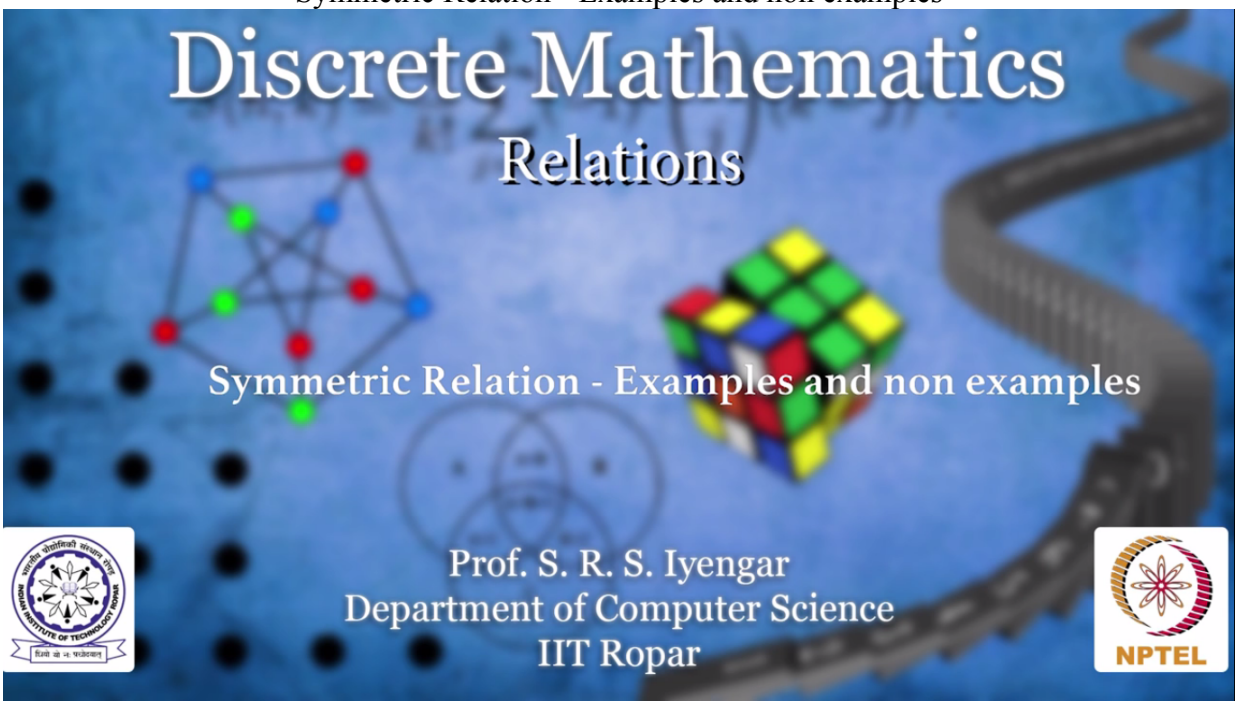
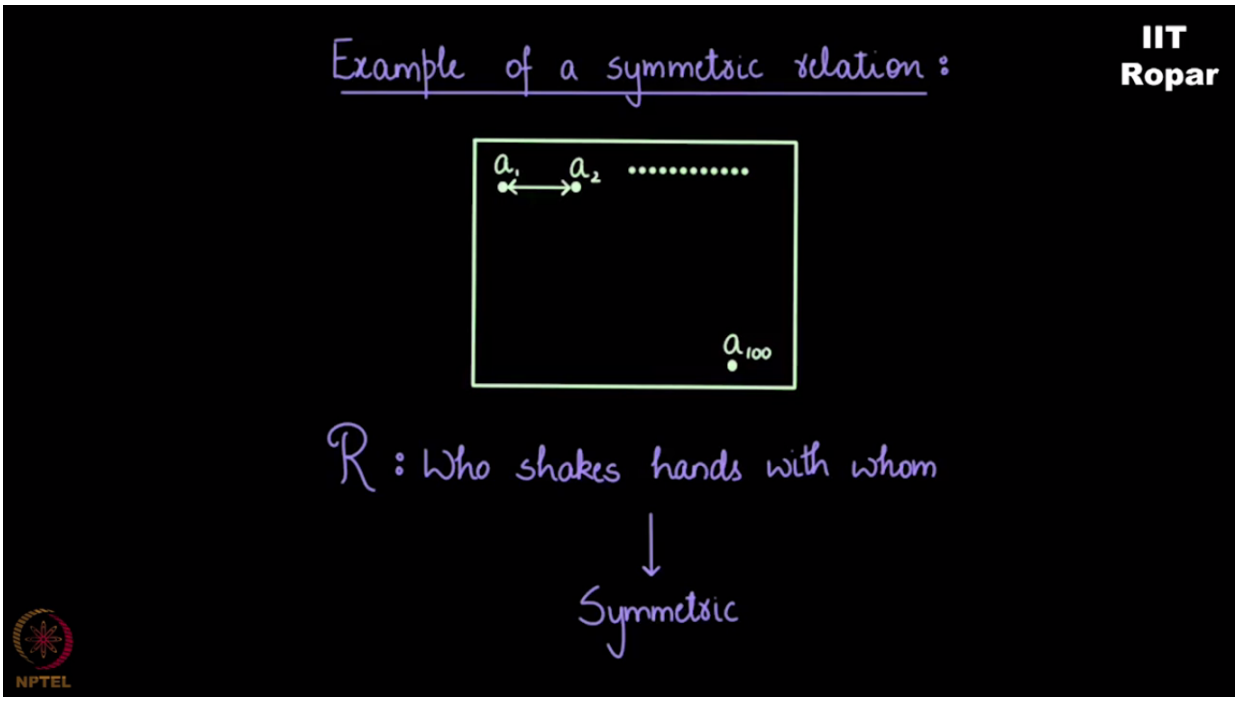
NPTEL
NPTEL ONLINE COURSE
Discrete Mathematics
Logic
Symmetric Relation - Examples and non examples

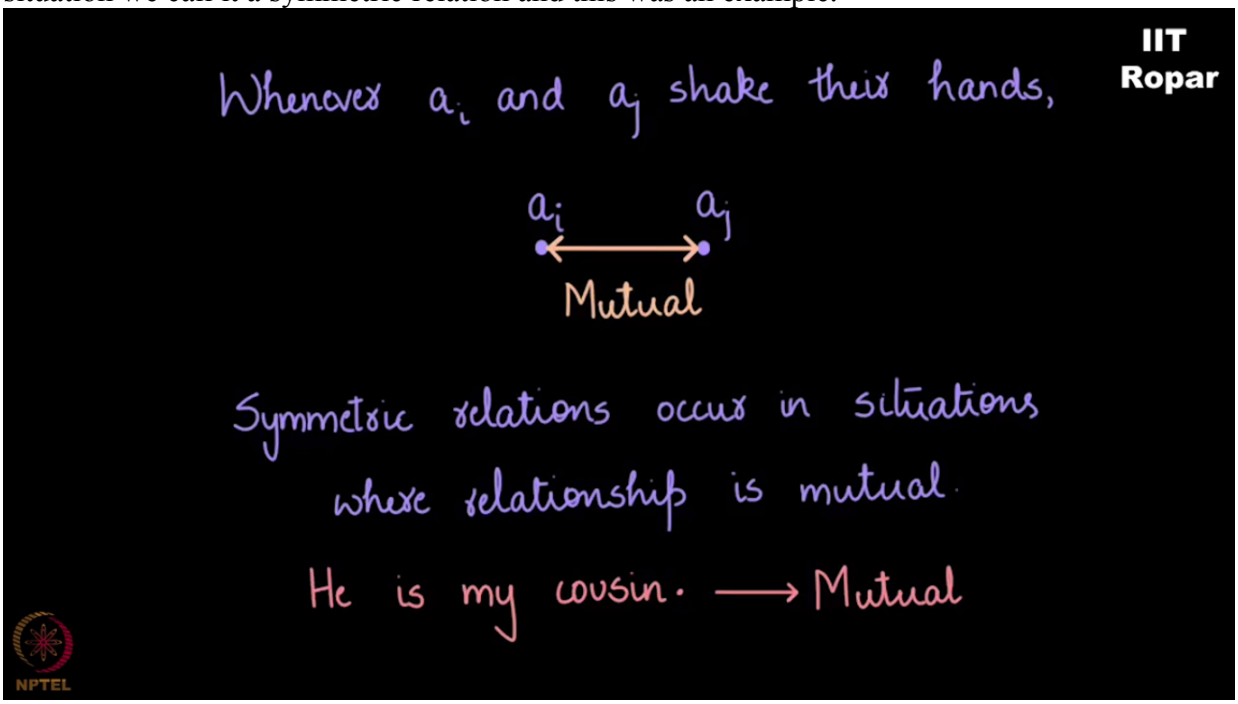


Prof. S.R.S Iyengar
Department of Computer Science
IIT Ropar

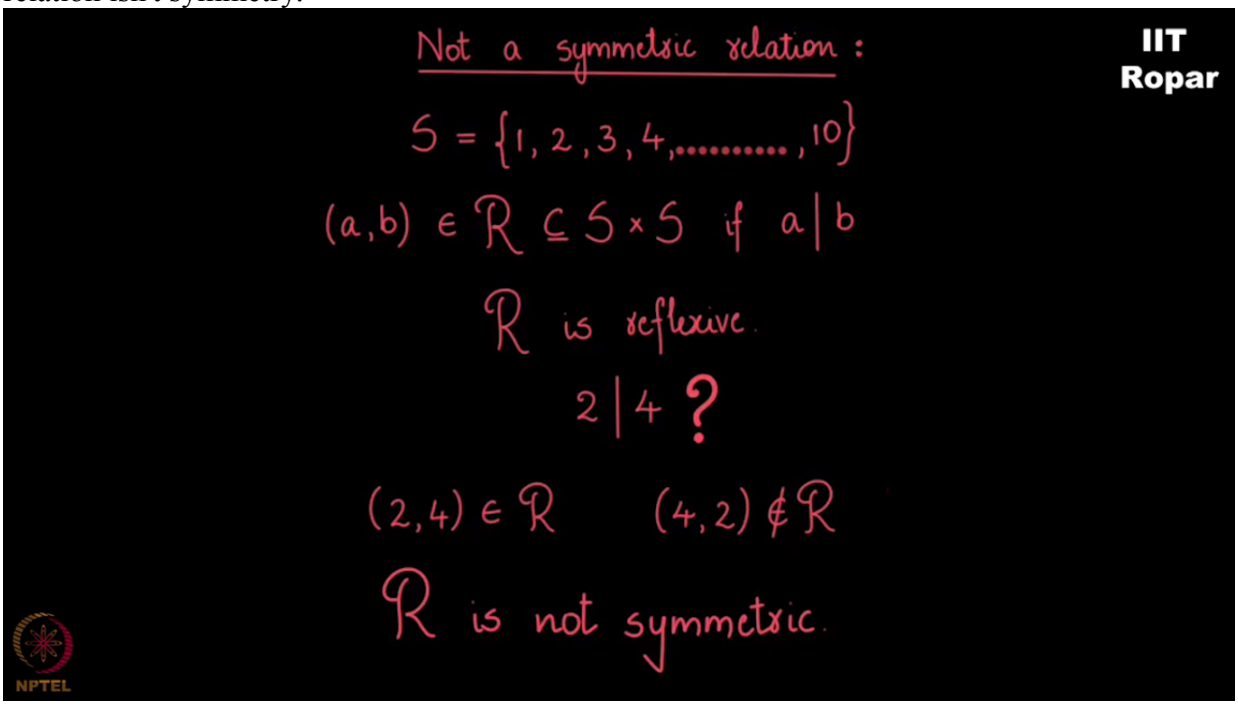
I am now going to give you a cool example of a symmetric relation. Imagine a hall full of 100 people. Let me call them a1, a2, a3 up to let's say a100. I am going to put an arrow from a1 to a2. If a1 shakes his hand with a2. Now please watch. Whenever a1 shakes his hand with a2 it is understood that a2 also shakes his hand with a1. You see. If I consider the relation of who shakes his or her hands with whom that results in a relation. Correct. And such a relation is obviously symmetric. Why is that?



That's because as I told you whenever ai and aj shake their hands it is understood that the handshake is not just from one person to the other, it is a mutual one.
Symmetric relations occur in situations where the relationship is mutual. As I told you there are many such relations namely the relationship of let's say he is my cousin. There is no situation where someone says he is my cousin but I am not his cousin. It's always mutual. In such a situation we call it a symmetric relation and this was an example.



Let me now give you an example of something that is not a symmetric relation and this relation example is a very popular one. You will see almost all textbooks quoting this example. Let me consider a few numbers. My set test is going to be 1, 2, 3, 4, up to 10 and I say A, B belongs to my relation R which as I told you is a subset of S cross S. If A divides B, I repeat whenever A divides B then I say A, B belongs to the relation R. How does this relation R look like? You would have observed that it is obviously reflexive? Why is that? Because for every element A, A divides A is not obvious, is it symmetric? Let's think. Do you think 2 divides 4 here. Yes that's obvious. So 2, 4 belongs to R but do you think 4,2 belongs to R? Obviously not. So this relation isn't symmetry.



So here is an example of a relation that is reflexive but not symmetric. In general I want to show you if one can come out with an example of something that is not symmetric and here is a good example.