CoSM Class Syllabus/Policy
MTH 300: Foundations of Mathematics, Spring 2019

Name: Clint Richardson
Email: crichardson@sfasu.edu
Phone: Office—936-468-1736
Office: Math 306
Office Hours: MTWRF 10–11 am
Department: Mathematics and Statistics
Class meeting time/place: (online)

Credit hours: 3

The following is an excerpt from SFA Policy 5.4:

The federal definition of a credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally established equivalency that reasonably approximates:

1. Not less than one hour of classroom or direct faculty instruction and a minimum of two hours out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or 10 to 12 weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time, or;

2. At least an equivalent amount of work as outlined in item 1 above for other academic activities as established by the institution including laboratory work, internships, practica, studio work, and other academic work leading to the award of credit hours.

To this end, all students in courses offered by the Department of Mathematics and Statistics that wish to be successful should plan to spend a minimum of two hours outside of class for every credit hour associated with this course. Expected activities to be completed in the time outside of class include reviewing notes from previous class meetings, reading assigned course resources, completing all assigned exercises and projects, and performing periodic assessment preparation.

Course Description: Set theory, relations, functions, mathematical structure, logic, and proof. Includes historical connections. Course prerequisites: MTH 129 and MTH 138.

Course Overview: Each of the ancient cultures has some form of mathematics, but the ancient Greeks, thanks to their emphasis on logic and deductive truth, left the greatest stamp on how mathematics developed in the Western world. The emphasis on explaining WHY something is true based on simpler principles and valid reasoning is the key to understanding how mathematics has developed over the millenia.

In this class, you will learn the logical reasoning and communication tools that are needed for advanced mathematics and why it is important to model these tools for your students, even if you never teach geometric proof in secondary schools. In this class, we have a variety of activities: readings, assignments, discussions and projects, both as an individual and in groups, to help you understand the concepts and develop necessary skills. Your course letter grade will be calculated as a weighted average of four tests and the series of assignments. Tests are intended
to be instruments by which you can show what you have learned as the semester progresses; as a result, I require that there be a proctor present when you take each test in order to help guarantee that no academic dishonesty occurs. You may take your tests in person on SFA Campus (see details below) or you may take your tests at a testing center at a local library or community college (or individual proctors approved by me in exceptional circumstances). Please start considering your testing plans now, and note that some proctoring centers require a fee.

This course is dependent on technology and making machines do what we need them to do when we need them to do it. If you find a glitch in anything, it is your responsibility to inform me immediately! If it is something that I can fix, I will do so ASAP. Otherwise, I will direct you to other means of help. Only with such notifications will I consider extending deadlines as a result of technical difficulties.

**Text and Materials:** No required textbook. This course is online, so a functional computer and internet connectivity (preferably high-speed) will be necessary. Several programs in the Microsoft Office suite will likely be necessary—these are available from SFA via mySFA and Office 365. Finally, some students may find a hand-held, non-CAS calculator useful for exams.

**About the Content Modules:** There are nine content modules in this course. The first three concern logical reasoning. The next two are concerned sets and logic, which form the symbolic foundation of most modern mathematics. Finally, the last four modules introduce you to the basics of mathematical proof. Each module includes practice problems and Stop and Think exercises; solutions to these are provided at the end of each module. At the end of some module, you will be required to complete a module quiz over the content in the module. In some modules, you will also have assignments that must be submitted via the dropbox tool or discussion assignments that will be posted to the discussion board. Graded assignments will be included in the class participation part of your course grade.

**The Discussion Board:** The discussion board is the location where you and your classmates will see any discussion assignments and post discussion responses that are to be shared with the whole class. Discussion assignments count toward the class participation portion of your grade. If you click the discussion tool, you will see that there are three items available to you on day one: Student Introductions, Errata Discussion, and Free Discussion. If you have already completed your student introduction, you should see that posted here along with the postings from your classmates. (Be sure to revisit this link so that you can find out who else is in the course with you!) The Free Discussion category is a place where we can talk in general about anything regarding the course. This is a place where you can post a question that you have about the course, whose answer might also serve other students.

In addition, you should see a category entitled “Errata Discussion”. Although I have tried to make sure that all information is correct, it is always possible to find errors. For example, if you find a link that is not working, please post that information to the Errata Discussion board including where the link is located in the module. All error captures to this board are greatly appreciated by the designer of the course!

**Student Learning Outcomes (SLO):** At the end of MTH 300, a student who has studied and learned the material should be able to:

1. Develop appropriate mathematical vocabulary. [SBEC: V]
2. Demonstrate a basic understanding of logic and valid reasoning. [SBEC: V]

3. Demonstrate an understanding of applications of logic to geometry. [SBEC: III, V]

4. Apply principles of inductive reasoning to make conjectures and use deductive measures to evaluate the validity of conjectures. [SBEC: V]

5. Communicate effectively about mathematics, with an ability to convey detailed information with clarity and accuracy, and to construct well-reasoned explanations. [SBEC: V]

6. Demonstrate strategies for proof and utilize counterexamples efficiently. [SBEC: V]

7. Demonstrate an understanding of applications of logic and proof to relations and functions. [SBEC: II, V]

8. Formulate well-designed proofs. [SBEC: V]

9. Demonstrate an understanding of the historical development of logic and proof. [SBEC: VI]

**Texas State Board for Educator Certification (SBEC): Mathematics Standards**

*Standard II.* Patterns and Algebra: The mathematics teacher understands and uses patterns, relations, functions, algebraic reasoning, analysis, and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

*Standard III.* Geometry and Measurement: The mathematics teacher understands and uses geometry, spatial reasoning, measurement concepts and principles, and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

*Standard V.* Mathematical Processes: The mathematics teacher understands and uses mathematical processes to reason mathematically, to solve mathematical problems, to make mathematical connections within and outside of mathematics, and to communicate mathematically.

*Standard VI.* Mathematical Perspectives: The mathematics teacher understands the historical development of mathematical ideas, the interrelationship between society and mathematics, the structure of mathematics, and the evolving nature of mathematics and mathematical knowledge.

**Course Requirements:** Your course grade will calculated based on individual and group assignments and in-class exams. The final exam will be comprehensive and is scheduled for (see above)

**Course calendar/outline:** (Topics may be presented in a different order than given here)

- **Formal Logic**
  - Statements and quantifiers
  - Negations, conjunctions, disjunctions, conditionals, and biconditionals
    - Truth tables
    - Converse, inverse, and contrapositive

Approximate time spent 15%
• Valid arguments and Euler diagrams
• Historical and classroom connections
• Sets
  • Basic definitions and properties
  • Venn diagrams
  • Cardinalities of sets
  • Historical and classroom connections
• Proof
  • Direct proof
  • Proof by contradiction
  • Proof by contraposition
  • Proof by mathematical induction
  • Proof by counterexample
  • Historical and classroom connections
• Applications to Relations
  • Definitions and properties
    • Inverse relations
    • Equivalence relations
  • Applications
  • Historical and classroom connections
• Applications to Functions
  • Definitions and notation
  • Properties
    • One-to-one
    • Onto
    • One-to-one correspondence
  • Function composition
  • Inverse functions
  • Binary operations: connections to arithmetic
  • Historical and classroom connections

Grading Policy: Your course grade will be determined by your performance on graded work in the following categories: (1) assignments (both individual and group), (2) three tests (3) a comprehensive final exam. Your final course grade will be the weighted mean as follows:

• Participation—10%. This is the mean of your scores, equally weighted, on the various assignments that I will collect during the course. Many assignment will be written homework to be turned in to D2L’s Dropbox feature. Some will be discussions or quizzes in D2L. All assignments will be detailed in the module and checklist in D2L.

• Three Exams—20% each. You will be required to complete three tests during this course. For each test, you will be allowed 1.5 hours. These must be completed on the SFA campus at designated times or at an approved testing center.
  – Off-Campus Test Dates—Off-campus testing arrangements are your responsibility so please begin making arrangements for the first test now. Please ensure that the testing center that you choose will return your exam to me by 8 pm on the last day of the testing window.
1. February 11–13
2. March 11–13
3. April 22–24

- On-Campus Test Dates—On-campus exams will be given in a window of 4–8 pm in Math 210 or Kennedy Auditorium.

1. February 13 (Math 210)
2. March 13 (Kennedy Auditorium)
3. April 24 (Math 210)

- Final Exam—30%. You will also be required to complete a final during this course. You will be allowed 2 hours for the final exam. This must also be completed on the SFA campus at designated times or at an approved testing center.

- Off-Campus Final Exam—May 12–15. Please ensure that the testing center that you choose will return your exam to me by 8 pm on the last day of the testing window.

- On-Campus Final Exam—May 15, 4–8 pm window, Kennedy Auditorium.

Grades will be assigned according to the standard 10% scale: A: [90, 100]; B: [80, 90); C: [70, 80); D: [60, 70); F: [0, 60).

Most assignments will be graded holistically on a 0–10 scale based on completion and performance; the overall Assignment component will be the mean of these scores converted to a percentage. The various scores are described below. To summarize, a "passing" score is a 7 or higher and a "failing" score is a 6 or lower. Each score will take execution, communication, and correctness into account. I am using this system so that I can better communicate to you whether you understand the material well enough or not. Your primary goal is to earn a 7 or better on each assignment. In addition, for any group assignments, participation by each group member will be considered.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
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<tbody>
<tr>
<td>0–5</td>
<td>Failing: Incomplete or mathematics/communication shows serious or fundamental flaws.</td>
</tr>
<tr>
<td>6</td>
<td>Deficient: Demonstrates some understanding, but flaws in mathematics/communication are not sufficient.</td>
</tr>
<tr>
<td>7</td>
<td>Average: Demonstrates acceptable understanding; some substantial mistakes in mathematics/communication.</td>
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<tr>
<td>8</td>
<td>Good: Demonstrates understanding, but still has some minor mistakes in mathematics/communication.</td>
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<tr>
<td>9–10</td>
<td>Excellent: Mathematics/communication flawless or nearly flawless.</td>
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Note that certain mistakes by themselves will automatically drop you to a 6 or lower because they are common but fundamental errors that wreck havoc on the truth of your work or fundamentally change the difficulty level of the task at hand. Also, be sure to think carefully about what your writing communicates to a reader: I grade what you have said, not what you meant to say.

**Attendance Policy:** As this is an online class, an attendance policy seems ridiculous; however, keep the following in mind:
• It is your responsibility to be aware of due dates and to have access to a computer and other equipment that can handle the necessary work, and to schedule enough time to complete the assignments.

• Generally, missed assignments cannot be made up except in the case of an extended, but excused, absence (such as a week-long illness). Please inform me as soon as is practical if such a major, unforeseen event occurs.

• Deadlines may be extended at the discretion of the instructor in case of exceptional technical difficulties, but you should make every effort to avoid doing things at the last minute.

• Discussions require time to develop. Please start on discussion assignments immediately so your classmates can have time to consider and respond.

• Please do not hesitate to contact me if you have questions. You may call my office, leave a voice mail, use chat in D2L, or e-mail me. I only have five scheduled office hours on campus and will be teaching two other face-to-face classes. So, schedule a time to meet me in person or online during the week if my office hours do not fit your schedule.

• You bear some responsibility to help make the class a welcoming learning environment. Please participate in the discussions respectfully.

• You are expected to participate every day and to contribute substantively to each group project; your grade on assignments can be affected by nonparticipation. As a 3 hour course, state policy is that you should expect to spend at least nine hours per week on the activities of this course.

• Cheating is a most serious offence, resulting in a grade of 0 on the assignment and being reported to the university. If you have any question as to what I consider cheating, contact me before you turn in the assignment. See also the official SFA policy later in the syllabus. Some common examples of academic dishonesty include: copying or paraphrasing from any source without citation or without permission, using unpermitted materials on an exam (generally, only a non-CAS calculator and a writing instrument are permitted).

• Make sure you have read this entire syllabus carefully because you are responsible for what lies within it. Ignorance of the rules is not an excuse.

**Academic Integrity (A-9.1):** Academic integrity is a responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism.

**Definition of Academic Dishonesty**
Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one’s
own work when, in fact, it is at least partly the work of another; (2) submitting a work that
has been purchased or otherwise obtained from an Internet source or another source; and (3) in-
corporating the words or ideas of an author into one’s paper without giving the author due credit.

Read the complete policy at http://www.sfasu.edu/policies/academic_integrity.asp

Withheld Grades (Semester Grades Policy A-54): Ordinarily, at the discretion of the
instructor of record and with the approval of the academic chair/director, a grade of WH will
be assigned only if the student cannot complete the course work because of unavoidable circum-
stances. Students must complete the work within one calendar year from the end of the semester
in which they receive a WH, or the grade automatically becomes an F. If students register for
the same course in future terms the WH will automatically become an F and will be counted
as a repeated course for the purpose of computing the grade point average. The circumstances
precipitating the request must have occurred after the last day in which a student could withdraw
from a course. Students requesting a WH must be passing the course with a minimum projected
grade of C.

Students with Disabilities: To obtain disability related accommodations, alternate formats
and/or auxiliary aids, students with disabilities must contact the Office of Disability Services
(ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as pos-
sible in the semester. Once verified, ODS will notify the course instructor and outline the
accommodation and/or auxiliary aids to be provided. Failure to request services in a timely
manner may delay your accommodations.

For additional information, go to http://www.sfasu.edu/disabilityservices/

Acceptable Student Behavior: Classroom behavior should not interfere with the instructor’s
ability to conduct the class or the ability of other students to learn from the instructional program
(see the Student Conduct Code, policy D-34.1). Unacceptable or disruptive behavior will not be
tolerated. Students who disrupt the learning environment may be asked to leave class and may
be subject to judicial, academic or other penalties. This prohibition applies to all instructional
forums, including electronic, classroom, labs, discussion groups, field trips, etc. The instructor
shall have full discretion over what behavior is appropriate/inappropriate in the classroom. Stu-
dents who do not attend class regularly or who perform poorly on class projects/exams may be
referred to the Early Alert Program. This program provides students with recommendations for
resources or other assistance that is available to help SFA students succeed.

Please be respectful of your fellow students and your instructor. Cell phone use and texting are
not allowed in class. Remember to turn your cell phone off or place it in quiet mode before
entering the classroom.