

Object-Oriented Programming

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Learning outcomes

1. Analyze a problem and design an object-oriented solution
2. Implement an object-oriented solution in JAVA/C++/C# programming language
3. Explain and use object-oriented programming concepts
 - classes,
 - methods,
 - objects,
 - encapsulation,
 - information hiding,
 - polymorphism,
 - inheritance,
 - abstraction...

Topics to be covered

1. Introduction to Object-Oriented concepts
2. A quick tour of Java
3. How to think in terms of objects
4. Classes and objects
5. Inheritance and composition
6. Polymorphism
7. Design with interfaces and abstract classes
8. Building Objects
9. Exception handling
10. Generic classes and methods
11. Object-Oriented design principles: SOLID
 - S: Single responsibility
 - O: Open/closed principle
 - L: Liskov substitution principle
 - I: Interface segregation principle
 - D: Dependency inversion principle
12. Reusing Designs Through Design Patterns
 - Singleton
 - Observer
 - Strategy

Grading policies

1. Quizzes: 10%
2. Project & Labs: 20%
3. Midterm: 30%
4. Final: 40%

Project topics

- Plants vs Zombies,
- Candy crush, or
- Monopoly

Tasks

- Read and present the game rules
- Design classes
- Implement the game with basic rules (50pts)
- Write report (10pts) – game rules, class diagrams, ...
- Demonstration (10tps)

Mandatory

- Use Git (10pts) – Commits history
- Implement a graphical user interface (10pts)

Bonus

- Extra features **(+2pts for each)**
- Apply design patterns **(+5pts for each)**

Materials

Textbooks

- Paul J. Deitel (Author), Harvey Deitel (Author), **Java How To Program**, 11th Edition, Prentice Hall, 2017

References

- Matt Weisfeld, **The Object-Oriented Thought Process**, 3rd Edition, Addison-Wesley, 2009
- Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, **Design Patterns: Elements of Reusable Object-Oriented Software**, Addison-Wesley Professional, 1994
- Eric Freeman, Bert Bates, Kathy Sierra and Elisabeth Robson, **Head First Design Patterns: A Brain-Friendly Guide**, O'Reilly Media, 2004
- <https://martinfowler.com/>