**Symbolic Logic**
Prof. Chhanda Chakraborti
Department of Humanities and Social Sciences
Indian Institute of Technology, Kharagpur

Lecture - 35
Validity and Invalidity of Syllogisms
Testing by Venn Diagrams

Hello, we are here module 35, of the symbolic logic course. How are you doing today and we about to finish this categorical logical that we started some 3, 4 modules back. So, today's module is going to be end of that categorical logical discussion. We have look into syllogisms in the last module and today we said we are going to look into.
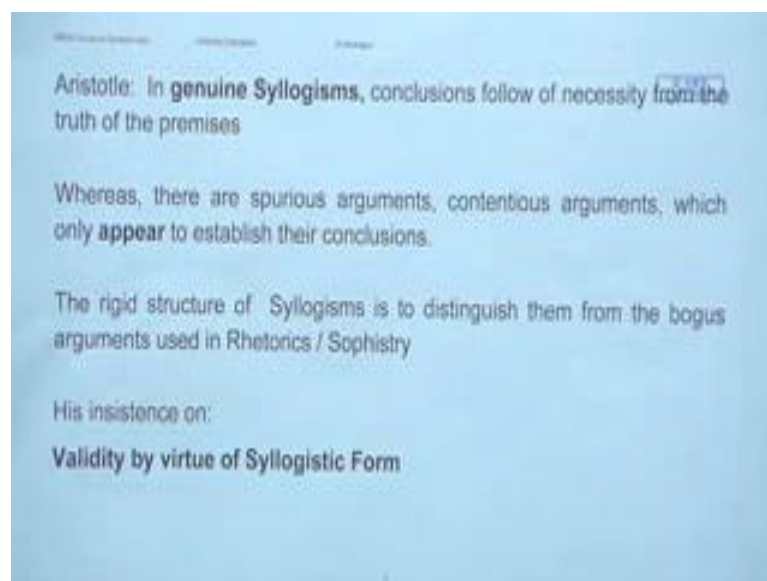
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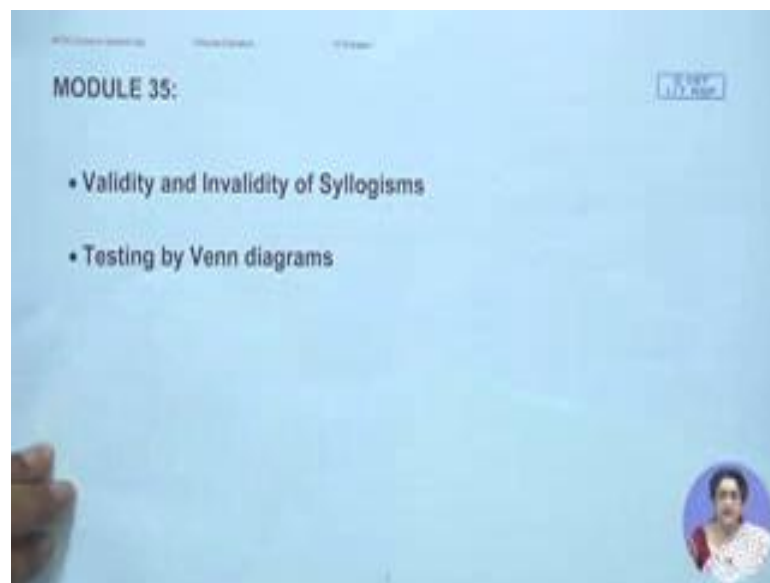
Who to establish the validity and invalidity of syllogisms and we will take a look into a brief glance into how it use to be done traditionally by conventional Aristotelian logic. But that is not the route we are going to follow so, but a brief to that and then we will move into what would be our way testing the validity and invalidity of syllogisms and that is going to be the last topic for today namely, how to test the syllogisms by Venn diagrams.

So, we are going to bring Venn diagram once more and show you how you can actually demonstrate the validity or invalidity of syllogisms by the Venn diagrams all right. So, that is going to be on our agenda for today's module see when I have told you already that you know there is a reason why I was, particular about the structure of the syllogisms you saw the formal requirements I mean that it has be this it has to that. So, many terms and. So, many places and position and. So, on the reason is that he was concern was to distinguish between the genuine arguments and the spurious one's in his time public speaker were all around they used to be call the restorations or the Oreators. So, people would be just listening to them, but at the same time it was felt especial by scholar like Aristotle that there has to be some criteria by which, we can tell that the reasoning of this kind is not acceptable and the reasoning of that kind is acceptable, so in a way.

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Aristotle: In **genuine Syllogisms**, conclusions follow of necessity from the truth of the premises

Whereas, there are spurious arguments, contentious arguments, which only **appear** to establish their conclusions.

The rigid structure of Syllogisms is to distinguish them from the bogus arguments used in Rhetorics / Sophistry

His insistence on:

Validity by virtue of Syllogistic Form

What we are looking is that that there has to be certain genuine pieces of argumentation, which we would call the syllogisms and where the conclusion would follow of necessity from the premises and then there would be the spurious kind of argument, where seemingly everything would be in place and apparent there would be some convincing argument is issue going on, but actually logically speaking they are all worth less.

So, the whole point was how to separate this seemingly acceptable one's from the actually acceptable once. So, the rigid structure of the syllogisms sort of gives us a clue how to have that distinction made this is how we landed into notion of formal requirements for an argument and formal validity, formal invalidity, because he is going to talk about validity of the syllogisms is a matter of the form the argument form it is nothing to do with subject matter it has nothing to do with what the syllogisms are about. So, this is how he went towards the syllogistic form. Now if you look into the traditional way they use to compute the validity of syllogisms then, you will have an idea about what I am talking about see they use to the Aristotle and Aristotelians.

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Use to determine syllogistic validity and invalidity in terms of two things namely； mood of the syllogism and the figure of the syllogism mood here does not mean the emotional state of the syllogisms mood. Here would mean the type of the standard form categorical proposition that the syllogism miss made of for example, take a look into this syllogism all subscribers are persons，who are listed no person who are listed are tax evaders. Therefore, no tax evaders are subscribers you have an a proposition followed by e proposition two premises and the conclusion is the e and this is going to be the mood of the syllogism this sequence AEE, that is the mood of the syllogism all right.

So, this what they call the mood of the syllogism the kind of categorical proposition that syllogism is made off right as you can see does not matter what content, we are talking about we are talking about the kind of categorical proposition that the syllogism is made off. Similarly the figure when we say the figure we actually mean a shape.

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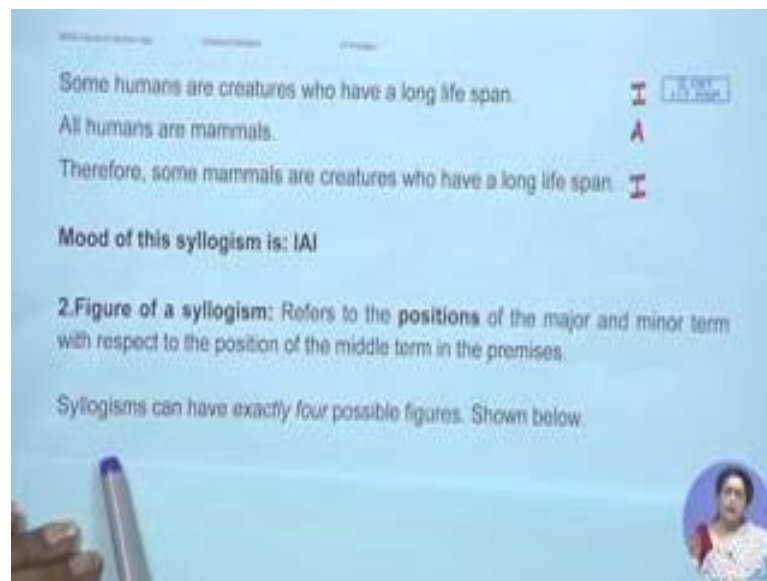
And the shape is rather an interesting proposition here is another just I keep an example for you to see the mood, this is the second syllogism some humans are creatures. Who have a long life span all humans are mammals. Therefore, some mammals are creatures who have a long life span IAI and the mood is also IAI. Lets come to figure as I was saying the figure refers to the position of the terms in the syllogism terms here would mean the major, minor and the middle term right now, there can be only, so, many configuration of this terms within the premises not including the conclusion, but in the premises where are this major minor and middle term located. So, accordingly they figure out that there is going to be only four possible figures just take a look and I will show you.
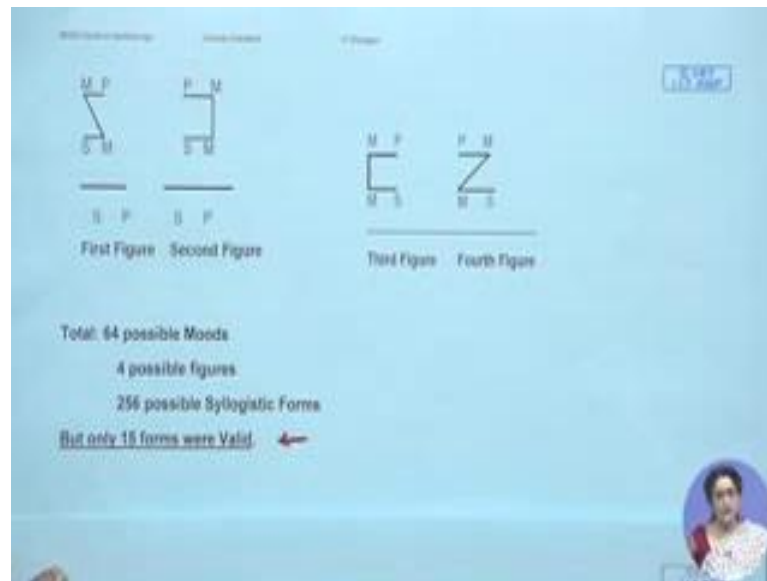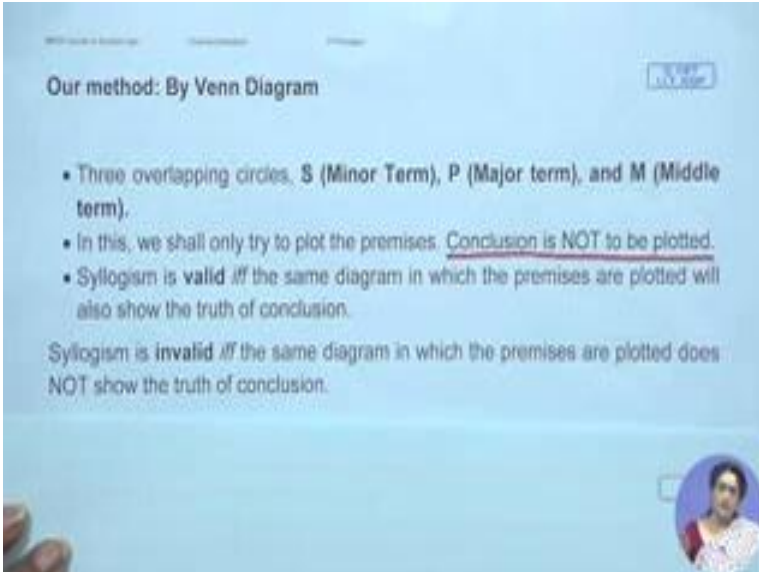
So, here is for example, the black line here; for example, this refers to the positioning of the major minor and the middle term major is p, minor is s and the middle term is m. So, here is the inverted z this is one kind of possibility that you can see where the terms are located in the premises.

This is second possibility. So, you see this is major term then come middle and then minor. So, you have sort of like a end bracket and this is the third figure, third possibility, that you have almost like the first or the opening bracket and here is the z figure that is 4. So, 4 possibility and then that they call it the first figure the second figure the third figure and the fourth figure. All right now, this are the possible positions in which the terms can be remember there is also the mood. Now if you this combine all of this. So, you have four possible figures and then there are. So, many therefore, categorical propositions there are. So, many kinds are possible permutation and combination possible. So, there are 64 possible moods and four possible figures that gives you total, 256 possible syllogistic forms that is totality, now out of that how many are valid and this is where the logicians, where really went into great details using this mood figure and distribution of the terms they had a very different kind of the scheme to come up with this kind of conclusion that only 15 out of this totality is are actually valid and they demonstrated that.

So, only 15 forms now as you can see this is pretty complicated this is very different kind of approach to validity involved, but they it was a very formal one not even once they refer to the content of the syllogism. Now we are not going to go this way we are not going to use the mood and the figure and distribution and so on.

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Our method is going to be as you know earlier also we have try to do this is by the Venn diagram. So, what we are going to do is take three overlapping circles why three because; there is going to be three separate terms in the syllogism namely the minor the major and the middle term. So, s p and m we will take an each circle would be dedicated for each of this term three overlapping circles within the universe of disperse without universe of disperse, I told you the Venn diagram does not make any sense now in this figure what we try to do is to only try to plug the premises I do not know how many time I need to repeat this, but al I that and I will say this that we shall only try to plot the premises we are not going to plot the conclusion please take it down, if necessary that conclusion is not to be plotted in this diagram only you plot the premises in this 3 overlapping circle.

Now, what is the idea the idea is that, if it is valid you know it is a deductive arguments, if it is valid the truth of the conclusion will be content within the premises. So, if you

plot the premises if, the syllogism is valid then the same diagram will show the conclusion. Truth also; obviously it is an, if and only if or if the same diagram shows the conclusion truth; obviously, then the syllogism must be valid otherwise it is invalid. So, once more our mood is that we are going to do a Venn diagram of three overlapping circles within universe of discourse. Where we only try to plot the premises and not the conclusion, if by plotting the premises there by we also show the truth of the conclusion we know that the syllogism got to be valid if it does not show the truth of the conclusion, as you will be able to see then syllogism is invalid. So, this is we are going to work with the Venn diagram and demonstration of the syllogistic validity or invalidity.

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Now, let is gets with a three overlapping circle diagrams, see this is your u d that has to be there and then in that we have drawn three overlapping circles a s p m, it would be worthwhile to sit down and sort of fill this round by yourself to see which area represent what. So, as you can see this is an area within the u d which is s bar p bar m bar. So, s p m has no presence here, but it is within your purview or the universe of discourse.

This on the other hand where, you have p, but you do not any s or m this is an area where you have m, but you do not have s or p this is where s you do not have p and m. Now this is where you have s and p, but you do not have m this is where you have s and m, but no

p take a look and this is the only area this is the only s p m area where all three are present.

So, this is how we are going to read the regions and this is an example that we will try to work in, but again I suggest that, you try to draw on your own and try to demark it the area what classes it represent that would be a hand on exercises for you just get acquainted with this kind of diagram. So, we take an actual example of the syllogism and we will try to represent it by using the Venn diagram in the second. So, no star is a planet no asteroid is a star all right. So, this is where we see that this got to be the middle term because, it is present twice and this is your major term this is your minor term. So, s p and m all are marked here now we go and we try to plot this together.

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So, here is your syllogism once more and first of all draw a rectangular box which is your u d right, and then inside you put your this three overlapping circles now you have a choice you can call them s p m or you can just label it like, asteroids planets and stars.

Now, what is to be done what is to be done is that we go by the premises, we take the first premises which is the major premises no star is a planet let see no star is the planet which are the class involve the stars and planets and this says the star planet intersection

area got to be empty. So, this is your area star planet has to be empty we shaded it in front of you maybe I can do that will just try to shape that. So, this is what the first one says right the second one says, no asteroid is a star which class asteroids and stars and it says the intersection area is got to be empty or shaded fine. So, we will do that. So, now we have this remember we said we are not going to plot the conclusion. So, we are not plotting this, but what does it say asteroid is a planet no asteroid is a planet which means asteroid planet intersection, got to be empty or shaded asteroid and planets. Let see what is the intersection area this is it totally shaded no only half of it is shaded what is that mean, it means that even after we have plotted the entire premises set there is still an area remaining un shaded.

Therefore the truth of the conclusion is not shown in the diagram did you see that this says no asteroid is the planet, if it had been shown the whole area would had been shaded out by just plotting the premises right. But that is not shown here therefore, we have not really establish that no asteroid is the planet correct the note we have not shown that and you need to indicate which area does not show that this is the area there is an area of asteroid planet which is still not empty it is not shaded it is not empty. Therefore, this syllogism is invalid we plot it the premises by plotting the premises it is expect if it is valid syllogism all conclusion, it will be automatically demonstrated that has not been done and. In fact, there is a whole lot of area that is open that should have been shaded that shows that, we have not able to establish the truth of the conclusion hence the syllogism is invalid right. So, this is how we are going to go about it and this is if you have a problem understanding it go slowly over what I have said and look at the picture and try to read, now this reading would depend upon how good you were when I explained the A E I O plotting with the Venn diagram you know.

So, if you have understand that part than this is not at all a problem other I suggest you to go back and take a look into the area your Venn diagram a little bit because that that learning is being implemented here. So, if you are not strong there than this is this is where you going to have trouble too, but I hope that should be not a problem for anyone the area you has a very clear sort of Venn diagrammatic represent and that is what we are doing right now.

So, here is the other example and we are try it together see this says all contributors for the charity event are successful industrialists and then minor premises, no successful industrialist are lazy persons all right. Therefore, no lazy person are contributors for the charity event right this we are going to now plot which ones to plot the premises and we are going to have as Venn diagrammatic presence with all three terms this is your middle term this is your major term and this is your minor term. So, you can do it I mean just for your sake I will try to do it in two steps.

So, that you see how it been done the first one first of all the rectangular box then, place the circle within and call them s p m or successful industrialist the labeling must be done take the first all contributors for the charity event which is p all p's are m fine all p are ms which two classes, p and the m class remember all p's are ms means; if you go back to your a Venn diagram then you will see all p's are m means there is the whole p area which is not m is empty. So, we shade this area right p, but not m area is empty correct this is what we capture same in the same picture I have done it in two steps, you do not have to do it in two steps I am just showing you because, we are beginners here and some of you might be a little bit taking time to understand this. So, here is this picture for the first premise the second premise and the same picture you plot it no successful

industrialist are lazy person. So, we are talking about this is your m and this is your s and no m are s this two circles will have to be seen.

So, no m are s according to this premise we shade this area m s intersection area is now shaded. Now what is the conclusion the conclusion says no s is p already. So, s and p are here and if it is true that no s are p what happen the s p area will be automatically shaded has that happen the answer is yes, just by plotting the premises here what you have done is to shade out this area the s p area you have declared as empty all right. Did you see that that establish the truth of the conclusion automatically therefore, you have shown by plotting the premises the truth of the conclusion hence, what happen to syllogism the syllogism is valid get it I think you are getting a better picture now and slowly I think you are coming to terms with. So, this is how you establish the validity of syllogism.

More examples see when you have. So, far what we have seen is that we had all universal proposition in our premise and conclusion now it may happen, that in the premises you have a mixture. So, there are some universal one them as universal and one of this particular.

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When that happens what to do the answer is always plot the universal first because universal indicate there are some empty areas, unpopulated areas and the particular shows, where there are people populated areas non empty areas. So, you want to indicate first the empty areas. So, that your population does not into an empty area. So, this how we will go by this is the syllogism which says all alligator are reptiles some alligator are creatures that live in Florida's wetlands. So, some creatures that live in Florida's wetlands are reptiles can you recognize the middle term the middle term is this alligators, right and this is you, this is whole thing is your minor term and this is your major term fine.

So, now, you are going to show how to do this is the picture once more reminding you to draw the universal discourse and all alligator are reptiles. So, this is alligator this is reptiles. So, all alligators which are not reptiles that class becomes empty can you see the shading, if not we will draw it like. So, this is where it goes and then some alligators are creatures that, live in Florida's wetlands and some alligators and creatures live in Florida's wetlands that, there you want some population see this x represents that because, you cannot land the x here which is already shaded. So, the only area that is remaining between this 2 circle is this area this is where your x automatically lands.

Now, the conclusion says some creatures live in Florida wetlands are reptiles. So, this two area this interception area of this 2 circle should have at least one person or one entity there is that the case yes why because this remember this is your s p m area right and this where you s and p are both present and anywhere, in this area and x would show that the conclusion is valid and this is exactly how it is shown get me. So, this is the verdict on this syllogism that the syllogism is valid.

And then let me further make this point that there may be situations when you are putting the x that there is not very clear, see I mean you have. So, many region in the in the Venn diagrams and you may not be sure where exactly the x would land the in this case, it is pretty clear this is where the x has to land right. There may be situations when you are not sure whether the x would fall here or x would fall here, now this is s p m area, but this is s p area, but it is not m get me. So, this is possible.

Now, and I mean different kind of syllogism come with different kind of demand. So, it may be possible that there is un clarity about which region the x belongs to when that happen, you are not sure which area the x should go to your job would be in all fairness to put the x, on the border of this two regions once more when you are not sure, whether the x belongs to this region or that region in all fairness I said put the x on the border of both the regions.

So, for examples this is just an arbitrary example of the syllogism where is was not clear it may not be clear from the premise, whether the x belongs here in the s p m area or whether it belongs to this area whether there are only two circles present, but this circle is not present fine in that case what is to do we need to put the x on this boarder this boarder x means the x may belong, here x may belong here you do not know which one

fine as a result syllogism may turn out to be invalid as a result the syllogism is still valid that is not the point the point is that this is what is required fourth coming from the premises and in that case you need to be logically fair all right.

So, this where we are going to close the discussion on the Venn diagram and the validity of the syllogisms and we have seen how traditional it used to be done and from that we have show also how we are going to do calculate by Venn diagrams all right. So, this puts the closer on our discussion of categorical logic from next module onwards we are going to leave categorical logic behind.

So, thank you very much for your time and your patience we will see you again in the next module.