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Contents:

1) **Micron Meeting-October 17 2002, 7:30PM, 171 Durham.**
Come meet and talk to Micron on October 17th. Obtain more information about the Micron organization, and find out about internship and full-time employee openings. Pizza and pop will be served!

2)

What makes a class GOOD?

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The other day, after a long walk from one side of the campus to the other side, thinking about how I could be more effective in getting my students more excited to work harder and learn better, I started to think about what is an ideal class. Wow, it felt and sounded so exciting—but is there such a thing? Would it not be a great opportunity if we all had ideal classes?

Thinking about the ideal class and ideal teaching and ideal students . . . I realized that perhaps asking for ideal is not practical. Perhaps instead of looking for absolutes and ideals we should be striving to be good instructors and students and try to make the best of what we practically have. So the real question is, "What would I expect from a 'good' class?" And, "What make a class good?" One can answer a good instructor; however, a person can be a great instructor for many, just fine to others, and very ineffective for a few. And all of the three types of students would consider that teacher good if he or she has certain traits. We must identify what those traits are. In addition, the same is true for a good student. Good students have certain characteristics. They do not always have the best grades; they do not always perform the best on the tests; however, their attitudes and behaviors make them good students. So we can all agree that to have a good class we need to have good students as well as a good instructor in the same class. Then the additional question will be how to define a good student. Finally, I believe there needs to

be a good working relationship between a good instructor and good students. Without the coherent working relationship, the class will not be effective and the experience will not be called successful. Let us think a little more about the way we would like to define the three elements of a good class. Those three elements are

1. A "good" instructor with the right attitude
2. "Good" students with the right attitudes
3. A good synergy for the whole class

In order to think more effectively, we need to identify what we mean by good. How should we define the characteristics of a good instructor? What do we expect from one who is a good professor? One may think that the instructor should . . .

- Be interested in the subject that they teach
- Be clear and understandable
- Be interested in teaching the subject
- Be interested in making the students excited about learning the subject
- Be exciting and challenging at the same time
- Make every class interesting, practical, and effective so people feel bad for missing

At first glance the list seems too long, but after a little generalization and thinking I came up with the following traits for a good instructor:

- Should know the subject to the level that it can be communicated coherently
- Should be prepared for each class
- Should be interested in the subject and the students' learning of the subject
- Should show expertise in the subject and share it with enthusiasm
- Should be clear on his/her expectations
- Should not be disturbed by the questions and try to answer all of the relevant questions
- Should be patient with the class and give the students time to learn and digest
- Should strive to be challenged by the students and encourage the class to participate with questions and suggestions to make the class better
- Should have an open mind throughout the term and be ready to change approaches to make the students learn more
- Should respect students and try to understand their points of view
- Should make the students look forward to going to class

Then, on the same track, here is what I think a good student should have:

- Should know what is required for the subject (class), and if he/she does not have the right background, should keep trying to build it and not use it as an excuse
- Should be ready for the class; be prepared for the class, read ahead if required, and know what happened in the last class

- Should be interested in the subject and the learning of the subject; even if it is a required class, the student should find something important and interesting to get his/her energy focused on the class
- Should show enthusiasm in the class and give feedback to the professor
- Should be ready to use the expertise of the professor
- Should strive to be challenged to learn more
- Should be open minded to think in new ways and learn things that may not be the most fun at the time
- Should be engaged and ask questions that are appropriate and challenging
- Should be respectful to the professor and other students
- Should show a good attitude that makes the professor and other students look forward to going to class

When I thought about all of the above, I realized that the items are very similar (if not the same). They indicate the same concepts from two different perspectives. A good, effective class is made by actively working on the above items. This effort should be made by both the students and the professor. They should both also work on the effective synergy for the whole class at the same time. The concept of the synergy is realizing and working together according to schedule to achieve what everyone wants from the class, which includes to learn, to excel in the subject, to have a great time learning, and to learn from each other and make great ties and friendships with colleagues that last a lifetime.

Then, if the characteristics for good professors and the students are indeed similar (if not the same), how should we create a good synergy?

I believe that the synergy is achieved by the students-instructor teamwork during each semester via effective communication, exact definition of expectations, and continuous dialog between the students and the professor. The professor should open up the floor to discussions and let the students feel a vital part of the class. The professor should encourage the students to provide their inputs for improving the class a couple of times during the term. He or she should also adjust what can be done to make the class better for the students and in special cases explain why some of the points cannot be implemented. At the same time, the students should try to understand the perspective of the professor and, even if they do not agree with the professor, adjust their styles and habits for maximum learning (not necessarily only for maximum grade) from the particular professor.

I always encourage all my classes to provide input as to how we can make the class more interesting and how to help the student learn better. Many times the students ask me questions that are great and worth detailed answers. Sometime they request things that cannot be implemented. There have been few classes in which the students do not give much input. In those cases I talk about some of the main questions that I have been asked. In this article I would like to share some of the more important questions/requests. I have always enjoyed the students' perspectives and have tried to learn from them. My experience shows that a few important and interesting questions are asked in many classes. I decided to include a few of them in this article. Perhaps they can help the

reader formulate his/her thoughts as to how to make the classes better. Here are four important questions/requests that I have been asked throughout the year 2001–2002 by the students in my electromagnetic class, electronics class, and the first class of electrical engineering.

1. Perhaps you should not teach us so many things so fast—focus on a few and make sure we understand them.
2. Give us more realistic problems and applications that would make us learn better.
3. Have questions on the tests that are similar to the homework and the examples of the book or the lectures.
4. Do more examples in the class—I learn by doing examples.

Following are a few of my replies to these requests.

Number 1: Perhaps you should not teach us so many things so fast—focus on a few and make sure we understand them.

I agree that by covering less material we can focus on fewer items and learn them better. For that reason we could only teach one item from many different angles and learn that as well as we can. However, in a learner-centric environment (which is what universities are), students take the responsibility of most of the learning. The instructor's role is to introduce the concepts, give meaningful and understandable examples about the concepts, and let the students go ahead to experiment and discover valued details of the concepts and learn more on their own. By slowing the lectures so we can all learn it well we will cover less, challenge each other less, and miss the whole power of the learner-centric environment. In fact, there is nothing easier than working numerous similar examples and not pushing myself or the students to learn more concepts and learn them faster.

The practical life of an engineer, as strange as it may sound, is dealing with concepts that are not necessarily fully or well understood at the beginning. Engineers are expected to learn what they need to and build their knowledge based of the fundamentals that they know. In addition, the engineers are expected to work on multiple projects at the same time and deliver them according to demanding schedules. When do we start training for such an environment? I believe it starts from the first class of engineering in the university.

Number 2: Give us more realistic problems and applications that would make us learn better.

I think all of our engineering classes should show numerous realistic applications. However, doing too much would not be practical. This is especially true for more conceptual classes. For example, in introductory or intermediate electromagnetism (or control) realistic issues are much more complicated than any of the problems that we are dealing with at any time during the class. In fact, the realistic and practical problems are either too complicated for the time of the class (or even for the whole term) or they are solved with a practical approach since engineers only need to do a shortcut to get an

approximate answer rather than find the detail. Consequently, due to the difficulty of the problem, shortcuts may be adopted and the effective nature of the practical problem as an educational tool will be reduced. The latter approach (with shortcuts) is fun and we should do it occasionally but not too much, and the former (the large, complicated, multifaceted problem) is not reasonable for a semester. In my opinion, we should talk about practical issues and help the students develop a good appreciation of the issues. However, we should make sure that we learn the basic concepts and approaches and not get too involved in such practical problems. We should use the practical cases to give us more exciting reasons to learn the concepts and tools that are being taught.

Finally, many of the books such as the one for EE201 and EE213 have many practical, realistic issues in them. Those are there for the students to read and learn. However, many of the students (even those who ask great questions like number two) do not think they have time to read those pages of the book, because their time is limited and they need to do the homework to make sure they do well in the class.

Number 3: Have questions on the tests that are similar to the homework and the examples of the book or the lectures.

I have always loved this request. I have always been accused of having problems on the tests that are not like the ones on the homework. When the students see the solutions to the tests, they agree that the concepts are the same as the homework and the examples. Somehow, in our current educational environment, we are trained to do homework (to get the right answers regardless of our understanding of the subject) and make sure that we have a good collection of examples, homework solutions, etc. Then in the tests we can just compare what we have in our collection of examples to the test problems and imitate the solutions. I admit that is very tempting. But, I also guarantee that such an approach is not a good educational achievement. Despite the fact that such a practice will make the students' lives as well as the professors' lives much easier, it will not teach those students to be independent thinkers and creative engineers. Such tests will test their powers of recitation and imitation, but not their understanding of the concepts and fundamentals. I suppose that would be great for some method classes, but not for thinking classes; I really hope that all classes are thinking classes.

So I suggest that each student look at the homework problems and understand the concept behind each of them. Then the class should review the examples in the text, as well as the lecture for the same information. When the concepts are known, the students can practice with problems that they create by themselves or find in reference material. They can also get together with their classmates and try brainstorming to learn better. They should pretend that they are to create a test for the class and figure out what are the important items in the class? As students, they either know what the instructor wants (that comes from good communication) or are off in that judgment, but in either case they can benefit from the practice. This is a part of being a good student—challenging themselves and working together to be an active partner in their own education.

Finally, Number 4: Do more examples in the class—I learn by doing examples.

This is closely related to all of the other questions. One can think about a class that is all taught by examples. That is a great way to do many classes; however, we should remember that the examples are to emphasize concepts and approaches. In concept classes such as electromagnetics, few examples would be better than too many. Too many examples can be confusing for the students. The students may get confused with many mathematical steps and may get an impression that knowing how to do all of them without understanding the few common concepts is the way to do it. I always do a few examples and put a few more on the Web; many of the students utilize other books and sometime special problem-solver books to have more examples. After all is said and done, those who understand the concepts do well and those who are confused about the concepts, regardless of how many examples they have seen, will not do as well. My experience shows that providing many examples will result in less favorable behavior of the students on tests.

In the final analysis, the major keys for having a good class are the attitudes of the professors and the students. We need to have the desire to be engaged, be challenged, and work together to make the whole experience better. Having good students and good professors without a good synergy is not as effective, either. When there is a good dialog between the professor and the students, the whole experience will engage our curiosities, and we will challenge ourselves and learn the most. I believe that we learn better and more effectively under pressure, so too easy of a paste will not be that conductive. Traditionally, ISU students have been known to be tough students, workers with great ethics, and ready to face the hardest problems. This has been achieved by many hard working students, challenging professors, and effective classes that were worthwhile for both the students and the professors. To be on the top requires great efforts on the professors' and students' parts, as well as a constructive synergy between them. I hope you are all engaged and are ready to be challenged, and remember that WE together make classes good—it starts with us, and it shapes according to our passions and efforts. Let us all work together to keep high standards for our education and create a challenging environment worthy of our time and effort. If we work together and help each other as a team we can make a unique education environment that will serve us all for a lifetime. May all the great synergy of our efforts create great classes for all of us. We all need to keep on keeping on!

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3) If you have any suggestions for IEEE for the Spring 2003 semester, please contact President Tyson Benson at bensont@iastate.edu. We are looking ideas to make the IEEE more beneficial to you!