

Engr 123

L1

We are on the wiki

Intro

Old vs New

<https://ecs.victoria.ac.nz/courses/>

ENGR123-2023T2





# Logic symbols

	121	C	123
And	•	&&	$\wedge$
Or	+		$\vee$
Not	—	!	$\neg$

## Truth tables

P	Q	$P \wedge Q$ P and Q	inclusive $P \vee Q$ P or Q	$\neg P$ $\bar{P}$
1	1	1	1	0
1	0	0	1	0
0	1	0	1	1
0	0	0	0	1



# Exclusive OR (New!)

$P \text{ xor } Q$

P	Q	$P \text{ xor } Q$	$(P \vee Q) \wedge \neg (P \wedge Q)$
1	1	0	1 0 0 1
1	0	1	1 1 1 0
0	1	1	1 1 1 0
0	0	0	0 0 1 0

we say  $P \text{ xor } Q \equiv (P \vee Q) \wedge \neg (P \wedge Q)$

## Biconditional

$P \leftrightarrow Q \equiv P \text{ xor } Q$

P	Q	$P \leftrightarrow Q$	$\neg (P \text{ xor } Q)$
1	1	1	0
1	0	0	1
0	1	0	1
0	0	1	0



## De Morgans

$$\neg(P \wedge Q) \equiv \neg P \vee \neg Q$$

$$\neg(P \vee Q) \equiv \neg P \wedge \neg Q$$

## Double negation

$$\neg \neg P \equiv P$$

## Associativity

$$(P \wedge Q) \wedge R \equiv P \wedge (Q \wedge R)$$

$$(P \vee Q) \vee R \equiv P \vee (Q \vee R)$$

## Distributivity

$$P \wedge (Q \vee R) \equiv (P \wedge Q) \vee (P \wedge R)$$

$$P \vee (Q \wedge R) \equiv (P \vee Q) \wedge (P \vee R)$$



Implication      If  $P$  then  $Q$

$$P \rightarrow Q$$

P	Q	$P \rightarrow Q$
1	1	1
1	0	0
0	1	1
0	0	1