MATH/MTH 4301: Modern Algebra Syllabus
Spring 2025 Sul Ross State University

MATH 4301, Secs. 001, VMC	Tue, Thu: 4:30-5:45 pm in ACR 206 or virtual
MTH 4301, Sec. VRG	
Instructor:	Dr. Kris Jorgenson
Office:	ACR 109D
E-mail:	kjorgenson@sulross.edu
Office Hours:	Mon, Tue, Wed, Thu: 10-11a; Fri: 10a-12p; Tue, Thu: 2-3:30p;
	Fri: 3:30-4:30p; 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 Geometry (Math 3301), or the consent of the instructor

Materials: No textbook is required. One of the source texts is the following:
RECOMMENDED, BUT NOT REQUIRED:
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 two tests will be given during class time. The 3rd test will be given during the special

2-hour final exam time. The test dates are as follows:

Test 1	Thu, Feb. 13
Test 2	Thu, Apr. 3
Test 3	Mon, May 5, 3-5 pm

Class **attendance** is mandatory and will be recorded. If a student misses 3 classes or less, then 100% can be used to replace 10% of the HW average.

Each student will work on and hand in an **Individual Project Problem** (**IPP**) worth **10**%, which will be an individual problem each student will pick with instructor approval that will be more than a homework problem, but less than a formal paper. The **IPP** will be an application problem over a topic covered in one of the units of study and will be different for each student and must be approved by me. I will have some suggested problems for this, but a student may pick a problem of interest from our resources as long as it has my approval. Each student's IPP must be chosen and approved by me on or before Thu. April 17 and completed by Fri. April 25. It is best to hand in the IPP before this date so that there is time for discussion and corrections so that you can get full credit on the IPP.

I give letter grades according to the traditional 90%-100% for an A; 80-89% for a B; 70-79% for a C; 60-69% for a D; and less than 60% for an F; with some exceptions. Students whose total average is between 50-59% with Test Average over 50% will often be rounded up to a D but only if the student has completed every major assignment (no exceptions) while doing their best work. Students working similarly who end up with a final grade that is a borderline grade of 89%, 79%, or 69% will often be rounded up to the next grade-level as long as their test average is in line with this total average.

Pandemic Restrictions It is strongly encouraged that students get a vaccination and a booster for the Covid-19 Corona Virus and any other vaccine that is advised for you by medical professionals. Students are also encouraged to wear a proper face covering and follow social distancing guidelines based on your own personal decision as there have been recent increases in contagious diseases that includes Covid-19.

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 3 weeks or more 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, but they will need to sign a note that documents this made-up time. Also I will allow you to excuse a test day for a documented medical absence as long as you also make up the test with me or in the testing center. If you have 3 weeks or more of 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 magically "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 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 the learning process.

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 immediately 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 an 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 to allow a sanctity of study for your fellow students. Habits such as holding conversations during class, or being engaged in activities not related to this course such as working on a different course or reading your cell-phone will work against the goals of this course and cause you to be counted absent and you will lose Daily Grade credit. 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 the 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 learn and succeed in this course.

Please be aware of the rules for Academic Honesty that you will find in the Sul Ross Student Handbook. 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.

SRSU Accessibility Services. Sul Ross State University (SRSU) is committed to equal access in compliance with the 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 each semester for each class. Students seeking accessibility/accommodations services must contact Mrs. Mary Schwartze Grisham, LPC, SRSU's Accessibility Services Director or Ronnie Harris, LPC, Counselor, at 432-837-8203 or email mschwartze@sulross.edu or ronnie.harris@sulross.edu. Our office is located on the first floor of Ferguson Hall, room 112, and our mailing address is P.O. Box C122, Sul Ross State University, Alpine. Texas, 79832.

Program Marketable Skills:
Marketable Skill (MS) 1: Students Demonstrate Logical and Analytical Skills.
MS 2: Students Demonstrate Problem-Solving Using Analytic and Algebraic Methods.
MS 3: Students Use Technology in Problem-Solving and Presentation.
MS 4: Students Use Communication and Pedagogical Skills.

Required Student Responsibilities Statement
All full-time and part-time students are responsible for familiarizing themselves with the Student Handbook and the Undergraduate & Graduate Catalog and for abiding by the University rules and regulations. Additionally, students are responsible for checking their Sul Ross email as an official form of communication from the university. Every student is expected to obey all federal, state and local laws and is expected to familiarize themselves with the requirements of such laws.

Classroom Climate of Respect
Importantly, this class will foster free expression, critical investigation, and the open discussion of ideas. This means that all of us must help create and sustain an atmosphere of tolerance, civility, and respect for the viewpoints of others. Similarly, we must all learn how to probe, oppose and disagree without resorting to tactics of intimidation, harassment, or personal attack. No one is entitled to harass, belittle, or discriminate against another on the basis of race, religion, ethnicity, age, gender, national origin, or sexual preference. Still we will not be silenced by the difficulty of fruitfully discussing politically sensitive issues.

Important Dates

Wed, Jan. 15	First day of classes, first day of late registration
	and schedule changes
Mon, Jan. 20	MLK, Jr. Holiday, No Classes
Tue, Jan. 21	Last day for late registration and schedule changes
Fri, Jan. 31	Last Day to Drop a 16-Week Course Without
	Creating an Academic Record; 12th class day
Mon, March 10	Mid-Semester, 16-week term
Mon-Fri March 17-21	Spring Break Holidays, No Classes
Thu, April 3	University/Community Meal on the Mall, SRSU Birthday
Fri, April 4	Last day to drop a class with a grade of "W" in a 16-week course
	by 4 pm in University Registrar's Office
Mon, April 14	Honors Convocation, 7 pm, Marshall Auditorium
Wed, April 30	Last Day of Class before Finals, 16-week term
Thu, May 1	Dead Day, No Classes
Fri, Mon-Wed: May 2, 5-7	Final Exams, 16-week term, End of Term

Tentative Class Schedule-MATH/MTH 4301, Sec. 001 Spring 2025		
X = no class	Tue	Thu
Jan. 16	X	First Day of Class Division Algorithm
Jan. 21, 23	Greatest Common Divisor Euclidean Algorithm	Euclidean Algorithm Integer Congruence
Jan. 28, 30	Integer Congruence Bar Codes	Introduction to Error-Correcting Codes

Feb. 4, 6	Introduction to
	    Error-Correcting Codes
		Rings and Fields
		    Basic Properties

Feb. 11, 13	Review Test 1	**Test 1**

Feb. 18, 20	Subrings, Subfields
	    Characteristic of a Ring
		Subrings, Subfields
		    Characteristic of a Ring

Feb. 25, 27	Review of Vector Spaces	Polynomials Euclidean Algorithm for Polyns
Mar. 4, 6	Euclidean Algorithm for Polyns Polynomial Factorization	Irreducible Polynomials Kernel, Ideals, Quotient Rings
Mar. 11, 13	Irreducible Polynomials Kernel, Ideals, Quotient Rings	Construction of Fields Cosets and Polynomial Congruence
Mar. 17-21	**X - Spring Break --------------------------------------->**	
Mar. 25, 27	Extension Fields	Extension Fields
Apr. 1, 3	Review for Test 2	**Test 2**
Apr. 8, 10	Groups	Groups
April. 15, 17	Multiplicative Properties of a Field Primative Elements	Geometric Constructions Application of Extension Fields
April. 22, 24	Transcendental, Algebraic elements Minimal Polynomials	Irrational Numbers
Apr. 29	Review for Test 3	**X - Dead Day, No Classes**
Mon., May 5	**Mon., May 5, Test 3 (Final Exam)** **Test 3: 3-5p**	