MATH 5325: Structure of Number Concepts: Bridging from Number to Algebra
Department of Mathematics and Statistics
FALL 2015

A. COURSE INFORMATION

Course number/section: MATH 5325.001
Class meeting time: W 7:00 – 9:30 PM
Class location: CS-107
Course Website: https://bb9.tamucc.edu

B. INSTRUCTOR INFORMATION

Instructor: Dr. James Dogbey
Office location: CI 304
Office hours: MWF 11:30am – 1:30pm & MW 6:00pm – 7:00pm or by appointment
Telephone: 361-825-3159
E-mail: James.Dogbey@tamucc.edu
Appointments: Feel free to make an appointment with me via email if you are unable to attend my regularly scheduled office hours. I’m here to help.

C. COURSE DESCRIPTION

An in-depth investigation of the real number system, base ten and other number bases, operations and algorithms, divisibility, Euclidean algorithm, congruence, modular arithmetic, and the Fundamental Theorem of Arithmetic, with an emphasis on quantitative and qualitative reasoning. Emphasis will be on the relationship of number and operations to Algebra I concepts. This class is intended for mathematics teachers.

D. PREREQUISITES AND COREQUISITES

Graduate standing; teacher certification or experience teaching mathematics in grades 6-12; and/or permission of the program coordinator.

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES

Required

Optional Textbook(s) or Other References
Navigating through Number and Operations in Grades 3-5, NCTM, 2006.
Navigating through Number and Operations in Grades 9-12, NCTM, 2006.
Regular access to high-speed Internet

The following Articles are posted on Blackboard:


F. **STUDENT LEARNING OUTCOMES AND ASSESSMENT**

Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes, students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

Upon successful completion of the course, students will:

1. Gain a perspective of the historical background of number theory.
2. Explore other number bases through historical/cultural class presentations.
3. Calculate and convert between different number bases.
4. Recognize and work with common subsets of the real numbers.
5. Write elementary proofs for number theory topics such as divisibility.
6. Make connections between number and algebra concepts and skills.
7. Understand and use theorems and algorithms of number theory.

G. **INSTRUCTIONAL METHODS AND ACTIVITIES**

The course will consist of lecture, collaborative group work, class discussions and class presentations. Students are expected to participate in collaborative groups and whole class discussions by contributing knowledge and thoughtful evaluation of the contribution of others.

H. **MAJOR COURSE REQUIREMENTS AND GRADING**

• Informal and formative assessment will be employed. The informal assessment includes observation of class activities, discussion and participation; questioning; and student
feedback. Formal and summative assessment will include individual and group papers and projects, and reflective writing.

Classwork 25%
Project 30%
Homework 20%
Final Presentation 25%

Classwork – participate in inquiry tasks, whole-class discussion, and group work activities during regularly schedules class time.

Project – select a historical or cultural number system or topic and give a class presentation.

Homework– demonstrate your mastery of select student learning outcomes during individual assessments. Homework may require high speed Internet access and word processing software.

Final Presentation – Topics will be discussed in class.

Final grades will be assigned as follows:

90%- 100% = A
80%- 89.9% = B
70%- 79.9% = C
60%- 69.9% = D
Below 60% = F

I. COURSE CONTENT/SCHEDULE

<table>
<thead>
<tr>
<th>Date</th>
<th>Lesson</th>
<th>Topic &amp; Chapter Activities</th>
<th>Readings &amp; Assignments Due</th>
</tr>
</thead>
</table>
| 08/26  | 1      | Course Introduction, number development, number systems, infinity & zero                     | Syllabus
                                                  |                                                  | Problem Set 1 (do in class)                       |
| 09/02  | 2      | Classifying numbers including some related proofs - Even and odd numbers, perfect and amicable numbers,iggurate numbers (e.g., square and triangular numbers) | Read: Ball (2003)
<pre><code>                                              |                                                  | Problem Set 2: Number pattern exploration       |
</code></pre>
<p>| 09/09  | 3      | Meanings and Models of Whole Number Addition and Subtraction in Multiple Bases             | Read: Frank (1989)                                |
| 09/16  | 4      | Meanings and Models of Whole Number Multiplication and Division in Multiple Bases          | Watch videos of real classrooms                   |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>#</th>
<th>Topic</th>
<th>Assignment/Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/23</td>
<td>5</td>
<td>Algorithms, Mental Math, and Estimation for Whole Number Operations</td>
<td>Watch videos of real classrooms</td>
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<tr>
<td>09/30</td>
<td>6</td>
<td>Models and Operations on Fractions</td>
<td>Problem Set 3: Fraction Exploration</td>
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<tr>
<td>10/07</td>
<td>7</td>
<td>Primes and composites, including sieve of Eratosthenes, Twin primes, Proofs about the infinitude of primes, Historical connections</td>
<td>Do: Will It Always Be Prime?</td>
</tr>
<tr>
<td>10/14</td>
<td>8</td>
<td>Unique factorization, Divisibility tests, Greatest common factor, Least common multiple</td>
<td>Do: What Divides $k$?</td>
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<tr>
<td>10/21</td>
<td>9</td>
<td>Euclidean algorithm and applications Numeration systems, including the binary system Sorting algorithms</td>
<td>Do: Sum of Divisors</td>
</tr>
<tr>
<td>10/28</td>
<td>10</td>
<td>Modular arithmetic, including basic proofs Applications to real life situations</td>
<td>Problem Set 4</td>
</tr>
<tr>
<td>11/04</td>
<td>11</td>
<td>Rational, Irrational and the Real Numbers, and Properties</td>
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<tr>
<td>11/11</td>
<td>12</td>
<td>The complex number system</td>
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<tr>
<td>11/18</td>
<td>13</td>
<td>Connecting number theory concepts to the school math curriculum</td>
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<tr>
<td>12/02</td>
<td>14</td>
<td>Presentation</td>
<td>Structure of Numbers Project Due</td>
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<tr>
<td>12/09</td>
<td>15</td>
<td>Presentation</td>
<td>Presentation</td>
</tr>
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</table>

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.

J. COURSE POLICIES

Attendance/Tardiness
Learning is a social process, maximized by active engagement, participation, and discussion. Thus, students are expected to attend every class and be an active participant in the classroom practices. In the event of an absence, students are to contact the instructor, arrange for a classmate to pick up any handouts, and turn in any work that is due. Absent students are responsible for any work announced in class and for all announced changes, additions, and deletions to the syllabus.
Absence from class is not a valid excuse for failing to meet deadlines or fulfill course requirements.

K. COLLEGE AND UNIVERSITY POLICIES

- **Academic Integrity (University)**
  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 failing grade.

- **Classroom/Professional 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.

- **Statement of Civility**
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- **Deadline for Dropping a Course with a Grade of W (University)**
  The grade of W will be assigned to any student officially dropping a course. Please consult with the instructor before you decide to drop to be sure it is the best thing to do. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Should dropping the course be the best course of action, visit the Office of the University Registrar for the Course Drop Form that must submitted. No student is eligible to receive a W without completing the official drop process by this deadline. Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day to drop a course.

- **Grade Appeals (College of Science and Engineering)**
As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, 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 Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

- **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 (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

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.

http://disabilityservices.tamucc.edu/

- **Statement of Academic Continuity**
In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

L. **OTHER INFORMATION**

- **Academic Advising**
The College of Science & Engineering requires that students meet with an Academic
Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop by the Advising Center to check availability and schedule an appointment. The College’s Academic Advising Center is located in Center for Instruction 350 or can be reached at (361) 825-3928.

GENERAL DISCLAIMER
I reserve the right to modify the information, schedule, assignments, deadlines, and course policies in this syllabus if and when necessary. I will announce such changes in a timely manner during regularly scheduled lecture periods.