MATH 167 — Explorations in Mathematics – Sec. 502 *Fall 2017*

Times/Rooms: TR 11:10 am —12:25 pm / RICH 114

Instructor: Dr. R. A. Gustafson

Office: Blocker 223D

Office Hours: TR 10:00–10:50 am, 2:45–3:30 pm and by appointment.

Email & Web page: *rgustaf@math.tamu.edu* www.math.tamu.edu/∼robert.gustafson

Phone: The department's phone number is 979-845-3261. There is no phone in my office, so email is a better way to reach me.

Course Material: Course material will be posted in eCampus (eCampus.tamu.edu)

Course Description: Application of mathematics to topics of contemporary societal importance using quantitative methods; may include elements of management science (optimal routes, planning and scheduling), statistics (sampling/polling methods, analyzing data to make decisions), cryptography (codes used by stores, credit cards, internet security), fairness (apportionment, voting), patterns (symmetry, tessellations, fractals), world health.

Prerequisites: High school Algebra I and II.

REQUIRED MATERIALS

- *Textbook:* COMAP For All Practical Purposes: Mathematical Literacy in Today's World 9th ed., W. H. Freeman. (Print or electronic) ISBN 978-1-319-09848-3 includes the text and WebAssign access as a bundle. If you purchase the book and WebAssign separately, the ISBN will be different. Notice that we are using the 9th edition.
- *WebAssign access for online homework* (www.math.tamu.edu/courses/eHomework/)
- *A non-programmable calculator that is able to find square roots.* This calculator should NOT be on your phone, tablet, or computer. You will not be allowed to use programmable calculators (such as TI-83/84) on exams or quizzes. Please bring an approved calculator to class. The TI-30XIIS is the preferred calculator.

- *Texas A&M Student ID* - Bring your student ID to all exams. If you have a question about your grade, please come see me in person and bring your ID. Due to privacy issues I cannot discuss your grade over email or by phone.

Learning Outcomes

Upon successful completion of this course, students will be able to satisfy the subset of these outcomes that pertain to the topics chosen for the semester:

- Design optimal and heuristic routes.
- Construct schedules that make the best use of resources.
- Display and analyze data.
- Determine good and bad samples for statistical data.
- Distinguish between good and bad inferences from data.
- Understand and apply the rules for identification numbers.
- Use cryptography to encode and decode information.
- Create a fair division of an item or items.
- Apportion using different apportionment methods.
- Understand and apply concepts of symmetry.
- Apply mathematical concepts to world health issues

Core Objectives

The specific topics used to demonstrate the core objectives will be based on the topics chosen for the semester and will be a subset of the following.

Critical Thinking

- Students will determine which graph theory model should be used to represent real-world situations.
- Students will synthesize data to look for trends and correlation along with determining if there is bias or bad sampling.

- Students will analyze codes and ciphers to make and break encrypted messages.
- Students will think creatively about how resources can be allocated fairly and decide the best way to divide contested items.
- Students will analyze the symmetries of objects.
- Students will determine which mathematical model should be used to analyze a world health issue.

Communication Skills

- Students will model streets, highways and communication infrastructure as a graph.
- Students will diagram machine scheduling problems as a Gantt chart.
- Students will display quantitative data as histograms, stem plots, boxplots, and scatter plots with all units and quantities clearly labeled.
- Students will express a word or phrase using various coding systems.
- Students will express the benefits and detriments of various apportionment methods.
- Students will create a fractal.
- Students will compare multiple models for world health issues.

Empirical and Quantitative Skills

- Students will solve network, graph theory, scheduling and packing questions using brute force and heuristic models.
- Students will describe data sets by finding relevant descriptive statistics. Students will determine whether or not a result is statistically significant.
- Students will use check digit schemes and prove if the check digits are able to find errors in codes.
- Students will calculate how to divide items fairly and how to apportion representatives using several different apportionment procedures, including the one currently used to apportion for the United States House of Representatives.

- Students will reflect, rotate, or translate objects.
- Students will model a world health issue.

TENTATIVE COURSE TOPICS AND SCHEDULE

All changes will be announced in class, on e-Campus, or by email.

Week 1	Aug 29, 31	Chap. 1 (Urban Services) and start chap. 2
Week 2	Sept. 5, 7	Chap. 2 (Business Efficiency) and start chap. 3
Week 3	Sept. 12, 14	Finish chap. 3 (Planning and Scheduling)
Week 4	Sept 19, 21	Review | **Exam I Sept. 21**
Week 5	Sept. 26, 28	Chap. 5 (Exploring Data: Distributions)
Week 6	Oct. 3, 5	Chap. 6 (Exploring Data: Relationships) and start chap. 7
Week 7	Oct. 10, 12	Finish chap. 7 (Data for Decisions)
Week 8	Oct. 17, 19	Review | **Exam II Oct. 19**
Week 9	Oct. 24, 26	Chap. 16 (Identification Numbers)
Week 10	Oct. 31, Nov. 2	Chap. 17 (Information Science)
Week 11	Nov. 7, 9	Review | **Exam III Nov. 9**
Week 12	Nov. 14, 16	Chap. 13 (Fair Division) and start chap. 14
Week 13	Nov. 21	Chap. 14 (Apportionment) | **Thanksgiving**
Week 14	Nov. 28, 30	Finish chap. 14 and start chap. 9
Week 15	Dec. 5, 7	Finish chap. 9 (Social Choice) and Review | **Reading Day**
Week 16	Friday, Dec. 8	**Exam IV, 3-5 pm** in our regular classroom

GRADING:

Grade Weights

Quizzes/Classwork	10%
Homework	10%
Exam I (Chap. 1,2 and 3)	20%
Exam II (Chap. 5,6 and7)	20%
Exam III (Chap. 16 and 17	20%
Exam IV (Chap. 9, 13, and 14)	20%

Required Averages

$90 \leq$ A$\leq 100\%$
$80 \leq$ B$\leq 89\%$
$70 \leq$ C$\leq 79\%$
$60 \leq$ D$\leq 69\%$
$0 \leq$ F$\leq 59\%$

Quizzes/Classwork: In-class quizzes and in-class assignments will be taken for a grade and may not be announced in advance.

Homework: The graded portion of your homework will be online in WebAssign. More information and the login link are available at http://www.math.tamu.edu/courses/eHomework/ There are also book problems that will not be taken up for a grade but are important for your test preparation.

Exams: Everything discussed in class, quizzes, and homework is fair game for content on exams. You should also read the textbook. Our exams will be taken during normal class time. Our fourth test will be taken during our final exam time slot.

Attendance & Make-up Policy: The University views class attendance as the responsibility of an individual student. Attendance is essential to complete this course successfully. University rules related to excused and unexcused absences and make-ups are located on-line at http://student-rules.tamu.edu/rule07. Please notify me via email prior to the date of an absence, if possible. Consistent with Texas A&M Student Rules, in cases where advance notification is not feasible (e.g. accident, or emergency), you must provide notification by the end of the second working day after the absence. This notification should include an explanation of why notice could not be sent prior to the class. For injury or illness too severe or contagious to attend class, you must provide confirmation of a visit to a health care professional affirming date and time of visit. The Texas A&M University Explanatory Statement for Absence from Class form will not be accepted in this case.

It is YOUR responsibility to learn what you missed from class, obtain any notes and assignments, and complete assignments by the regularly scheduled due date. In other words, missing class on the day work was assigned is not a reason for an extension. It is also your responsibility to schedule a make-up if one is needed. Make up exam times can be found at http://www.math.tamu.edu/courses/makeupexams.html. Make up exams should be taken at the first opportunity after an exam unless you have a university excused absence for that time too. Make-up quizzes and class assignments should be completed prior to the next class when feasible. Any assignments given on the day(s) missed will still be due according to the regular schedule.

No rule can cover every situation. If you encounter extenuating circumstances, please communicate with me as soon as possible. No exams will be administered without prior approval, so contact me as

soon as possible if you need to miss a scheduled exam, quiz, or class assignment. If class is officially cancelled for any reason, you can expect that the assignments due/taken on the missed class day will be due/taken the next time the class meets. Please also check eCampus for additional information.

EXTRA HELP AND PREPARING FOR EXAMS

See Your Professor. Communication is essential. Please communicate with me before class, after class, during office hours, and via email.

See the Textbook. Take some time with the book. Working examples and taking notes is key. Do this repeatedly.

Do the Homework. Both WebAssign and textbook homework problems. They reinforce what you are learning in class and the book. Most skills are acquired through practice, You don't know what you don't know until you do examples.

Work with Classmates. We help each other understand and do examples, making it enjoyable and productive. You can't do it alone, but you must contribute–passive learning is not learning.

Additional Practice. See the homework and extra practice problems posted on ecampus. The goal is to make sure you can work the examples, the more the better.

Help Sessions. You can receive help (at no additional charge) from other students who were specifically hired for this course. You can find the available times at http://www.math.tamu.edu/courses/helpsessions.html.

Week in Review Notes. Previous week-in-review notes (from T. Carter) can be found here: http://www.math.tamu.edu/~tcarter/Math167WIR_2015c/

Electronic Device Policy

Unless given permission otherwise by me, **all** electronic devices must be **turned off and put away while in the classroom.**

Academic Integrity Statement

"An Aggie does not lie, cheat, or steal or tolerate those who do". Academic integrity is vital to an academic community and essential for all students and professors. As an Aggie, you have agreed to know and uphold the honor code. You will be asked to sign the honor code on your work as a reminder of that commitment. If you ever have a question about whether or not an action would be acceptable under the honor code, please ask your professor BEFORE you take the action. If you don't have time to ask, then consider whether or not you would take the action if your professor was beside you. For this class, I encourage you to study with your classmates (unless I specifically state otherwise). However, all graded work (exams, quizzes, homework, etc.) must clearly be your own individual work, and you should not discuss graded work with anyone who has not completed that work yet. If you use a source when completing work, cite the source. I further refer the student to the Honor Council Rules and Procedures on the web at http://www.tamu.edu/aggiehonor.

Students with Disabilities

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 contact Disability Services, currently located in the Disability Services Building at the Student Services at White Creek complex on west campus or call 979-845-1637. For more information, visit http://disability.tamu.edu

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