Course Syllabus for Math 1010: Essential Mathematics for the Informed Society (Critical Thinking), Fall 2015

Section 101

1:25 - 2:15 pm MWF, Martin M101

Required Text: *Puzzles, Paradoxes, and Problem Solving: An Introduction to Mathematical Thinking* (Reba & Shier).

Calculator: A basic or scientific calculator is recommended.

Instructor Information:

Instructor:	Dr. Meredith Burr
Office:	Martin Hall, O-216
Office phone:	(864)-656-6406
Email:	burr3@clemson.edu (email is the best way to contact me)
Office Hours:	MWF 10:05 - 11:05 am
	Tuesday 9:00 - 10:30 am
	Thursday 2:00 - 3:30 pm
	and by appointment

An appointment is not needed if you come to my office during office hours. But do not hesitate to make an appointment at another time if my office hours do not work for you. It is important to get any questions answered early so you don't fall behind! I am always happy to help you.

Course 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 Thinks2 (CT2) 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.

Prerequisite: 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 : All Clemson students must demonstrate achievement of the Gen Ed Competencies listed on pp. 37-38 of the 2014-2015 Undergraduate Announcements. MATH 1010 teaches the Mathematics competency:

Demonstrate mathematical literacy through solving problems, communicating concepts, reasoning mathematically, and applying mathematical or statistical methods using multiple representations where applicable.

Learning Outcomes: CT2 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, I will administer the following:

- The California Critical Thinking Skills Test at the beginning and end of the course. Completion of these tests will be part of your daily activity grade.
- Certain assignments that you complete for this course will be designated as CT2 artifacts. Copies of these assignments will be kept as documentation of your critical thinking learning process.

Blackboard and Email: I will post the syllabus, homework, handouts, and other important course materials on Blackboard (`bb.clemson.edu`). I may also email course information to your Clemson email address. It is your responsibility to check Blackboard and your Clemson email account regularly.

Attendance: You are expected to attend every class. If you must miss class, YOU are responsible for the notes and assignments you missed. I will be taking attendance for my records. You must provide me with proper documentation for university sanctioned absences. Any student with more than 6 absences total may be dropped from the course. If I do not arrive in the classroom within 15 minutes after the scheduled start time, class is dismissed for the day.

Cell phone policy: Please turn off or silence all cell phones during class. This means NO texting, messaging, or websurfing during class time. Also note that you may not use your cell phone as your calculator.

Grading:

Homework and In-Class Activities	20%
3 Midterm Exams	60% (20% per exam)
Final Exam	20%
Total	100%

The final exam grade may replace the lowest midterm grade if this is beneficial. Your final grade will be recorded as shown below.

90% - 100% A	80% - 89% B	70% - 79% C	60% - 69% D	Below 60% F

Homework and In-Class Activities: In many classes, a portion of class time will be used to complete an activity or work on problems related to the day's material. There will be no make-ups on these activities, but about 10% of the in-class activity grades will be dropped to account for occasional unavoidable absences. I will also assign homework regularly. In general, late homework will not be accepted for credit, but about 10% of homework grades will be dropped. Homework and In-Class Activities will be graded on a points system. Your homework/activities grade will be computed as total points earned out of total points possible.

Additional notes on homework: Write neatly, show all work, and organize your work clearly. If your work cannot be followed or certain steps are missing, you may not receive full credit. It may sometimes take you a few tries to figure out the method of solution on a problem. Work through problems on scratch paper first, then re-write your final solution that you will hand in. This helps in clearly organizing your work and reinforces the concepts involved in the solution.

Exams: There will be 3 midterm exams and a final exam.

Exam 1:	Wednesday, September 16, 5:30 - 7:00 pm
Exam 2:	Wednesday, October 21, 5:30 - 7:00 pm
Exam 3:	Wednesday, November 18, 5:30 - 7:00 pm
Final Exam:	Wednesday, December 9, 7:00 pm - 9:30 pm

Absence from a test will result in a grade of zero. In general, *make up tests are not given*, however, a University-Sanctioned Absence **may** qualify as an excused absence, and a make-up test **may** be possible in this case. If a student will be unable to attend a test for such an absence, a request to take the test at a later time must be made no later than 24 hours **prior** to the scheduled test.

Inclement Weather Policy: Any exam that was scheduled at the time of a class cancellation due to inclement weather will be given at the next class meeting unless contacted by the instructor. Any assignments due at the time of a class cancellation due to inclement weather will be due at the next

class meeting unless contacted by the instructor. Any extension or postponement of assignments or exams must be granted by the instructor via email or Blackboard within 24 hours of the weather related cancellation.

Academic Integrity: 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.

Accommodations: Student with disabilities who need accommodations should make an appointment with me to discuss specific needs within the first month of classes (I must receive the letter at least one week before an exam in order to provide accommodations). Students should present a Faculty Accommodation Letter from Student Disability Services when we meet. Student Disability Servies 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.

Title IX (Sexual Harassment): `http://www.clemson.edu/campus-life/campus-services/access/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, veterans 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. 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).

Disclaimer: This syllabus is subject to change, if necessary, for reasons including those related to unforeseen conflicts, cancellations, course needs, or educational needs. I will contact you whenever a change must be made, and an up-to-date version of the syllabus will always appear on the course website.

Class	Day	Date	Topic
			Unit 1: Graph Theory
1	Wed.	Aug. 19	Introduction; Chapter 1: Graphical Representation and Search
2	Fri.	Aug. 21	Chapter 1 cont.
3	Mon.	Aug. 24	California Critical Thinking Skills Test
	Tues.	Aug. 25	*Last day to add*
4	Wed.	Aug. 26	Chapter 4: Routing Problems and Optimal Circuits
5	Fri.	Aug. 28	Chapter 4 cont.
6	Mon.	Aug. 31	Chapter 5: Traveling Salesmen and Optimal Orderings
	Tues.	Sep. 1	*Last day to drop; No W*
7	Wed.	Sep. 2	Chapter 5 cont.
8	Fri.	Sep. 4	Chapter 6: Vertex Colorings and Edge Matchings
9	Mon.	Sep. 7	Chapter 6 cont.
10	Wed.	Sep. 9	Graph theory cont.
			Unit 2: Logic
11	Fri.	Sep. 11	Chapter 7: Inductive and Deductive Arguments
12	Mon.	Sep. 14	Chapter 7 cont.
13	Wed.	Sep. 16	Review
			Exam 1 (5:30 - 7:00 pm)
14	Fri.	Sep. 18	Chapter 8: Deductive Arguments and Truth Tables
15	Mon.	Sep. 21	Chapter 8 cont.
16	Wed.	Sep. 23	Chapter 10: Deductive Logic and Equivalence
17	Fri.	Sep. 25	Chapter 10 cont.
18	Mon.	Sep. 28	Logic cont.
			Unit 3: Probability and Statistics
19	Wed.	Sep. 30	Chapter 12: Probability and Counting
20	Fri.	Oct. 2	Chapter 12 cont.
21	Mon.	Oct. 5	Chapter 13: Counting and Unordered Outcomes
22	Wed.	Oct.7	Chapter 13 cont.
	Fri.	Oct. 9	*No class - give back day #1*
	Mon.	Oct. 12	*Fall Break - No class*
23	Wed.	Oct. 14	Chapter 14: Independence and Conditional Probabilities
24	Fri.	Oct. 16	Chapter 14 cont.
25	Mon.	Oct. 19	More probability
26	Wed.	Oct. 21	Review
			Exam 2 (5:30 - 7:00 pm)
	Fri.	Oct. 23	*No class - give back day #2*
			Last day to drop (with W)
27	Mon.	Oct. 26	Chapter 15: Bayes' Law and Applications of Conditional Probabilities
28	Wed.	Oct. 28	Chapter 15 cont.
29	Fri.	Oct. 30	Chapter 16: Expected Values and Decision Making
30	Mon.	Nov. 2	Chapter 16 cont.
31	Wed.	Nov. 4	Fundamental of Statistics; Correlation and Causality
32	Fri.	Nov. 6	Characterizing data: center, spread, and shape; Normal distribution

33	Mon.	Nov. 9	Statistical inference: statistical significance and confidence intervals
34	Wed.	Nov. 11	Statistics cont.
			Unit 4: Voting and Apportionment
35	Fri.	Nov. 13	Chapter 17: Voting Methods
36	Mon.	Nov. 16	Chapter 17 cont.
37	Wed.	Nov. 18	Review
			Exam 3 (5:30 - 7:00 pm)
38	Fri.	Nov. 20	Chapter 19: Weighted Voting Systems and Voting Power
	Mon.	Nov. 23	*No class - give back day #3*
	Wed.	Nov. 25	*Thanksgiving Break - No class*
	Fri.	Nov. 27	*Thanksgiving Break - No class*
39	Mon.	Nov. 30	Chapter 19 cont.; Chapter 20: Apportionment
40	Wed.	Dec. 2	Chapter 20 cont.
41	Fri.	Dec. 4	Review
	Wed.	Dec. 9	**Final Exam (7:00 pm - 9:30 pm)**