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**Salisbury University Department of Mathematical Sciences**
**MATH 402/512 : Theory of Numbers  
Syllabus (Tentative)**

**Description:** Basic concepts: integers, prime numbers, divisibility, congruencies and residues. 4 Hours  
Credit: Meets four hours per week. Meets General Education IVB or IVC.

**Prerequisites:** C or better in MATH 210 or MATH 306 (both recommended).

**Intended Audience:** Junior and senior mathematics majors.

**Objective:** To study some of the fundamental topics of classical number theory while developing techniques of proof associated with this discipline.

**Textbooks:** *Elementary Number Theory*, by David M. Burton; McGraw-Hill Publishing Company, 7th Edition, 2011.

Topic	Weeks
<b>Preliminaries</b>	1
Mathematical induction; Binomial Theorem; early number theory	
<b>Divisibility Theory in the Integers</b>	1.5
Division algorithm; greatest common divisor; Euclidean Algorithm; Diophantine Equations	
<b>Primes and Their Distribution</b>	1
Fundamental Theorem of Arithmetic; Sieve of Eratosthenes; Goldbach Conjecture	
<b>Theory of Congruences</b>	1
Basic properties of congruence; binary and decimal representations; divisibility tests; linear congruences; the Chinese Remainder Theorem	
<b>Fermat's Theorem</b>	1.5
Fermat's Little Theorem; pseudoprimes; Wilson's Theorem; Fermat-Kraitchik Factorization Method	
<b>Number-Theoretic Functions</b>	1
The functions $\sigma$ and $\tau$ ; Möbius Inversion Formula; greatest integer function	
<b>Euler's Generalization of Fermat's Theorem</b>	1
Euler's phi-function; Euler's Theorem; Properties of Euler's phi-function	
<b>Primitive Roots and Indices</b>	1
The order of an integer modulo $n$ ; primitive roots; theory of indices	
<b>The Law of Quadratic Reciprocity</b>	2
Quadratic Congruences; The Legendre Symbol; Quadratic Reciprocity	
<b>Additional Topics (as time permits)</b>	2
Possible topics include: cryptography; perfect and amicable numbers; Fermat numbers; Fermat's Last Theorem; Sums of Squares; Fibonacci Numbers; Continued Fractions	
<b>Tests</b>	1
<b>Total</b>	<b>14</b>

**Evaluation**

Group Project	5 – 15%
Homework	15 – 25%
Boardwork and Participation	15 – 25%
Midterm Exam	20 – 30%
Final Exam	25 – 35%

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- Graduate students will be assigned special homework/test problems or projects.
- Clear descriptions of thought processes, evidence of critical thinking, and effective communication must be demonstrated in written work.
- **Writing Across the Curriculum:** Students will be expected to communicate mathematics and mathematical ideas effectively in speech and writing. At the University Writing Center, trained consultants are ready to help you at any stage of the writing process. In addition to the important writing instruction that occurs in the classroom and during professors' office hours, the Center offers another site for learning about writing. **All students are encouraged to make use of these important services.**
- **NOTE:** Once a student has received credit, including transfer credit, for a course, credit may not be received for any course with material that is equivalent to it or is a prerequisite for it.