NPTEL
NPTEL ONLINE COURSE
Discrete Mathematics
Logic
Tautology, Contradiction - Part 3
Prof. S.R.S Iyengar
Department of Computer Science
IIT Ropar

And now let us look at an example of a contradiction. Consider this complicated expression. Not of P implies Q and Q. My question is, if you write the truthtable how will the truthtable of this look like? Can you guess without writing the truthtable? Okay. so let's write the truthtable right now and then let me give you a tip on how to do this even without writing a truthtable. So P is as and always 0, 0, 1, 1, Q is 0, 1, 0, 1. What is P implies Q? We have seen enough of it. 1, 1, 0, 1, right. Perfect. What is not of P implies Q? We are basically going step by step. Not of P implies Q will be the negation of P implies Q which is 1 becomes 0, 1 becomes 0, 0 becomes 1, and 1 becomes 0 here as you can see. And then this column and Q will simply be 0 and 0 is 0. 1 and 0 is 0. 0 and 1 is 0. 1 and 0 is 0 and hence the column corresponding to your expression not of P implies Q AND Q happens to be all 0s and hence are contradiction. Now look at very different way of showing that such a truthtable should end up having all 0s in this expression, below this expression. So how do I show that? When the, on contrary, let me assume that this becomes 1 how will it become 1? Let me see Q has to be 1 for this expression to be 1. When Q is 1 this Q becomes 1 and no matter what P is 0 or 1, okay, this implication will become true. And when this implication becomes true not of that becomes false. So false AND Q whenever Q becomes 1 this expression on the left side of AND forces itself to become 0; think about it and hence this is always 0. You can never make this become equal to 1. It will always be equal to 0. You may want to understand this carefully by maybe watching the video once more and trying to figure it out all by yourself.

IIT MADRAS PRODUCTION
Founded by
Department of Higher Education
Ministry of Human Resource Development
Government of India
www.nptel.iitm.ac.in