CSC444F
Software Engineering I

Prof. Paulo Pacheco ppacheco@ecf.toronto.edu
office hours: SF3207 Mon and Wed 1-2 pm

Prof. Kersti Wain-Bantin kwain@ecf.toronto.edu
office hours: SF3207 Thurs 9-11 am

Syllabus

The software development process.

Software requirements and specifications.

Software design techniques.

Techniques for developing large software systems.

CASE tools and software development environments.

Software testing, documentation and maintenance.

(Prerequisite: ECE344S)

Course Objectives

- to help students to develop skills that will enable them to construct software of high quality – software that is reliable, and that is reasonably easy to understand, modify and maintain

- to foster an understanding of why these skills are important

Teaching Methods

Lectures (2 per week)
- …are compulsory
- …cover core material

Practicals (1 per week)
- …last for 3 hours
- …are compulsory
- …are used to do term assessments
- …are used for the team projects

Team meetings (at least 1 per week)
- You will need to meet with your team regularly

(Labs)
- (There are no regularly scheduled lab sessions)

Timetabling

Lectures

LEC 01	LEC 02	LEC 03
Mon 12pm GB248	Mon. 12pm GB119	Tues 10am MC102
Wed 12pm GB248	Wed 12pm GB119	Wed 11am MC252

Practicals

alpha	beta	gamma	delta
Mon 12:00-13:00 GB304	Thurs 16:00-19:00 GB404	Fri 15:00-18:00 GB404	Fri 15:00-18:00 GB405

you will be allocated to one of these...

Team Projects

Phase 0: Requirements Analysis
We will organize you into teams at your first practical.
You will receive an initial specification.

Phase 1: Module Development (4 weeks)
Each team will implement one of several modules.

Phase 2: System Integration and Test (3 weeks)
Each team will integrate its module with modules bought from other teams.

Phase 3: Software Maintenance (4 weeks)
Each team will make modifications to a system it has bought from another team.

Trading

Each practical section is a trading block
- You can only buy and sell software within your trading block
- There will be 12 teams within a trading block
  - 3 teams working on each of 4 modules in phase 1
- You will need to work out a strategy both for buying and selling

Each team has a bank account
- Your TA operates the bank account for you
- You get an initial balance of S$300 ("software dollars")
- There is a 5% bonus on coursework marks if you end the term in profit
  (and there is no penalty for making a loss)

Each purchase must include a signed contract
- Your TA will not transfer funds between bank accounts without one
  ... and it must be signed by both parties!
- You can include anything you like in a contract
- There is a mechanism for investigating breaches of contract

Assessment

6 assignments
- Assignment 1 is worth 5% of your grade
- Assignments 2-6 are each worth 10% of your grade
- All assignment are team assignments (each team hands in one report)
- Assignments are handed out during practicals
  ...and are due in at the *beginning* of the practical two weeks later

2 presentations
- Each presentation is worth 5% of your grade
- All presentations are team presentations
- Each team will give a demo of their system
- Each team will give a presentation of "lessons learned"

1 exam
- The end of term exam counts for 35% of the course grade
  (there is no mid-term exam)

Books

Main Course Text (Required)

- Hans van Vliet, "Software Engineering: Principles and Practice (Second Edition)". Wiley.

Other Texts (Recommended)

- Babara Liskov and John Guttag, "Program Development in Java: Abstraction, Specification and Object Oriented Design". Addison Wesley.
- Mary Shaw and David Garlan, "Software Architectures: Perspectives on an Emerging Discipline". Prentice Hall.

Background Reading

- Sections of comp.risks forum
- Other readings will be suggested during the course

Lecture topics guide

Phase 0
- Orientation (this lecture)
- Motivational Case Studies

Phase 1
- Software Processes
- Software Project Management
- Decomposition and Abstraction
- Procedural Abstraction
- Data Abstraction
- Testing
- Reviews & Fagan Inspections
- Formal verification

Phase 2
- Debugging & Exception handling
- Software quality; modularity
- Design Representations
- Requirements Analysis
- Structured Analysis
- Object Oriented Analysis

Phase 3
- Formal Analysis
- Specifications
- Software Architectures
- Software Maintenance & Reuse
- Software Measurement
- Process Modeling, process improvement

Top 10 Reasons Why Software Projects Fail

Incomplete requirements
Lack of user involvement
Lack of resources
Unrealistic expectations
Lack of executive support
Changing requirements and specifications
Lack of planning
Software no longer needed
Lack of Information Technology management
Technology illiteracy

from "Sketchy Plans, Politics Stall Software Development" *Computerworld,* June 19, 1995

Success Rate of Software Application Development Projects

Completed on time, on budget	16.2%
Canceled at some point in the cycle	31.1%
Over budget, late and with fewer features and functions than specified	52.7%

from "Tough Love Reins in IS Projects" *Computerworld,* June 19, 1995

Danger Signs of Runaway Projects

The project is the largest ever undertaken by the organization.
The project uses people without comparable experience
(whether employees or consultants).
The project is highly integrated.
Leading-edge technology is involved.
The software being used is untested in the industry.
The software needs modification to meet your needs.

from "Before Disaster Strikes" *CIO Magazine,* June 15, 1993

productivity

standard software	**25 bugs/errors per KLOC**
good software	**2 bugs/errors per KLOC**
space shuttle software	**<1 bug/error per 10 KLOC**
cell phone	**3 bugs/errors per KLOC**
Windows-95	**20 bugs/errors per KLOC**

(Windows-95 has approx. 10,000,000 lines of code)

ACM computing curricula 2001 software engineering

processes
requirements and specifications
design
validation
delivery of systems
evolution
project management
tools and environments
component-based computing
formal methods
reliability

Any Questions??

course web site
http://www.dgp.toronto.edu/~ppacheco/course/444/