

Math 4303: Modern Algebra Syllabus
Independent Study
Fall 2020 Sul Ross State University

Sec. 003: Modern Algebra	Tue, Thu: 6-7:15p in ACR 206
Instructor:	Dr. Kris Jorgenson
Office:	ACR 109D
E-mail:	kjorgenson@sulross.edu
Office Hours:	Mon: 10-11a, 2-3:30p; Tue, Thu: 10-11a, 3:30-4:30p; Wed: 10-11a, 1:30-3p; Fri: 10-11a; also by appointment

Student Learning Objectives Students will gain understanding of rings, fields, and groups in part by the study of such underlying concepts as congruence, congruence classes, and quotient structures. Students will study examples of rings including the integers, polynomial rings, and fields. Students will use various methods of logical proof such as direct, indirect, and inductive arguments in the writing of their own original proofs. Applications to information theory topics such as bar codes, error-correcting codes, and public-key cryptography will be studied employing such tools as modular arithmetic, the Euclidean algorithm, and finite fields. Students will express their solutions clearly in writing and use complete sentences when appropriate.

Prerequisite: Linear Algebra (Math 2318) and Calculus II (Math 2414), or the consent of the instructor

Materials: Required textbook: Abstract Algebra: Structure and Application by David R. Finston and Patrick J. Morandi 2014 Springer International Publishing ISBN (Print) 978-3-319-04497-2, (Electronic) 978-3-319-04498-9.

You may also use a scientific calculator to aid in calculations, but this cannot be part of an electronic communication device during tests.

This course is supportive of the
Student Learning Outcomes for the Bachelor of Science degree in Mathematics:

- 1) The student will be able to demonstrate content knowledge of basic mathematical principles.
- 2) The student will be proficient in logic, able to negate statements, provide counterexamples to false statements, and determine the validity of arguments.
- 3) The student will be able to communicate mathematical content clearly and with valid reasoning.

Grade: The **Homework Grade (30%)** will be based on daily homework assignments. Part of this grade will be based on in-class presentations. There will be 3 tests each worth (20%) so the **Test Average** is worth **60%** altogether. Each test will count in the test average. **The first 2 tests will be given in your campus Testing Center on the following dates:**

Test 1	Thu or Fri, Oct. 8 or 9
Test 2	Thu or Fri, Nov. 5 or 6
Test 3	Take-Home Dec. 8-9

You will have slightly more than 24 hours to complete Test 3 as a take-home final exam over Tues.-Wed. Dec. 8-9.

Each student will work on and hand in a **Personal Project Problem (PPP)** worth **10%**, which will be an individual problem each student will pick with instructor approval that will be more than a homework problem, but not a formal paper. The PPP must be chosen and approved by me by Fri Nov. 13 at the latest. I reserve the right to question a student in private regarding a PPP as a learning experience to insure there is adequate understanding before accepting a PPP assignment. **Class attendance** is mandatory and will be recorded. If a student misses only 3 classes or less, then 100% can be used to replace 10% of the HW average.

Pandemic Restrictions Note: This is a face-to-face course that requires attendance, so with recent Covid-19 restrictions, this class also requires proper face covering and social distancing. Students will not be allowed into the classroom without a proper face covering (or mask). There should be free masks available in all main departmental offices. However, students are responsible for their own proper face covering before entering the classroom. “Proper face covering” does not include a mask with an air valve or a single-layer, cloth handkerchief. Cloth handkerchiefs can be used if they are folded to create a double-layer (or more) or have another mitigating layer such as a coffee filter inserted underneath. “Social distancing” means a 6-foot (or more) distance between people with proper face coverings.

Late Work, Rescheduled Quizzes/Tests I will accept homework as long as it is handed in by 5 pm on the due date. To take a test at a time other than the scheduled time, you must notify me of this **ON OR BEFORE THE SCHEDULED TEST DATES**, and this must satisfy one of two requirements: either (1) supply a written medical excuse signed by a medical professional for the day of the absence, or (2) your excuse is for a university activity, in which case you must notify me of this authorized absence in writing with your name, the name of your organization and the date(s) of your absence, and your name must appear on a published explained absence list that I am provided (or this is verified by a faculty sponsor). Also, you and I must set up a time for you to make up the quiz or test within a reasonable time period (less than a week) before or after the time of the missed grade. Usually I will let you make up a grade according to the above conditions if it is due to another one-time occurrence, such as the care of someone else in your family or a friend, or for a work-related

excuse as long as you can document your absence and you let me know BY THE DAY OF THE ABSENCE AT THE LATEST.

Attendance I will be taking attendance as university policy precludes you from missing more than 5 class days (6 classes is the equivalent of 3 weeks of a long semester) for anything other than authorized university activities. To excuse an absence for a university activity, in addition to letting me know of the absence by the day of the absence (as explained previously) you must also spend at least 60 minutes outside of class on this course with me or with a tutor. Also I will allow you to excuse a test day for a documented medical absence as long as you also make up the test. If you have 6 or more unexcused absences, I reserve the right to drop you from this class with a grade of 'F', which is university policy.

Good Advice Concentrate on learning the material of the course rather than worrying about your grade. Your time is best spent concentrating on the material to be learned in the impending assignments, asking questions, and devoting yourself to activities that will help you learn the material and do better in the course. I will worry about the details of your grade since you doing so does not help you earn a higher grade. But learning the material and doing well on the tests *will* help your grade. **Remember that math is not a spectator sport**, so the more problems that you work yourself, the more practice you will get, the more confident you will be, and the better you will do in this course. Working on the problems helps you to figure out what your specific questions are.

It is important to be working on the homework assignments yourself so that you will undergo the personal growth necessary for success on the tests. Making mistakes and learning from your mistakes is an important part of the learning process in mathematics. But you won't have this growth important for success if you are not doing the homework yourself and then asking questions. Losing some points on a homework assignment will not count for a lot, but if you learn from these mistakes, then you will do better on the tests, which do count for a lot of your grade. So working on the homework yourself, asking questions, and learning from mistakes is **essential** to your success in this course. The best lessons learned often come from correcting a quiz or homework problem in which you have made a mistake. Remember that

LEARNING FROM MISTAKES + PERSISTENCE = SUCCESS!

More Good Advice

Keep absences to a minimum. You never know when you might miss something important either from the lecture or class discussion such as questions other students ask. Remember: YOU ARE RESPONSIBLE FOR EVERYTHING THAT IS DISCUSSED DURING CLASS WHETHER YOU ARE PRESENT OR NOT.

Also do not allow yourself to develop bad habits such as missing classes. It's human nature to be controlled by our habits, so once you develop a weekly habit for the semester, it can be hard to break this habit. So be sure that you allow the necessary time for this course, FROM THE BEGINNING OF THE TERM, ESPECIALLY if you consider mathematics not to be your best subject. If you have

trouble in math, then you should attend EVERY class of a college mathematics course. Not showing up to class or not doing the required work will not cause this class to “go away”. If you are not understanding the material and/or have fallen behind in your work, missing class will not help. IF YOU FALL BEHIND, PLEASE DO NOT DROP THIS COURSE WITHOUT TALKING TO ME FIRST. Making mistakes or falling behind is natural, so it is best to talk to me about this. If you do have to miss class, let me know before class. Discuss with me what you are not understanding. It is essential to get your questions answered. But meeting with me outside of class is not a substitute for attending class.

Ask questions no matter how easy or trivial they may seem. There is no such thing as a bad or silly question. Questions result when you are interested and have been thinking about areas, such as mathematics, in which you have some limitations in your educational background. Being in a college mathematics course means you will have questions both obvious and more subtle. Asking questions is a very important part of learning.

Study and work problems regularly—every day. Work on assignments discussed in class as soon as you can after class while the methods discussed are still fresh in mind. You can’t expect to succeed in a math course by waiting till the last minute to only study and cram prior to a test. If you promise yourself you will study for ½-hour, get into the work, forget the clock, then the next thing you know, you’ve studied and worked for one or two hours.

Classroom Conduct It is important to conduct yourself in a college classroom so that everyone can benefit from good communication between instructor and students. My goal is to create a classroom environment in which everyone can do their best work, learn, and make the best grades possible.

I think you will find that I am a very friendly, sympathetic, and generous instructor as long as you are sincerely working to succeed in this course and certain guidelines for classroom behavior are followed during class to allow a sanctity of study for your fellow students. Habits such as holding conversations during class lecture, or being engaged in activities not related to this course such as working on a different course or reading your cellphone will work against the goal of this course and cause you to be counted absent. Also engaging with electronic communication devices of any kind during class or coming into class more than 5 minutes late or leaving early before class is dismissed circumvent the goals of this course and cause you to lose credit. My sympathy and generosity will quickly evaporate if I find that you are working against the goals of this course or that you are simply trying to get a good grade without learning or without honestly doing the required work. I want you to have every opportunity to succeed in this course.

Please be aware of the rules for Academic Honesty that you will find in the Sul Ross Student Handbook and building codes prohibiting food, beverages, tobacco (smokeless or otherwise) in the classroom. Use commonsense to think of anything else that will allow you to learn and do the best work that you can in this class, and for me to better help you do your best work. Remember that being registered for this course does not allow you to behave in any manner you wish during class. You must

keep other people in mind. It is within university policy for me to send a student out of this class on a temporary or permanent basis if disruptions or interruptions like the types listed above persist.

Equal Access and Students with Special Needs:

Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the Student’s responsibility to initiate a request. Please contact Ms. Rebecca Greathouse Wren, M.Ed., LPC-S, Director/Counselor, Accessibility Services Coordinator, Ferguson Hall (Suite 112) at 432.837.8203; mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. Students should then contact the instructor as soon as possible to initiate the recommended accommodations.

Important University Dates

Mon, August 24	First day of classes, first day of late registration and schedule changes
Thu, August 27	Last day for late registration and schedule changes
Mon, September 7	Labor Day Holiday, No classes
Wed, September 9	Last Day to Drop Without Creating an Academic Record
Fri, September 25	University as a Community Meal on the Mall, in celebration of
	Lawrence Sullivan Ross’s birthday Sept. 27
Wed, November 11	Veteran’s Day Holiday, No classes
Fri, November 13	Last day to withdraw from a course with a grade of “W” by 4 pm
	in Registrar’s Office
Wed-Fri, Nov 25-27	Thanksgiving Holidays, No classes
Mon, November 30	REMOTE DELIVERY ONLY for remainder of classes
Wed, Dec. 2	Last Day of Classes
Thu, Dec. 3	Dead Day, No classes
Fri-Wed, Dec. 4, 7-9	Final Exams, End of Term, REMOTE DELIVERY ONLY

X = No Class Tentative Class Schedule for Math 4303-003--Independent Study--Modern Algebra

	Tue	Thu
Aug. 25, 27	1.1: Identification Numbers, Bar Codes 1.2: Modular Arithmetic	1.2.1: Arithmetic Operations in Z_n 1.2.2: Greatest Common Divisors
Sep. 1, 3	1.2.3: The Euclidean Algorithm	1.3: Error Detection with Identification Numbers
Sep. 8, 10	2.1: Error Correcting Codes 2.2: Gaussian Elimination	2.3: The Hamming Code
Sep. 15, 17	2.4: Coset Decoding 2.5: The Golay Code	3.1: Rings 3.2: First Properties of Rings
Sep. 22, 24	3.3: Fields	4.1: Vector Spaces 4.2: Linear Independence, Spanning, Bases
Sep. 29, Oct. 1	4.3: Linear Codes	5.1: Polynomial Rings
Oct. 6, 8	Review for Test 1	5.2: Ideals and Quotient Rings Test 1 over Chaps. 1-3 in Testing Center Thurs or Fri, Oct. 8 or 9
Oct. 13, 15	5.3: Field Extensions	5.4: Algebraic Elements and Minimal Polynomials
Oct. 20, 22	Chap. 6: Constructible Numbers	Chap. 6: Classic Construction Problems
Oct. 27, 29	7.1: Cyclic Codes 7.2: Finite Fields	7.3: Minimal Polynomials, Roots of Polynomials
Nov. 3, 5	Review for Test 2	7.4: Reed-Solomon (RS) Codes Test 2 over Chaps. 4-6 in Testing Center Thurs or Fri, Nov. 5 or 6
Nov. 10, 12	7.5: Error-Correction for RS Codes	8.1.1: Groups and Subgroups
Nov. 17, 19	8.1.2: La Grange's Theorem	8.2: Cryptography and Group Theory
Nov. 24	8.2: RSA Encryption	X - Thangsgiving
Dec. 1	Review for Test 3 Zoom Class	X - Dead Day
Dec. 8-9	Test 3 Take-Home Tues, Wed Dec. 8-9	