

**Pandit Deendayal Energy University**  
**School of Technology**  
**Department of Computer Science and Engineering**  
**Even Semester 2022-2023**  
**Course student handout file**

**INDEX**

<b>Name of the course: Design Pattern</b>	<b>Course Code: 20CP210P</b>
<b>Program: B. Tech.</b>	<b>Semester: 4<sup>th</sup></b>
<b>Branch: CE</b>	<b>Academic Year: 2022-23</b>
<b>Name of Course Coordinator: Dr.Debabrata Swain</b>	
<b>Subject Teachers (Division wise/Batch wise): Lab Course</b>	
<b>1. Dr. Tanmay Bhowmik</b>	
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<b>19</b>	<b>Direct Attainment of COs and POs and interpretation (Result analysis)</b>
<b>20</b>	<b>Indirect Attainment of POs through Course Exit Survey (Just before end sem. exam)</b>
<b>21</b>	<b>Final Attainment of COs and POs and interpretation (Result analysis), Actions to be taken if COs and POs are not achieved</b>
<b>22</b>	<b>Sample answer scripts of mid sem., end sem. exam and assignments of Good, Better and Best performing students (at least five copies of each assessment tool)</b>
<b>23</b>	<b>Class notes (Lecture PPT &amp; Lab manual etc.) in Soft/ Hard copy</b>

**Date:**

**Signature of Subject Teachers**

**Signature of Department  
Coordinator (IQAC)**

**Signature of Head of the  
Department**

**Departmental Vision & Mission**

### **Vision**

“To contribute to the society by imparting transformative education and producing globally competent professionals having multidisciplinary skills and core values to do futuristic research & innovations.”

### **Mission**

- To accord high quality education in the continually evolving domain of Computer Engineering by offering state-of-the-art undergraduate, postgraduate, doctoral programmes.
- To address the problems of societal importance by contributing through the talent we nurture and research we do:
- To collaborate with industry and academia around the world to strengthen the education and multidisciplinary research ecosystem.
- To develop human talent to its fullest extent so that intellectually competent and imaginatively exceptional leaders can emerge in a range of computer professions.

### **Program educational objectives (PEOs) of Department**

The Program Educational Objectives of B. Tech. (Computer Engineering) program are:

1. To prepare graduates who will be successful professionals in industry, government, academia, research, entrepreneurial pursuit and consulting firms
2. To prepare graduates who will make technical contribution to the design, development and production of computing systems
3. To prepare graduates who will get engage in lifelong learning with leadership qualities, professional ethics and soft skills to fulfill their goals
4. To prepare graduates who will adapt state of the art development in the field of computer engineering

### **Program Outcomes (POs)**

**Undergraduate engineering program are designed to prepare graduates to attain the following program outcomes:**

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design / development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **Program Specific Outcomes (PSOs)**

The graduates of CSE department will be able to:

1. Develop computer engineering solutions for specific needs in different domains applying the knowledge in the areas of programming, algorithms, hardware-interface, system software, computer graphics, web design, networking and advanced computing.
2. Analyze and test computer software designed for diverse needs.
3. Pursue higher education, entrepreneurial ventures and research.

## Academic Calendar

## Class Time Table and Faculty Time Table with office hours

**Pandit Deendayal Energy University**  
**School of Technology**  
**B.Tech - Computer Engineering**  
**Semester : 4 (4)**

Spring Semester 2023		w.e.f : 2nd January 2023							
Day	09:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00
Monday	G7G8 (20CP207T) F-404, TABH-L	G7G8 (20CP208T) F-404, SONA-L	G7G8 (20HS201P) C006, KKV-P	G (OE4) F-404, OE4F-L		G7 (20CP210P) E216, NSC-P		G8 (20CP209P) E213, ADHS-P	
Tuesday	G8 (20CP210P) F-202, TABH-P		G7G8 (20HS201P) C006, KKV-P	G (OE4) F-502, OE4F-L		G8 (20CP208P) E213, HAK-P	G7G8 (20CP207T) F-404, TABH-L	G7G8 (CDC) E105, VBA-L	
Wednesday	G7G8 (20CP209T) F-404, ADHS-L	G7G8 (20CP207T) F-404, TABH-L		G (OE4) F-502, OE4F-L		G7 (20CP209P) E216, ADHS-P	G7G8 (20CP209T) F-404, ADHS-L	G7G8 (20CP206T) F-404, PCH-L	
Thursday	G7G8 (20CP209T) F-404, ADHS-L	G7G8 (20CP208T) F-404, SONA-L	G7G8 (20CP206T) F-404, PCH-L	G (OE4) F-502, OE4F-L		G8 (20CP210P) E213, TABH-P			
Friday	G7G8 (CDC) F-402, VBA-L	G7G8 (20CP208T) F-503, SONA-L	G7G8 (20CP206T) F-503, PCH-L	G (OE4) E107, OE4F-L		G8 (20CP207P) E216, RUZ-P		G7 (20CP208P) E215, HAK-P	
Saturday									
<b>Faculty Abbr.</b>	<b>Faculty Name</b>		<b>Subject Abbr.</b>	<b>Subject Name</b>					
ADSH	Aditya shastri		20CP206T	Theory of Computation					
HAK	Hargeet Kaur		20CP207P	Operating System - Lab					
KKV	Kapil Kella - VF3 HS		20CP207T	Operating System					
NSC	Nisha Chauhan - VF CSE		20CP208P	Database Management System					
OE4F	OE Fac		20CP208T	Database Management System					
PCH	Payal Chaudhary		20CP209P	Design & Analysis of Algorithm					
RUZ	Rutvij H Jhaveri		20CP209T	Design & Analysis of Algorithm					
SONA	Sonam Nahar		20CP210P	Design Pattern - Lab					
TABH	Tanmay Bhowmik		20HS201P	Communication Skills - II					
VBA	Vineet CDC		CDC	CD CELL					
			OE4	OE SEM IV					

Dr. Santosh Bharti  
Timetable Coordinator

Dr. Shakti Mishra  
HoD

Prof. Dhaval Pujara  
Director  
(School of Technology)

**Pandit Deendayal Energy University**  
**School of Technology**  
**B.Tech - Computer Engineering**  
**Semester : 4 (6)**

Spring Semester 2023		w.e.f : 2nd January 2023							
Day	09:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00
Monday		G11 (20CP207P) F-104, HITH-P		G (OE4) E107, OE4F-L		G12 (20CP208P) F-202, HAK-P		G11G12 (CDC) F-403, VBA-L	
Tuesday	G11G12 (CDC) F-403, VBA-L	G11G12 (20CP206T) F-403, PCH-L	G11G12 (20HS201P) C007, CSV4-P	G (OE4) E107, OE4F-L		G11G12 (20CP207T) F-403, HITH-L		G11G12 (20CP206T) F-403, PCH-L	
Wednesday		G11G12 (20CP208T) F-503, HAK-L	G11G12 (20HS201P) C007, CSV4-P	G (OE4) E108, OE4F-L		G11G12 (20CP209T) F-403, SVS-L	G11G12 (20CP206T) F-403, PCH-L	G11G12 (20CP207T) F-403, HITH-L	
Thursday	G11G12 (20CP209T) F-503, SVS-L	G12 (20CP209P) F-103, ADHS-P		G (OE4) E108, OE4F-L		G11 (20CP209P) E216, ADHS-P		G11G12 (20CP208T) F-403, HAK-L	
Friday	G11G12 (20CP209T) F-503, SVS-L	G12 (20CP207P) F-203, DEP-P		G (OE4) E108, OE4F-L		G12 (20CP210P) F-202, TABH-P			
Saturday		G11 (20CP208P) E215, HAK-P							
<b>Faculty Abbr.</b>	<b>Faculty Name</b>		<b>Subject Abbr.</b>	<b>Subject Name</b>					
ADSH	Aditya shastri		20CP206T	Theory of Computation					
CSV4	VF4 - HSE - CS		20CP207P	Operating System - Lab					
DEP	Deepti - VF - CSE		20CP207T	Operating System					
HAK	Hargeet Kaur		20CP208P	Database Management System - Lab					
HITH	Hiren Thakkar		20CP208T	Database Management System					
OE4F	OE Fac		20CP209P	Design & Analysis of Algorithm - Lab					
PCH	Payal Chaudhary		20CP209T	Design & Analysis of Algorithm					
SVS	Shivangi Surati		20CP210P	Design Pattern - Lab					
TABH	Tanmay Bhowmik		20HS201P	Communication Skills - II					
VBA	Vineet CDC		CDC	CD CELL					
			OE4	OE SEM IV					

Dr. Santosh Bharti  
Timetable Coordinator

Dr. Shakti Mishra  
HoD

Prof. Dhaval Pujara  
Director  
(School of Technology)

# Faculty Time Table:

**Tanmay Bhowmik**  
**Computer Science & Engineering**

Spring Semester 2023

w.e.f : 2nd January 2023

Day	08:00-09:00	09:00-10:00	10:00-11:00	11:00-12:00	12:00-13:00	13:00-14:00	14:00-15:00	15:00-16:00	16:00-17:00	17:00-18:00	18:00-19:00
Monday		G7G8 (20CP207T) F-404, CP(4) - L	G12 (20CP210P) F-202, CP(4) - P				G11 (20CP210P) F-104, CP(4) - P				
Tuesday		G8 (20CP210P) F-202, CP(4) - P							G7G8 (20CP207T) F-404, CP(4) - L		
Wednesday			G7G8 (20CP207T) F-404, CP(4) - L				G8 (20CP210P) E213, CP(4) - P				
Thursday			G11 (20CP210P) F-104, CP(4) - P				G12 (20CP210P) F-202, CP(4) - P				
Friday											
Saturday											

Location Abbr.	Location Name	Subject Abbr.	Subject Name
E213	E, Web Tech. Lab (CP2)	20CP207T	Operating System
F-104	F, Data Analytics Lab	20CP210P	Design Pattern - Lab
F-202	F, AI-ML LAB		
F-404	F, Lecture Hall		

**Office Hours: Wednesday 4:00 pm – 6:00 pm (Students are requested to send prior mail before cotacting).**



20CP210P					Design Patterns/Thinking LAB					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
0	0	4	2	4	-	-	-	50	50	100

**COURSE OBJECTIVES**

- To address design related recurring problems in software development.
- To familiarize students with standard design patterns as Creational, Structural, Behavioral and architectural patterns.

**LIST OF EXPERIMENTS**

Preferred Programming Language: Any object-oriented programming language such as Java, C++, C#.

- |                           |  |   |
|---------------------------|--|---|
| 1. Creational patterns    | <ul style="list-style-type: none"> <li>• Factory method</li> <li>• Prototype</li> <li>• Singleton</li> </ul>   | <ul style="list-style-type: none"> <li>• Abstract Factory</li> <li>• Builder</li> </ul>   |
| 2. Structural Patterns    | <ul style="list-style-type: none"> <li>• Façade</li> <li>• Flyweight</li> <li>• Proxy</li> <li>• Decorator</li> </ul>  | <ul style="list-style-type: none"> <li>• Adapter</li> <li>• Bridge</li> <li>• Composite</li> </ul>  |
| 3. Behavioural Patterns   | <ul style="list-style-type: none"> <li>• Memento</li> <li>• Observer</li> <li>• State</li> <li>• Strategy</li> <li>• Template method</li> </ul>                        | <ul style="list-style-type: none"> <li>• Chain of Responsibility</li> <li>• Command</li> <li>• Interpreter</li> <li>• Iterator</li> <li>• Mediator</li> </ul> |
| 4. Architectural patterns | <ul style="list-style-type: none"> <li>• Peer to peer</li> <li>• Model View Controller</li> <li>• Interpreter</li> <li>• Blackboard</li> <li>• Microservice</li> </ul> | <ul style="list-style-type: none"> <li>• Layer</li> <li>• Client Server</li> <li>• Pipe and Filter</li> <li>• Broker</li> </ul>                               |

**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1- Construct a design consisting of a collection of modules.  
 CO2- Apply Creational, Structural, Behavioural, and architectural design patterns.  
 CO3- Distinguish between different categories of design patterns.  
 CO4- Relate the Creational, structural, behavioural Design patterns.  
 CO5- Apply Pattern Oriented Architectures to construct software.  
 CO6- Select suitable design patterns to refine the basic design for given context.

**TEXT/REFERENCE BOOKS**

1. Erich Gamma, R. Helm, R. Johnson, J. Vlissides, "Design Patterns- Elements of Reusable Object-Oriented Software", Pearson.

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**

**Max. Marks: 100**

Part A: Continuous Evaluation based on lab records and performance.  
 Part B: 2 Experiment conducted and Viva at final exam.

**Exam Duration: 2 Hrs**

50 Marks  
 50 Marks

**Course Articulation Matrix---- TBD**

	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PS01</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO 1</b>	2	3	3	3	3	1	0	0	3	2	2	2	3	3	3
<b>CO 2</b>	2	3	3	3	3	1	0	0	3	2	2	2	3	3	3
<b>CO 3</b>	2	3	3	3	3	1	0	0	3	2	3	2	3	3	3
<b>CO 4</b>	2	3	3	3	3	1	0	2	3	2	3	3	3	3	3
<b>CO 5</b>	2	3	3	3	3	1	0	1	3	2	2	3	3	3	3
<b>CO 6</b>	2	3	3	3	3	1	0	1	3	2	3	2	3	3	3

**Program Articulation Matrix-TBD**

<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PS01</b>	<b>PSO2</b>	<b>PSO3</b>
2.00	3.00	3.00	3.00	3.00	1.0	0	0.67	3.00	2.00	2.50	2.33	3.00	3.00	3.00

Correlation levels 1, 2 or 3 as defined below:

1: Slight (Low)      2: Moderate (Medium)      3: Substantial (High)

## Evaluation Scheme and Rubrics

**Course code:** 20CP210P **Course name:** Design Pattern / Thinking Lab

**Course Outcomes (CO's):** On completion of the course, students will be able to

- CO1. Construct a design consisting of a collection of modules
- CO2. Apply Creational, Structural, Behavioral and architectural design Patterns
- CO3. Distinguish between different categories of Design Pattern
- CO4. Relate the creational, structural, behavioral Design Patterns
- CO5. Apply Pattern Oriented Architecture to construct software
- CO6. Select suitable design pattern to refine the basic design for given context.

### CO Assessment Tools (Direct Assessment):----- TBD

Various assessment tools used to evaluate CO's (Rubrics) and the frequency with which the assessment processes are carried out are listed below.

Assessment Method	Assessment Tool	Description	Marks	Mapping with CO	Contribution to CO's
	Problem solving/ design/Project	Analytical/design based questions on syllabus covered	50	CO1,CO2, CO3,CO4, CO5, CO6	It contributes to 50% weightage of Direct Assessment to CO attainment.
	Total marks will be converted into 50 marks at the end.				
Direct	End-Sem Examination	<b>Topics to be covered:</b> Unit I, II, III, IV	50	CO1,CO2, CO3,CO4, CO5, CO6	It contributes to 50% weightage of Direct Assessment to CO attainment.
	Total 50 marks at the end.				

### 11. Tutorials, Assignments, Case Studies, Quiz, Presentations etc.

Available online on Teams Platform, PPT sent to students through Email and Teams. Tutorials, Assignments, Case Studies, Quiz, Presentations etc.

### LAB - LIST OF EXPERIMENTS

Preferred Programming Language: Any object-oriented programming language such as Java, C++, C#.

1. Creational patterns

- Factory method • Prototype • Abstract Factory • Builder • Singleton

2. Structural Patterns

- Façade • Flyweight • Proxy • Decorator • Adapter • Bridge • Composite

3. Behavioural Patterns

- Memento • Observer • State • Strategy • Template method • Chain of Responsibility • Command • Interpreter • Iterator • Mediator

4. Architectural patterns

- Peer to peer • Model View Controller • Interpreter • Blackboard • Microservice • Layer • Client Server • Pipe and Filter • Broker

Lecture No.	Topic to be covered	Teaching Aid to be used	Remarks (Text book/Unit No etc.)
1	Factory method	IDE+PPT	Erich Gamma
2	Builder	IDE+PPT	Erich Gamma
3	Prototype	IDE+PPT	Erich Gamma
4	Singleton	IDE+PPT	Erich Gamma
5	Adapter	IDE+PPT	Erich Gamma
6	Composite	IDE+PPT	Erich Gamma
7	Façade Design Pattern	IDE+PPT	Erich Gamma
8	Observer	IDE+PPT	Erich Gamma
9	Template	IDE+PPT	Erich Gamma
10	State	IDE+PPT	Erich Gamma
11	Model View Control	IDE+PPT	Erich Gamma

