I. COURSE INFORMATION

Meeting time & place: CS 107, Tues/Thurs 9:30 am - 10:45 am (Sec. 001) OR 11:00 am - 12:15 pm (Sec. 002)
Instructor: Joe Champion, Ph.D.
E-mail: joe.champion@tamucc.edu
Webpage: http://math.tamucc.edu/~jchampion
Office location: Center for Instruction #359
Office hours: Tues/Thurs 2-3 pm, Wed 9-11 am; also by appointment
Office phone: 361-825-3165

II. COURSE DESCRIPTION

The conceptual framework for understanding and applying properties, models and operations related to various number systems in problem solving settings.

This research-based course provides the conceptual framework for understanding and applying properties, models and operations of number systems. Related topics are studied in problem solving settings. Most students in this course have learned mathematics through a rule-based, abstract instructional program. This course is designed to emphasize in-depth basic understandings of number systems and arithmetic patterns, which are core ideas in the elementary mathematics curriculum. Communicating concepts, processes or solutions effectively, in oral and written forms, will be emphasized. Using physical models to teach the content topics and understanding how learning occurs through their use will be a substantial portion of the class instructional plan.

The course will cover chapters 1-6 in the textbook.

III. PREREQUISITES for the COURSE

MATH 1314: College Algebra or equivalent, or placement beyond College Algebra on the departmental placement test

IV. TEXTBOOKS and OTHER REQUIRED SUPPLIES

Required:

- Scientific calculator
- Texas Essential Knowledge & Skills (online)
- Principles and Standards for School Mathematics, NCTM, 2000 (online)
- Family Math Night presentation materials (may cost up to $10)
- Regular access to high speed internet, word-processing and presentation software

Suggested:

V. STUDENT LEARNING OUTCOMES

A student will –

Sequences & problem solving
- Identify patterns, predict next term, find and apply formulas for arithmetic, geometric, Fibonacci, “see-and-say”, exponential (n^n), and power sequences (2^n)
- Use inductive reasoning to identify, extend, and create patterns using concrete models, figures, numbers and algebraic expressions
- Investigate subsets of the natural numbers (evens, odds, powers of two, Fibonacci numbers, perfect squares)
- Illustrate concepts of functions using concrete models, tables, graphs & symbolic expressions
- Develop and use iteration and recursion to model and solve problems

Number systems
- Compare and contrast numeration systems
- Identify the structure and chart the relationships in the real number system
- Describe the roles of zero, face and place value in the base ten system
- Model binary operations on whole numbers
- Recognize and analyze standard and non-standard algorithms for binary operations on whole numbers
- Analyze error patterns of students working with standard algorithms for binary operations on whole numbers
- Recognize and analyze non-traditional algorithms for operations on whole numbers
- Apply properties of real numbers

Prime & composite numbers
- Explain two or more reasons why one is not a prime number
- Develop full definitions of prime and composite numbers
- Identify prime numbers between 1-100 and how to find prime numbers greater than 100
- List all factors of a given whole number
- Determine the prime factorization of any given whole number
- Find GCF/LCM for a given set of whole numbers

Integers
- Model integers using two-color chips
- Analyze, explain and model binary operations on integers using two-color chips
- Explore historical/cultural scenarios using powers of two
- Explore powers of ten

Rational numbers
- Demonstrate an understanding of equivalency among different representations of rational numbers
- Model fractions using pattern blocks, fraction bars and fraction grids (area models)
- Model binary operations on fractions using pattern blocks, fraction bars and fraction grids (area models)
- Evaluate, explain and justify traditional algorithms for binary operations on fractions
- Create equivalent fractions using paper and manipulatives
- Explain why rational numbers are dense on the real numbers; give an example of a number set that is not dense and explain why not
• Put a set of fractions in order from smallest to greatest
• Find at least two fractions between a given pair of fractions

*In the context of the above expectations, a student will -*

**Mathematical Processes**
• Make conjectures and use deductive methods to evaluate the validity of conjectures
• Recognize that a mathematical problem can be solved in a variety of ways, evaluate the appropriateness of various strategies, and select an appropriate strategy for a given problem
• Evaluate the reasonableness of a solution to a given problem
• Use physical and numerical models to represent a given problem or mathematical procedure
• Recognize that assumptions are made when solving problems and identify and evaluate those assumptions
• Explore problems using verbal, graphical, numerical, physical, and algebraic representations

**Mathematical Perspectives**
• Appreciate the contributions that different cultures have made to the field of mathematics and the impact mathematics has on society and culture
• Understand and apply how mathematics progresses from concrete to representation to abstract generalizations

**Communication**
• Communicate mathematical ideas and concepts in age-appropriate oral, written and visual forms for a class presentation
• Use mathematical processes to reason mathematically, solve mathematical problems, make mathematical connections within and outside of mathematics, and communicate mathematically
• Reflect on personal learning, change of attitude and beliefs, and growth in understanding through mathematical journaling
• Translate mathematical statements among developmentally appropriate language, standard English, mathematical language, and symbolic mathematics

**Technology**
• Use appropriate technology such as calculators, computer software, and the Internet to explore, research, solve, and compare mathematical situations and problems

**Professional Development**
• Be familiar with the National Council of Teachers of Mathematics and the Principles and Standards for School Mathematics, the NCTM website, and NCTM journals

**VI. INSTRUCTIONAL METHODS and ACTIVITIES**

The course will be a combination of lectures, individual and group work. Students are expected to participate in group and whole class discussions by contributing with knowledge and thoughtful evaluation of the contribution of others. Using physical models to teach the content topics and understanding how learning occurs through their use will be a substantial portion of the class instructional plan.
VII. MAJOR COURSE REQUIREMENTS and ASSESSMENTS

The final course grade will be a weighted average of scores in six categories:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classwork &amp; Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Family Math Night Project</td>
<td>10%</td>
</tr>
<tr>
<td>Class Presentation</td>
<td>20%</td>
</tr>
<tr>
<td>Fraction Mastery Exam</td>
<td>10%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>20%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
</tbody>
</table>

Final weighted grades are rounded to the nearest percent. Those $\geq 90\%$ earn a letter grade of A, $\geq 80\%$ earn at least a B; $\geq 70\%$ earn at least a C; $\geq 60\%$ earn at least a D; $< 60\%$ earn an F.

**Classwork & Homework** – includes individual, collaborative and cooperative group work, reflections, in-class discussion, readings, written assignments, worksheets, and (announced and unannounced) quizzes. Assignments may include online exercises.

**Family Math Night Project** – To gain experience doing enjoyable math with elementary students and their families, you will be creating a Family Math Night at a local elementary or middle school. This will entail substantial time and effort outside of class.

**Class Presentation** – work individually or in a small group to choose an alternative number system or algorithm, and develop an interactive presentation to share your topic with the class. Assignment details, project ideas, and evaluation criteria are posted on the course website.

**Fraction Mastery Exam** – show proficiency in fraction arithmetic by correctly completing at least 75% of exercises involving by-hand calculations of fractions. Exam items are graded “all or nothing,” and the exam may be retaken once with instructor permission.

**Midterm Exam** – an in-class individual exam with focus on interpreting patterns and representations of numbers. The midterm exam may not be retaken or made-up if missed.

- The midterm exam is initially planned for **Thursday, February 16th**.

**Final Exam** – comprehensive summative evaluation of your individual content knowledge. This 2 ½ hour exam is scheduled by the university and may not be retaken or made-up if missed. If you have a conflict with the scheduled time, please see me two weeks before the final time to discuss options.

- The final for 1350.001 (T/R at 9:30) is scheduled for **Thurs, May 3rd, 8 am - 10:30 am**.
- The final for 1350.002 (T/R at 11) is scheduled for **Tues, May 8th, 11 am - 1:30 pm**.

VIII. COURSE OUTLINE

The tentative class schedule is updated at math.tamucc.edu/~jchampion/smte1350/2012/calendar

<table>
<thead>
<tr>
<th>WEEK</th>
<th>DATES</th>
<th>TOPIC</th>
<th>CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/12</td>
<td>Intro. to Problem Solving</td>
<td>Pre-assessment; problem solving</td>
</tr>
<tr>
<td>2</td>
<td>1/17, 1/19</td>
<td>Heuristics &amp; Play</td>
<td>The game of NIM, Tower of Hanoi</td>
</tr>
<tr>
<td>3</td>
<td>1/24, 1/26</td>
<td>Patterns</td>
<td>Figurate numbers, Shapes &amp; Sequences</td>
</tr>
<tr>
<td>WEEK</td>
<td>DATES</td>
<td>TOPIC</td>
<td>CONTENT</td>
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<tr>
<td>4</td>
<td>1/31, 2/2</td>
<td>Counting</td>
<td>Enumerate, Subitize, Correspondence</td>
</tr>
<tr>
<td>5</td>
<td>2/7, 2/9</td>
<td>Positional Systems</td>
<td>Base 10, other bases, Place Value</td>
</tr>
<tr>
<td>6</td>
<td>2/14, 2/16</td>
<td>Midterm Exam</td>
<td>Review activity, exam</td>
</tr>
<tr>
<td>7</td>
<td>2/21, 2/23</td>
<td>Binary Operations</td>
<td>Inverse operations, Addition, Subtraction</td>
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<tr>
<td>8</td>
<td>2/28, 3/1</td>
<td>Multiplication</td>
<td>Representation of Multiplication, Division</td>
</tr>
<tr>
<td>9</td>
<td>3/6, 3/8</td>
<td>Fractions</td>
<td>Real and Rational Numbers, Equivalence</td>
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<tr>
<td></td>
<td>3/13, 3/15</td>
<td>[ Spring Break ]</td>
<td>No Class</td>
</tr>
<tr>
<td>10</td>
<td>3/20, 3/22</td>
<td>Factorization</td>
<td>Primes, Multiples, Factors</td>
</tr>
<tr>
<td>11</td>
<td>3/27, 3/29</td>
<td>Integers</td>
<td>Models of Signed Numbers</td>
</tr>
<tr>
<td>12</td>
<td>4/3, 4/5</td>
<td>Fraction Arithmetic</td>
<td>Models of Fraction Operations</td>
</tr>
<tr>
<td>13</td>
<td>4/10, 4/12</td>
<td>Ordering Numbers</td>
<td>Density, Fraction Comparison</td>
</tr>
<tr>
<td>14</td>
<td>4/17, 4/19</td>
<td>Non-standard Arithmetic</td>
<td>Analyzing Alternative Algorithms</td>
</tr>
<tr>
<td>15</td>
<td>4/24, 4/26</td>
<td>Algebra Transitions</td>
<td>Connections between Algebra &amp; Number</td>
</tr>
<tr>
<td>16</td>
<td>5/1</td>
<td>(Comprehensive)</td>
<td>Review for final exam</td>
</tr>
<tr>
<td>17</td>
<td>5/3 OR 5/8</td>
<td>(Comprehensive)</td>
<td>Final exam</td>
</tr>
</tbody>
</table>

IX. CLASS POLICIES

**Attendance/Tardiness.** Attendance is expected and is reflected in in-class participation. If you must be tardy or absent, please contact me by email before class or as soon as possible.

**Late Homework.** Homework will usually be due at the beginning of class, but may be submitted later if the student requests an extension prior to the deadline. The instructor may enforce strict deadlines on some assignments by announcing a “hard deadline.” Partial credit on submissions after hard deadlines will be assigned at the instructor’s discretion.

**Exams.** You must attend the final exam, so please plan accordingly. Description of exam content and review material will be available on the course website. Please contact the instructor if you think you are in need of alternate testing conditions.

**Cell Phones/Electronic Devices.** Please silence electronic devices during class and step out of class to use them. You may not use any personal electronic device during exams.

**Written Work.** Good writing skills are important in this class. Please type and proof-read your written assignments. The Writing Center is available for help with written assignments.

**Dropping a class.** I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with me before you decide to drop to be sure it is the best thing to do. Should dropping
the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. **Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class.** Friday, Nov. 5th is the last day to drop a class with an automatic grade of "W" this term.

**Academic integrity.** University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one's own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a minimum of a 0 on the assignment or test.

**Disability services.** The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Driftwood 101.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.

**Grade appeals process.** As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule 13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules Web site at tamucc.edu/provost/university_rules. For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.

**Classroom Behavior.** Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor's ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

**Changes.** The instructor may amend the syllabus at any time prior to the final exam by announcing the changes in class.