



**Basic Information:**

|                        |                                    |                       |                 |
|------------------------|------------------------------------|-----------------------|-----------------|
| <b>Course Title:</b>   | Design Patterns                    | <b>Code</b>           | IT-662          |
| <b>Program:</b>        | MBIT via BBIT (IT Major)           | <b>Credit Hours:</b>  | Three (03)      |
| <b>Total Sessions:</b> | 30 Classes + Mid Term + Final Term | <b>Pre-Requisite:</b> | BBIT (IT Major) |

**Course Description:**

*Design patterns are typical solutions to common problems in software design. Each pattern is like a blueprint that you can customize to solve a particular design problem in your code. This course focuses on building best coding abilities among students.*

*This course extends object-oriented analysis and design by incorporating design patterns to create interactive business applications. Through a survey of established design patterns, MBIT students will gain a foundation for more complex software applications. As a term project, students will have to redesign an existing C#/Java/Android based application to implement a combination of design patterns.*

**Learning Outcomes:**

*After the completion of this course, it is expected that students who will involve themselves in the knowledge base working of the course will be capable to*

- ✓ *Design the real-world coding problems*
- ✓ *Apply patterns efficiently*
- ✓ *Improve coding capabilities*

**Teaching Learning Methodology:**

*The formal teaching component of this course consists of active student participation in and contribution to all forms of teaching and learning i.e. lectures, discussions, research assignments and projects. Lectures will be twice a week of 90 min each. Lecture will include on spot demonstration of coding sample and students will be performing in class assignments.*

**Individual Research Term Project:**

*Once the midterm exam is done. Students will be asked to submit a research proposal individually. The research assignment must display applied design patterns. Student will submit written report and defend his document in final presentation at the end of semester.*

**Weekly Term Plan**

| <b>Wk</b> | <b>Lecture Topic</b>   |
|-----------|--|
| 01        | <i>Revision of OO Concepts</i>   |
| 02        | <i>Revision of UML</i>   |
| 03        | <i>Practice of UML to Code and Code to UML</i>                                     |
| 04        | <i>Introduction to Design Patterns</i>   |
| 05        | <i>Introduction to SOLID</i>   |
| 06        | <i>Single Responsibility &amp; Open Closed Principles</i>                          |
| 07        | <i>Liskov Substitution , Interface Segregation, Dependency Inversion Principle</i> |
| 08        | <i>Mid Term Examination</i>  |
| 09        | <i>Case Study on SOLID</i>   |
| 10        | <i>Singleton Pattern</i>   |
| 11        | <i>Factory Pattern &amp; Abstract Factory Pattern</i>                              |
| 12        | <i>Observer Pattern</i>  |
| 13        | <i>Decorator Pattern</i>   |
| 14        | <i>Iterator Pattern</i>  |
| 15        | <i>Revision</i>  |
| 16        | <i>Final Term Examination</i>  |

### Topics in Detail

| No | Topic  |
|----|--|
| 01 | <i>Course Outline and Norms to Course</i>                        |
|    | <i>Encapsulation, Information Hiding, Object &amp; Instances</i> |
| 02 | <i>Inheritance, polymorphism, Delegates, Abstract Classes</i>    |
|    | <i>Interfaces, State Models</i>                                  |
| 03 | <i>Class Diagram, Sequence Diagram and Collaboration Diagram</i> |
|    | <i>State Diagram and Activity Diagram</i>                        |
| 04 | <i>UML to Code</i>   |
|    | <i>Code to UML</i>   |
| 05 | <i>What is design pattern? Properties of Good Design</i>         |
|    | <i>Why Design Patterns are required? SOLID</i>                   |
| 06 | <i>Singleton, Command, Decorator and Builder Pattern</i>         |
|    | <i>Factory Method and Abstraction</i>                            |
| 07 | <i>Template Method Pattern and Observer Pattern</i>              |
|    | <i>Strategy Pattern, Visitor Pattern, and Adapter Pattern</i>    |
| 08 | <i>Case Study</i>  |
| 09 | <b>Mid Term Examination</b>                                      |
| 10 | <i>Term Project Allocation</i>                                   |
|    | <i>Flyweight Pattern</i>   |
| 11 | <i>Proxy Pattern</i>   |
|    | <i>State Pattern</i>   |
| 12 | <i>Facade Pattern</i>  |
|    | <i>Iterator Pattern</i>  |
| 13 | <i>Mediator Pattern</i>  |
|    | <i>Memento Pattern</i>   |
| 14 | <i>Prototype Pattern and Case Study</i>                          |
|    | <i>Interpreter Pattern</i>                                       |
| 15 | <i>Bridge Pattern</i>  |
|    | <i>Composite Pattern</i>   |
| 16 | <i>UML for Design Pattern</i>                                    |
|    | <i>Practical Implementation</i>                                  |
| 17 | <b>Final Term Examination</b>                                    |

#### Text & Recommended Readings

- A. *Design Patterns: Elements of Reusable Object-Oriented Software*  
 Erich Gamma, Richard Helm, Ralph Johnson, John M. Vlissides
- B. *Pattern Hatching: Design Patterns Applied*  
 John M. Vlissides

#### Term Research Assignment Specification

1. *C# Dot Net*
2. *Microsoft Word for Documentation*

|                      |                                 |
|----------------------|---------------------------------|
| <i>Headings</i>      | <i>Arial 11pt Bold</i>          |
| <i>Normal Text</i>   | <i>Times New Roman 10pt</i>     |
| <i>Header Footer</i> | <i>Times New Roman 8pt</i>      |
| <i>Paragraph</i>     | <i>Single Line Spacing</i>      |
|                      | <i>First Line Indent 1.0 cm</i> |
| <i>Page Margins</i>  | <i>2 cm from each side</i>      |



### Grading Policy:

Final Grade for this course will be the cumulated result of the following term work with relevant participation according to the quoted percentage.

| <b>Sessional</b> | <b>25%</b> | <b>Mid Term</b>        | <b>35%</b> | <b>Final Term</b>               | <b>40%</b> |
|------------------|------------|------------------------|------------|---------------------------------|------------|
| Assignments      | 10 %       | Mid Term Exam          | 25%        | Final Exam                      | 30%        |
| Quizzes          | 10%        | Lab Work/ Lab Mid Exam | 10%        | Case Study/ Project/ Term Paper | 10%        |
| Presentations    | 05%        |                        |            |                                 |            |

*Remember subdivision of Mid Term and Final Term Examination should be done only in case of very essential and major Grading Instruments.*

### Dishonest Practices & Plagiarism

A student found responsible for dishonest practice/cheating (copying the work of others, use of unauthorized material in Grading Instruments etc.) in relation to any piece of Grading Instrument will face penalties like deduction of marks, grade 'F' in the course, or in extreme cases, suspension and rustication from IBIT.

For details consult Plagiarism Policy of the PU at <http://pu.edu.pk/dpcc/downloads/Plagiarism-Policy.pdf>

### Grading System:

| Letter Grade | Grade Point | Num Equivalence |
|--------------|-------------|-----------------|
| A            | 4.00        | 85 – 100 %      |
| A-           | 3.70        | 80 – 84 %       |
| B+           | 3.30        | 75 – 79%        |
| B            | 3.00        | 70 – 74 %       |
| B-           | 2.70        | 65 – 69 %       |
| C+           | 2.30        | 61 – 64 %       |
| C            | 2.00        | 58 – 60 %       |
| C-           | 1.70        | 55 – 57 %       |
| D            | 1.00        | 50 – 54 %       |
| F            | 0.00        | Below 50 %      |
| I            | Incomplete  | *               |
| W            | Withdraw    | *               |

### Norms to Course:

- ✓ Submission Date and Time for the term instruments is always **Un-Extendable**
- ✓ 7 Absentees in class will be result in forced withdrawal. **(PU Policy)**
- ✓ Re-sit in Mid and Final Term will cause you a loss of 2 and 3 grade marks respectively. **(PU Policy)**
- ✓ This is your responsibility to keep track of your position in class evaluation units.
- ✓ After the submission date, NO excuse will be entertained.
- ✓ **Keep a copy of all submitted Grading Instruments.**
- ✓ Assignment is acceptable only in its Entirety.
- ✓ No make up for any assignment and quiz.
- ✓ Copied & Shared work will score Zero.
- ✓ Assignments are Individual.

**Good Luck**