Discrete Mathematics
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Lecture - 01
Course Introduction

Hello everyone, I am Sourav Chakraborty, and welcome to the course of discrete mathematics, this is the first lecture video and I will be focusing on the introduction to the discrete mathematics.

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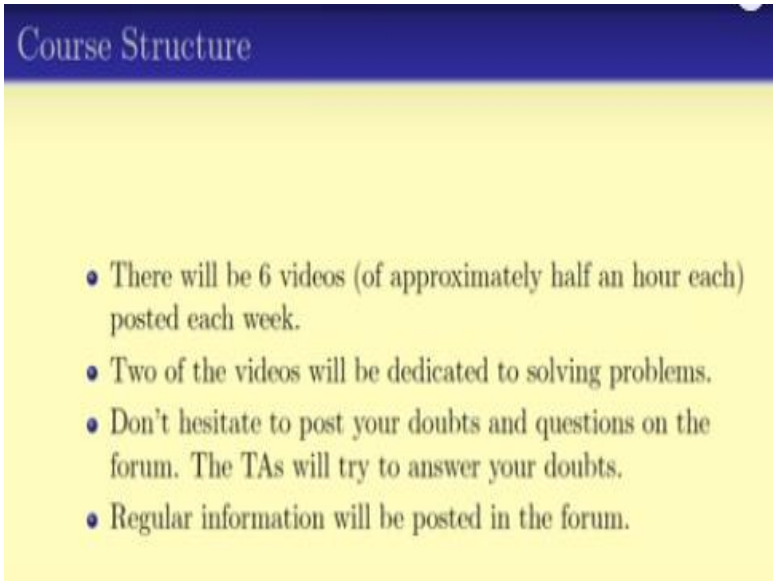

To start with, let us start with the course structure I will be uploading around 6 videos per week of approximately half an hour each, 2 of the video will be dedicated to problem solving only. the remaining 4 will be lecture videos. You should not hesitate at all to post your doubts or ask questions in the forum. We have TA's for this course who will be always there to help you out with your doubts. Regular information will be posted in the forum also.

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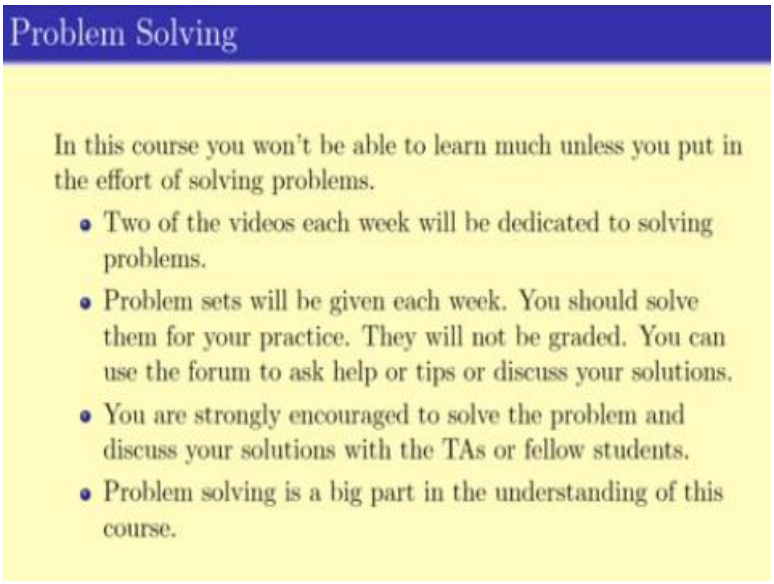

Now this course is a lot about problem solving unless you do a lot of problem solving you will not be able to make much progress in this course of discrete maths. As I told you earlier, two of the videos each week will be dedicated to problem solving. Other than that also there will be problem sets that will be assigned each week, you should take them for practice. You do not have to submit them; they will not be credit.

You should use the forum to ask for help or tips for solving the problems and also to discuss your solutions, once you get them. Also these set of problems that will be assigned every week will not be credit, you are strongly encouraged to solve the problem and discuss your solutions with the TA's and fellow students. I reiterate it again problem solving is a big part in the understanding of this course.

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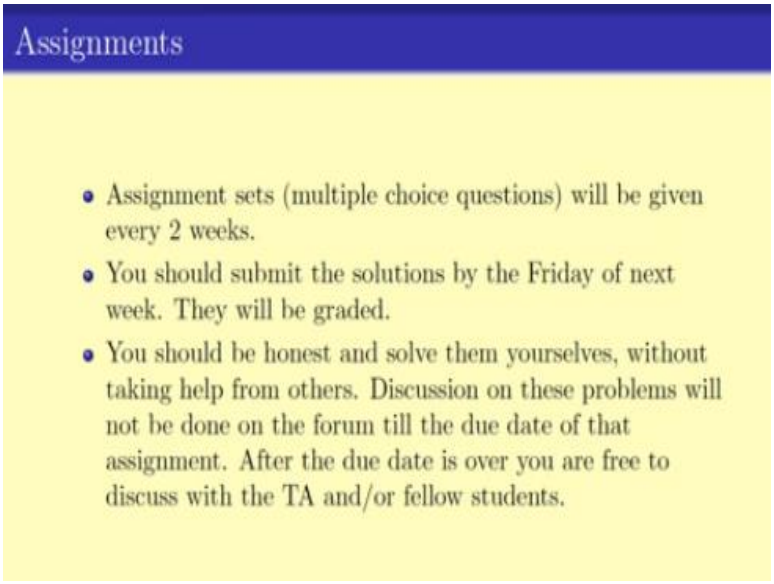

Other than the problem said, assignment will also be given every 2 weeks. There be mostly multiple choice questions, you should solve them and submit them by the Friday of the next week. They will be credit, you should be honest and solve them yourselves without talking the help of others. This is for your own good. Discussions on this problem will not be allowed on the forum till the due date of the assignment.

After the due date, of course the TA's will discuss the solutions of the problem.

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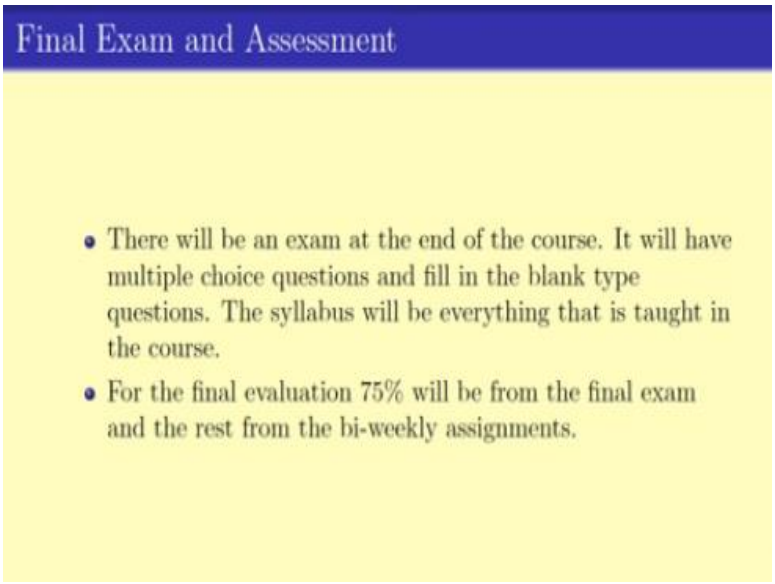

There will be a final exam at the end of the course, the syllabus will be everything that is taught in the course. It will also be multiple choice question or fill in the blank type questions. For the

final evaluation, 75% of the codes will be taken from the final evolution and the rest, that is the 25% will be taken from the biweekly assignments.

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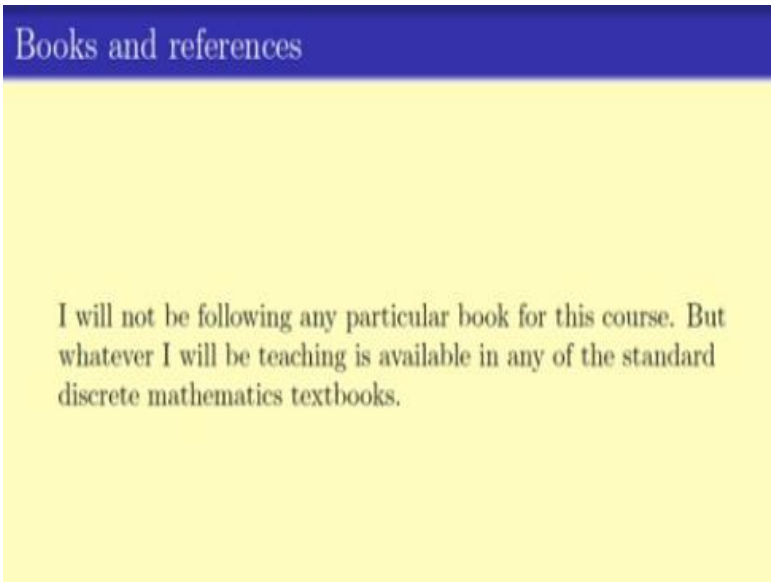

Regarding the books and references that will be used in this course, I will not be following any particular book for this course, but the number of good books that are available in the market, you can pick any one of them whatever is being taught here should be available in any standard textbook. The TA's can help you out with some specific names of books if required.

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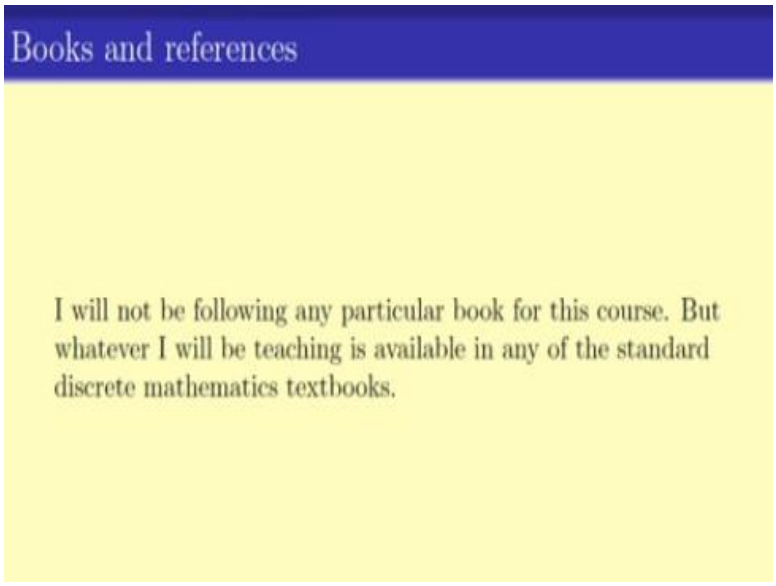

Now this brings us to the end of the setup for this course. If you have any doubts regarding the setup of this course, feel free to ask in the forum, now let us start with the main course itself,

before we begin one of the first things that should come to your mind are some important questions about this course.

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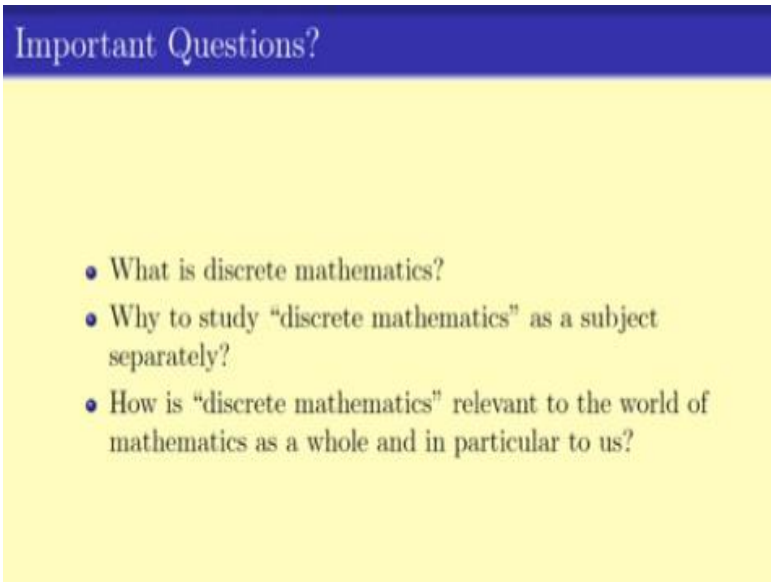

In particular, what is discrete mathematics? It is not a very well-defined object, there is hardly much understanding of what should comprise of discrete mathematics and hence this is a very natural question to ask. There are more questions that one can ask or one should ask. For example, why should discrete mathematics as a subject we studied separately and thirdly how is discrete mathematics relevant to the world of mathematics as a whole and in particularly to us.

So I will be answering these 3 questions in the next few slides.

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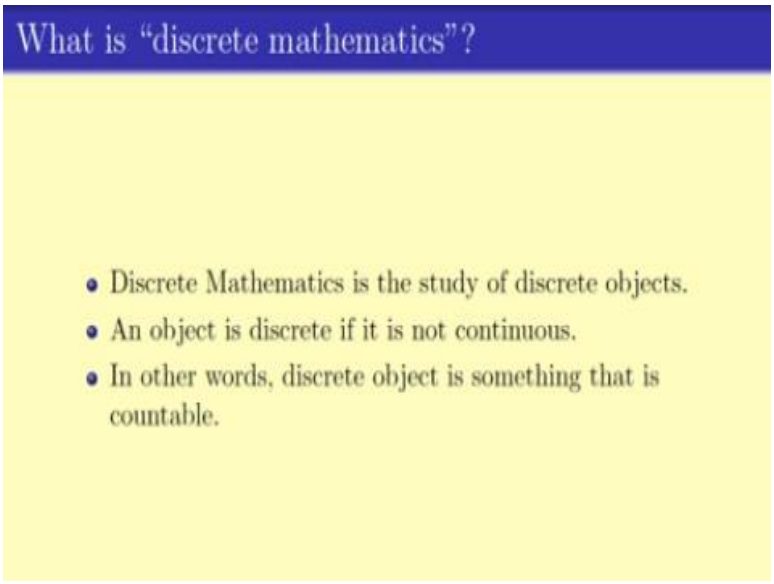

To start with, what is discrete mathematics? So discrete mathematics is the study of discrete objects, that is a pretty simple answer to the question though it does not eliminate too much information. So the question is that what a discrete object? So an object is discrete if is not continuous, again it is like answer that is vague enough. Do we have a slightly bit more understanding of what a discrete object is?

Yes, a pretty good answer to this question is discrete mathematics is something that is countable, something that is you can count like the first, second, third, fourth, fifth and so on.

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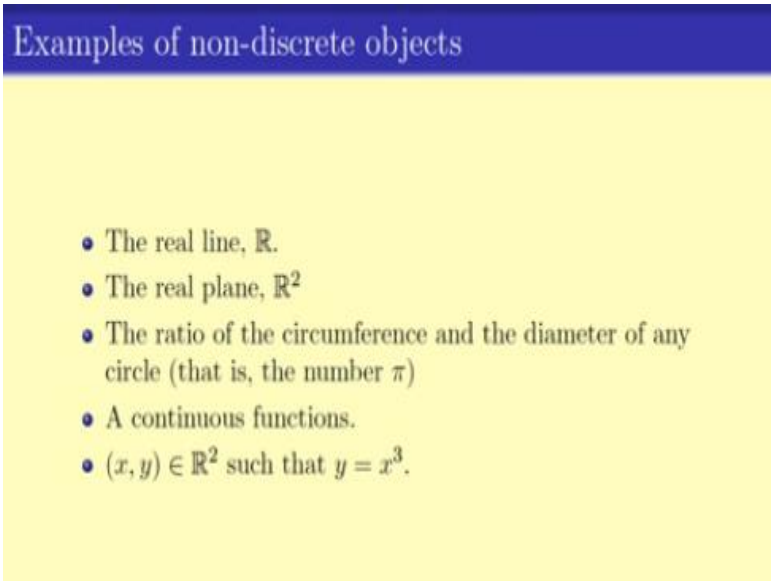

Let us see some examples of objects that are not discrete, one such example is the real line, real line many all the numbers starting from - infinity to + infinity. The set of real numbers from a continuous spectrum and hence it is not a discrete object. Similarly, a real plane, the plane of R2 is a continuous object. The number pi that is the ratio of the circumference and diameter of any circle is not a discrete object.

Now why is it so? The reason is that the number pi cannot be expressed concisely. There is no pattern to the digits of the number pi. In other words, the number pi is a transcendental number, so it is not discrete object. Another example of not discrete objects, the continuous function for a number of function of the form y equal to x cube. These are not discrete objects.

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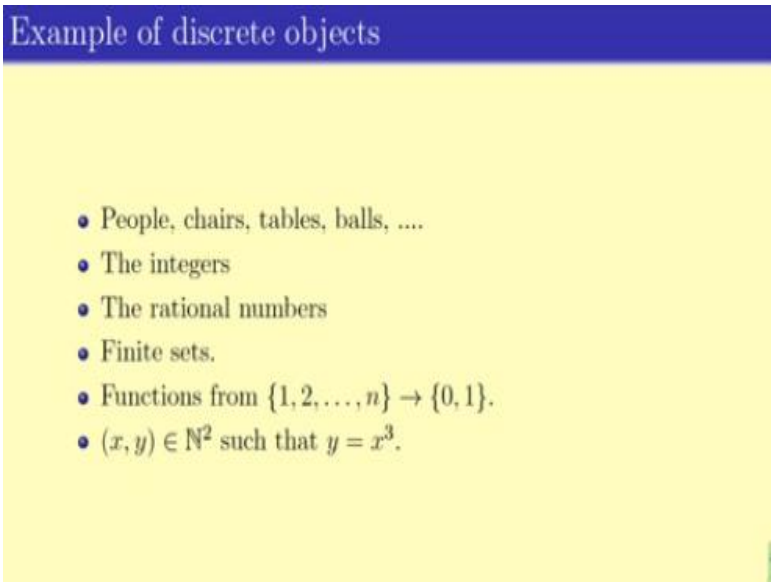

Now what are the discrete objects? Things that we see around us objects like people, chairs, tables, balls etc., they are discrete objects. The integers that is 1,2,3,4,5 or 0 - 1, - 2, - 3, - 4, they are discrete objects, they countable. The rational numbers like 2 by 3, 11 by 49, 23 by 108, they are also countable objects. They can be written up like a fashion of 2 integers. So they are also discrete objects. Any finite set is the discrete object.

Functions from the set 1 to n to 0, 1 is a discrete object. Even the function of the form Y equals to X cube, were both X and Y are from the natural numbers, all are discrete objects. So this gives us some understanding of what discrete objects are.

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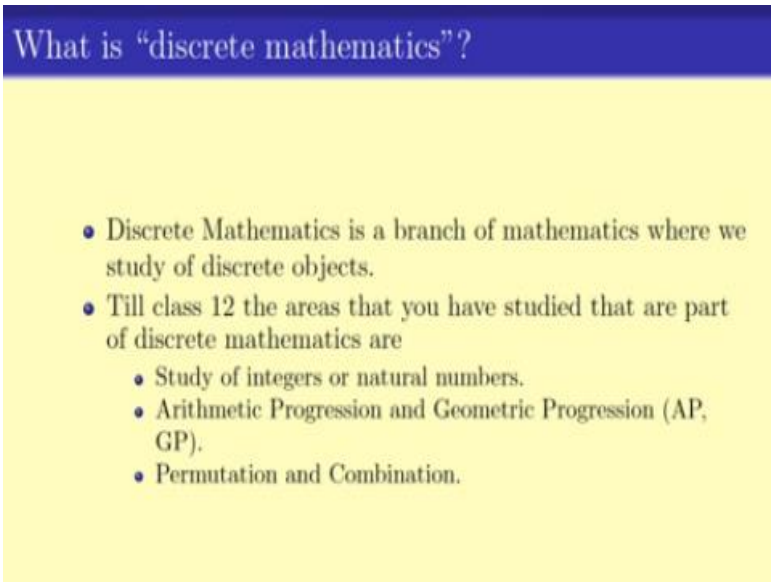

And now to go back to the question of what is discrete mathematics, again discrete mathematics the branch of mathematics where we study discrete objects. So till the class twelve, you have done a number of subjection math out of which subjects like study of integers and natural numbers, arithmetic progression, geometric progression, etc. Permutation and combination, all these comprises of subjects related to discrete mathematics.

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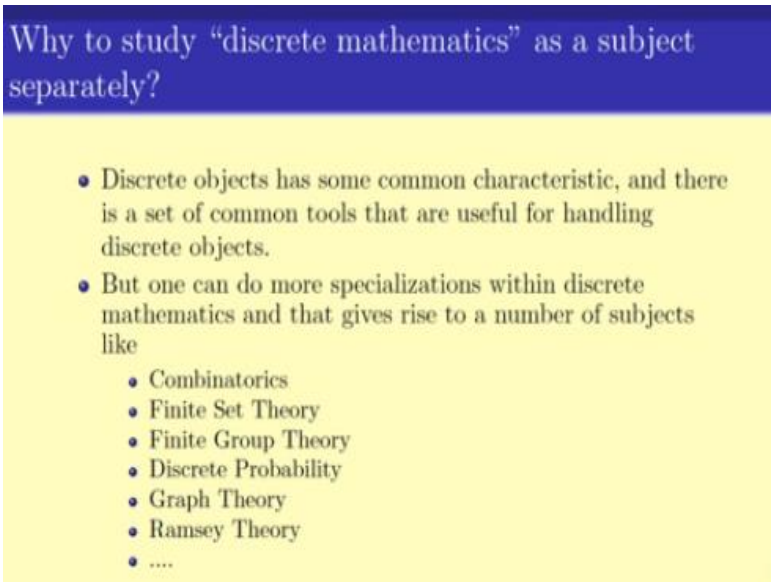

Now to the - let us go to the next most important question, why to study discrete mathematics as a separate subject? The reason being that discrete objects have some common characteristics and hence a set of common tools that are useful for handling these objects has been developed. So in

this subject, we study this set of tools. So in this subject of discrete mathematics, we study this general set of tools. This general set of tools are very handy.

Depending upon some more properties of the discrete objects, the tools can be revised can be made better and this gives rise to a number of different subjects which are much more focused. For example, combinatorics, finite set theory, finite book theory, discrete probability, graph theory, Ramsey theory and the list goes on. These all subjects that are special cases of the discrete mathematics as a subject.

That is in other words, in discrete mathematics, we take a high level view all of these subject and more.

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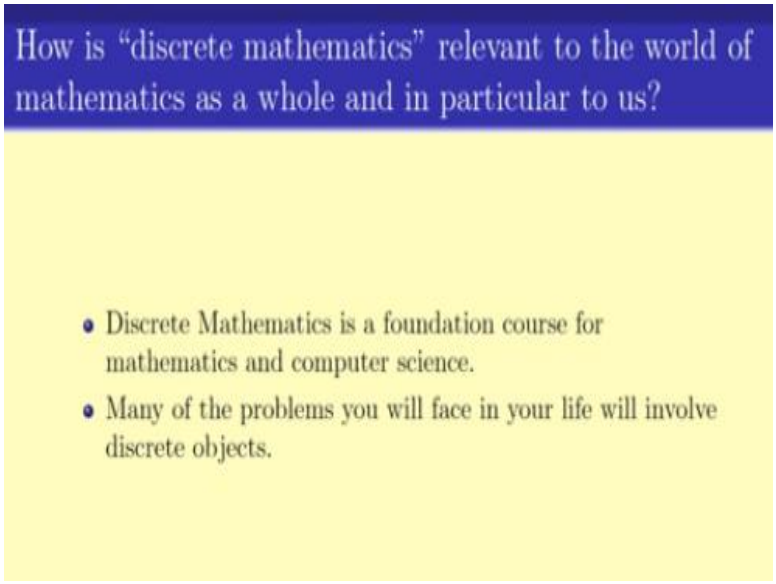

The third question is how is discrete math relevant to the world of mathematics as the whole and particular to us. I hope I will be able to explain this question better by the end of the course but for now believe me that discrete mathematics is a very foundational course for mathematics and computer science and many of the problem that you face in your life or you see in mathematics are about discrete objects.

And hence discrete mathematics is a big part of mathematics as well as your life.

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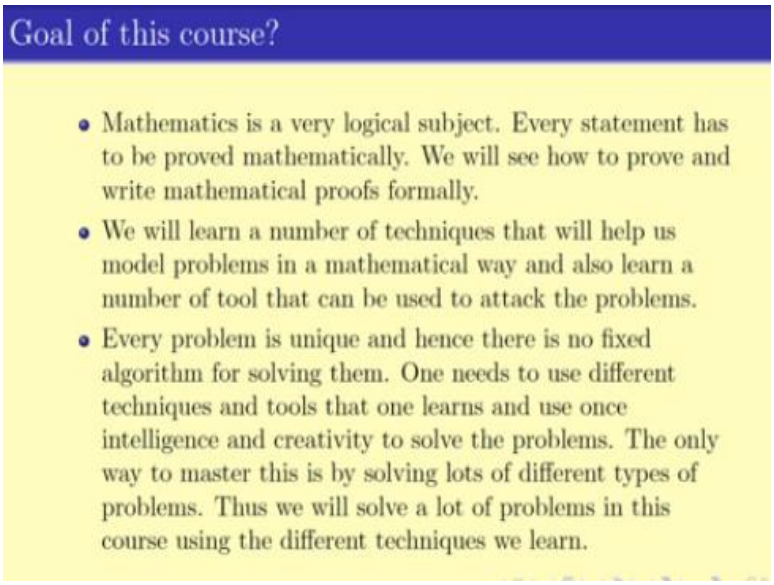

Now what you expect or what do I expect from this course? So the goal of this course is to understand mathematics. First of all, mathematics is a very logical subject. Every statement of mathematics has to be proved logically, has to be proved formally. So in this subject, we will learn how to give formal mathematical proofs that is the first and foremost goal of this course. We will learn techniques that will help us model problems in the mathematical way.

And also learn a number of tools that can be used to attack the problems. Now having said all these, one should realize that every problem in mathematics is an unique problem and hence every problem demands a new creative idea. We will be teaching you a number of tools and techniques to handle these problems, but at the end of day, for solving individual problems you will need to understand how to apply these tools and techniques for that specific problem.

This thing requires a lot of creativity and the only way, you can develop this creativity is by practicing a lot. Hence, we will be solving a lot of problems in this course using different techniques that we learn. In other words, in this course, we will see how to attack the problem how to use various techniques and tools to solve the problem and how to write a mathematically formal proof for this problem.

This brings us to the end of our first lecture video. This is a just an overview of what is going to come for the rest of the lectures.

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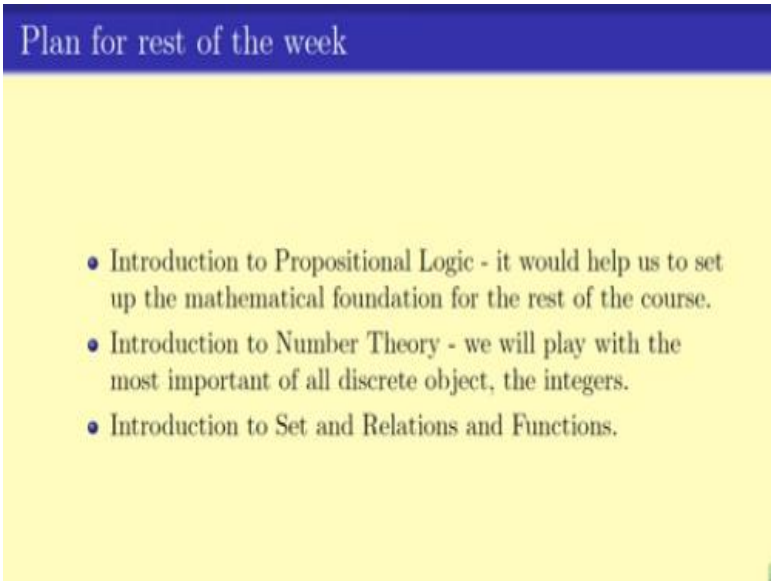

In the rest of the week, I will be talking about propositional logic sets, relations and functions and number theory. Thank you.