

CS2100 Lab Guidelines

**Remember to
bring this along
to your lab!**

GENERAL

- Please bring this along to your lab.
- Please be punctual for your lab, or you may not have enough time to complete the exercise.
- No food or drink is allowed in the lab.
- Aim to finish the lab on time, 15 minutes before the end of the hour.
- Submit your lab report and tidy up the bench before you leave the room.
- No extra time or make-up lab will be given unless otherwise stated.
- Please inform the Lab TA of any missing or spoiled equipment.
- Please return all items in their proper places before you leave the lab. No equipment is to be taken out of the lab.

EQUIPMENT

1. Logic trainer
2. Wires
3. IC chips (will vary from experiment to experiment)
4. IC extractor
5. Pincer
6. Wire stripper/cutter
7. Logic probe

Logic trainer	<ul style="list-style-type: none">• There is a possibility that holes are shorted wrongly, so, you should test out these holes during debugging.
IC extractor	<ul style="list-style-type: none">• Always use this to extract the chips else the pins might bend or break.
Wire stripper/cutter	<ul style="list-style-type: none">• Cut the wires to length.• Strip off only a little bit of the rubber. If too much is stripped off, there is a danger of short-circuit when 2 bare wires touch each other.• Length of exposed wire should be about 3mm.
Logic probe	<ul style="list-style-type: none">• Use it for checking and debugging purposes.
IC chips	<ul style="list-style-type: none">• Know how to differentiate the different types of chips.• Insert the chips properly. Do not force it down the logic trainer.• Keep the chips in the Styrofoam when not in use.• Remember the basic structure of the gates. Bring along the chip physical layout diagram. Do not assume.
Wires	<ul style="list-style-type: none">• Cut them to a suitable and required length.• Keep the wires tidy.

IMPORTANT NOTES

- Prepare yourself well **BEFORE** you attend the lab session, by reading through the lab sheet and completing whatever you can in the report. (In the past, there were students who went for their lab totally unprepared and unable to complete the lab on time.)
- You are supposed to do the lab by yourself. You should check your circuit and try as much as possible to identify the problem yourself first before you ask your lab TA for advice. Use the logic probe to help you debug the circuit.
- Check the chips before you start the lab.
- Switch off the power while you are connecting the circuit.
- Place the IC chips in the correct orientation – the notch of the IC chip should be at the top.
- Do not force down the IC chip onto the breadboard. If anything gets stuck (e.g. broken wire or pin), do not force it too hard. Call for the Lab TA.
- Do not use your hand to remove the chips from the circuit board. Use the IC extractor.
- Always check the circuit before turning on the power, to avoid burning the IC chips.
- Do not dismantle the circuit until it has been checked and graded by your lab TA.
- Make sure that the wire connections are neat to ease checking and debugging.
- Define a personal colour code for wires (e.g. red for power, green for inputs etc.). This is especially useful for debugging.
- Familiarize yourself with the logic probe and use it. Always attempt to debug yourself with the logic probe. Trace through the circuit carefully.
- Once completed, get the circuit accessed by the Lab TA. Do not wait till the end of the lab session. You may leave after your Lab TA has accessed your circuit and you have submitted your lab report.
- Please prepare layout diagrams before the lab for your own use. See Figure 1 below. You need not hand in these diagrams if they are not asked for, but they are useful for wiring up your circuit, especially for complex ones.

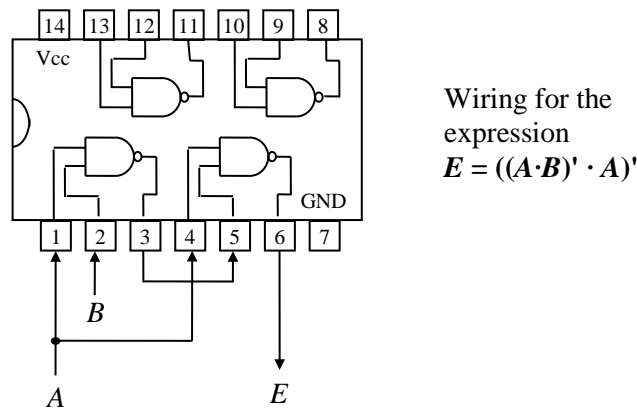


Figure 1.

- Please write and draw clearly and neatly. You may use pencil for logic diagrams. Untidy writing or drawing will be penalized.
- Please draw large and neat circuit diagrams. See some real students' samples below.

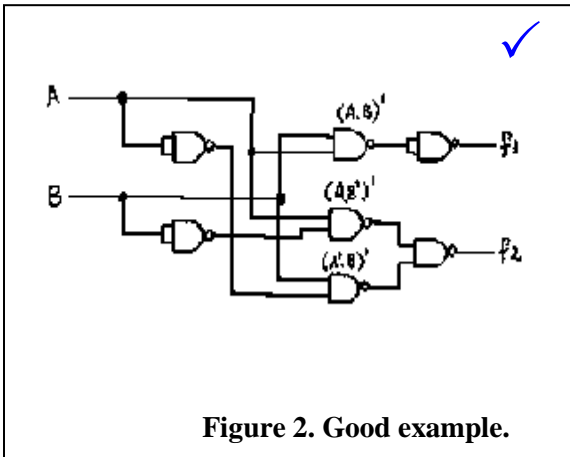


Figure 2. Good example.

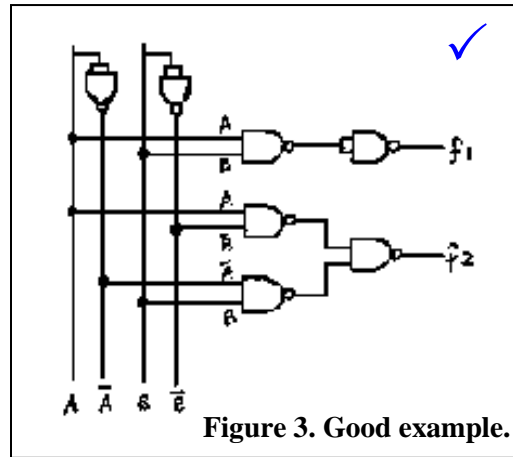


Figure 3. Good example.

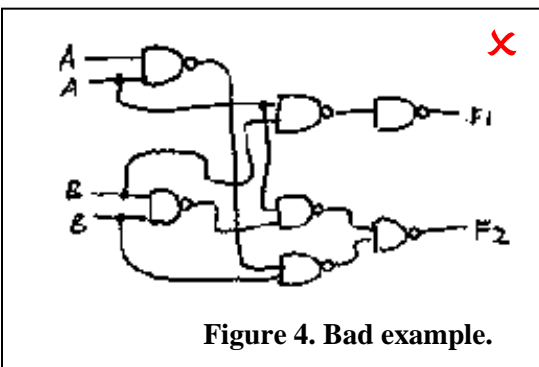


Figure 4. Bad example.

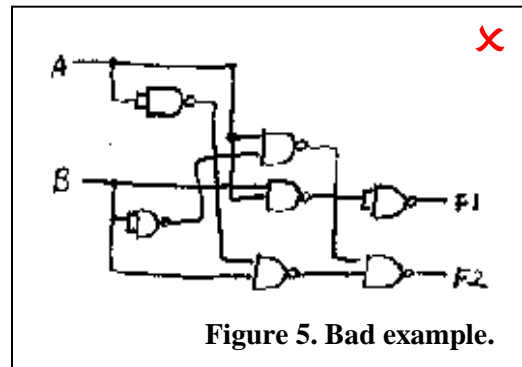


Figure 5. Bad example.

- When you are asked to draw logic diagrams, we are looking for diagrams that look like the one in Figure 6, not Figure 7, which shows the actual connection of the pins of the chip. The diagram in Figure 7 may be used for your own reference.

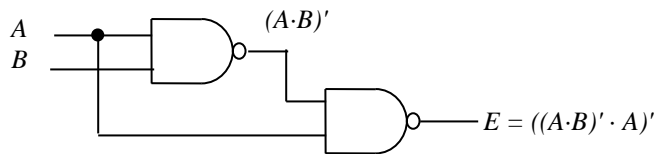


Figure 6. Logic diagram.

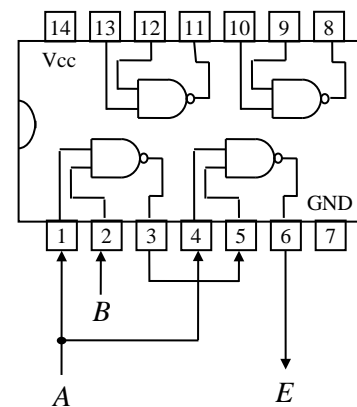


Figure 7. Pin connections.

- For logic diagrams, all lines should be straight. All inputs, outputs and intermediate outputs should be labeled, as shown in Figure 8. Use black dot to indicate a fork.

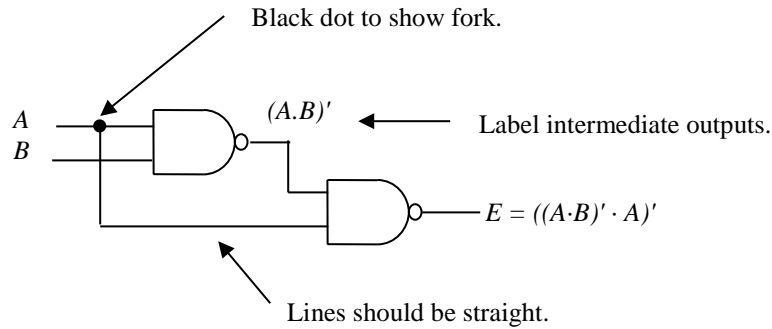


Figure 8.

- All inputs of a gate must be fed with some value. You should not leave any input unconnected. For example, to use a 2-input NAND gate as an inverter, here are two correct methods:

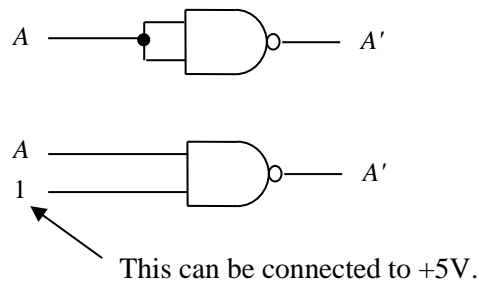


Figure 9.

But this is wrong:

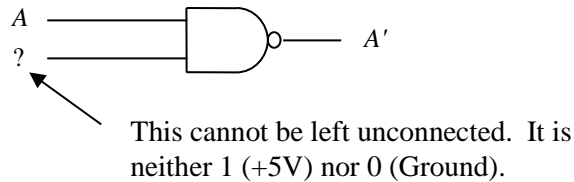


Figure 10.