University of Dhaka
Department of Computer Science and Engineering
Faculty of Engineering and Technology (FoET)
Second Science Complex, Mokarram Bhaban Area
University of Dhaka, Dhaka 1000, Bangladesh

Course Outline
CSE 2103 Object Oriented Design and Programming

1 Basic Information

Faculty	Faculty of Engineering and Technology (FoET)
Department	Department of Computer Science and Engineering
Programme	Bachelor of Science in Computer Science and Engineering
Semester	**2nd year 1st semester 2025**
Course Code	CSE 2103
Course Title	*Object Oriented Design and Programming*
Course Credit	3.0 units
Contact Hours Per Week	3
Course Status	Core Course
Prerequisite Course	CSE 1201 - Structured Programming

2 Course Teacher

Section	Name	Office	Email
1	Md Fahim Arefin	Room 426	fahim@cse.du.ac.bd

3 Class Hours

Section	Room	Weekday	Time	Weekday	Time
1	Room 417	Sunday	11:30 AM - 1 PM	Thursday	11:30 AM - 1 PM

4 Counseling Hours

Section	Weekday	Time	Weekday	Time
1	Sunday	10AM - 11AM	Thursday	1PM - 2PM

5 Course Rationale

This course introduces the object oriented programming paradigm to the students. After completing the course on procedural programming (in C language), the students are now prepared to transition from procedural programming to object-oriented programming, which emphasizes abstraction, modularity, and reusability. The course focuses on core object oriented programming principles with the help of a particular language. The course also teaches common object oriented design practices and patterns.

6 Syllabus

Introduction: Object Oriented Programming (OOP). Object-oriented concepts: modeling problems using object-oriented concepts, namespace, inheritance, encapsulation, polymorphism, Object-oriented design methodologies, and OOP memory models. Object-oriented design patterns in OOP and class diagrams. Use case, activity, and interaction diagram. **Creational design patterns:** UML class diagram and creation of an object in OOP using a singleton, factory, abstract factory, builder, and prototype design pattern. **Structural Design Pattern:** UML class diagram and object composition or extension in OOP using an adapter, flyweight, composite, proxy, facade (or interface), bridge, and decorator. **Behavioral Design Pattern:** UML class diagram and modify the behavior or control the access scope of OOP objects using template, chain, mediator, observer, strategy, command, interpreter, visitor, memento, and state design pattern. **Exception handling:** exception types, chained exceptions. **OOP I/O:** Stream and files using decorator and factory design pattern. Java GUI event, Event Container, and Components.

7 Course Outcomes

CO	**CO Description**	**PO**	**Domain (LoBT)**	**Weight**	**Assessment Methods**
CO1	Understand the evolution of programming, the rationale behind OOP, basic concepts of OOP such as objects and classes, class diagram, java class design using design pattern	PO1	Cognitive (C3)	40%	Please refer to Section 8.
CO2	Analysis of design methodologies, UML, interaction class diagram using design pattern in Java developing enterprise application.	PO2	Cognitive (C4)	50%	
CO3	Understand and apply design patterns in OOP to solve real-life complex problems, demonstrate OOP design skills.	PO6	Affective (A4)	10%	

Legend:

CO:	*Course Outcome*	**PO**:	*Program Outcome*
LoBT:	*Level of Bloom's Taxonomy*		

8 Assessment Methods of COs

Assessment Method	**CO1**	**CO2**	**CO3**	**Total**
Final Exam	25%	35%		60%
Midterm Exam	10%	10%		20%
Class Test/Quiz	5%	5%		10%
Assignment/Presentation			5%	5%
Class Participation			5%	5%
Total	40%	50%	10%	100%

9 Topic Outline

Lecture	Selected Topic	Article	Problems
1-2	Introduction to Object Oriented Programming, Object-oriented concepts, modeling problems using object-oriented concepts	T	T
3-6	Object-oriented programming: namespace, inheritance, encapsulation, polymorphism, Object-oriented design methodologies, OOP memory models	T	T
7-9	Object-oriented design patterns: OOP and class diagrams. Use case, activity, and interaction diagram	T	T
10-13	Creational design patterns: UML class diagram, class definition, and creation of an object in OOP using a singleton, factory, abstract factory, builder, and prototype design pattern.	T	R
14-17	Structural Design Pattern: UML class diagram, class definition, and object composition or extend in OOP using an adapter, flyweight, composite, proxy, facade (or interface), bridge, and decorator.	T	R
17-19	Behavioral Design Pattern: UML class diagram, class structure and change the behavior or access scope in OOP-object using template, chain, mediator, observer, strategy, command, interpreter, visitor, memento, and state design pattern	T	R
20-22	Exception handling: exception types, chained exceptions using chain design pattern.	T	T
23-24	Exception handling: motivation, basic constructs, exception class hierarchy, exception types, multiple catch clauses, creating own exceptions.	T	T
25-26	Java I/O: Stream and files using decorator and factory design pattern.	T	T
27-28	GUI Containers and Components: GUI packages/library, GUI Event component classes, GUI Event Accumulator, and design pattern.	T	T

For the definitions of **T** and **R** , Please refer to Section 10.

10 Text and Reference Materials

T Textbook:

- *Herbert Schildt*, **Java: The Complete Reference**, 10th Ed..
- *Olaf Musch*, **Design Patterns with Java: An Introduction**, Springer Vieweg Wiesbaden, First Edition, 2023
- *Eric Freeman (Author)*, *Elisabeth Robson*, **Head First Design Patterns: Building Extensible and Maintainable Object-Oriented Software**, O'Reilly Media, 2nd Edition, Jan 2021

R References:

- *Erich Gamma*, *Richard Helm*, *Ralph Johnson*, *John Vlissides*, **Design Patterns: Elements of Reusable Object-Oriented Software**, Addison-Wesley Professional, 1st Edition, October 1994
- *Robert Sebesta*, **Concepts of Programming Language** 11th Ed.
- *Deitel & Deitel* **Java: How to Program** 11th Ed.

11 Grading Policy

Marks Obtained	Letter Grade	Numerical Evaluation	Definition
80% and above	A+	4.00	Excellent
75% <80%	A	3.75	Excellent
70% <75%	A-	3.50	Very Good
65% <70%	B+	3.25	Good
60% <65%	B	3.00	Good
55% <60%	B-	2.75	Good
50% <55%	C+	2.50	Average
45% <50%	C	2.25	Average
40% <45%	D	2.00	Below Average
below 40%	F	0.00	Failing

Md Fahim Arefin, Course Teacher CSE2103
August 23, 2025

Chairman, Dept. of CSE, DU
August 23, 2025

Appendix A : Program Outcomes (POs)

POs	Category	Program Outcomes
PO1	Foundational Knowledge	Apply a profound understanding of basic science, mathematics, and core principles of computer, computing, and communications to tackle intricate challenges within the field effectively. Utilize theoretical insights and practical skills to devise innovative solutions.
PO2	Problem Analysis and Modeling	Identify, formulate, and rigorously analyze complex engineering problems in computer science and engineering domains. This involves extensive computing and scientific issues, literature review, and the application of mathematical, statistical, and computational algorithmic techniques to derive substantiated conclusions.
PO3	Algorithm Design and Implementation	Design solutions for complex computer science and engineering problems and design systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. (K5)
PO4	Investigation	Conduct investigations of complex problems using research-based knowledge (K8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PO5	Modern Tool Usage	Apply a cutting-edge array of computing, communication and artificial intelligence techniques to develop innovative software application models, network systems and other AI applications. Understand the use of prediction and modeling techniques for complex engineering activities and their limitations.
PO6	Computer Engineers and Society	Apply reasoning informed by computer science and engineering knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems. (K7)
PO7	Environment and Sustainability	Understand and evaluate the sustainability and impact of professional engineering work in solving complex computer science and engineering problems in societal and environmental contexts. (K7)
PO8	Ethics	Apply ethical principles and commit to professional ethics, responsibilities, and the norms of engineering practice.
PO9	Individual Work and Teamwork	Function effectively as an individual and as a member or leader of diverse teams and in multidisciplinary settings.
PO10	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.
PO11	Project Management and Finance	Demonstrate knowledge and understanding of the computation, software and network systems, and AI principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.
PO12	Life Long Learning	Recognize the need for and have the preparation and ability to engage in independent, life-long learning for adaptibility in the broadest context of technological change.

Appendix B : Domain and Level of Bloom's Taxonomy

Cognitive Domain		Psychomotor Domain		Affective Domain	
C1	Remembering	P1	Perception	A1	Receive
C2	Understanding	P2	Set	A2	Respond
C3	Applying	P3	Guided Response	A3	Value
C4	Analyzing	P4	Mechanism	A4	Organize
C5	Evaluating	P5	Complex Overt Response	A5	Internalize
C6	Creating/Designing	P6	Adaption		
		P7	Origination		