Design Patterns

1. **Course number and name:** 020MCOES3/020DPAES3 Design Patterns

2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours

3. **Name of course coordinator:** Rima Kilany

4. **Instructional materials:** course slides (Moodle); lab sessions (Moodle)

   References:
   - Design Patterns: Elements of Reusable Object-Oriented Software (GOF)
   - Design patterns Java Workbook (Steven John Metsker)
   - Effective Java 3rd Edition, (Joshua Bloch)

5. **Specific course information**
   a. **Catalog description:**
      This course covers the principles of Object Oriented Programming in Java. It details the 23 design patterns of the book: Design Patterns: Elements of Reusable Object-Oriented Software (GOF) and shows how and when to use creational/structural/behavioral design patterns in a greenfield project or in refactoring a brownfield project. It introduces the UML modeling language for modeling Object oriented solutions as well as it covers the main java libraries and packages for handling multithreading, input/outputs and network communications. Finally, it initiates the students to the use of documentation, and application monitoring (profiling, logs, and traces) tools.

   b. **Prerequisites:** None

   c. **Required** for CCE Software Engineering Option students; **Selected Elective** for students in the CCE Artificial Intelligence and Telecommunication Networks Options.

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
      - Understand UML class and sequence diagrams for modeling object-oriented solutions.
      - Cite, recognize and use GOF object-oriented design patterns.
      - Develop object-oriented Java applications using the main Java packages and libraries as well as document these applications using the Javadoc utility.
      - Make a productive use of the GOF object-oriented design patterns in application development in order to have self-documented, open, extensible and reusable applications.

b. PI addressed by the course:

PI	1.1	1.2	1.3	2.1	2.2	2.4	2.5	5.1	7.1
Covered	x	x	x	x	x	x	x	x	x
Assessed	x	x	x	x	x	x	x	x	x

7. Brief list of topics to be covered

- Introduction to Design Patterns (1 lecture)
- Introduction to UML: The essential diagrams needed to model a solution with design patterns (1 lecture)
- Introduction to Java (interpreted vs compiled) – bytecode – JVM Installation and configuration (1 lecture)
- Java syntax, and tools (java, javac, javadoc for documentation, etc…) (1 lecture)
- Classes, Packages, and Encapsulation (1 lecture)
- Static members, inheritance, and polymorphism (2 lectures)
- Interfaces, Upcast, Downcast, exception handling (2 lectures)
- Design patterns according to the GOF: Façade, Strategy (1 lecture)
- Input-Output as an example of the Decorator pattern (2 lectures)
- Threads in Java and their use in the Singleton pattern (2 lectures)
- Network Communication (UDP-TCP) and the proxy pattern (2 lectures)
- State, Builder (1 lecture)
- Visitor, Prototype (1 lecture)
- Memento, Chain of Responsibility (1 lecture)
- Command, Flyweight (1 lecture)
- Adapter class scope, Adapter object scope, Bridge (1 lecture)
- Template Method, Composite (1 lecture)
- Factory Method, Abstract Factory (1 lecture)
- Observer, Iterator (1 lecture)
- Lab (4 lectures)