahoo or Hotmail addresses are not acceptable). Examples of potential proctors include university faculty and staff members, testing centers, library staff, elementary or secondary teachers or administrators, law enforcement or military officers, and human resource or workforce development staff. Friends, family members, and other students are not allowed as proctors. You should speak to your potential proctor and ensure that he or she understands the time commitment and responsibilities before submitting his or her name for approval by the instructor of this course.

Your proctor information should be submitted at the start of the semester and must be submitted **at least 10 days prior to the first proctored exam.** Failure to have a proctor secured by exam time may result in a zero grade.

Provide your live proctor with the following information:

In this course the first proctored one-hour exam is due on Monday, February 24. Proctored Exam 2 is due on Wednesday, March 19. The third proctored unit exam is due Monday, April 7, and the take home unit 4 exam is due on Wednesday, May 7 with the comprehensive 200-point proctored final exam due Tuesday, May 13.

Students may use a live proctor in their community, YuJa video proctoring, or zoom proctor with Professor Mary Townsend. At least 48 hours before taking an exam, students will e-mail the live proctor's e-mail address (professional address – no gmail or yahoo type accounts may be used) as well as the

proctor's phone number and profession. Students may not have a proctor who lives at the same residence or one who is a family member or close friend.

- The proctors will print the exam and provide a quiet location. The student may use two one-sided pages of notes and a graphing or scientific calculator on each exam and eight pages of notes on the proctored final exam. When the student has completed the exam, the proctor will scan and e-mail the completed exam and the notes page to the instructor at mary.townsend@mayvillestate.edu.
- Proctors are expected to watch students as they take the exam or to provide an empty room for students as they ensure that additional resources are not used during the exam.
- If technical issues arise, please contact the professor immediately at 218 779 2321 (Mary Townsend's cell phone number).
- Students may not use laptops or cell phones or the help of anyone while taking proctored final exams.

Students who wish to take the unit exams and/or final exam via YuJa proctoring will need to complete the exam in myOpenMath and/or Blackboard, while they are recorded on video. In the event that YuJa proctoring is unavailable, students may use Zoom proctoring with the instructor or a live proctor with the printed exam. Students who use YuJa proctoring may submit their notes and written work to potentially earn partial credit on incorrectly solved problems.

Enrollment Verification

The U.S. Department of Education requires instructors of online courses to provide an activity which will validate student enrollment in this course. The only way to verify that a student has been in this course is if he or she takes an action in the LMS, such as completing an assignment or a taking a quiz. Logging into the LMS is **NOT** considered attendance. Please see the enrollment verification activity and complete it by the date indicated. If it is not complete your enrollment in this course will be at risk. Attending class in the first week on campus is sufficient for enrollment verification for students enrolled on campus. Completing the 6 Critical Questions journal, the syllabus quiz and the introduction forum (due Friday, 1/17/2025) will suffice as enrollment verification for online students in this course.

Late Arrivals

The grading system for students adding this course after the first day of instruction will not be modified. Students will be graded on all the activities regardless of the date of enrollment in the course. Students will not be penalized for late assignments if enrollment occurs after the due date of the assignment, but the students are still responsible for completing the course material that was covered during their initial absence. Arrangements will be made for new due dates.

Starfish is the Student Success and Early Alert System

At Mayville State University Starfish will be used to report feedback on your academic performance, attendance, etc. If you receive a Starfish notification (sent to your @mayvillestate.edu e-mail from the Director of Student Success), please read it immediately.

As your instructor, I will send Kudos (messages of congratulations for doing great) or flags (messages of concern that you are not performing to expectations) using Starfish. Periodically, I will use Starfish to provide students with grade reports throughout the semester during the second week, before the final day to drop a course, and when other progress reports are due. You and your support team (your advisor, your

athletic coach, the director of student success, and the other faculty who are teaching you this semester) will be able to see these messages. You are also able to raise flags with "I have a question" or "I need help." You are also able to e-mail me directly with your questions at mary.townsend@mayvillestate.edu.

Important Student Information

Navigate to Blackboard > MaSU tab > Student Resources tab to find a document entitled, "Important Student Information," which includes information about:

- ✓ Land Acknowledgement Statement
- ✓ Academic Grievance Concerns and Instructor English Proficiency
- ✓ NetTutor - Online Tutoring Program
- ✓ Starfish - Student Success System
- ✓ Students with Documented Disabilities
- ✓ Student Learning Outcomes / Essential Learning Outcomes
- ✓ Academic Honesty
- ✓ Emergency Notification
- ✓ Continuity of Academic Instruction for a Pandemic or Emergency
- ✓ Family Educational Rights and Privacy Act of 1974 (FERPA)
- ✓ Diversity Statement (Title IX)

Students with Documented Disabilities

Students such as learning disabilities, orthopedic, hearing, visual, speech, psychological, ADD / ADHD, health-related or other disabilities may request accommodations to ensure full access to academic opportunities at Mayville State University. In order to receive these services, students must disclose their disabilities and request accommodations by providing documentation to the student success center. Any information shared will remain confidential.

Course Timeline/Schedule

The course timeline and schedule is a separate document in the Blackboard tab labeled "Syllabus, Schedule, myOpenMath Access, and Links to Textbooks". The course timeline and schedule are subject to change as deemed necessary by the instructor.