# Math 284 Course Content and Objectives

## COURSE CONTENT AND SCOPE
- **Lecture:** Outline the topics included in the lecture portion of the course *(Outline reflects course description, all topics covered in class)*.

<table>
<thead>
<tr>
<th>Hours Per Topic</th>
<th>COURSE OBJECTIVES</th>
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</thead>
<tbody>
<tr>
<td></td>
<td><strong>Lecture:</strong> Upon successful completion of this course, the student will be able to... <em>(Use action verbs - see Bloom's Taxonomy for 'action verbs requiring cognitive outcomes'.)</em></td>
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### Integers: Primes, perfect numbers, divisibility, and Mersenne primes.
- 6 hours
- **Apply the definition of divisibility.**
- **Demonstrate the relationship between Mersenne primes and even perfect numbers.**

### Prime factorizations: Greatest common divisors, the Euclidean algorithm, Diophantine equations, and the Fundamental Theorem of Arithmetic.
- 6 hours
- **Calculate the greatest common divisor using the Euclidean algorithm.**
- **Apply the Fundamental Theorem of Arithmetic to decompose composite numbers.**
- **Apply the Fundamental Theorem of Arithmetic to calculate the least common multiple.**
- **Solve Diophantine equations using the Euclidean algorithm.**

### Congruences: Congruence classes, linear congruences, the Chinese Remainder Theorem, systems of linear congruences, Wilson's Theorem, and Fermat's Little Theorem.
- 10 hours
- **Perform calculations with congruence classes.**
- **Solve systems of linear congruences.**
- **Develop tests for divisibility using congruences.**

### Applications of congruences: Divisibility tests and cryptography.
- 6 hours
- **Use congruences to cipher and decipher crypto-systems.**

### Multiplicative functions: The Euler phi function, the sum of divisor functions, and the number of divisor functions.
- 6 hours
- **Perform calculations with the Euler phi function**
- **and with the sum of divisors, and number of divisors functions.**

### Primitive roots: The group of units, existence of primitive roots, application of primitive roots, and the universal exponent.
- 6 hours
- **Determine the order of an integer.**

### Quadratic residues: Residues, non-residues, Euler's criteria, Gauss's Lemma, the Jacobi symbol, and the Law of Quadratic Reciprocity.
- 6 hours
- **Determine the quadratic residues and non-residues of an integer using the Law of Quadratic Reciprocity, Euler's criteria and Gauss's Lemma, and properties of the Jacobi symbol.**

### Continued fractions: Rational and irrational numbers and finite, infinite, and periodic continued fractions.
- 6 hours
- **Express rational and irrational numbers as continued fractions using the Euclidean algorithm.**

### Final examination.
- 2 hours
- **Final examination.**

Total Lecture Hours In Section I Class Hours: 54 hours