

**Instructor** Alexander Stoimenov

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Office hour: per appointment (see ‘Organisatory’)

**Warning:** DO NOT seek my email under ”알렉산더”, you get the address of Prof Alexander Zhbanov (azhbanov@gist...). He turned into an unpaid secretary of mine forwarding me diverse messages of yours. Maybe I can be found under ”스토이메노프”? Read about this class rules below.

### Class room and hour

Mon/Wed 13:00-14:15 (Sect. 1),

Mon/Wed 16:00-17:15 (Sect. 2);

GIST College A 229 (Sect. 1), A 229 (Sect. 2)

### Recitation (*I supervise recitation myself!*)

Wed 17:30-18:20 (Sect. 1), GIST College A 224

Wed 18:30-19:20 (Sect. 2), GIST College A 224

### Course description

Linear Algebra is one of the requisite topics in undergraduate programs in mathematics, sciences and engineering, along with Calculus. In this course, fundamental concepts of linear algebra (such as vector spaces, linear transformations, and their representations and matrix theory) will be studied. It also aims to introduce a few applications in geometry (conics), calculus (evaluating series using Fourier calculus), and, possibly, differential equations (linear ODE systems). Prerequisites are basic mathematical English and first year calculus level of mathematics.

### Textbook

*Linear Algebra* (4th Edition), by Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence

### Warning!

Considering the overall poor quality of the blue cover paperback ”International Version” (a missing chapter of important course material; poor paper quality and binding), I *strongly recommend* that you ask for purchasing the original version of the textbook (beige-red hardcover).

## Grades (tentative)

Class attendance	5 %	Final exam	50 %
Midterm exam	25 %	Recitation	10 % (5% att.+5% sheet score)
Homework	5 %	Quiz	5 %

## Schedule (*very* tentative)

Class week (days)	Topics
1 (9/2, 9/4)	Organisatory, Numbers, Sets, Fields, Vector spaces, Linear combinations,
2 (9/9, 9/11)	Linear (in)dependence, Bases, Dimension
3 (9/16, 9/18)	Linear transformations,
4 (9/23, 9/25)	Matrices, Elementary matrix operations,
5 (9/30, 9/31)	Computation of Rank and Inverse, Linear equation systems,
6 (10/7)	Gaussian elimination, — 10/9 Recess —
7 (10/14, 10/16)	Determinants, Properties of determinants,
8 (10/21, 10/23)	Expansion formula, Cramer's Rule
9 (10/28)	—Midterm Exam—
10 (11/4, 11/6)	Eigenvalues and Eigenvectors, Characteristic polynomials, (Midterm Exam Evaluation,)
11 (11/11, 11/13)	Conjugate matrices, Eigenspaces, Diagonalizability, Cayley-Hamilton theorem,
12 (11/18, 11/20)	Eigenvalue theorems, Rotations, Reflections, Jordan normal form,
13 (11/25, 11/27)	Inner products and Norms, Orthogonal sets, Gram-Schmidt orthonormalization,
14 (12/2, 12/4)	Fourier series, Orthogonal, Self-adjoint operators, Conics, (Review)
15 (12/9)	—Final Exam—

**Note ✖ :** It's possible (not decided!) that I'm on business trip on 11/11. In that case there is makeup class on 10/9 (Hangul day) same time, and I'll try same room.

## Organisatory

First, let me say why this section is long and why I nevertheless like you to read and understand it.

On the one hand, the ***language problem*** always complicates communication. It is that much more important to clarify certain matters in advance for everyone to know, so that confusion is minimized. On the other hand, when only a few students are left behaving

badly, this deteriorates the atmosphere in the entire class. Students also often seek to convenience themselves with little concern for the rest of the class. Therefore, it is critical to maintain **discipline**. Over the time I have experienced loose manners surfacing in a number of ways. The below instructions are meant to prevent or handle these occurrences – and not scare you and to justify that I am particularly tough or unpleasant. *If you join the class, I'll assume that you have read and agree on these rules.* In many cases I receive requests about something directly explained in these rules, so do not wonder that I just reply by referring to them.

1. This syllabus is still subject to minor updates/corrections until the semester starts, but by any means should override the outdated official course syllabus you'll find in the syllabus section of the GEL entry for the course or other places across the GIST university system. (I'm sorry, there are technical reasons why I cannot remove the old syllabus there.) This does not refer to my personal posts on GEL, where I'll very likely upload a copy of (or link to) *this* (valid) syllabus.
2. GEL is (if it works!) the place I, and also TAs, post a lot of **class-related information** (homework, solutions, scores, TA contact, announcements). I usually can't (and even less so do I like to) find time to repeat such information in class. If I receive no inquiry, I assume you follow, read and understand GEL posts. If you do not, the problem is entirely yours. (On the other hand, do not expect to read there every announcement you don't come to hear in class!) Thus if you like or need such information, it is your duty to either get access to that site, or to have someone with access report you what you like or need to know. Write 박주영 (Section of Undergraduate Administration Services) (jooyoung@gist...) to get added.

In recent semesters our technicians have developed the lovely habit of setting up GEL only after lectures start. (A few semesters ago they failed to get to work the entire semester.) This leaves me alone, certainly at the beginning of the semester, which turns out to be a critical time. For this reason I set up my own teaching page, which is <http://stoimenov.net/stoimeno/homepage/teach/teach.html>. Follow information there as well.

3. **Warning:** DO NOT seek my email under "알렉산더", you get the address of Prof. Alexander Zhbanov (azhbanov@gist...). Maybe I can be found under "스토이메노프"? In any case, **please leave Prof. Zhbanov alone**. He turned into an unpaid secretary of mine forwarding me diverse messages of yours. This has been going on for semesters now, and I feel I must do something against it. Thus, if after the first class I still find Prof. Zhbanov forwarding me your message, the  $n$ -th such message will cost you  $5^{n-2}\%$  of your final score.

#### 4. Enrollment

- While I appreciate students' attention to my class, the continuous moving of students between classes and sections creates an enormous amount of confusion. As I know, the official moving period is 2 weeks from semester start. Thus let

me fix that you either put yourself on the *official uZeus student lists* by that time, or at least attend class or notify me of your intention to take the class. Otherwise I will not keep any scores of you. (You can check for your ID on my students lists I upload on GEL/class website.)

- I plan to handle **over-enrollment** hassle thus.
  - As you know, the normal (and safest) way is to enroll on uZeus. This includes cases where you take the spot of students cancelling when the limit was reached. (There are seats reserved for freshmen for some courses.) I will be bound to this official uZeus list, except for one situation explained below. Thus regularly watching out for a free place is highly recommended.
  - Students who are not enrolled on uZeus, but who contact me by email, will be put on a **waiting list**. The student should provide at least name (hangul) and student ID, name and number of section of the course desired to add. If some of this information is missing in the mail, it is possible, at worst, that I ignore his/her request. (Please understand that, when adding requests become a continuous stream of emails, I cannot respond with a similar continuous stream. Ultimately when classes start, absolutely everyone has opportunity to find out what I want him to do exactly.) I may ask for further information, for example, if he/she retakes, which semester he/she took the course, with which prof, and what grade.
  - My plan is offer to add students in order of email. However, this order is by no means binding, and further criteria can play a role (like retaking status/record, survey participation), in particular if the number of extra seats I can offer is small. Note that when 30 students (classroom size) are exceeded, I'll have to make effort to limit, not to expand class size. Thus ultimately which and how many students I accept on the waiting list is solely my decision. I'll notify them. By any means, do not assume you must/will be allowed to participate just because you told me you want to do so.
  - Students notified by me should appear with an add request form as soon as possible in class, or my office. The later this happens, the more likely I will assume that the student lost interest, and not treat him/her any further (already after the first class there is no longer any guaranty).
  - *Students who appear with an add request form but have not been told in advance will not get it signed.*
  - Having me sign an add request form is understood as a commitment to participation. Tacitly discarding later my adding permit (and disappearing), as well as dropout during the semester, are treated as in §17. (In particular, they may potentially affect your grade the following time you decide to take my class.)
  - Students who are enrolled on uZeus, but accumulate 1.5 or more absences the first 3 classes (according to the rules of §5), may be notified on GEL/class website and asked to confirm to me they want to attend.

- For people among these I have no notice from *until the next day*, I may offer their seat to students on the waiting list, who will be asked by email to confirm they still like to join. (If they join, their absences the first 3 times will be excused.)
- If a student loses his class seat in this way, he will be notified on GEL/class website and *excluded from my records, even if still on the uZeus list*. He should then formally cancel there as well, or will receive an F (he will be handled as written in §17).

This is somewhat of an ordeal, but the reason is, again, that I seek ways to attract students interested in attending, rather than “record phantoms” who just master the enrollment system.

- Some students wrote they cant add my advanced class, since they had not taken the prerequisite course in GIST, but they claim they had taken a comparable class elsewhere (like at grad school), or they got the GIST College class record reset at grad school or ... No exact policy seems discussed about prerequisite courses, but my view is that prerequisite courses are more than a padded formality. Do not expect I readily take these students in. I could ask they send a class record (or seek someone to somehow provide administrative support for this information), or take a prerequisite course for S/U rather than for grades. Sorting this out can take some time, thus please make such adding inquiries early enough.
- While there are reasons to allow students to retake courses, I increasingly see this opportunity misconceived as a sort of self-indulgence. To counter this trend, I will *strongly frown upon seeing the same student enrolling for the third time in the same course* I teach, and I'll ask for a serious explanation. Trying the same thing again and again and expecting a different result is Einstein's definition of insanity. Leave the seat to someone who deserves more of a fair try.

Students may well not be to blame for feeling uncomfortable with what I teach or how I teach, and there is no way for me to please absolutely everybody. But neither do (as far as I know) most courses hold full control over your curriculum, nor do I (definitely at least over time, which I know for sure) hold full control over any particular course. And if you experience the same difficulties with different instructors, the problem should clearly not be sought at the instructors.

- In certain cases of extremely bad experience, I reserve myself the right to declare a student “*persona non grata*” for my classes. (Such reasons could be accumulated failures for sloppy attendance or, in particular unnotified, dropouts of previous classes; see §17.) This status means that, whatever the student chooses to do, he/she will never receive from me a grade different from F, ultimately making his/her further enrollment in my classes senseless. Thus if I encounter the student enrolling again in my class, I will insistently advise him/her to drop the class. This rule, again, results not from my desire to be blunt, but rather to behold myself as a sane person (in Einstein's sense). For example, if two semesters are not enough for a student to grasp a fact as basic as my classes

being given to be attended, what is the prospect of further efforts to ‘teach’ this student?

## 5. Attendance

- For **class attendance**, the rule of the university has changed:
  - For more than 1/3 unexcused absences until midterm exam week, you are excluded from midterm, and fail the class.
  - For more than 1/3 unexcused absences until final exam week, you are excluded from final, and fail the class.

For me unexcused absence is a form of ignorance of the instructor’s effort, and I have enough reason to take it sensitively and go along with the university rule. I’ll apply the 1/3 threshold on the exact number of classes we have (excluding exam weeks, public holidays, university event days, etc.) until midterm/final week.

- You can track your absence from the score tables I upload on GEL/class website (see §15). I can also, of course, answer inquiries about the current number of unexcused absences. Apart from this service, I will no longer issue warnings to people eager to challenge these critical thresholds of unexcused absences.
- Due to my experience in the past, I will apply the absence rule strictly. This will go as follows. I will semi-regularly (and ultimately before the exams) check the record of often missing people. If I find someone whose *unexcused absences exceed 1/3 of the classes until the next exam* (midterm or final), I will *label the student as attendance-failed*, stop updating my records of him/her, and not display them in tables I show in the following (§15). At that point, I’ll only offer to help the student drop the class (if this is still possible). In one way or another, the class is finished for him/her (as far as credits go).
- Let me warn you: If you succeed in appearing at the exam not knowing that you already failed for sloppy attendance, I’ll have extra sheets to let you solve the exam. It is only because, at the time the exam starts, I have more appropriate things to do than seeking you in the crowd, discussing your attendance problems, and sending you off in front of everybody. But I’ll sort your sheets out afterwards, and this will not change anything about you receiving an F. I say it because I’ve already had such situations. If someone is so detached from and so indifferent about the class process, this is what he/she will get: taking the exam will be in the end only a waste of time and effort. Thus understand the better way, before you do it the bitter way, that there is more to a class than exams worth taking notice of.
- You can excuse your absence orally or writtenly (by email or text message) *before* the time you are absent. *For a single absence*, it is not necessary to give serious reasons in advance. However, for more absences, please give a meaningful explanation (to avoid things like “I’ll be missing the rest of the semester”). I also insist that excusing absences is done to me directly, and not via third (or

fourth, etc.) parties – I am not someone who cant be found or cant be talked to. An excused absence counts as no absence.

- For excusing your absence *after* it occurred, you must present to me a written document (for example from a doctor), or I must have word from the 3F office or higher GIST authority (for example, your Dean). *If I approve it*, you'll need to go to the staff in the office on 3F with this document. They then give you a form I must sign.
- *Belated* (and not so previously announced) *attendance*, i.e., after I check names, *counts as half an absence*. If you need to go for toilet, water, etc., come early enough to have done all you need when class starts. If you do not hear me calling your name (because you came late, went out, etc.), it is on you to come after class *in person* to tell me your name (and get a belated attendance noted), otherwise you count as absent. This will apply regardless of any other evidence that at some point you were present in the class room (for example, you submitted a quiz sheet). Again, the reason is simple. While it makes sense to check attendance once per class per student, the goal of the class cannot become to study who was where or who went when in or out. Even if I know you, I'd have to be fair to all. So I would have to be able to recognize dozens of students' faces, and this just because some like to afford being late and not even telling me about it. I hope you see there is no meaningful logic in all this.
- *If you enroll late* in a class (and do not inform me in advance about your intention to do so, and unless this occurs at the request of some prof teaching another section), *classes missed* (before I have any notice from you) *count as unexcused* (and towards your unexcused absences thresholds). The system offers you (temporarily) the freedom to shuffle classes at your own convenience, but then it should also occur at your own cost. So, in particular, *if you comfort yourself with a full 2-week delay to join at the end of the add period, you'll basically have to attend every further class until midterm to avoid being failed*. Thus plan your class schedule well ahead, or at least display on time true commitment to attend. However, if you request adding a class by email, I will excuse absences occurring while you wait (that is, between your request and my approval; see §4).
- Absences occurring because you moved late from another section (but not another course!) can be excused by asking the prof of the initial section to confirm to me your attendance in his/her class. If I have no confirmation from him/her, these absences will be unexcused (and counted towards your unexcused absences thresholds). It is *your* duty to enact this confirmation.
- *No proxy attendance please*. Do not order others to respond at attendance checks under a different name, and do not accept such orders from others. Given that you can excuse yourself in advance, this cant be such a problem. But if I catch a proxy attendance attempt, both of you *may* have a problem. (My memory is not perfect, but decisively better than this of some other, in particular foreign, profs.)

- *There is no implicit class cancellation.* This means, unless a day is officially designated as class-free by the administration, or I make a clear statement (usually in class or on GEL/class website) about cancelling/moving a class, you must assume class takes place, and not attending will count as an absence. So please do not come up later with excuses like you *thought* that there should be no class (because of first week, university event, etc.).
  - For **recitation attendance**, there are two choices. If I check attendance, the rule is for class attendance. If I do not check attendance, it will be decided by who submitted a sheet. (In this case there is no belated attendance.)
  - The 1/3 attendance (failure) threshold does not take into account recitation attendance (but you will still have a hard time in exams if you miss many recitations!).
6. Among the things I strictly forbid in class are **hats** and hoods, **telephone conversations**, and **food**.

## 7. Homework assignment

- is given *for class*  $\approx$  every 1-2 weeks on GEL/class website. I plan to always announce it so that there is at least one weekend until the deadline.
- It consists (mostly) of exercises I make up, or (occasionally) exercises in the book.
- Problem sheets are available only temporarily; if you need them later (like for preparing exams), please keep copies yourself; *it's not my or TA's job to archive old sheets for your requests*.
- Usually there are 40 to 60 points per assignment. (The number of points for each problem is indicated on the HW sheet or in brackets after the number of the problem when written on the GEL/ webpage post.)
- If a book exercise is given, it is given in the form 'section(.subsection).number\_of\_exercise (page\_in\_book)'. If you do not find (or you are not sure you find) this exercise on this page, it is possible you have a different version of the book from mine. In this case, you ask me and do not solve instead an exercise you think is right; at worst you may get no credit!
- HW should be submitted in class, at (or prior to) the deadline. **Late assignments**, or assignments not submitted in class, must be submitted directly to the TA, and are accepted only *until I return the corrected (punctual) ones* and/or upload a solution on GEL/class website. Deadline is midnight of the due day (to the following day). Delays are heavily penalized. The  $n$ -th belated assignment of the same student will have its normal number of points divided by  $2^n$ . Late assignments are definitely not accepted after I upload a solution on GEL/class website or return corrected ones.
- If TA suspects you copy MY solution (from previous semesters), he writes that and gives 0 points for that particular problem. If you copy the solution of other students, solutions are evaluated equally (I allow doing the homework together).



- I have allowed assignments to be sent to the TA by email. But in case you mistype his address, the file quality is so poor that he cannot read your writing, etc., all happens at your own risk. (Reading on mobile phone photos is usually hard. Scanning or writing in .doc or .hwp is better, as long as the TA is ok with that.)
- If you find your HW sheets missing, please contact me *immediately* after I return them. (As I write in §12, do not expect to see your sheets even one class later!) Then ask the TA in charge. I apologize, but in general it is too hard for me to track all sheets, and if they are lost, it's mostly a matter between the student and the TA. To prevent such situations, I will try to minimize shuffling of sheets between different TAs. In particular,
- it is not another TA's job to forward your sheets to the TA in charge. *You should ask me (or check on GEL/class website) in advance which TA to submit to.* If a TA is not, or does not know, to be assigned to a particular section of HW, he should refuse students trying to submit to him. Instead, he should refer them to me – to submit to me or to ask me which TA to submit to. To facilitate this, I'll try, as best as I can, not to switch duties between TAs over the semester. I may otherwise indicate in advance on GEL/class website which TA will handle which section of which HW.
- Given you have these options, I will almost certainly refuse any other personal arrangements about how or when to submit HW. Please understand that I can't delay the whole class' HW schedule because of individual people, no matter how serious their (individual) reasons. Let me add something. Arguments I often hear in such cases are that you work, live in another city, or take these and these other courses. Such circumstances are both out of my jurisdiction and well known to you when the semester starts (some even before you come at GIST). It is that much more unfair to assume that I, or the class as a whole, should be affected by your own failure to prepare well for your situation.
- Despite that I try to return all sheets and on time, I've heard complaints about so many sheets I didn't return. If you do not trust me, feel free to make your own arrangement with the TA and go yourself to pick your sheets up in the Math Clinic; I don't mind.

8. *My duty is for you to understand, so please ask during class.* I should be interrupted during class, if

- You do not understand some math,
- I speak too fast, or
- My blackboard writing is too illegible.
- For pointing out serious flaws during my talk in class and in exam questions I occasionally assign extra credits.
- 무슨 문제가 있어도 먼저 저랑 이야기를 부탁드립니다. 불만을 학기말 까지 쌓고, 강의평가에서 풀면, 자신에게도 도움이 안되고, 저를 생각 보다 곤란하게 만드는 것이니까요. (I write more detail under 'evaluations'.)

If you have *questions*, you can contact me.

9. I personally find it not very efficient to set up a formal **consultation hour** during the semester, since no hours conveniently match every potential student's schedule. If you like/need to talk to me in person, I suggest you propose a time you can come to my office, and I'll reply if I can be there or not. Once we agree on a time, I have to organize my schedule and will wait for you. I consider your unpunctuality a sign of disrespect towards me, so you please commit yourself to coming. *Missing* (without prior notice or very serious subsequent excuse) *an appointment by more than 15 minutes brings -1% in total final score.* (At repetition, it will bring 2 grades lower, and at a third time you fail the class.) 마찬가지로 조교면담 필요할 때, 직접 연락하고 시간을 결정하세요! (연락정보는 GEL/class website 올림)
10. **Ways to contact me**, roughly in decreasing order of preference:
  - in person. I may, though, ask you to send me something written extra.
  - kakao: I usually can respond quite (at least most) quickly.
  - email (please only the address at GIST and, again, *not* the one of Prof Zhbanov!): the other method of contact I like, if it is not a matter of minutes. I usually read several times a day.
  - SMS. I can read, but I'd seek to respond by kakao or email.
  - messages through the GEL system (or other e-facilities I don't even know of). Please NEVER since I never read them.
11. **Lecture note** is *not regularly available*. If I manage, I will try to prepare some material in electronic form, but it will be incomplete. I can, however, scan and put on the website my own notes. (They are more complete, but not always legible.) Occasionally I may put a typed summary of material which is difficult and/or not included in the book. It is *not* meant as a substitute for the lecture. It is mainly there to give a shorter exposition than the book on some topics that I treated in class and that are more difficult to understand.
12. **Quizzes and exams**
  - *Neither the book, nor the GEL/homepage material is a definitive reference, it's the material of the class that decides the scope of quizzes and exams.* So please take (and rely mainly on) your notes.
  - Exams build very much on previous HW/quiz/recitation problems. Thus make sure you know how to solve these problems, *including those you legitimately skipped* because I offered you an alternative or you exceeded the 100% mark (see §14).
  - I prepare and distribute sheets for you for exams and quizzes. I also make the recitation sheets, although some TA may manage the recitation, and sometimes skips some of the recitation problems.

- As for homework, do not expect us to archive old quiz/recitation sheets for your later requests.
- **Midterm exam** is, unusually, week 9 this semester. Usually we get a 3 h spot, it is in two parts: solution problem part and multiple choice problem part.
- Solution problem part consists of 6–8 solution problems, total  $\sim 100$  points.
- The multiple choice part consists (usually) of 20 multiple choice problems (1 out of 4), total 100 points. For each problem, there should be exactly one correct answer among the four (unless I made a mistake; see below). The evaluation is 5 points for right answer, 0 points for no answer,  $-1$  point for wrong answer. This penalty point scheme is introduced, because otherwise students are both compelled and abetted to guessing, rather than thinking about the answers.
- **Final exam** is in Week 15. Similar structure to midterm exam. Will cover *all* material, incl. the one of midterm exam. The proportion is about 30% for material of first half (before midterm) and about 70% for material of second half (after midterm).
- **Quiz** is in class, and usually (but not always) has 6 multiple choice problems (30 points) and one solution problem (10 points). The evaluation of multiple choice problems is as in exam.
- The plan is to write quizzes almost every week in class. Often I have reduced this number. The rule is: the better you do in previous quizzes (or midterm exam), the more likely we will skip one.
- *You can ask questions during quiz and exam.* Of course, there are types of questions I will not answer you, but I have made in the past mistakes on exam sheets (despite trying to check them), so please ask if you are confused. I do not want to retroactively adjust scores in such a situation.
- In the solution parts of the exams, you receive a problem sheet. Please write your solution on *extra answer sheets*. *Submit both problem sheet and answer sheets.*  
If you write answers or solution on the problem sheet, they will not be evaluated. But if you do not submit the problem sheet, you will receive 0 points. Write name (hangul), dept./year, student and section number on the problem sheet and each solution sheet! Also, each solution sheet without name and student number will not be evaluated.
- For the multiple choice exam problems, you submit the problem sheet with your answers (and name, dept./year, student number).
- For quiz, there is usually one solution problem; write solution on (the remaining part of) the back side of the problem sheet.
- Quiz/exam sheets are printed on both sides. Do not forget problems on the back side. (The number of problems is written at the top of each problem sheet.)
- A negative total score in quiz or multiple choice exam (i.e., when the accumulated penalty points exceed the credit points) would be ‘upgraded’ to 0 – a student will not lose credits for trying, however unsuccessfully, to solve a test.

- Cellphones are to be turned off in exams, and during quizzes if I request so. I usually ask for exams cellphones to be put in your bag, and bags to be put in front. If your bag starts playing music during the exam, you may have to seek it in some other room after the exam.
- *In multiple choice parts of exams only paper and pen(cil) are allowed. If you plan to use a blank sheet for side calculations, ask for my permission.* Unauthorized use of your own sheets can result in point penalty. You can also ask me for blank sheets or use the blank space on the problem sheets as well.
- In solution parts often (but by no means grantedly!) I have agreed class material (GEL/class website sheets, your own old returned HW/quiz/recitation sheets) to be used. By any means, the textbook and electronic devices (incl. dictionaries) are not allowed.
- Modalities of quizzes (what you can use, and if you are allowed to talk to others) differ from exams, and I usually specify them at quiz time.
- Generally no toilet, etc., visits during exams are allowed (and at quizzes at least explicitly and directly ask for my permission). None is so long that it is impossible to organize yourself well in this regard in advance. If you want to exit the room, submit your sheet and leave (or return for the second part of the exam).
- Violation of exam rules does not result in disqualification, but it does result in *ad hoc* score penalties I assign and acts as a good mark for grade division (see §16).
- A quiz or exam will end, before its designated time, when all students who were initially in the classroom, or came while others were still there, (submitted and) left. That is, I do not wait in an empty room for potential latecomers (unless they have announced their delay in advance!) to merit me with a look at the problems.
- **Make-up quizzes** and exams are generally not offered. For the same reasons as for HW, I am even more averted to attempts at personal arrangements about taking a quiz or exam. Abide to the schedule decided for the entire class. ‘Generally’ means that at the presence of serious reasons I may decide separately. Usually, in such situations I consult your Dean or the 3F office.
- If you fail to appear, without excuse, at an exam or quiz, it will not simply bring 0 points, but it will bring a penalty (negative) score, which is  $-5$  times the number of quiz/exam (counted together) missed unexcusedly. Thus the penalty is not only cumulative, it is progressive. I introduce this rule, if for no other reason, at least because I waste paper on sheets for people who do not even come to try to work on them.
- Sometimes there are reasons (not lying on students) that quizzes cannot be taken entirely simultaneously. This does not imply that problem sheets are identical, or similar to whatever degree. Since grades are comparative, advising fellows about exam problems, students can end up compromising on their own grade. On the opposite end, they take every burden of being misinformed (or misled)

in queries about test contents. In the bottom line, even beyond my capacity to monitor such activities, spying on problem sheets is not a good way of exam preparation. This certainly does not mean that past exam sheets are unhelpful in that course, but that learning them at heart is.

- Homework, recitation sheets and quizzes are returned. However, I bring them only once in class; if you are not there (and have no one else) to pick them up, I usually discard your sheets immediately afterward (too much paper piles up otherwise). Also, they are returned before class. To get your sheet back, you appear sufficiently early (and do not wallow in the pile while I teach).
- It is the GIST policy that exams are not returned. I usually let TAs arrange a *revision period* (3-7 days) when you can meet them to look at graded exams and make queries. This should be done *in person* and *on GIST campus*. The TA will not send any electronic copies of your exams. This is necessary to avoid students collecting exercises and promoting speculation about future exams. (I know of a case where students have tried to sell for money old sheets.) And we cannot spread the sheets across the country (or the world) according to everyone's personal holiday travel plans. After the revision period I keep the exams on record.

13. **Writing** is *your* great responsibility:

- Please write clearly and cleanly.
- I can generally *not* read Korean well, sorry. You can use Korean in SMS or email to me, and occasionally when you talk to me in person (not on the phone). I strongly discourage Korean in homework, but will for now tolerate it, until I declare otherwise. If you use Korean in homework, please do not write by hand. Please do *not* use Korean *in quizzes and exams*.
- I strongly request you staple multiple sheets of assignments. Please no paper clips, no file cases and no entire notebooks. If you get unstapled multiple sheets only partially evaluated or returned, the problem is yours.
- A proof or solution is deemed complete (only) if it includes enough detail so that I, the TA, or a fellow-student can understand it without solving the problem (or doing any steps in its solution) by him/herself.
- One basic rule of mathematical work is that *either you think a little more, or calculate (and write) a lot more*. My courses are organized so that you'll see more than enough instances of this principle. I understand you may think this is cruel. But it is the reality of how a mathematician should work. Straightforward calculation may please students, but this is not what makes mathematics beautiful or important. And conveying this important point is also an essential part of my teaching attitude.
- In multiple choice problems, first think and then check. Do not check, cross through, check again, etc. If you use a pencil (as opposed to pen), you can at least erase (although this is still not the best). Smearing in answer boxes is your

problem. Ultimately, if we do not clearly see a right answer, a problem not left alone will count as ‘wrong answer’.

- My TAs and I dislike playing detective on nameless sheets. On whatever sheet submitted for credit,
  - a missing entry in “Dept/Year” or “Section” fields at the head of the sheet will bring 1 point deduction each (for quiz and exam sheets only).
  - A missing student number brings 5% point deduction (of the achieved score),
  - and a missing name brings 10% point deduction.
  - *Both name and student number missing*, in principle, bring *100% point deduction (0 points)*. This is because the sheet is formally unidentifiable. (We do not study dozens of people’s writing style etc.) If you want to get something in this case, it is fully at my mercy. Unless you come to me with your sheet *immediately* after I return it, I will not investigate who you are, and I will not enter your score into the score table. (It will count as if you didn’t submit.)

#### 14. Grading

- Grading of solution exercises is done mainly with respect to solving skill rather than final result. Keep in mind: *I, or the TA, can (and will) only evaluate what is on the exam sheet, and not what is in your head.* A correct answer with no solution will often bring few points. A(n otherwise correct) solution with one calculational mistake and incorrect answer could bring maximal points minus one.
- Read the scoring information on HW/quiz/recitation sheets. It is possible that alternative problems are given, one to choose and solve. It is also possible that the total number of points of problems is higher than the maximal mark set (see top of sheet), in which case exceeding scores will be ‘cut’ (to this mark). Note that the maximal mark can in turn be higher than the 100% mark, meaning that I allow students to earn bonus points.
- Grading of homework and quizzes is usually done by the TAs. Queries regarding the grading should be sent to them directly. (Their contact information is on GEL/class website.) I advise TAs to write their name on corrected sheets (so you know whom to talk to if you have questions). Requests to fix missing or incorrect scores in the score table must be addressed by bringing your sheet and consulting the TA who signed on top of your sheet to confirm your (correct) score to me. If you didn’t pick up or discarded your sheet, there is no meaning in scoring queries.
- Score changes must be reported to me by the TAs, not by students. Students must urge the TA to write back to me to confirm the score change.
- In case of exams, your right to contest the grading will result in *regrading the entire exam* (not only individual exercises) and you may receive a lower score. Be aware of this!

- Finding all mistakes in your solutions is usually not the TA's job, and definitely not mine. Even if I provide a solution (which may not be the only one), you must check your work yourself. If you find mistakes in *my* solution (or other material I provide), then you should say (and I try to give extra credit; see §8).
- **Solution sheets** can be shown by TAs to students, however, only under the following conditions:
  - Students have to ask the TA who graded and signed on their sheet. Ergo: if you don't submit or don't pick up your HW/quiz/recitation, don't ask for solutions!
  - I also insist solution sheets to be shown by TAs at personal appointment, and not in some electronic form (incl. scan/ photos). The *TAs will refuse if students ask to see the solution paper, unless they organize a time to meet the TA in person, on GIST campus* – the usual place is the math office.
  - TAs are advised to dispose of solution sheets about a week after I return corrected ones, i.e., about 2 weeks after the (due) date of HW/quiz/recitation. Do not complain if you cannot be shown the sheet later. *It is your duty to recover your missing knowledge as quickly as possible*, and not the TA's duty to collect these sheets for you until you find out all what you didn't understand.
  - This means in particular that you meet TA well ahead of the exam! I take this issue sensitively now, after recitation sheets were leaked in the past. Since this happened at a flood of requests right before an exam, I will have TAs advised to bluntly ignore such requests later than, say, 3-4 days before exams.

15. **Point lists** are updated on GEL/class website and include score in exams, recitations, homeworks, quizzes, and attendance. I offer this service to students to see how they progress over the course, and how they fare compared to others. Please *do not* take the level of detail as a basis to *speculate about your following development, simply work and learn!* The lists are anonymous; students can identify themselves using their student number. (The reason is suggestive: while I can appraise some good student in front of others, few students will like being openly exposed doing poorly.)

#### 16. **Final grades.**

- Evaluation is uniform independent of sections (all sections are ranked jointly, even if I publish some point lists with sections divided) or of whether you take the course for math minor, etc.
- Grade division is *usually* made at largest gaps in final score ranking. I agree with most faculty on this common rule.
- The grades are decided by overall class performance. I cannot know what students enroll into the class and how they do, so I do not decide grade division by fixing score percentages in advance. (E.g., I've had a class with the bar for A+ being at 62%, and another with 89%.) Just one rule of thumb: > 90% is almost

certainly an A+, while  $< 20\%$  is almost certainly an F. (Failing to collect 20% of credits, spread over various activities during the entire semester, is for me the result of not excessive, but already blatant sloppiness towards the instructor, and I see no reason to tolerate this.)

- In marginal cases, secondary criteria play a role. These can be, but are not limited to,
  - the score trend (foremost, final as compared to midterm),
  - regularity of attendance, homework/quiz submission, and
  - my personal impression, e.g., of the student's working effort and attitude, incl.
  - illegitimate favor requests (like rescheduling exams), punctuality to obey appointments, level of politeness in communication (incl. mails sent to Prof. Zhbanov),
  - failures to observe class or exam rules (wearing hats, eating, unallowed materials used in exam or exits of the exam room), and
  - experience from previous semesters (like failure or, especially unnotified, cancellation of classes, attempts at grade negotiations, etc.).

I consider these factors important, and a mathematical formula for calculating the score can never optimally reflect them. I will resolve this problem thus: *within the tolerance of  $\pm 1\%$  of total final score*, I will reserve myself the right to *override the calculated score order* if I see serious reasons. For example,

- a student may get a better grade who improved a lot but scored only minorly below one who deteriorated a lot.
- Also, behavioral infractions during, or a previous dropout of a course will later speak strongly against an A+ (in the same course).

I have not yet had a case where such manipulations were compelling, and I will reserve them to exceptional circumstances. However, even without overturning score order, I do take these factors increasingly heavily into account when deciding divisions where gaps are narrow (which becomes more common when the number of students increases).

- *Grades are usually undebatable.* I must evaluate the performance you bring in class, and not your negotiation skills after class. You are sensitive about what grade you get, but I am sensitive about being fair to all. This premise is what I have in mind when writing grades. Once they stand, there is nothing reasonable or helpful in changing your grade (and grades of others) just to make you happier. No serious prof will engage in such a practice. When you didn't work hard enough on time, understand at least to try a bit harder next time! But please learn not to ask for grade favors: you portray yourself as a low discipline student, which is not good for your future. In this spirit, I do put a final score table, without grades, on GEL/class website, but *I do not publish grades and I will not enter into debates following queries of the sort that you want a better*



*grade, why you got this grade, etc.* The final score table, along with my explanation here, is detailed enough to convince you why you got what you got – and also that I, too, invest enough work in deciding that.

- In particular, if I assign an F, I am convinced that the student has failed to offer even an absolute minimum to achieve the glass goal. I regard these cases as very exceptional. Thus be aware that they attract a lot of my attention, even over a long period, and I often discuss my F grades also with other profs.
- A grade change (but not necessarily for the better!) may occur if I have miscalculated your exam (*cf.* the regrading policy in §14) or miscalculated your score. Queries about such errors are legitimate. Serious reasons for a grade change are not that
  - you believe you deserve a better grade than someone else if you have a slightly better score, or equal grade if you have a slightly worse score (one must put divisions somewhere, but cannot put everywhere),
  - that you want to apply for a scholarship or enroll into some program,
  - or retake the class.
- I understand ‘*guidelines*’ for grade distribution are made by the university not to extremely depart from them, not set to follow them as closely as possible. Therefore, you should not expect me to put any lower limit on the proportion of students getting an A+, A, or similar. When class score (and discipline) drops, it does not mean I should lower my criteria along with it to provide for a certain number of good grades – I will rather do the opposite. In general, the worse the class’ discipline, the lower the proportion of A+ and A. I have had a class where I have not given a single A. This is of course an exceptional situation, but it should serve as a warning.
- As opposed to guidelines, I will obey university *restrictions for grades* (like for retaking students, number of As, etc.), as requested by the input system. They provide sometimes artificial but compelling reasons to downgrade students. This situation is very rare, but it does occur, thus I cannot promise we will always be free from such trouble. It is possible that I have to put grade divisions at unusual places. Thus *a few points should not matter, but they could* and, seen positively, this is an attitude students should take toward their examination. This also means that *I cant know even myself for sure your grade until I try to input it into the system*. Note, however, that downgrading someone to allow him/her to retake the class is not a university-based compelling reason, but the student’s personal desire, and will be treated accordingly (and aversely; see also my remarks on retaking in §4).
- I strongly frown upon requests to communicate the grades to students personally. They should access them through the system. I will make exceptions, but in order to prod students to follow the (system) rules, I will fix that *I will not tell a grade personally until 1 month after I enter it into the system*.

You should be aware that I do not mean this grade policy in an adversary spirit. My duties toward students do not end with the classroom, and so I am certainly not

indifferent about their campus life, study/career plans, etc. What I say, though, is that these issues should not be reflected in, and hence should not (at least directly) influence, learning evaluation. In fact, knowing students over the semester(s), I find it often painful to write bad grades. But I try to be maximally transparent about your score development (one main reason I decided to provide point lists), and indications of a weak performance are usually visible early and continuously. A student should keep in mind that others are trying their best as well, and also that, even although I see him/her heading for a disappointing result, prodding him/her to work harder is neither my duty nor my pleasure.

And since this fundamental point rises (after) every semester, I write it one more time in Korean:

이유를 잘 이해하면서도 왜 제가 등급 변경으로 도우면 안 되는지 이해해 주세요. 등급은 학생능력평가할 뜻 있는데 누구나 결정한 장학금규칙 따위는 전혀 다른 것. 이런 조건이 등급에 영향을 미치게 되면 점점 등급의 기능이 사라질걸요. 다른 도울법 있으면 말씀해 보세요.

#### 17. Cancelling the class.

- If you want to *cancel the class*, it is *your* responsibility to get removed from the list of students. If you appear on the list (which is given to me by the university at the end of the semester through uZeus), and you have insufficient score, you will receive an F.
- I do not mind signing cancel class forms, I have to accept students' decisions to take absence leave for the semester, etc. No point to enforce participation, whatever reasons against it.
- However, avoid the misconception that a dropout is merely your legitimate right to use a service provided at students' disposition. It seems some see an offered curriculum merely as a pool to draw from for credits at one's preference (or, worse, convenience). Not only your effort is on the line, and someone else looking for your place might have tried harder. Thus beyond the initial add-drop period, *I will not treat your failure to complete my class as a regular act*, no matter how regularly you obey university procedures, and regardless of whether you receive an F or not. Do not assume your departure will go unnoticed, or unaccounted for with the time. I am especially sensitive to the attitude the student displays in such a situation (for example, does he notify me or simply disappear?). Dropouts could (definitely at repetition) leave me with a bad impression, which may have negative impact, in particular if the student decides to take my classes again.

#### 18. As you know, at the end of the class you have the right to submit **evaluations**. These have created so much headache to me past semesters (my holidays were gone), so it seems important to discuss this.

- While I try my best to make my class for you as attractive, easy to understand, etc., as possible, I can do this only from what I know. You will hardly get anything you wait for others to read in your mind. Thus you must learn to

*make effort by yourselves and **seek dialog with me** to resolve your difficulties and have your desires heard* – or at least someone to moderate such a dialog: there are other students, TAs, administration staff, faculty. In how far I find your requests feasible and legitimate is a separate issue (which I have now discussed in extensive detail above). But the solution is by any means *not to wait until the end of the semester and use the evaluation to let the whole university know your complaints* (before I learn about them, when getting passed on your comments). Such way to criticize me is neither honorable nor productive: not only does it fail to solve your own problems (on time), but it unnecessarily and unfairly adds damage to me in front of my colleagues. Thus I will from now on consider problems written in the evaluation but not discussed with me as a ‘hit in the back’.

- It seems fundamental to remind you that, whatever I can and cannot do for you, **ULTIMATELY THE MOTIVATION TO LEARN MUST COME FROM YOURSELF**. Once you decide to enroll (and your reasons are completely irrelevant in this context), *it is your duty to take my class seriously – and not mine to push you, entertain you, or the like*, and I will expect this attitude from each one of you. Look at why I am saying this. I assume you study to get a job in a few years. Do you think at a workplace someone (your boss??) will spend effort to guess your desires, to listen to grievances why do you have to work this or that, etc.? As harsh as it sounds, this advice is meant for your own good, and *if you do not understand this crucial point, it is time for you to grow up quickly!*

Thus, if you fail to get yourself committed to working in class (and to do anything about your learning difficulties, etc.), it is you to take the consequences.

***The evaluation is not a place to dump over the professor for your lack of self-discipline.*** (It is precisely because students have done this in the past, and in very bad ways, and some profs were shocked, that the university must moderate evaluation comments sent to profs.) 지금 이걸 정말 괜찮다고 생각하면, 미래에 다른 사람에 대한 이런 태도의 효과를 체험하기 전에, 자신을 위해 이 태도를 바꾸도록 진심으로 권한다.

I have tried to be maximally clear, but of course, there is no complete set of rules to resolve every possible situation, and neither is this list supposed to become a student bible. Thus please cooperate that we can get along with each other as well as possible, and do not complain, certainly not when I do exactly as I said somewhere above.