

Introduction to Computer Architecture

Assignment 2

Question 11 Compilation

"Promise me a place in your house of memories."

Dear All,

I hope you really enjoyed the class (at least for some moments) so far. You can't get to hear classmates rap and sing, eat chocolate and dztz in every class, right?

I am quite impressed with your overall performance. Alongside many other evidences are the concentration and interaction you dedicated in class, the confidence and English proficiency you showed in presentation, the collaboration and fraternity you built in lab, and the humor and joy you shared in QQ-group. For students taking the research practice, I really enjoyed all our meetings and discussions. You kept amazing me with your greater potential. Even though some may have played mobile games or fallen asleep in class, you still managed to guarantee a constant high attendance rate. This, in turn, motivates and encourages me to keep improving my teaching skills.

How to make the most of your attendance in class? As I occasionally mentioned in previous lecture sessions, I sincerely hope that you could try to follow slides on the projector screen instead of your computers/smartphones. Why? Can you imagine what I felt each time I saw some of you staring at your computers/smartphones (or even desks)? Sometimes, it was really challenging to feel pumped up when my inner voice questioned the necessity of my interpretation of the slides. I felt like even if I was simply mumbling and you would not even notice or care. Surely I have no rights to regulate your behaviors in any situation. And I could've simply focused on the students following my lead. Then why I still insist on trying to make teaching attractive and interesting through, for example, crafting slide design and organization, rehearsing corresponding presentation, and experimenting likely fun activities?

As students, you are always the reason. You decided to study Computer Architecture with me among several instructors. I truly appreciate your trust and support. Ever since we met, I keep working on how to provide you with a satisfactory learning experience in return. Again, why am I suggesting you to follow slides on the projector screen instead of your computers/smartphones (and also suggesting you not to preview slides before class)? This is because it likely increases the chances for you to grasp the essence of the teaching content. How? You may wonder. I have attempted to organize the content on each slide deck into a series of logically progressive questions. It has been my hope that this helps to create a conversational teaching style. Consider when you are chatting with your friend. Have you ever simply listened to her or him for two or three 45-mins without interruption? Presumably (if you are not a dztz and

care at least a little bit of your conversation with your friend), the answer is no. Then that's exactly what I think we should follow in class. I expect you to take initiative to make the class more interactive (and hopefully more interesting). May it be raising a question or answering a question I asked. We can thus ensure that we are on the same page with the teaching content. With the slides, my interpretation, and our interaction, I believe that together we can improve the odds of knowing not only how but also why. Knowing not only how a strategy works but also why it works in its own way instead of some other ways, I think, is the ultimate goal of taking any course. The design rationale behind it may benefit problem solving and decision making in work and life.

So, please take more initiative in class. Wouldn't it be great if we could create an atmosphere in class like what we have in QQ-group?

At least, give it a try.

??With this question, I would like you to express your thoughts and feelings of this course so far. For example, did you gradually understand strategies or things from different perspectives and weight their tradeoffs? What do you think is the real challenge for you to learn this course? Do you consider interactions in class helpful? What held you back when you were trying to ask or answer questions in class? What suggestions (for better learning this course) would you like to provide to other students? What help or assistance would you like from me or other students? What else?

Thank you for everything and look forward to hearing you out. [Have fun.](#)

01

Dear Prof.Kai,

It's my pleasure to read such sincere words out of your pounding heart that both inspires and embarrasses me quite a lot. Truly, I have never seen such conscientious but meanwhile amiable professor as you are since university. Sincere thanks.

As for the class, let's start from the selection period. Since actually my major is [redacted] but just pick CS for bachelor, I don't quite acquaint with students in CS college.

When I tried to select the instructor for Architecture class, I just consulted the Chao-Laoshi for comment searching and the personal website for the first sight. I just thought, 'Oh this is a young professor with shining smile, he must be more inspiring and enthusiastic [redacted]

[redacted] That's the whole story of my picking this class. After half of the semester, it turns out I made the best choice with no regret. This is a professor who keeps interacting in the class, discussing for lab in person, speaking in pleasant accent and moreover laughing like a child. This is the very professor that catches my appetite. Sincere thanks again.

For this class, the ISA, pipelining and cache we learned, as I may suppose, are all well clarified through your interpretation. But I have to admit that sometimes I felt sleepy even though I persisted to keep awake. I may miss some points in the class and one associative phenomenon is that when I then try to read the book on my own, there always exist some points I can't understand especially in pipelining. The strategies it takes may be understandable in the theory aspect, but when it comes to analyze aspect, it always confuses me. I have to read several times throughout the chapter but still feel dizzy for crucial concepts like the delays and the branch hazards. It may still take time for me to

read and understand the concepts since hardware is quite difficult from my view. I can still recall the anxiety I suffered through those night study in the end of term when first taking logic and computer design fundamental as hardware introduction. Sorry again for sometimes not participating in the class but I will try harder.↵

Actually for CS students, it seems to be a general personal habit to bring a laptop to class and then whether refer to the slides on laptop or simply do personal things. It's may be excused for heavy loads on several courses, or someone may just prefer to practice coding ability or learn techniques to their interest. Even if some may refer to slides, one defect for just staring at the laptop is that one can always lose his concentration or maybe it's just me. So through all these two and a half years, I always bring a print book to class rather than pdf or something. It hits me that referring to the book while listening to the professor and making necessary notes or underlining are not simply manners but benefiting to myself own. I hold the inspiration that skills can be learned or must be learned on one's own, but such class can never be attended twice, such basic knowledge can be better learned if one can stand on giant's shoulder. Some may argue that these concepts are out of time, like say created twenty years old, but that's what is called classic. Maybe I just absolved myself for not learning coding skills well. But I still believe that techniques are always rolling to update, concepts inherited from time stand.↵

It's actually my first time to take three full-foreign classes in one semester say Architecture, OS and That's quite challenging for me since all the three classes are difficult even if taught in Chinese. But through all the half semester, I get to be accustomed for learning in oral English (though I still use the translated textbook lol).

I have to learn at class once but learn in the night for quite more times. Actually, OS is not that challenging since the book explains well, [REDACTED] while for architecture, the concepts and strategies. The book itself is not well written as I may say. Architecture itself is a tough class, with the addition of oral English teaching, more tough. Every time I get confused for what you're saying, I try to catch up but then fail (then get sleepy). I suppose it's still way too challenging for me to learn in oral English teaching but that's a good practice and start.↵

As for interactions, those are absolutely necessary for an active class. But as I explained above, sometimes no one wanted to answer may be that most did not catch up the lecture or question. I believe there always exist gangsters lol. But most of the ones are just insisting on their own or not catching up like me. Even if I may know the answer in Chinese, the silence holds me back and I can be quite shy for not organizing proper answer in English.↵

For suggestions, I would rather not say since I'm the guy that needs advice. From the ability aspect, I may be the weakest in the class. What I can do this half semester is simply focus focus and focus. Try not to fall asleep or simply not let prof.Kai down.↵

One tip: [REDACTED] fresh air is quite important. Since the classroom holds quite a lot students before our lecture, I recommend to open the window and let in the fresh air. In winter, the classroom gets quite smelly after the one and a half hours lecture meanwhile the oxygen content gets low. With no sufficient oxygen supply, one get less concentration and feel sleepy quite easily since the blood supplies less oxygen for brain. If you can see someone's cheek get pink or even red, he/she may be shy, but most likely it's the symptom of lacking fresh air.↵

Forgive me for my hasty and immature views plus my infantile English.↵

Yours sincerely↵

[REDACTED]

11. First of all, I have to admit that I did learn something in CA class. For example, the different ISA types; some characteristics about PWD, desktop, server, cluster, embedded computer, the main idea about pipeline and some evaluating indicators. However, I also admit that I cannot keep every point in memory and I don't really understand pipeline architecture. For example, I still don't know how to detect RAW or some of the other hazards and to control the datapath to make it stall. Besides, I felt kind of difficult to finish ~~every~~ the whole problems in this assignment. For example, although we discussed a lot about "predicted-not-taken" today but I still don't know "predicted-taken", which troubled me when I was trying to solve problem 5.

Next, it is about my feeling of this class. Although I have taken several courses taken all in English in my the last two years in ZJU [redacted], it is still difficult for me to understand over half of the sentences you speak in English class. Maybe ~~that's~~ it's my fault not practicing my English skill well before I take part in this course. And maybe because of not understand well (and sometimes not hearing clearly), some else do can attract my attention. And although I hope I can answer your questions more frequently, in normal situations, I cannot find out your question points and I am sorry to make you feel embarrassed for no one answering your questions. Actually, I do think the interactions an important part of the class, and which I hope can be kept. But I don't think it a good idea to wait too long after a question because we either don't understand the questions or have already gotten an answer before long after being questioned. I'm not sure but I think things will be better if you repeat the questions several times instead of just waiting for answering.

As for the difference between in-class group ideas in class, I think the difference on language the difference between "speaking" and "typing" and whether some pictures can be used and whether teacher know the "speaking person" or not, are the most important difference that leads to the different atmosphere. And another thing that matters, I think, is your different performing in the different stage — casual chatting, comparing to reading. And it's sure that some of my opinion can be wrong.

I think everyone in class, including teachers and students that attend the class, does a good job by now and I don't think I can come up with any more good suggestions. If I have to give a suggestion, I think I will say that I hope the requirement of the lab, demo especially, can be more clear.

We are learning CA together. I believe we are making progress a little bit and a little bit.

03

It's impractical to pull a whole class from screens even for the most proficient teacher in ZJU. So forgive me for considering your effort towards `dream class` in one move as a Don Quixote's act. To be more practical, as a teacher you should expect less and start with small. There are indeed ways to strive for different parts of students' attention. For some, question and quiz works; some other, slower speech with stronger rhythm.

I myself seldom listen at any class, which mostly benefits from my personal reasons. But the sad thing about your class is that I do not think I miss something important (since the slides are already a vivid mirror of your speech). No doubt, during your speed, the logical coherence is revealed in plain words. But few new arguments is made (干货很少), putting me in a constant state of hunger. As the saying goes `talk is cheap, show me the code`, good brains in ZJU are always willing to listen to brilliant ideas, especially in CS area. So as far as I'm concerned, a class with new insights stretched out from basics, instead of largely repeat of old computer logic class, is more likely to gain eyeball attention. To be more detailed, things like edge-cutting tech details or complex compiler optimization sample is my type of meat, which is most likely not suitable for the whole class, but sweet dessert for few.

To end, I believe any kind of effort you contribute to this course will be appreciated and stays in our memory. Whether or not we are worth such energy is somewhat another question.

04

At first, what I want to express is that what you said makes me touched. There are few teachers who will talk with you like this in university. I achieve a lot from this course. I know how to perform the pipeline and how to evaluate the performance of the CPU from bandwidth, throughput, energy and other different aspects. I think the real challenge for me is how to establish a global view. I have to know what it will do in every stage, when data or structure hazards will happen and how to deal with them by applying different technology, like stall and forwarding.

From my perspective, the way you teach is good. In class, you will try your best to find some practical instances to help us understand the abstract concepts and theories. I think it is useful. I also think the interactions in class is helpful, because during this process, it will solve this problem better and maybe produce more problems which will give us a deeper understanding of this problem. I think the way to help students learn more about computer architecture through a presentation is good, but there are some problems in choosing the topic. Some topics are so difficult that they can't understand, so they will copy something from the paper, without thinking, just because they want to talk about something different, which will also result in that we can't ask some questions. I think the topics can be more close to the course content. Because if we have a certain understanding of it, we can discuss it more deeply.

For myself, I don't like asking questions to the teacher. I will spend time on solving them on my own, because after considering, you can understand it better. Some students don't look at the slides on the projector screen. There are some reasons from my perspective. One is that they just don't want to listen. Second is they can't follow you and they want to learn it according to their own rate, so they stare at their own computers or books. And some others may think they have understood it, so it is not necessary to hear. However, I think no matter you understand the content, you should listen to the teacher carefully. In class, you can build up a global view first. After class, you can try to understand it more deeply. And in class, the teacher may raise some questions which you have not considered. This is all what I want to say.

05

First of all, I have to admit that Kaige is indeed the first teacher I met in this style, a teacher who is willing and wants to mingle with the students. Leave the course aside, I think Kaige is a very amiable person who is easy to get along with and to get very well. I am very glad to meet you in this course. I am very grateful that you have taught us a lot of knowledge outside of the course -- for example, some skills to make a presentation, some etiquette with friends and so on. **Mutual respect is the premise and foundation of everything.**

Then, let me briefly talk about my thoughts and feelings about the course. Kaige may be more inclined to interact and communicate in the classroom, since this is what a class should be. Otherwise, a teacher gives a presentation on the state, while the students in the audience do their own things, such as reading books, looking at the slides in the computer or taking a nap and so on. This is no doubt a waste of everyone's time. I agree with Kaige in this point. However, some content does seem to be better understood from the book, because these books are very classic and there are many ideas of experts. Looking at such a book is like setting up your own thought with the help of other people's thoughts. And if you only learn from the classroom, there will be some missing, which is just the teacher's understanding of the book. As we know, a thousand readers have a thousand Hamlet, so **I think it may be still necessary to take some time to read.** Yep, this is also a tradeoff between these two learning modes.

Of course, I think this can still have a comprehensive way, but this is not friendly to everyone. The premise requires that everyone has read the book before the class and the content in the class may be changed into discussion on different understanding of the topic in the book. We can still interact and communicate in the classroom. The way may be more efficient, because everyone has known something about the topic. The content/topic of the class is to solve our doubts, which we can't understand by reading book. However, this may be a burden for other students.

Anyway, I will do more interaction in the class as much as possible.

06

凯哥我觉得最主要的问题是这门课前面的内容跟计组的内容太相似了，lec3 计组已经讲过了，而且只要认真做过实验，指令的那部分内容稍微过一下就知道了，大部分时间就应该放在 pipeline 上，像 lec6，前 60 页其实没什么必要，如果能把这些时间花在讲 pipeline 的一些实现上我觉得更好。我觉得这个 slide 讲的 pipeline 就更清晰一点。而 cache, virtual memory, RAID, 计组也都讲过，操作系统课也提了一遍，我觉得稍微回顾之后，完全可以再深入一点，再重新介绍一遍我感觉没什么必要。

这样子的内容就让人上课很难受，认真听一下，发现我都知道了，那接下来还要不要听。我觉得要把握好重点，可以把计组的 ppt 看一看，这样就知道我们学了什么，知道我们缺少了什么，然后可以适当补充。

我觉得上课不听也没有办法，cs 的课，只要不是太硬核，就很容易给人一种感觉，不听没有关系，我看看 ppt 就懂了，而且很多时候也确实是这样子。

07

11. This course is the most interesting one I have taken since I came to ZJU, both in class and in QQ group. And you are the first teacher who can play with students in such a relaxing way. However, to tell the truth, sometimes it may become difficult to follow your step in class. Teaching with English is pretty good, I think, because it may practice students' listening. But in the other way, continuously listening English may become a challenge for students in the class. To comprehend English, most of the attention may be payed to listening. When there is something fusing or difficult, and if the student need some time to think, he may be left behind by the teacher. For some students, such as me, when feel difficult to follow, may need to look at the previous PPT and try hard to comprehend. If it is really difficult and I can't find much reference on the Internet, the interest to listen might be lower, thus cause doing something not belong to the class. Therefore, I have some suggestions as follows, though some of them may be ridiculous. First, you may speak Chinese sometimes to help us comprehend, more frequently. Also, in our QQ group, you can give us some reference of difficulties, help students learn after class. And in the class, there could be some example questions, to help student learn, instead of pure explanation of principle and theory. And in the last, interaction in class is pretty good, better with your jokes and impressive laughing. I think it is really a useful way to get students' attention. Maybe I talk too much, that' s all. Lucky to have you as my teacher.μ

08

- Certainly, not just from class like how to design CPU & pipeline, for assignment1's our group also do a little research about the CPU vulnerability which further strengthen my understanding about tradeoffs. What I want to explain is that how we treat **security**, which is a factor receiving more and more attention these days. In order to obtain absolute security, we can use *one-timepad* (一次一密) but no one does. Why? Just because of the overhead and unconvenience it brings. There is always a tradeoff and balance we need to consider when facing with security and balance (that's my SRTP's work hahaha) and different situation will lead to different results.
- For me, it's about the time. Computer architecture is an interesting class while the content is abundant. It's recommended to review the PPT and read the book after class. And the commendatory extended reading 《Three easy pieces》 also require time. Of course the entire English class is pretty challenging for me.
- Yep! Every time teacher asking a question can bring me back to class as soon as possible (especially when you get into absent-minded). Besides it can help us concentrate on class, it also help with our positivity.
- English expressing is the biggest challenge for me ask/answer question; And afraid of giving wrong answer also embarrassed me to give up trying.
- 1. Getting a seat in front rows.
 2. Try to spend more time on reading textbooks.
 3. Try the best to follow teacher's fluent speaking.
- Perhaps more examples when explaining new concepts. Last class we had a good discussion about the branch-untaken method and its pipeline graph and more examples/questions may help us to trigger our thinking.
- Thanks to teacher's try we can feel about a different class and we will try our best to adjust ourself to an active mode and try to be a positive participant instead of an audience in class.

09

I'm sorry that I can't always look at the screen in class. In fact, my English is poor, so I can barely keep up with the content of the course by reading the notes below the PPT. I will try my best to interact with you in class in the future.↵

I think your lecture is very vivid and the course is very interesting. It would be better if we could intersperse the relevant knowledge with some examples, which can help us learn to apply knowledge. ↵

In addition, the content that can be referred to in the experimental class is relatively small, which is difficult for the students with a general foundation(such as me). It is hoped that some examples of similar problems can be given.↵

10

I am embarrassed to see a letter you wrote to us. In the letter, you stated the fact that most of the students were watching their own computers and mobile phones during class, and did not look at the PPT, which led to the lack of feedback from our students. And I am one of them. This is not to say that your teaching is not vivid. It is just that our students are used to seeing some pages on their computers. These pages may be some explanations of the course, or they may be just Chinese translations of words that we do not know. All in all, I apologize for my previous actions in this class, and I made up my mind to listen to the teacher carefully and take a serious look at the PPT. In fact, Teacher Bu is really good, really have been teaching this course very seriously. I only blame myself for not working hard enough. I just hope that when the teacher feels that our students are in a hurry, you can explain it in Chinese because our English may not have reached such a high level. Finally, end with a sentence from the teacher's personal page, More often than not, people don't fail; they stop trying.

11

11.

I am very glad to meet such an interesting teacher as Kai Bu and this is my first time to try a course taught in all English this semester, which is a great challenge to me. At the beginning, the lecture in English makes me feel that the time to concentrate is shorter and it is easy to leave for other things. However, after half a semester's study, great progress has been made and I can gradually catch up with the speed of the lecture content. The course of Computer Architecture is very important for CS majors, and I will study it seriously, not only for exams and grades, but also to acquire more professional knowledge and research and lab experience. I hope the teacher will speak slowly in class, emphasize what key contents and broaden some knowledge outside the text book.

12

As a student, it's glad to take class with happiness and fun, and that is what makes our more effective in study.

Sometimes we may fall in boring, the reason is that a succession of snap english might result in lose the direction of what we are learning. The pictures in the slide is great, which is easy to understand meanwhile funny enough. So teaching with the schematic diagram and points out and discuss the detail may have a better effect.

Finally, the course is helpful and trully funny, that is before this course we might never thought a teacher can be so active in qq group, that also helps to build a good communication atmosphere in learning. Thanks a lot.

11. As for me, the biggest challenge may be English (laugh). Professor Bu's English is so frequent that I have to work hard to follow, which makes me a little exhausted. (:()

I'm glad to study in your class, or, it's a pleasure for me. I seldom saw such an easy-going ~~teach~~ teacher that can incorporate into us easily, ~~and maybe it will~~ thanks to the QQ group and your dztz (XD).

As for me, I am a little "self-closed", so that I'm not very willing to answer or ask questions in class, I prefer to ask friends in a more private occasion. ()

Finally, a little suggestion: could you please speak a little ~~more~~ slower. I will be very appreciate for that.

Best wishes! ()

14

11. So far, I think Mr. Bu took pretty good preparation for the class, not only from the powerpoints and other materials but also for the well-designed inclass structure. If listening carefully, I can keep up with the pace of the class. However, in ~~fact~~ face, delivering the same thing with Chinese and English is very different. We are easy to catch effective information if with Chinese but not that good in English. In my own perspective, it will be better to strengthen some points in Chinese to make us easier to catch the point.

15

The atmosphere of this class is special while other courses' teacher don't care too much about the student's behavior. Mr. Bu ~~is very~~ fulfilled his duty in this class. (That's obvious) The atmosphere is always cheerful ~~when~~ after teacher thrown out a question. Students speaks positivity. There may be differences opinions on a problem, but we ~~can solve~~ ^{all} it by discussion in class. That helps us a lot. Because we can deepen the impression of what Mr. Bu ~~what~~ ^{want} to express.

This may be my first time to be in a course of full-English. This is out of my expectation. But I try to understand and catch every word ~~with~~ the teacher said. Some of the ideas ~~are~~ not very easy to be understand, so I have to refer to the book (textbook) for more explanation. But this may lead to a much more ~~terrible~~ result. That is "miss more ideas when ~~we~~ refer to the book." Because I can't ^{terrible} Pause Teacher when I'm thinking.

So my solution in the next classes is making preview of what the teacher may teach us next time. I have to catch up with the teacher's schedule.

Mr. Bu:

Thank you very much for your willingness to listen to some of my suggestions, although the followings are just some of my personal thoughts, they may reflect something.

Firstly, I would like to give some of my thoughts on the questions you raised in the pdf: I think the biggest challenge for me is the experiment, no matter it is multi-cycle, pipeline or some other experiments. I really feel a headache when I have to face them. Sometimes I know the principle, but the Verilog and ISE, which make me really feel deeply helpless, and I even don't know how to start. So usually in the lab class, I was faced with a computer daze, very helpless.

I think the interaction in the class is still very useful. This kind of interaction helps the students to concentrate on and activate the atmosphere of the classroom. But I think language is the biggest difficulty. To be honest, it is not easy for me to understand your spoken English. And I will have a situation where I don't understand or have an idea and I don't know how to express it. I understand that excellent English is also very important for a computer professional course, but listening to a full English course is a very big challenge when my English level is limited. The most important suggestion I want to give to you is that when you talk about key knowledge points in class, I hope that you can slow down and give me some time to understand. Of course, if you use Chinese to explain some things, it is good. I think what you mentioned in the letter, when you are in class, the enthusiasm for listening to the class is not high, which is largely due to this. Because students can't understand what you are saying, then we feel discouraged. That is the idea of reading books by myself.

Anyway, I still have a lot of enthusiasm for the architecture, and I hope that some of my feelings can bring you some ideas. I wish you and this class better and better, and I wish I can make progress and gain in this course.

17

To 1. 凯儿老师
完字如啞。
半个学期下来, 在您的课上收获颇丰, 与老师沟通感觉完全没有代沟, 非常亲切。
如果说建议的话, 那有以下几点。
1. 英语语速有点快, 而且音调较单一, 在比较缺乏睡眠的时候难以完全听进去。
2. 可以多在课堂上互动, 比如点名回答问题来活跃气氛。
3. 真的没啥意见了, 老师您太厉害了!

18

After reading the question 11 written by the teacher, I feel a little ashamed, because I am one of the people who is not paying attention in class and often staring at my computer. I think the main reason is that this course is a little difficult for me. From the course of logic and computer design fundamental in sophomore year, the course and the experiments brought me a lot of burden, and also computer organization. If I don't preview the textbook, I cannot easily understand the knowledge taught by the teacher, so I will easily get distracted in class sometimes. The course of computer architecture gives me the same feeling. Even if I listen so carefully, there will still be a lot of things I can't understand. There are also some problems about experiments. The previous experiments of logic and computer design fundamental will have many lab methods and steps offered by teacher that I can follow, but this course is more difficult than before and I can't find detailed methods form the lab ppt, so I can only ask others for help, it makes me feel a little bit depressed and stressful. So experiments are also the reason that I loss the interest of this course. But I know that teacher you are pretty warm-hearted and working really hard, every student can feel your heart through the course ppt you prepared, the notes you write in the ppt, and the attitude you show on the class. From the next class, I will try harder to listen to the class, preview teacher's lessons in advance, and ask my classmates and you when I don't understand anything about the course, also I will try to increase the class participation. Thank you for your hard work in autumn semester. I will pay more attention on winter semester, and I am really sorry that I did not concentrate on the class before, I will definitely do better in the future!↵

19

Answer:

I think Architecture is an important course in the hardware course system. Logic course is the physic foundation of hardware, organization course teaches us how can these transistors execute instructions. And in Architecture course, we must think why these transistors are arranged in such way, if there is a better way to arrange these transistors. In my opinion, computer Architecture should focus less on how to attach the wires between components to make a CPU work correctly but focus more on those ideas that can improve our CPU's performance.

Mr. Bu gives us very little guidance on experiment course and just explain how pipeline works on theory course, this is great because we must build our CPU by ourselves and this can help us understand pipeline better.

About theory course, Mr. Bu prepared very well for every class. Especially the quality of slides are very high. But I don't know if it is because our dear teacher prepared too well, I think his speed of speech is a little fast. Maybe it is because my English is too vegetable, and I know this is a full-English course. But still I hope Mr. Bu can explain those important parts of knowledge in Chinese again, just as he has done sometimes before.

I think many students want to interact with teacher and other students in the class, but English speech is a great challenge for them. Maybe they can't express their problem in English, or maybe they just feels shy to speak English in front of others. So, I think Mr. Bu can encourage students to join the interaction, even though in Chinese.

20

11

I realized that I missed some key points in class when I saw this assignment. And I had to review the PPT and the book. I think it's my fault that I didn't focus during the class but these questions might help us to figure out what we should have learned in the class. Every week there could be some questions about the key point during the class, and next week upload the answer and the reasons. It could be asked to submit in order to make students review the content.

21

1. For a student who has not taken the course of computer organization, this course of computer architecture is definitely a huge challenge. But throughout the Fall semester, I find this course can be challenging as well as interesting. There are some highlight moments, my favorite one is the setup for discussion and presentation. Our group picked a relatively hard topic, we spend a lot of time reading paper and discussing. I really learnt a lot from this form of learning. And the presentation part sharpens the necessary skills to present. As for suggestions, my humble knowledge limits me from providing any solid ones. I only suggest that the teacher may raise his voice louder so that everybody can hear you loud and clear.

22

Dear Kai Ge,

I really enjoyed your class. You are a very nice teacher who can talk with us just as our friends. I mean there's no generation gap between us. I can feel your intentions, not just the knowledge in textbook, but also other aspects in life. Thus, I'm really glad to meet you.

Here are my views on our lessons.

In experimental class, I don't understand the experiment very well. It would be better if there was an explanation about the implement and the method to debug.

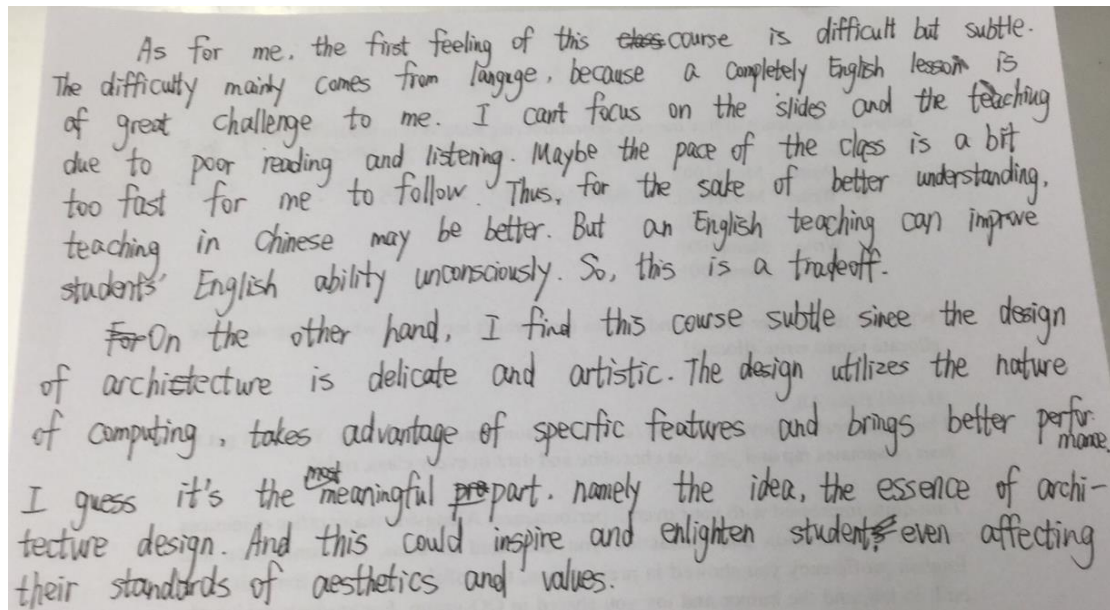
In theory class, I think interaction may help us understand. While answering questions by name is an awkward part. It is better for us to answer questions voluntarily.

There is also a small suggestion that when the student asks the next time, could you please repeat it? Because there are several times that I didn't get the meaning. These are just my personal views. Hope it is helpful.

PS: dztz xswl

Best wishes

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Up to now, the computer architecture course has completed half of the content. In terms of the way of teaching, I have to say that the professor is happy with us and has no generation gap. A relaxed atmosphere can make the course less boring, isn't it? As for the problem of not watching the screen during class, I think it is probably because the teaching in English is easy to distract. The teacher's slide structure is clear, but many times people are more inclined to read and understand the teacher's thinking. Questioning each other really helps the understanding of the course content, but I think this can only help a small number of people. More people can't accurately express their ideas in English, perhaps the most important obstacle. Of course, this is a lack of our own ability. The problem is not your way of teaching. The last thing I want to say is that I hope that the teacher can give more guidance in the experiment or extend the experiment acceptance time. After all, there will be many inexplicable bugs in the hardware experiment. Thank you for your dedication and sincere hope that you will all go well. ↵

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For example, did you gradually understand strategies or things from different perspectives and weight their tradeoffs ?

I can't say I've mastered CPU or memory design through this class but I've actually learned something about the idea of solving a problem from a another perspective.

What do you think is the real challenge for you to learn this course ?

1. Getting up early in Mon. 8:00.
2. English listening
3. Complexity of a well-designed CPU structure.

Do you consider interactions in class helpful ?

Yes.

What held you back when you were trying to ask or answer questions in class?

Ask:

1. English speaking
2. Have no such habit (Instead of asking, I'd like to find the answer by myself)

Answer:

1. English speaking
2. English speaking
3. Confidence

What suggestions (for better learning this course) would you like to provide to other student ?

1. Experiment is more important than we expected.

Some ideas about the pipeline and solving the hazards will not be fully understood without implementation. I think some best practice of Verilog and hardware design can be taught in experiment class.

2. Writing CPU in Verilog is full of boilerplate

Verilog offers something lower than what we need. Some control signals and their logic is trivial especially for those state registers and CPU itself. Writing a Verilog generator will be helpful.

What help or a assistance would like from me or other students ?

Nothing.

What else?

I think this class is good enough for me to learn computer architecture.

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I think interaction in class is helpful to our learning. Since listening to a long lecture requires a lot of effort and students are easy to get distracted. So we can just continue the way we are now.

I also have a suggestion. It's better if we have an assignment every week, rather than several weeks, aiming at the corresponding knowledge in the lesson that week. It is a way of motivating students to review what they have learned. If it's not very frequent and immediate, we're likely to forget what we've learned, which severely blunts our performance in the next week's lesson.

↓

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- 1). Last semester, when studying Computer Organization, I often missed some concepts or important information. Then I turned to Coursera and watched videos of course of Washington University, and I find it very efficient. Maybe in the course, we can watch some videos of other teachers, this may let us no feel boring.
- 2). Can there be any animation of the ~~esp~~ concepts, to better illustrating the principle?
- 3). While reviewing, I find it useful to use the Mind-Graph, which is pretty much the case that we list the guideline of the whole structure.
- 4). Is there any summary for reviewing?

28

Dear Mr. Bu,

Thank you for your letter and the chance I can express my feelings and thoughts.

I'm also impressed on you with your humor and easy companionship. I have never met a teacher like you before, especially in the university. Your ways of teaching make me feel the classes are not boring and be willing to attending every class.

But first, I want to say, is that for most people, I think, English is the biggest challenge. It's not that we don't answer questions, but that listening in English is really difficult for us. For me, maybe I am skilled in reading and writing in English, but I am poor at listening and speaking and failed my English level test in speaking once(hahaha...now I passed). It is still a problem to be able to fully understand what you say, that is we have not understand the last sentence, the next one is coming. On the other hand, there are so many professional terms, although we may know those words, we need time to react, which may also cause the missing of the next sentence. So for the questions you raise in class, perhaps we don't understand your words in English fully, so we can't answer the question naturally. Sometimes I feel very powerless. But teaching in English is unchangeable. So it has nothing to do with the teacher. However, it is really a reason.

In addition, I am sometimes not as focused as the beginning of class. You know, if we don't notice for a few minutes, we will miss a lot. When you asked some questions, I don't know where it is occasionally.

An immature little suggestion: the important part ---pipeline, I think you teach this part a little fast. Maybe we had a slow progress before. So we need to hurry up.

As for why we stare the screen on the computer. I think it is just a habit. Sometimes the screen on the blackboard is not very clear. So we need another reference. Some students like doing some notes on the slides with ipad or computers. After all, technologies today are really convenient haha-- However, I still be willing to give it a try and if you see students staring the computer, don't be frustrated. They are still listening to you.

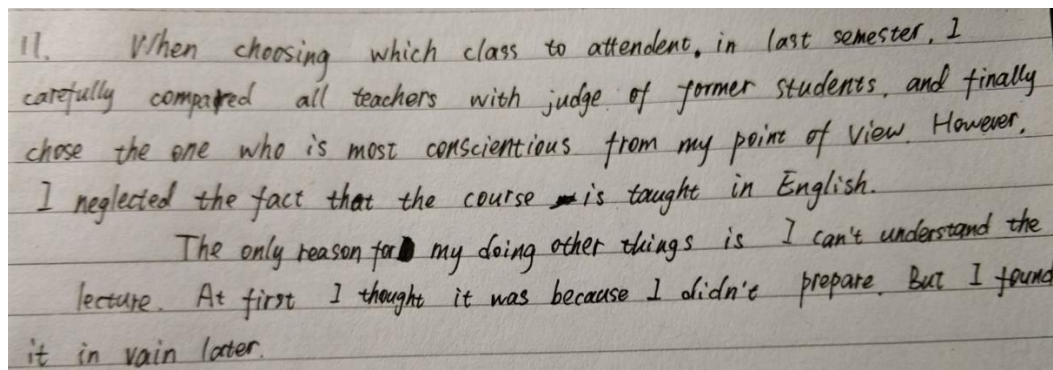
But I am very appreciate the help you provide to me. When I knew less about something, you can take me to ask others for help. So thank Zhang Jiyuan for patiently explaining a lot of questions I asked. And I am very glad we can share something useful in the class and QQ group. Thanks Jiang Zengkai for his sharing. Thus, we can deal with lots of difficulties in the lab. And last not the least, thank you for remembering my name.

I hope Mr. Bu can tell more about the labs. I meet a few difficulties doing them. You can generally tell us how to do the labs including its datapath and controller. In fact, this may be mentioned in the class. But there are always differences between the practice and theory. We need to clear the thoughts and ideas. And I also hope when the teacher post assignments, you'd better @all. HAHAA-- I always get the assignments from my roommate with surprise on my face.

We all know you are a good teacher. You are finding how to teach an attractive and excellent lesson all the time. You are a teacher worth trusting and I like you so much. Don't doubt yourself and suspect that there is a problem with your own teaching skills while seeing someone not following the slides in the front.

I know a good class is the cooperation of the teacher and the students. There is nothing bad to have more communication and interaction in the class. So raising some questions is necessary. Well, what I should do is improve my English hahahaha--:D

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11. When choosing which class to attend, in last semester, I carefully compared all teachers with judge of former students, and finally chose the one who is most conscientious from my point of view. However, I neglected the fact that the course is taught in English. The only reason for my doing other things is I can't understand the lecture. At first I thought it was because I didn't prepare. But I found it in vain later.

30

11 [10]

Thanks for the videos.

The first course taught in full English I attended is *Introduction to Computer System*, whose lecture is Yale N. Patt. He has a lot of beards, and always began course with having a can of coffee.

That coffee may have magic. He became excited, and gave us a perfect class.

I had no idea about computer system at that time, but I was able to understand most of his words.

The first key point is that, he uses simpler words. That's important for a first grade student.

He is louder and slower. I mean that, he is passionate like a president fighting for campaign. You will wonder what happened while hearing an excited man saying loudly. You will want to figure out what he is expressing.

He makes sure we understand his every sentence instead of every paragraph. He observes our response after every sentence. If he thinks we miss that point, he will re-express his thought in another form. A paragraph is too long to recover.

I think the problem is that your students cannot understand you well. And that's the first step, you can do nothing until listeners understand you. Compared with Patt, you are only one can of coffee behind, I think.

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Till now, I think more definitions of some specific problem can be demonstrated, which would help us understand more. The current slides are more general with lots of entertainment, compared with this, generating a more academic one is nice.

Real challenge is to understand what is new here. For the reason that lots of information has been indicated on the organization course, I would like to know more about what we would do and could do to improve the current architecture. For the one in the interactions, I think it is an option for us to know what definition is the key one. The interaction would call us.

Nothing held me back. Actually I would prefer to look up this information first on the website so that I would not give questions immediately.

For professor, I think focusing more on the main problem would be nice. Occasionally, I am not able to understand why professor wants to ask certain questions. Thus, a brief more explanation would be appreciated.

32

Hello Teacher Bu:

I want to say thank you that this is my honor I have this opportunity can listen your class. After a half semester, I feel that you are absolutely an enthusiastic teacher. You always want to have interaction with us. In my opinion, I consider that the biggest challenge to me is my poor English. Because teacher Bu has very great English, thus I always feel the speaking speed of teacher in class is too fast that I can't understand what teacher's mean in time, and it also limit me when I want to ask question. But in other hand, this situation really trains my English ability.

I also want to mention one thing that the QQ group in our class is really friendly as well. Everyone can very relax to ask any question even talking about joke. And sometimes because of someone's shy character, he or she can ask her question in anonymous.

Last but not least, this class is really a specially class with a special teacher who truly care every student. And teacher Bu is not only a teacher to our class but also a lightly older friend to us, this relationship let us have a different angle to think about this class and why we learn in this class.

Thank you

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11. 我觉得布置作业如果频率高一点的话能让我这种菜鸡及时发现自己啥都不会进而认真看书

11.
Dear teacher,
It's been two months before I realized it, and it's clear that what I said in the first class, "I think the teacher's voice sounds good." Although I think so now ~~also~~, it's only Chinese and English I can understand. (Many times in class, I can't understand the teacher's speech. It's real.)
However, I experienced some interesting things in class. The self-introduction of the first lesson made us happy and made many new friends. (Like Kun Yang?) Sharing the QQ group with previous courses ~~is~~ also a novel experience. It's interesting to speak with fellow students and the teacher ~~in~~ in QQ group and we can also learn a lot and make many new friends. And the group exhibition also brought us a lot. Although I told myself not to be nervous

before going to the stage, I was still nervous on the stage and dared not raise my head and look at students. And I like the happy atmosphere in our group. Thank you for the grouping.
I was still on the subway in Beijing when I received the homework description. When I saw the letter, I was moved and even my friend asked me what happened.
In a word, ~~the~~ although sometimes I can't understand what you said in class, it's ~~the~~ an interesting lesson.
Best wishes!

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Hello Mr. Bu,

,

I am very honored to be in your class. I think you are very nice since you became my head teacher. Now I am really glad to get to know a humorous and lovely you again. I think you are the second most enthusiastic teacher I have ever met in Zhejiang university, who consider giving lectures so seriously.

,

I would like to explain some of my views:

1. Why I choose this course?

Because it is compulsory. Although I'm terrible at hardware class learning, but I still have to take the course regardless of my weak foundation. And among several teachers I did not hesitate to choose you because I think you can help me.

2. Why don't I follow you in class?

I sincerely appreciate your beautiful slides, but I really can't keep up with you. I think you may emphasize some modal particles and thus talk about the actually mattered sentences very quickly and unclearly. I always have to think about your words for several seconds to understand what you are saying. However, after that I could not follow your new talking anymore, so I have to staring at my computer to read the slides on my own. Therefore, my efficiency in class is also extremely low, and I really do not want to see that. Lack of efficiency in class makes me despaired.

3. A few Suggestions: I wish someone could give the guidance of the experiment before we get to start, or at least talk about the requirements of the experiment. What' more, although I know Chinese teaching will be much better, I'm afraid you can't do that, so I sincerely wish you could explain the key points more clearly and slowly. I would appreciate it if you could review the key points of last lecture before the new one. Also, I think leaving some basic exercises for theoretical knowledge may be helpful to me.

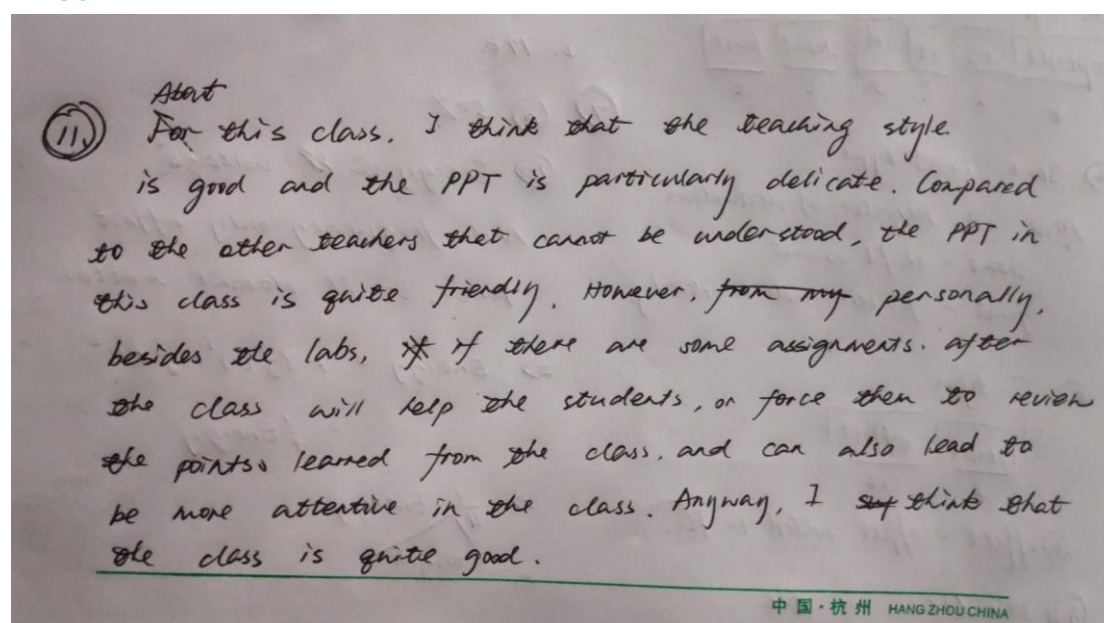
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I am very happy to meet such an interesting teacher as Bu Kai in the class of computer architecture. This course is a very important course for me this semester. I also encountered some obstacles in the course taught in English. I couldn't keep up with the lecture sometimes, probably because my English was not good enough. I think classroom interaction is very important. I also want to participate in it, but sometimes it is embarrassing to be selected but unable to answer. I hope the teacher can speak more clearly in class, and it is very effective to slow down the speed of speech in some important parts of the slides. In the end, I am full of enthusiasm for this course and I really enjoy it.

37

I have ever tried to concentrated on the class. However, I'm poor at English, and I'm often hard to understand the meaning that the teacher want to express in class. Additionally, I think that the teacher's voice is flat, making students like me easy fall asleep in class. It makes more and more difficult for weak academic-ability students like me to gain more knowledge in class, but doze off. Thanks.

38



39

i am quite satisfied with the class now. the only suggestion i have is that please add a little bit more detail into the slice of experiment instruction, if possible of course.

40

11. I think this class is fine so far, but I do have some things to complain. Personally speaking, I don't like chat in the qq group, sometime makes me miss the important message. I also think that it's hard to get answer about labs since we don't have a TA.

11. ~~For~~

First of all, I'm glad to be remembered by you. I really enjoy your classes and I'm impressed with your humor in QQ group. Also, it's great fun to chat with Kaige in QQ group.

Then, I have to say sorry for bringing trouble when 'staring' at my computer. Actually, I listened to you most of the time. However, because of my poor English, it's hard for me to catch up with your English words. ~~Thus~~, sometimes. Thus, I will try to learn the part I can't understand by looking for the information ^{of the part} on the textbook. or try to understand the last slide. But it will leads to a problem that I will pay less attention to the rest of the class.

In a word, I think I should improve my English listening ability and focus on the slides.

Thanks for reading these Chenglish ^{sentences} ~~words~~! ~ ~
Best wishes!

42

First I have to say sorry for my sometimes distraction and low-voice talking in the class. I will correct later. And here are my opinions.

Try to more English-Chinese combined

- Although we are all good at English, although we actually experienced other full-English lessons, most of us still not used to full-English teaching. Long-time English listening is boring for me, lead to low attendance.
- English teaching combined with Chinese deeper explanation can reinforce our remembering. And I think it will not waste too much time.

Raise questions more gracefully

- Always, there are situations that we cannot answer the question you raised.
- Of course we often distract and you want to reminded us to listen more carefully, but I think it is a bit sudden, make student somewhat awkward. Maybe more hints when asking? or informing beforehand "I will raise question soon".

Important info Post on QQ-group 公告

- Important info means those about the lesson
- I pretty like the atmosphere in QQ-group and talking is very fun. However important information will quickly flow away when we are watering. There may be some difficulty when we looking for the detail of the info you posted just now.

Thanks for listening so much from us students and I think you are a good teacher and will be better.

43

Thank you brother kai. I am very moved when reading this question. ↵

I feel comfortable in theory class because I don't have any problem in understanding your oral English. But I have to be true that I can't make myself concentrate on the slide all the time, especially I stayed up very late last night. Also, when we meet some difficult points, explained in English may be harder to understand than in Chinese. ↵

In experiment class, I feel very confused. Exploring by ourselves may be too difficult. Even we don't know how to start the first step. We have too many class to learn and we have to guess when the lab classroom is open. ↵

I have some suggestions about the class. For the theory class, I hope that brother kai could explain the most important and difficult points in English and also in Chinese. This may help us to understand accurately and quickly. For lab class, I hope we can get some instructions before we start. It may help us more quickly to get start. ↵

Brother kai, I believe you will be the best teacher in our university life. ↵
You are the angel of us, aren't you? ↵