MATH 1010 – 113 ***Fall 2014***
Essential Mathematics for the Informed Society —(Critical Thinking)
Location Martin M-302 — TTH 2:00 – 3:15 PM

Course Information and Policies

Instructor: Dr. Marilyn Reba
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Office Hours: Tuesday (9:30-10:30 am)
Wednesday (3:00-4:00 pm)
Thursday (9:30-10:30 am)
(or by appointment)

Instructor: Dr. Meredith Burr
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Office Hours: Monday (10:05 – 11:05 am)
Wednesday (10:05 – 11:05 am)
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(or by appointment)

Description
MATH 1010 (Essential Mathematics) was created with three specific objectives: (1) To prepare the student for the mathematics encountered in the other college courses, particularly core courses in social and natural sciences; (2) To develop the ability to reason with quantitative information in a way that will help the student achieve success in a career; and (3) To provide the critical thinking and quantitative reasoning skills needed to understand major issues in life.

MATH 1010 – Special Section on Critical Thinking: This section is participating in the Clemson Thinks^2 (CT^2) experiment in critical thinking. This means that this section embraces the three goals of the general course, but emphasizes (3). We will practice critical thinking while exploring mathematical representations, strategies, and algorithms from graph theory, logic, statistics and probability, and voting theory. In these contexts, we will introduce mathematical techniques and ways of thinking that will assist us in analyzing and solving a wide range of problems in society. Too often we confront complex problems at work or in other contexts where our intuitions about how to solve them are either misleading or too vague. Experience with these mathematical techniques will provide us with models for decomposing complex problems and for constructing systematic solution strategies. Critical thinking will be needed to effectively communicate and interpret these solutions in context.

Prerequisites
To enroll in MATH 1010 a student must score a minimum of 50 on the CMPT or have course credit for any EXST or MATH course with the following exception. This course is not open to students who have credit for MATH 3010, 3020, 3090 or EXST 3010. Students who do not meet prerequisites will not be permitted to remain in the course.

General Education
This course meets the Mathematical, Scientific, and Technological Literacy general education requirements.

Text
Puzzles, Paradoxes, Problems: Introduction to Mathematical Thinking (Reba & Shier).
Additional Reading Materials (provided on Blackboard).
[The text may be purchased at the Campus Copy Shop, 384 College Avenue, Clemson, SC 29631. Phone: (864) 654-3863.]
Software
Adobe Acrobat to read pdf files (http://www.adobe.com/products/);
Flash Player to read .swf files (http://www.adobe.com/products/flashplayer/).

Calculator
A basic or scientific calculator is recommended.

Learning Outcomes: CT^2 outcomes are in bold below, with course-specific outcomes listed underneath. Upon successful completion of this course, a student will be able to:

1. **Explore complex challenges.**
   - Explore complex problems from a variety of areas including biology, communication, transportation, business, politics, and the law.
   - Identify goals, explain how to organize and expand the given data, and recognize appropriate strategies and solution algorithms.

2. **Analyze multi-dimensional problems.**
   - Analyze various puzzles using directed and undirected graphs and determine the most efficient set of moves.
   - Analyze the logical validity of arguments arising in the public sphere.
   - Draw and analyze decision trees for a variety of problems.

3. **Extrapolate from one conceptual context to others.**
   - Recognize that certain mathematical representations and strategies used to solve one type of problem may also be useful in others.
   - Apply exact algorithms for finding Eulerian circuits and shortest paths.
   - Apply heuristic algorithms for routing problems and coloring problems.
   - Construct Boolean circuits that execute a given task.
   - Compute the probability of occurrence of a particular event using theoretical methods and counting techniques.
   - Calculate *a posteriori* probabilities using Bayes' Theorem.

4. **Synthesize alternative solutions (some exact, some approximate) to multi-dimensional problems.**
   - Compare alternative solutions to a given problem and identify strengths and weaknesses.
   - Recognize when a conclusion to an argument is and is not necessarily true.
   - Evaluate the accuracy of statistical statements to identify inadequate or deceptive statistics.
   - Analyze the outcome of an election using a variety of voting methods; Explain the concept of weighted voting; Explore the implications of a variety of apportionment methods.

5. **Communicate complex ideas effectively.**
   - Interpret basic statistics and probabilities. (For example, find the probability of the occurrence of a particular event using theoretical methods and counting techniques; Explain conditional probabilities.)

- Interpret statistical information or evidence and draw appropriate conclusions.
- Determine the consequences of errors in computing and interpreting statistics and probabilities.
- Construct a valid argument based on explicit or implicit assumptions and information.

Documenting the critical thinking learning process:

Critical thinking is a process and your skills and attitudes develop over time. To document this process, we will administer the following:

- The California Critical Thinking Skills Test at the beginning and end of the course. Your grade on these tests will be part of your activity grade.
- Certain assignments that you complete for this course will be designated as **CT^2 artifacts**. Copies of these assignments will be kept as documentation of your critical thinking learning process.

Websites

http://bb.clemson.edu – Follow links to this course in Blackboard. You are responsible for checking this website and your university e-mail account on a regular basis for announcements and class materials.

www.registrar.clemson.edu/publicat/catalog/2012/2012.htm– Detailed information about Clemson University undergraduate class regulations including academic integrity, attendance policy, mid-term grades, final examinations, and posting of grades.

Course Structure

The following teaching methods will be used to teach the course content and improve your critical thinking skills.

Readings: Prior to each class meeting, you will read the assigned material. This material will help prepare you to engage in analyzing and solving problems in the next class.

Lectures and modeling: Each class will be team-taught with mini-lectures. The instructors will present content, as well as model the problem-solving process through examples.

Group learning activities: Class time often will be used to work in groups on solving problems or analyzing a case study. Both instructors will serve as coaches during the learning activities. The instructors will walk around to direct further discussion, asking questions to aid in discovery of a solution or to point out further considerations.

Communicate, analyze, and compare solutions: We will ask groups to share their solution to a problem with the class. You will need to be clear in communicating your solution as well as your solution process. The class will be asked to analyze your work. Questions to consider may include: What assumptions were made in the solution? Are there any errors? Are there possible alternative solutions? Does the method of solution generalize to more complex problems? In the case of alternative solutions, we will compare alternative methods and discuss strengths and weaknesses of each approach.

Grading

In-Class Group Activities (Including Problem Summaries)	10%
Homework	20%
3 Midterm Exams	45 %
Final Exam	25 %
Total	**100 %**

(The lowest 10% of both group activities and HWs will be dropped to allow for unavoidable absences.)

Your final grade will be determined using the standard grading scale.

A	90 – 100	**B**	80 – 89	**C**	70 – 79	**D**	60 – 69	**F**	Below 60

In each class you will work on class activities and submit homework, which is an important portion of your grade. Class work and homework provide the best ways to prepare for the exams. Exams will test basic techniques used on the types of problems you've worked on in class. (Exams will not test the hardest concepts nor contain surprise problems.)

Exam Dates

Exam 1: 9/17 (6:45 – 8:15 PM)
Exam 2: 10/15 (6:45 – 8:15 PM)
Exam 3: 11/12 (6:45 – 8:15 PM)
Final: 12/10 (7:00 – 9:30 PM)

Attendance: You are expected to be regular and punctual in your class attendance. You are responsible for all notes, assignments, and announcements made in class.

As a courtesy to everyone, please stow away all cell phones and other electronic devices prior to the start of class. We will have a fully equipped classroom for any exercises involving computer use.

Accommodations: Student with disabilities who need accommodations should make an appointment with the instructor to discuss special needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Disability Services at the meeting. Student Disability Services is located in the lower level of Redfern Health Center/G-20 (phone: 656-6848; Email: sds-l@clemson.edu). Please be aware that accommodation letters are NOT retroactive and new accommodation letters must be presented each semester. If you have a letter stating specific testing accommodations to which you are entitled, please turn in a copy to your instructor at least one week prior to the test.

Clemson University Title IX: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at http://www.clemson.edu/campus-life/campus-services/access/title-ix/. Mr. Jerry Knighton is the Clemson University Title IX Coordinator. He also is the Director of Access and Equity. His office is located at 111 Holtzendorff Hall, 864.656.3181 (voice) or 864.565.0899 (TDD).

Academic Dishonesty

Students are expected to adhere to the following official Clemson academic integrity statement:

> *As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning." Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form.*

Class Calendar MATH 1010-113 (CT2) – Fall 2014: Dr. Reba; Dr. Burr

	UNIT ONE: GRAPHS
8/21	Intro and Critical Thinking Exam
8/26	Chapter 1 Graph Representation: Mazes and Jugs
8/28	Chapter 4 Routing Problems and Circuits
9/2	Chapter 5 Optimal Orderings: Traveling Salesmen, Circuit Boards, Archeologists
9/4	GROUP PROBLEMS
9/9	Chapter 6 Graph Coloring and Matchings: Maps, Cell Phones, Scheduling, Kidney Exchanges
	UNIT TWO: LOGIC
9/11	Chap 7 Evaluating Inductive and Deductive Arguments
9/16	GROUP PROBLEMS/ Review
9/17	Exam 1 (Chaps 1,4,5,6,7)
9/18	**Give Back Day #1**
9/23	Chapter 8 Deductive Arguments: Truth-Tables and Validity
9/25	Chapter 10 Deductive Logic and Equivalence
	UNIT THREE: PROBABILITY
9/30	Chapter 12 Probability and Counting
10/2	Chapter 13 Counting and Unordered Outcomes
10/7	Group Activity
10/9	Chapter 14 Independence and Conditional Probability
10/14	GROUP PROBLEMS/ Review
10/15	Exam 2 (Chaps 8, 10, 12, 13, 14)
10/16	**Give Back Day #2**
10/21	Chapter 15 Bayes' Law and Applications of Conditional Probabilities
10/23	GROUP PROBLEMS
10/28	Chapter 16 Paradoxes, Random Events and Expected Value
10/30	Statistics Supplement
	UNIT FOUR: VOTING AND APPORTIONMENT
11/4	No class – Fall Break
11/6	Chapter 17 Voting Methods
11/11	GROUP PROBLEMS/ Review
11/12	Exam 3 (15, 16, S, 17)
11/13	Chapter 19 Weighted Voting Methods
11/18	Chapter 20 Apportionment Methods (I)
11/20	GROUP PROBLEMS
11/25	**Give Back Day #3**

12/2	Apportionment (II) Critical Thinking Exam
12/04	GROUP PROBLEMS/ Review
12/10/14	**Final Exam - 7:00 – 9:30 PM (1, 4-8, 10, S, 12-17, 19-20)**