Math 3330 Syllabus
Number Theory and Cryptography
Fall 2024 Sul Ross State University

Secs.: **MATH 3330 001**, **MATH 3330 VMC**, **MTH 3330 V01**	
Time and Location:	Tue, Thu: 4:30-5:45p in ACR 206 and remotely
Instructor:	Dr. Kris Jorgenson
Office:	ACR 109D
E-mail:	kjorgenson@sulross.edu
Office Hours:	Mon, Tue, Wed, Thu: 10-11a; Fri: 10a-12p, 3:30-4:30p;
	Tue, Thu: 2:00-3:30p; also by appointment

Course Description: This is an introductory course in number theory with applications in modern cryptography. Topics include divisibility and the Euclidean algorithm, congruences, prime numbers, finite fields, bar codes, and public-key cryptography, among other topics. The prerequisite course is Calculus II, Math 2414, or permission of the instructor.

Student Learning Objectives Successful students will demonstrate correct understanding and knowledge of the topics including but not limited to those of the preceding paragraph. Students will demonstrate knowledge of the computational tools of number theory as well as proficiency in using complete sentences to write mathematical proofs.
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.

Required Materials: <u>Textbook</u>: No textbook is required. I will provide lecture notes containing theorems, proofs, examples, assignments, and strategies. I will also provide references for this course upon which the lecture notes are based for your information. <u>Class Materials</u>: Students are expected to be prepared in every class with writing implements to take notes and get involved in in-class assignments. It is suggested that students keep a loose-leaf notebook for the purposes of taking class notes and for producing your work on the assignments. A few homework solutions will be due each week. <u>Technology</u>: Students may use a scientific calculator (one with buttons labeled y^x, a^b, $\ln x$, $\wedge$, or something similar to these denotations) for some of the computational requirements of the assignments. Use of an Excel spreadsheet application may also be helpful, but not required. You must also have access to Blackboard and have an e-mail address that you

check regularly be the e-address you have registered in Blackboard.

Pandemic Restrictions It is strongly encouraged that students get a vaccination and a booster for the Covid-19 Corona Virus. 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.

Grading and Assignments: The assignments discussed below will help students achieve all of the Learning Objectives mentioned previously through active learning and assessment. Your total grade will break down as follows:

Grading: Exercises will be assigned most classes to be handed in during the following week. The best strategy is to have work to show or hand in on a homework assignment by the next class. This way you will know what your questions are related to an assignment and you can get these questions answered and complete the assignment by the next class period. The **Homework Assessment** (**HWA**) **grade is worth 20**%. Time will be made for in-class presentations in order to give help on homework assignments. Approximately half of class time will be devoted to students presenting their work on homework assignments. The **presentation grade worth 10**% will include attendance. There will be **3 in-class test grades worth a total of 50**%. The dates of the tests are as follows:

Test 1	Thu Sept. 26
Test 2	Thu Oct. 24
Test 3	Thu Nov. 21

All students will present an **individual project problem** (**IPP**) **worth 15**% at the end of the semester during the final exam time and perhaps the last class of the semester. This will be an individual problem (or sequence of problems) that a student chooses with instructor approval concerning a number theory topic of interest. The deadline for having a final project chosen and approved is Friday Nov. 22. A **Project Attendance Grade** (**worth 5**%) will be calculated based on the percentage of final project problem presentations for which a student is present (not counting their own). **Final Projects will be presented during the scheduled Final Exam Time for this class which is Monday Dec. 9, 3-5 pm and handed in by this date**.

Late Work, **Rescheduled Quizzes/Tests** There will usually be a grace period for homework handed in late since I would rather students have slightly more time to do good work and get their questions answered, than to hurry to meet a deadline only to do work that is below their potential. This said, there will most likely be a penalty for HW handed in after this grace period. To take a test at a time other than the scheduled time, you must notify me of this absence ON OR BEFORE THE DAY MISSED, and 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 test within a reasonable time period (not more than 1-3 days) 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 of classes 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. 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 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 you work yourself and the more practice you 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. Remember an individual homework or quiz grade may not count for a lot in your overall grade, but working and learning from the homework and quizzes is **essential** because this is where you learn the topics that will appear on the tests, which do count for a lot of your grade. The best lessons learned often come from correcting a quiz or homework problem in which you have made a mistake.

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 to not 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 beforehand. 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 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 or every other 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 a ½-hour, get into the work, forget the clock, then the next thing you know, you've studied and worked for one to two hours. Remember that

LEARNING FROM MISTAKES + PERSISTENCE = SUCCESS!

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 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.

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.

SRSU Alpine Disability Services. 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 each semester for each class. Alpine students seeking accessibility/accommodations services must contact Mary Schwartze Grisham, M.Ed., LPC, SRSU's Accessibility Services Coordinator at 432-837-8203 (please leave a message and we'll get back to you as soon as we can during working hours), or email mschwartze@sulross.edu . Our office is located on the first floor of Ferguson Hall, room 112, and our mailing address is P.O. Box C-122, Sul Ross State University, Alpine. Texas, 79832.

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 (16-week term)

Mon, Aug. 26	First day of classes, first day of late registration and schedule changes
Thu, Aug. 29	Last day for late registration and schedule changes
Mon, Sep. 2	Labor Day Holiday, No Classes
Wed, Sep. 11	12th Class Day: Last Day to Drop a Class Without Creating an Academic Record for 16- week Courses
Fri, Sep. 27	University as a Community Meal on the Mall
Mon, Oct. 28	Freshman Mid-Term Grades are Due
Fri, Nov. 8	Last day to drop a class with a grade of "W" for 16-week term by 4 pm in University Registrar's Office
Wed-Fri, Nov. 27-29	Thanksgiving Holidays, No Classes
Wed, Dec. 4	Last Day of Class before Finals
Thu, Dec. 5	Dead Day, No Classes
Fri, Mon-Wed: Dec. 6, 9-11	Final Exams, End of Term

Tenatative Course Outline MATH/MTH 3330 Fall 2024		
	Tue	**Thu**
Aug. 27, 29	First Class Day Logic and Induction	Logic and Induction

Sep. 3, 5	Divisibility,
	  Euclidean Algorithm
		Divisibility,
		  Euclidean Algorithm

Sep. 10, 12	Linear Diophantine Equations	Linear Diophantine Equations
Sep. 17, 19	Prime Numbers	Prime Numbers
Sep. 24, 26	Review for Test 1	**Test 1**
Oct. 1, 3	Relations and Partitions	Arithmetic in Zn
Oct. 8, 10	Arithmetic in Zn	Equations in Zn
Oct. 15, 17	Equations in Zn Bar Codes	Bar Codes
Oct. 22, 24	Review for Test 2	**Test 2**
Oct. 29, 31	Chinese Remainder Theorem	Euler Phi Function
Nov. 5, 7	Theorems of Euler and Fermat	Theorems of Euler and Fermat
Nov. 12, 14	Public-Key Cryptography	Public-Key Cryptography
Nov. 19, 21	Review for Test 3	**Test 3** Friday Nov. 22: Deadline for approval of Individual Project Problem
Nov. 26	Final Project Work	**Thanksgiving Holiday** **Nov. 27-29** **X - No classes**
Dec. 3	Final Project Work Last Day of Regular Classes Before Finals	**Dead Day** **X - No Classes**
Mon. Dec. 9	**Final Project Presentations** **Mon. 3-5 pm**	