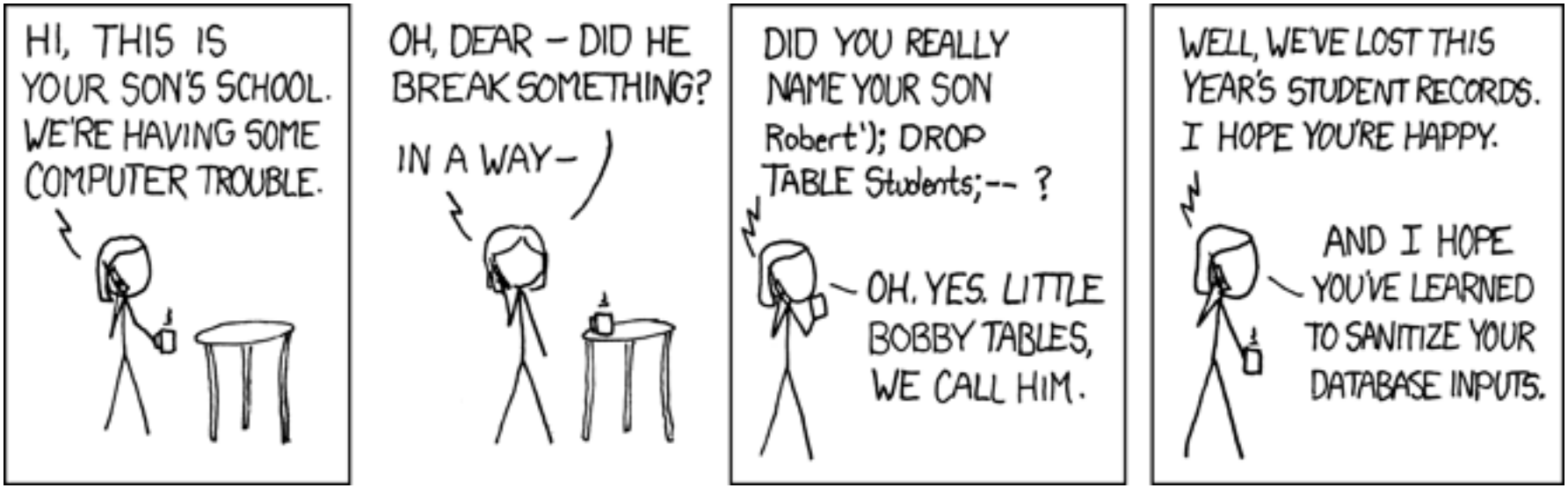

HI, THIS IS YOUR SON'S SCHOOL. WE'RE HAVING SOME COMPUTER TROUBLE.
OH, DEAR – DID HE BREAK SOMETHING?
IN A WAY–
DID YOU REALLY NAME YOUR SON Robert'); DROP TABLE Students;-- ?
OH. YES. LITTLE BOBBY TABLES, WE CALL HIM.
WELL, WE'VE LOST THIS YEAR'S STUDENT RECORDS. I HOPE YOU'RE HAPPY.
AND I HOPE YOU'VE LEARNED TO SANITIZE YOUR DATABASE INPUTS.

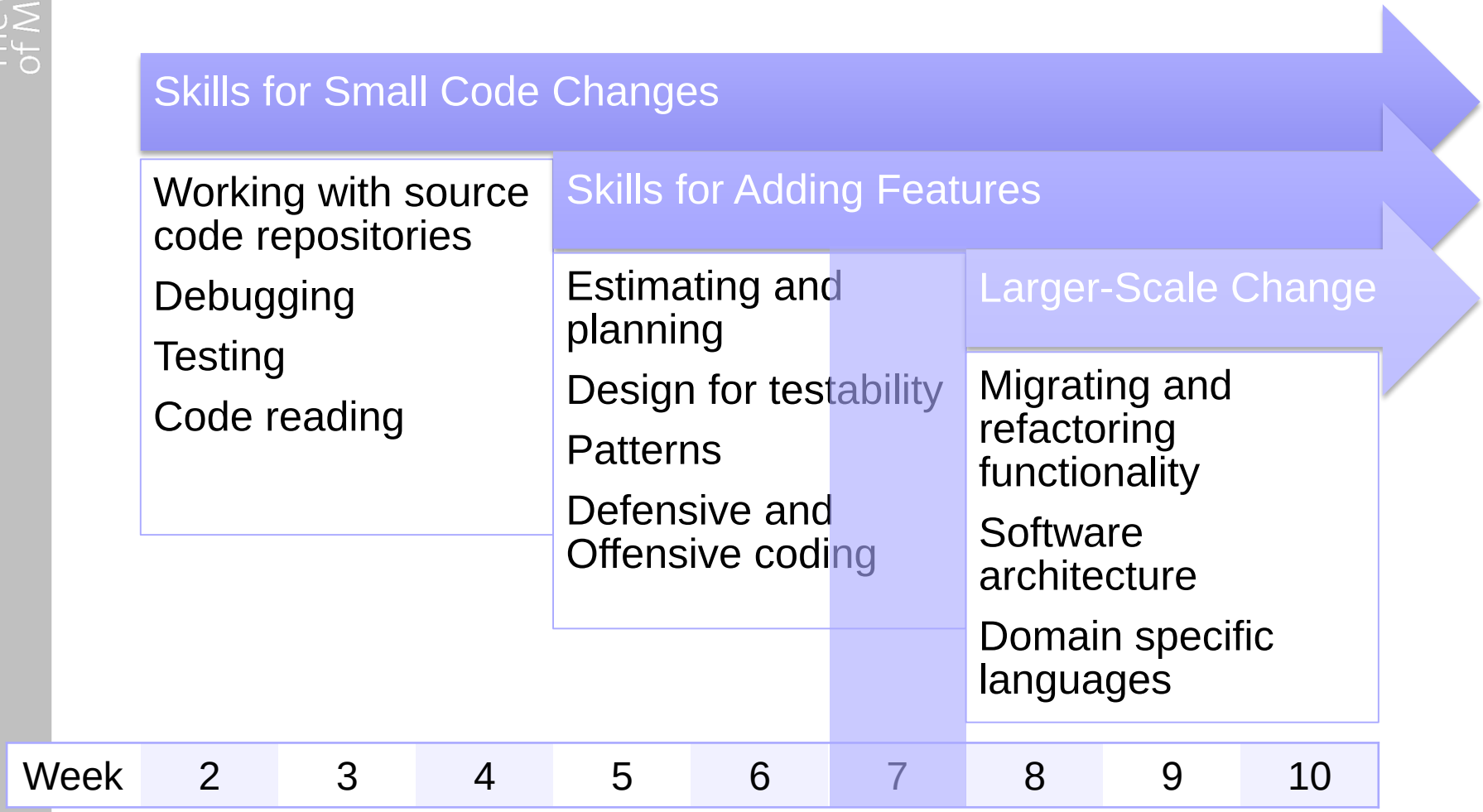
Software Patterns and Offensive and Defensive Coding

COMP23420: Software Engineering

Week 7

Caroline Jay and Robert Haines

Course Unit Roadmap (Weeks 2-10)



Link to the Coursework/Exam

- We will introduce design patterns and a couple of typical coding styles – offensive and defensive coding.
- Coursework: As you work on your projects and add new features it is important to be aware of standard methods of coding.
- Exam: There will be questions on patterns and offensive and defensive coding.

Patterns

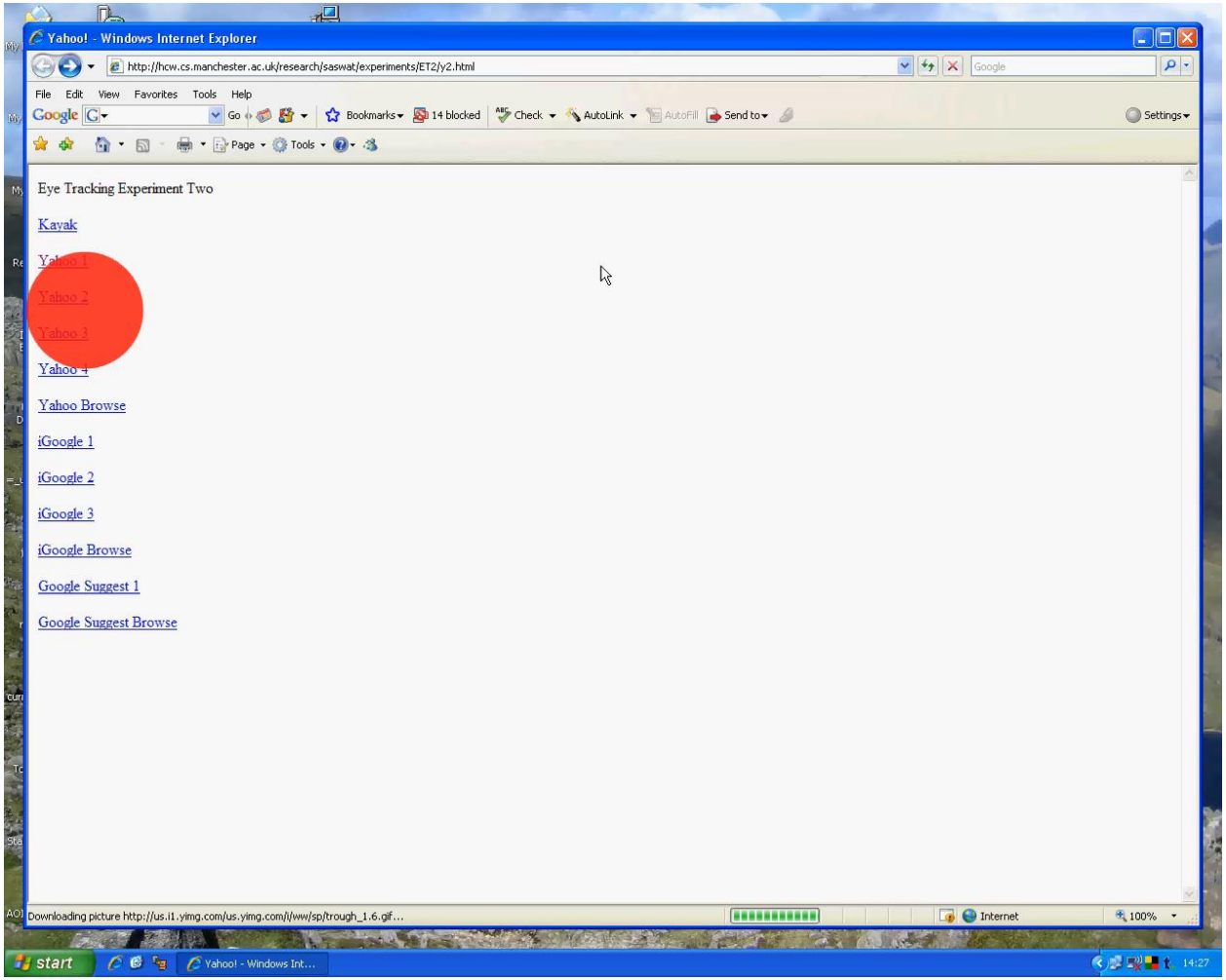
- Reusable solutions to recurring problems that occur during software development
  - Not necessarily the same code
  - Same structure
- Can be used in discussions among programmers who know them
  - Know that we're talking about the same thing
  - More effectively collaborate
- Mark Grand, "Patterns in Java"

Common patterns: Singleton and Factory

- Can you find any instances of the Singleton and Factory Method patterns in the Marauroa code?
  - Use Mark Grand Chapter 5 (in moodle) as a reference
    - Forces and Consequences
  - In which situations are they used?
  - Why?

- Can you spot any problems with some uses of Singleton in the code?
- How might use of the Factory pattern relate to testability?

UI Patterns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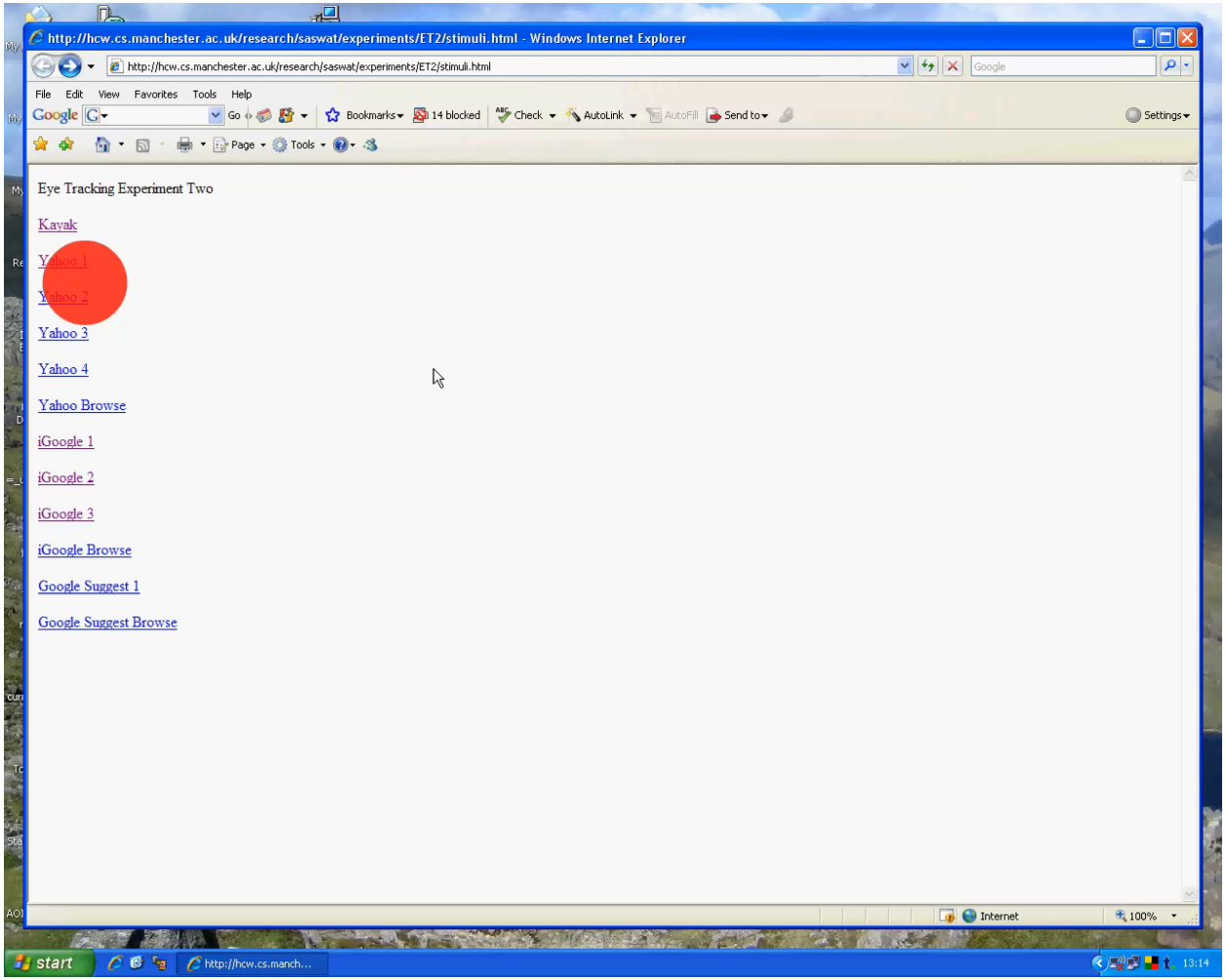
UI Patterns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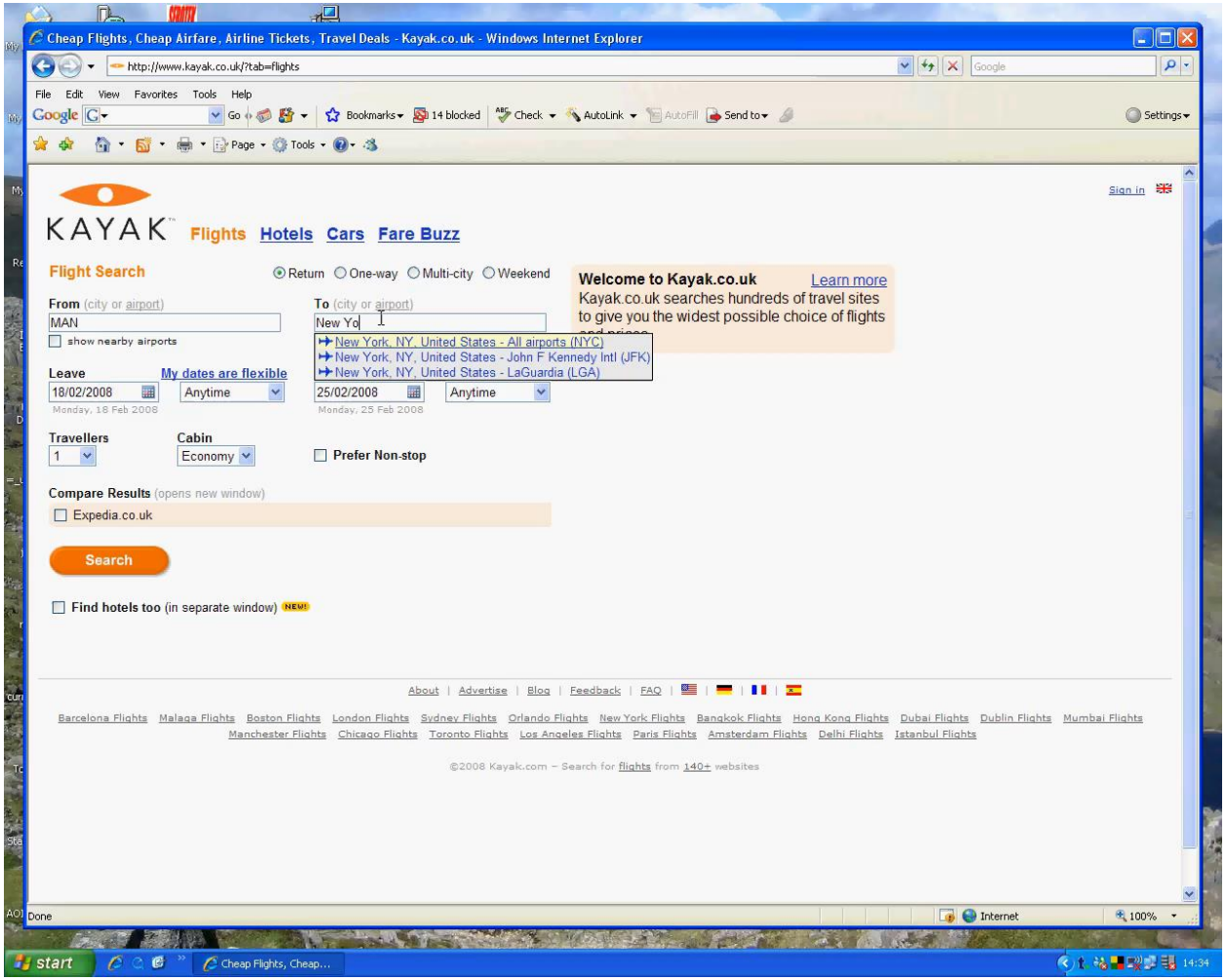
UI Patterns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Weekend
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Coding styles: Defensive programming

- *A blanket term for various practices to increase code stability once it is in production*
- Pros
  - "Defend against the impossible, because the impossible will happen"
  - Systems will not fail, but try as hard as possible to continue
    - Even in the face of unexpected user input or actions
  - Aids maintenance
    - Higher quality code: readable and comprehensible
- Cons
  - The impossible cannot happen so why defend against it?
    - New people join the team, new features, etc
  - Hurts maintenance
    - Hides bugs, bad for testability
  - Defensive coding often degenerates into paranoid programming

Defensive programming example

- No braces around `if`:

```
if (a == 1)¶
»   run();¶
```

- !!

```
if (a == 1)¶
»   init();¶
»   run();¶
```

- Set your IDE to add braces when you save?

```
if (a == 1) {¶
»   init();¶
}¶
run();¶
```

A note on `assert`

- `assert` is used to verify the correctness of an invariant in the code
- Should never trigger in production code
  - Turned off by default
  - Should be on during testing
  - Turn on with `-ea` option on the `java` command

- Do not use `assert` to check public method parameters!
  - Use Exceptions
- Do use `assert` to check post-conditions

A reasonable use of `assert`

```
public Foo acquireFoo(int id) {
  Foo result = null;
  if (id > 50) {
    result = fooService.read(id);
  } else {
    result = new Foo(id);
  }
  assert result != null;

  return result;
}
```

- http://stackoverflow.com/questions/2758224/what-does-the-java-assert-keyword-do-and-when-should-it-be-used

Paranoid programming vs testability

```
public House(Door door, Window window, Roof roof, List<Room> rooms) {¶
»   assert door != null;¶
»   assert window != null;¶
»   assert roof != null;¶
»   assert rooms != null;¶
»   assert rooms.size() != 0;¶

»   this.door = door;¶
»   this.window = window;¶
»   this.roof = roof;¶
»   this.rooms = rooms;¶
}¶

public void lockUp() {¶
»   door.lock();¶
»   window.lock();¶
}¶
```

- How do I test the `lockUp()` method?

Paranoid programming vs testability

```
@Test¶
public void testSecure() {¶
»   Door door = new Door();¶
»   Window window = new Window();¶

»   House house = new House(door, window, null, null);¶

»   house.lockUp();¶

»   assertTrue(door.isLocked());¶
»   assertTrue(window.isLocked());¶
}¶
```

- Only need a `Door` and `Window` to test `lockUp()`
- But the assertions will fail!

Coding styles: Offensive programming

- "*The best defence is a good offence*" – Anon
- Pros
  - Don't silently ignore errors, let them happen!
  - Force bugs to be detected and fixed as soon as possible
  - Simpler code (less error checking)
  - Errors shipped to the customer will be obvious
    - Easier to get management buy-in to fix them?
    - *No* results better than *wrong* results?
- Cons
  - Errors shipped to the customer will be obvious
    - Low quality more obvious
    - Errors visible to everyone
  - More crashes
    - Real-time life-critical systems won't try to recover

After the Easter break

- In the team study sessions you will continue to work on the coursework and you will have your second mentoring session
- In the workshop we will learn about making large scale changes to existing software safely