MATH 3510.001. Abstract Algebra. Spring 2015.

Spring 2015. T/Th, 11 to 12:20, Lang 216. Information on this sheet applies only to Section 001. The two sections of 3510 are different and not isomorphic.

"Required" Textbook for 3510.001 and teaching style. Allan Clark, Elements of abstract algebra. Dover, New York, 1984, ISBN 978-0486647258. This particular book is chosen because of its price; the list price is around $15. This is a servicable book; it contains all the definitons and theorems you will want to reference. This course will be taught in a discovery style; you learn whatever you discover yourself. If you want a course taught "by the book" , then you should transfer to section .002.

Estimated cost of taking this course, in addition to UNT tuition and course fees. The cost of the textbook is around $15 or less. A calculator (the most basic kind) will be helpful.

Final and test dates. There are three tests, tentatively on Thursday, February 26 and April 2 or April 9 [the second date will be adjusted because many of you are TNT and will be away one of these two weeks.] The final is Tuesday, May 12, 10:30 to !2:30.

Attendance. You are expected to attend all scheduled classes. This course is taught by "discovery", so classs attendance is absolutley necessary. Attendance means attendance during the entire class period! Attendance will be checked randomly. The policy is that you may miss at most 5 class periods during the semester you can miss for any reason – including so-called "university-approved absenses". Any extra missed class period will cost 2 percent of your final grade.

Grades and exams. Your final grade is determined by homework (20% total), two tests given during the semester (25% each) and the final (30%); there is a possible penalty (negative percentage) in the case you are absent for an excessive number of class periods, as explained in the section on attendence. I will hand out review sheets before each test and the final. The letter grade will be given strictly according to the recommended university standards: D = at least 60%, C = at least 70%, B = at least 80%, and A = at least 90%. Acceptable excuses for missing a test or the final are: illness or injury requiring professional medical attention, deaths of an immediate family member, or injury accidents. You may be asked to furnish documentary proof. Alternate tests will be different from the regular test and may be graded using a different procedure. Requests for alternate tests must be made *in person* during class or office hours no later than one week after the regular test time.

Your tests (but not the final) will be returned to you, usually the first class day following the test. You should be in class to pick up your test. No responsibility will be taken for tests which are not picked up within two weeks.

Homework. Homework will be assigned, once a week, almost always due on Wednesday. Homeworks are required and are worth 20% towards the final grade. The number of points on each homework varies, depending on the length and difficulty. "Not all homeworks are equal; some are more equal than others." See the individual schedules.

Prerequisites and code of conduct. As stated in the catalog, the prerequisite course is MATH 3000. MATH 2700 Linear algebra will be a very useful course to have taken. You will need to know the basic facts about matrices and matrix multiplication.

You may be dropped administratively at any time if you do not have the prerequisites. It is your responsibility to check that you have taken the prerequisite course. Having a prerequisite course means that you have *current* knowledge of the material covered in that course as stated in the official syllabus regardless of what your instructor for that course actually covered.

I expect you to behave in accordance with the student code of conduct. There will be **zero** tolerance of violations of this code: this particularly applies to cheating during tests and the final.

I also expect you to behave with courtesy and consideration to your fellow students (and to me), particularly during class periods. Cell phones should always be turned off. Computers/Laptops can only be used during class for things directly related to the class material.

Other matters. All university policies will apply to this course. Any requests arising from university policy *(including but not limited to a request for accomodation for certified disabilities or religious observances* **at any time during the semester***)* must be submitted to me in writing before 5 pm on Thursday, January 29. Your request must be delivered to me in person during one of the scheduled class periods and a signed receipt must be obtained from me for any request to be valid.

Important note about schedules, review sheets, and other handouts.

Schedules are given out every week. The schedules are intended to give you useful information. Handouts, such as review sheets, will also be given out. Information on schedules or handouts might be changed and errors will be corrected; these amendments will be announced during class. You are responsible for keeping track of these amendments, as well as making sure you get all the schedules and other handouts.

Fine print. There are **no** verbal agreements in this course. If you think that I promise you something, be sure to get it from me in writing! This handout is intended as an general guide to the policies pertaining to the administration of this course. This handout does not replace or supercede any official university document.

Instructor. Joseph Kung. GAB 471C. Office hours: Tuesdays 9 to 11. Thursdays, 12:30 to 2.30 pm; other times by appointment.

e-mail: kung@unt.edu [Expect some delay and possible computer problems when using email. The university email server may not accept email from smartphones. I reserve the right to ignore messages not in complete sentences or abbreviated in any way. Be sure to put MATH 3510 Abstract Algebra in the subject line. Email without this heading may be put into a SPAM file and unread.]

Phone 940-565-4084.

Tentative syllabus.

This is a course about abstract algebra. Abstraction is never easy, although once you "get it", abstraction will make things easy! Abstraction is also impossible to teach in the normal way; it is a method, a way of thinking, or even, a way of life: really, ask my cat, who is abstraction personified. In this course, I will use the discovery method used by the German group theorist Helmut Wielandt. The aim is for you, the students, to discover the concepts and the theory by means of examples. I will present examples which will motivate algebraic concepts. We will then discover the abstract concepts from the examples. So the topics will be hidden; otherwise, how can they be discovered?

A rough syllabus for this course is the following. The first half is about GROUPS, and occupies Weeks 1 to 8. We will discuss functions and compositions, how the algebraic properties of bijective functions lead naturally to the definition of a group. We will discover the notions of subgroup, coset, conjugation, and normal subgroup, as well as quotient group. We will discuss various groups: the group of integers under addition modulo m, the ax+b-group H, the symmetric or full permutation group S_n, the dihedral groups D_{2n}, the orthogonal groups $\mathrm{O}(n, \mathbb{R})$, and the general linear group $\mathrm{GL}(n, \mathbb{R})$. It would be counter to the discovery method to say which theorem will be done, but we will do the xxx lemma, the famous theorem of L, the ccc equation of F, as well as the nnn hhh theorems.

The second half is about rings and fields, and occupies Weeks 9 to 14. We will do examples of rings and fields, leading to their axiomatic definitions. We will talk about ideals in rings, quotient rings, how you can create rings with any algebraic property you wish (as well as properties implied by the properties you wish for) and how to compute with such rings. We will also discover which analytic properties of fields are forced by algebra. We will do examples from geometry and (elementary) number theory. We will do the h/k theorem, the theorem of K, and the CR theorem. We will also iscuss how error-correcting coes are made and do examples of the H code.