AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)

Faculty of Science and Technology (FST)
Department of Computer Science (CS)
Undergraduate Program

COURSE PLAN

Fall 2021-22 SEMESTER

I. Course Code and Title

CSC 2210: Object Oriented Analysis and Design

II. Credit

3 credit hours (3 hours of theory per week)

III. Nature

Core Course for CS, CSE, CSSE, SE, CIS

IV. Prerequisite

CSC 2105: Data Structure
CSC 2107: Introduction to Database

V. Vision:
Our vision is to be the preeminent Department of Computer Science through creating recognized professionals who will provide innovative solutions by leveraging contemporary research methods and development techniques of computing that is in line with the national and global context.

VI. Mission:
The mission of the Department of Computer Science of AIUB is to educate students in a student-centric dynamic learning environment; to provide advanced facilities for conducting innovative research and development to meet the challenges of the modern era of computing, and to motivate them towards a life-long learning process.

VII - Course Description:

- Explain the necessity of formal modelling techniques in system development
- Describe system analysis and design using object-oriented concepts and techniques
- Quote the UML building blocks along with their notations
- Demonstrate the use of object-oriented analysis concept with UML diagrams
- Solve complex engineering problems using UML concepts and tools

VIII – Course outcomes (CO) Matrix:

By the end of this course, students should be able to:

COs*	CO Description	Level of Domain**				PO Assessed***
		C	P	A	S	
CO1	Illustrate the concept of object-oriented analysis through the use of UML diagrams.	3				PO-e-2
CO2	Design a Complex engineering problem using UML Tools and explain the system using a project report and presentation		6			PO-e-2

C: Cognitive; P: Psychomotor; A: Affective; S: Soft-skills (CT: Critical Thinking, TS: Teamwork)
* *CO assessment method and rubric of COs assessment is provided in Appendix section*
** *The numbers under the 'Level of Domain' columns represent the level of Bloom's Taxonomy each CO corresponds to.*
*** *The numbers under the 'PO Assessed' column represent the PO (appendix) each CO corresponds to.*

IX – Topics to be covered in Class:

American International University-Bangladesh (AIUB)

TOPICS	Specific Objective(s)	Time Frame	Suggested Activities	Teaching Strategy(s)	CO mapped
Introduction to Software Modeling	Explain the outline of the upcoming topics and discuss the necessity of formal modeling techniques in system development.	Week 1	Why we do software modeling will be lectured in summarized form along with necessary explanation of phrases and concepts	Lecture notes, Explanation of quotations, real life examples, question answer session	CO1
Introduction of UML	Name the various UML and its building blocks with their notations.	Week 1	The introduction of UML necessary explanation of phrases and concepts.	Lecture notes, question answer session	CO1
Use Case Diagram Data Flow Diagram	Demonstrate the requirements with the static view of a system.	Week 2-3	Students will realize the importance of the requirement analysis as the first step of system analysis with the help of the most visual tool Use Case Diagram	Lecture notes, real life case study solutions, question answer session	CO1,CO2
Class Diagram Object Diagram	Illustrate the relationships between a set of classes, interfaces and collaborations. Class diagrams demonstrate the static design view of a system.	Week 4-5	The most common artifact of OO design classes will be introduced to the students with all possible relationships explained with notations and examples	Lecture notes, real life case study solutions, question answer session	CO1,CO2
Sequence Diagram	Illustrate a sequence diagram which is an interaction diagram that emphasizes the time ordering of messages.	Week 6	Notations of interaction diagrams would be introduced to the students with its necessity to understand the dynamic view of a system. Both, UML 1.4 and 2.0 specifications will be introduced.	Lecture notes, real life case study solutions, question answer session	CO1,CO2
Midterm Week Week 7					

Activity Diagram	Illustrate the activity diagram as a special kind of a state chart diagram that shows the flow from activity to activity within a system	Week 8-9	Students will learn the notations of activity diagram along with identifying and drawing the flow of the system from activity to activity within a system	Lecture notes, real life case study solutions, question answer session	CO2
State chart Diagram	Illustrate that state chart diagram is important in modeling the behavior of an interface, class or collaboration and emphasize the event ordered behavior of an object	Week 10	Students would be able to understand the behavioral aspects of the system by drawing states of the objects using various examples	Lecture notes, real life case study solutions, question answer session	CO2
COCOMO & Function Point (Software Project Estimation) OO Software metrics	Illustrate various aspects of IS project estimation using one of the popular methodologies named COCOMO To introduce the Software measuring technique specially for Object Oriented Methodology using various OO software metrics	Week 11-12	Students will be introduced with theories and formulae of COCOMO and practice them in exercises. Students will study the theories and formulae of various OO Software metrics and then apply them in exercises	Lecture notes, board work, question answer session	
Design Patterns	Model design patterns which capture the essence of a design solution that has been proven to be useful in practice of OO Methodology	Week 13	Students will be shown the theories and technique of using various design patterns	Lecture note, examples, code walkthroughs	
Final term Week Week 14					

XI- Course Requirements

At least **80% class attendance** is necessary to sit for the exam. If there is any assignment given to the students, they have to submit it before the deadline decided by the course teacher.

XII – Evaluation & Grading System

The following grading system will be strictly followed in this class

Mid Term Exam:
Written Exam: 40% (MCQ + Diagram Drawing)
Quizzes: 20%
Assignment: 30%
Attendance & Performance: 10%
Final Term Exam:
Written Exam: 40% (MCQ + Diagram Drawing)
Quiz: 20%
Assignment/Project: 30%
Attendance & Performance: 10%
Semester grade: 50% midterm + 50% final term

Letter	Grade Point	Numerical %
A+	4.00	90-100
A	3.75	85 - < 90
B+	3.50	80 - < 85
B	3.25	75 - < 80
C+	3.00	70 - < 75
C	2.75	65 - < 70
D+	2.50	60 - < 65
D	2.25	50 - < 60
F	0.00	< 50
I		Incomplete
W		Withdrawal
UW		Unofficially Withdrawal

XIII – Teaching Methods

Maximum topics will be covered from the textbook. For the rest of the topics, reference books will be followed. Some Class notes will be uploaded on the web. White board will be used for most of the time. For some cases, multimedia projector will be used for the convenience of the students. Students must study up to the last lecture before coming to the class and it is suggested that they should go through the relevant chapter before coming to the class. Just being present in the class is not enough- students must participate in classroom discussions.

XIV – Textbook/ References

1. The Unified Modeling Language User Guide by Grady Booch, James Rumbaugh, Ivar Jacobson
2. UML Weekend Crash Course by Thomas A Pender
3. Head first design patterns by Eric Freeman, Elisabeth Freeman, Kathy Sierra, Bert Bates
4. Design Patterns- Elements of Reusable Object-Oriented Software by Eric, Gamma, Richard Helm, Ralph Johnson, John Vlissides
5. An Integrated Approach to Software Engineering by PankajJalote
6. Object Oriented Software Engineering-Ivar Jacobson, Magnus Christerson, Patrik Jonsson, Gunnar Overgaard
7. The Unified Modeling Language Reference Manual by Grady Booch, James Rumbaugh, Ivar Jacobson
8. Object Oriented System Analysis and Design, Second Edition by Grady Booch

XV - List of Faculties Teaching the Course

MANZUR H. KHAN
0209-187-2
MD. ANWARUL KABIR
0001-047-2
Dr. Md Alamgir Kabir
XXXX-XXXX-2
Dr. S. M. Hasan Mahmud
XXXX-XXXX-2
SUPTA RIACARD PHILIP
1909-1997-2
DR. RAZIB HAYAT KHAN
1705-1787-2

XVI – Verification:

<table>
<tr><td>Prepared by :

Dr. Razib Hayat Khan
Course Convener

Date:.....</td><td colspan="2">Moderated by :

Dr. M.M. Mahbubul Syeed
Point Of Contact
OBE Implementation Committee for CS

Date:.....</td></tr>
<tr><td>Checked by:

.....

Dr. M. M. Mahbubul Syeed
Associate Professor
Department of Computer Science

Date:.....</td><td>Certified by:

.....

Dr. Dip Nandi
Director,
Faculty of Science & Technology

Date:.....</td><td>Approved by:

.....

Mr. Mashiour Rahman
Associate Dean,
Faculty of Science & Technology

Date:.....</td></tr>
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APPENDIX

Table 1: Knowledge Profile (WK / K)		
Curriculum		
Indicator		**Attribute**
K1	Theory based natural science	A systematic, theory-based understanding of the natural sciences applicable to the discipline
K2	Conceptual based mathematics	Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline
K3	Theory based engineering fundamentals	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
K4	Forefront specialist knowledge for practice	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
K5	Engineering Design	Knowledge that supports engineering design in a practice area
K6	Engineering Practice (Technology)	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
K7	Comprehension of engineering in society	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability
K8	Research Literature	Engagement with selected knowledge in the research literature of the discipline

Table 2: Range of Complex Engineering Problem Solving (WP / P)		
Complex Engineering Problems have characteristic P1 and some or all of P2 to P7		
Indicator	**Title**	**Description**
P1	Depth of knowledge required	Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach
P2	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues
P3	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
P4	Familiarity of issues	Involve infrequently encountered issues
P5	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering
P6	Extent of stakeholder involvement and conflicting requirements	Involve diverse groups of stakeholders with widely varying needs
P7	Interdependence	Are high level problems including many component parts or sub-problems

Table 3: Range of Complex Engineering Activities (A)		
Complex activities means (engineering) activities or projects that have some or all of the following characteristics		
Indicator	**Title**	**Description**
A1	Range of resources	Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and technologies)
A2	Level of interaction	Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
A3	Innovation	Involve creative use of engineering principles and research-based knowledge in novel ways
A4	Consequences for society and the environment	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation
A5	Familiarity	Can extend beyond previous experiences by applying principles-based approaches

Mapping of PO/PLO and K, P, A of this course:

PO-e: Modern Tool Usage Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations. (K6).					
PO Indicator ID	PO Indicators Definition (As per the requirement of WKs)	Domain	K	P	A
PO-e-2	Create appropriate techniques, tools, or resources (e.g., prediction & modeling) to solve complex engineering problems considering their limitations.	Psychomotor Level 6 (Create)	K6 Engineering Practice (Technology)	P1, P4, P7	A1, A2, A3

Mapping of CO Assessment Method and Rubric

The mapping between Course Outcome(s) (COs) and The Selected Assessment method(s) and the mapping between Assessment method(s) and Evaluation Rubric(s) is shown below:

CO	Description	Learning Domain	Assessment Method	Assessment Rubric
CO1	Illustrate the concept of object-oriented analysis using UML diagrams.	Cognitive	Quiz	Rubric for Quiz
CO2	Design a Complex engineering problem using UML Tools and explain the system using a project report and presentation	Psychomotor	Project	Rubric for Project

Rubric for Quiz Assessment (CO1)

Criteria	Marks distribution (Max 3X5 = 15)				Acquired Marks
	Inadequate (1-2)	Satisfactory (3)	Good (4)	Excellent (5)	
Object Oriented Concept	Identifies very few of the object-oriented design elements and their relations	Identifies some of the object-oriented design elements and their relations	Identifies most of the object-oriented design elements and their relations	Identifies all of the object-oriented design elements and their relations	
Diagram Standard	Lack of design element and in many cases inappropriate notations are used	Appropriate notations are used for some of the design elements	Appropriate notations are used for most of the design elements	Appropriate notations are used for all design elements	
Correctness and Efficiency of the Design	In many cases the design is not correct and not efficient	The design is mostly correct and in some cases not very efficient	The design is correct and not efficient in some cases	The design is correct and efficient	
				Acquired Marks:	
				CO Pass/Fail:	

Rubric for Assignment Assessment (CO2)

Criteria	Marks distribution (Max 4X5 = 20)				Acquired Marks
	Inadequate (1-2)	Satisfactory (3)	Good (4)	Excellent (5)	
Content Knowledge	Student does not have grasp the idea of the subject matter and cannot explain the proposed solution	Student is uncomfortable with project idea and is able to explain only basic information	Student is at ease with project content but fails to elaborate with more details	Student demonstrates full project knowledge with the explanations and required elaboration	
Diagram Standard	The diagram covers very few of the desire features mentioned in specification and their relations	The diagram covers some of the desire features mentioned in specification and their relations	The diagram covers most of the desire features mentioned in specification and their relations	The diagram covers all the desire features mentioned in specification and their relations and provides well understanding of the Tool functionality	
Report Organization	Inappropriate content of several sections of report	Some content placed incorrectly in report	Content appropriate to all section of report	Content organization enhances readability and/or understandability of report	
Presentation Delivery	Holds no eye contact with audience, as entire report is read from notes, speaks in low volume and monotonous tone.	Displays minimal eye contact with audience, while reading mostly from the notes, speaks in uneven volume with little or no inflection	Consistent use of direct eye contact with audience, but still returns to notes, speaks with satisfactory variation of volume and inflection	Holds attention of entire audience with the use of direct eye contact, seldom looking at notes, speaks with fluctuation in volume and inflection to maintain audience interest and emphasize key points	
Tool Use	The use of UML tool is inappropriate and lack of efficiency in the design	The use of UML tool is mostly appropriate but lack of efficiency in the design	The use of UML tool is appropriate but lack of efficiency in the design	Provides a great understanding of the Tool functionality	
				Acquired Marks:	
				CO Pass/Fail:	