Advanced Programming

Barbara Russo

The philosophy of the course

- **What you hear, you will forget**

- **What you see, you will remember**

- **What you do, you will know**

Prerequisites

- Prerequisite material
  - Introduction to Programming
    - Basic understanding of how a program is written, compiled, and executed
    - Syntax and basics of semantics of Java
    - Object oriented coding

- Prerequisite material for
  - Software Engineering and Software Process

Course goals

- Introducing you to the **web of producing a software system**, with an agile, practical, hands-on, project oriented approach.
- There are **no clear rules** on how software should be developed
  - However, there are **best practices**
  - This course focuses on **such best practices and on the ways to assess them**

Course goals

- You will be exposed to a variety of issues related to the **software lifecycle, requirement, analysis, design, coding, and maintenance and advanced programming**
- During the lab you will develop your Java project and discuss it with the lab instructor during your weekly deliveries.

Syllabus

- Organizing Software Development with Object Oriented Paradigm
- Requirements and requirements elicitation with eXtreme Programming
- Design modeling with CRC cards and UML class diagrams
- Testing, Unit Testing, and Test Driven Development
- Exception handling
- Code execution and Memory models
- Virtual function and late binding

- Advances in inheritance: subtyping and sub-classing the Liskov principle
- Multiple inheritance with delegation
- Pseudo polymorphism in Java
- Run Time Type identification and Reflection API
- Generics, type inference and erasure
- Introduction to design patterns in Java
- Servlet
- Synchronization

Tools used

- Java compiler
- Eclipse, IDE platform to develop and manage the Java project
- SVN, to share code in team
- JUnit, to create unit tests
- TRAC, for project management
- MySQL database

Learning Outcome

- Understanding and applying languages and techniques to analyze requirements, and design and code software
- Understanding and applying advanced techniques of Java programming
- Understanding code compilation and execution by modeling memory allocation in Java
- Applying methods to develop software in team while controlling its quality

Learning outcome

- Understanding and applying the basic phases of the software lifecycle and development
  - Capability of identifying the key features of software projects and their software processes
  - Ability of developing in team small to medium size software projects in Java with an object oriented approach
  - Understanding the role of tools in software development
  - Managing a small IT infrastructure for software development in teams

The lab

- Two lab slots in English
- Two Lab assistants: Luis Corral and Anton Georgiev
- Iterative project development
  - Each week a task to perform
  - Every second week students are interviewed by the assistants
  - Use of SCRUM and some eXtreme practices
- Work for a single project as in a company or open source community

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The project

- Implementation from a scenario using OO paradigm
- Iterative development
- Team work
- Proper and light documentation

EMSE portal

- Develop a portal that accepts student applications for a Master of Science in Software Engineering.
- The portal is intelligent
  - It automatically opens and closes the application session
  - It ranks the applications by some given criteria. It also show statistics based on nationality, gender, and proficiency.
  - The portal has a real use! It will be used for the 2015-2016 students intake

Further information

- Basic material of the course
  - Pressman "Software Engineering" MacGrow Hill, sixth edition,
  - http://www.rspa.com/spi/
  - Slides of the course

Further information

- Useful Links
  - Moodle portal: www.teleacademy.it and
  - my personal home page
    https://pro.unibz.it/staff/brusso/AdvancedProgramming/index.html
  - Java http://java.sun.com/
  - Eck D.J. Introducing to programming using Java,
  - math.hws.edu/javanotes
  - Course calendar (RIS)

Course timetable

- Frontal lectures: Barbara Russo
- Labs: Luis Corral and Anton Georgiev
- Frontal lectures: Wednesdays 8:30-10:30 and Fridays 8:30-10:30
- Labs:
      Tuesdays 08:30-10:30 Corral
      Wednesdays16:00-18:00 Georgiev
- Lectures office hours:
- Wednesday 14:00-16:00 by email appointment
- Lab office hours:
  - Corral, XXX
  - Georgiev, XXX

Assessment

- Format: Step by step and All in one
- Step by step
    - Midterm evaluations (35%)
    - Oral exam (20%)
    - Project (45%)
- All in one
    - Project (45%)
    - Oral exam (55%)
    - Midterm is voluntary (but it is advisable).

Assessment

- Midterm date (16th April 8:30-10:30)
- Project (weekly deliveries, biweekly assessment, and final presentation)
- Please visit the teleacademy web site for further details