As you wait for class to start, answer the following question:

Bob has $500, but owes $300 to Shirley in CA, who’s going to kill him if he doesn’t pay off the money in person in a week. Plane tickets to CA cost $175, while bus tickets cost $75. Based on this, finish off the following statement:

plane or bus but not both

If Bob buys a ________ ticket then Bob won’t be killed.
271: Introduction to Digital Circuits and Systems

- Professor Scott Hauck, EEB-307Q
  (hauck@uw.edu)
  - Office Hours: stop by or email w/schedule for a slot


- TAs (EEB-361):
  - Yuan Liao (liaoy4@uw.edu)
  - Sripathi Muralitharan (sripathi@uw.edu)
  - Shashank Vijaya Ranga (svijay97@uw.edu)

- TA Office Hours: most times most weekdays
  (check website)
Grading

- 20% - Homeworks
- 30% - Labs
- 20% - Midterm Exam 2/13 Thursday
- 30% - Final Exam Thu, Mar 19 8:30 - 10:20
- Homework is due at the end of class on the specified date.

- Late penalties:
  - <24 hours: -10%
  - <48 hours: -30%
  - <72 hours: -60%
  - >72 hours: not accepted
Joint Work Policy

- Labs will be done alone, homeworks in groups of 1-2.
  - Students may not collaborate on labs/projects, nor between groups on the specifics of homeworks.
  - All submitted student work must be from their own efforts, and not any other source.

- OK:
  - Studying together for exams
  - Discussing lectures or readings
  - Talking about general approaches
  - Help in debugging, tools peculiarities, etc.

- Not OK:
  - Developing a lab together
  - Checking homework answers between groups

- Violation of these rules is at minimum:
  - Loss of twice the points of that assignment.
  - Report of Academic Misconduct to Dean’s Level.
  - Potentially fail class, be expelled from UW.
Class & Lab Meetings

- Labs:
  - Each student assigned a lab kit, can work where-ever.
  - **There are no specific assigned lab times.**
  - TAs have large blocks of office hours to help with labs, homeworks, class material, etc.
  - Signups for lab demos will be posted shortly.

- Labs are an integral portion of the class learning. Failure to make a good-faith effort at the labs is grounds for failing the class.
Motivation

- Readings: 1-1.4, 2-2.4

- Electronics an increasing part of our lives
  - Computers & the Internet
  - Car electronics
  - Robots
  - Electrical Appliances
  - Cellphones
  - Portable Electronics

- Class covers digital logic design & implementation
Example: Car Electronics

- Door Ajar (DriverDoorOpen, PassDoorOpen):
  \[ DA = DDO \lor PDO \]

- High-beam indicator (lights, high beam selected):
  \[ HBI = \text{lights} \land HBS \]
Example: Car Electronics (cont.)

- Seat Belt Light (driver belt in):
  \[ SBL = \text{not}(\text{DBI}) \]

- Seat Belt Light (driver belt in, passenger belt in, passenger present):
  \[ SBL = \text{not}(\text{DBI}) \text{ or } (\text{PP} \text{ and } \text{not}(\text{PBI})) \]
Basic Logic Gates

- **AND**: If A and B are True, then Out is True
  
  ![AND Gate Diagram]

- **OR**: If A or B is True, or both, then Out is True
  
  ![OR Gate Diagram]

- **Inverter (NOT)**: If A is False, then Out is True
  
  ![Inverter Diagram]
TTL Logic

Vdd (TRUE)

GND (False)
Digital vs. Analog

Digital:
only assumes discrete values

Binary/Boolean (2 values)
yes, on, 5 volts, high, TRUE, "1"
no, off, 0 volts, low, FALSE, "0"

Analog:
values vary over a broad range continuously
Advantages of Digital Circuits

- Analog systems: slight error in input yields large error in output
- Digital systems more accurate and reliable
  - Readily available as self-contained, easy to cascade building blocks
- Computers use digital circuits internally
- Interface circuits (i.e., sensors & actuators) often analog

This course is about logic design, not system design (processor architecture), not circuit design (transistor level)
Combinational vs. Sequential Logic

**Sequential logic**

Network implemented from logic gates. The presence of feedback distinguishes between *sequential* and *combinational* networks.

**Combinational logic**

No feedback among inputs and outputs. Outputs are a function of the inputs only.