AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)

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

COURSE PLAN	SEMESTER: Summer 2023-2024
I. Course Core and Title CSC 3220 Compiler Design **II. Credit** 3 credit hours (3 hours of Lab and 2 hours of theory per week) **III. Nature** Core Course for CS, CSE, CSSE, SE, CIS **IV. Prerequisite** CSC 3113 Theory of Computation	**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

- Define Preprocessor, compiler, Assembler and Linker.
- Describe how high-level languages can be implemented on a computer.
- Include specification of languages and its relation to automata, lexical analysis, finite state machines, context free languages, LL and LR parsing methods, syntax directed translation, error recovery, code generation, and portability.
- Analyze the principles, algorithms and data structures involved in the design and constructions ofcompilers.

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	
CO1	**Illustrate** a solution for a complex problem using the principles of existing computational models	4			PO-c-3
CO2 **	**Analyse** methods to automate compiler construction.	4			PO-c-3
CO3 **	**Evaluate** your designed deterministic machine based on compiler construction methods	5			PO-g-2
CO4	**Compare** parse table from a context free grammar for any given language.	5			PO-g-2

C: Cognitive; P: Psychomotor; A: Affective Domain

* *CO assessment method and rubric of COs assessment is provided in later section*

** *COs will be mapped with the Program Outcomes (POs) for PO attainment*

*** *The numbers under the 'Level of Domain' columns represent the level of Bloom's Taxonomy each CO corresponds to.*

**** *The numbers under 'PO Assessed' column represent the POs each CO corresponds to.*

IX – Topics to be covered in Theory class*

Time Frame	CO Mapped	Topics	Teaching Activities	Assessment Strategy(s)
Week 1	CO1	Knowing Mission & Vision of AIUB. Introducing the concept of OBE (Outcome Based Education). Introduction to Compilers and Simple one-pass compiler	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 2	CO1	Different Phases of a Compiler	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 3	CO1, CO2	Linker and Loader, Front End and Back End of a Compiler	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 4	CO1, CO2	Symbol Table Management, Error Handler	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 5	CO4	A Simple Syntax Directed Translator	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 6	CO2, CO4	Synthesized Attribute, Inherited Attributed, Context free Grammar	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 7		Regular Expression, Construction of an NFA from a Regular Expression	Lecture, Question-answer, Homework	Quiz, Term Exam
Midterm (Week 8)				
Week 9	CO3	Conversion of an NFA to DFA, Deterministic Finite Automata.	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 10	CO3	Input Buffering, Lexical Analyzer, First Set.	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 11	CO3	First Set, Follow Set	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 12	CO4	Construct Parsing Table from First Set and Follow Set	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 13	CO4	Implement the Syntax Analyzer using Parsing Table.	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 14	CO4	Implementing L-Attributed SDD's	Lecture, Question-answer, Homework	Quiz, Term Exam
Week 15	CO4	L-Attributed SDD-s and LL Parsing	Lecture, Question-answer, Homework	Quiz, Term Exam
Final term (Week 16)				

** The faculty reserves the right to change, amend, add, or delete any of the contents.*

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

PO Indicator ID	PO Indicators Definition (As per the requirement of WKs)	Domain	K	P	A
PO-c-3	Apply engineering management principles and economic decision making to solve engineering projects as a team	Cognitive Level 4 (Analyzing)	K5	P1 P2 P6	
PO-g-2	Evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts.	Cognitive Level 5 (Evaluating)	K7		

XI – K, P, A Definitions

Indicator	Title	Description
K5	Engineering Design	Knowledge that supports engineering design in a practice area.
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
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
P6	Extent of stakeholder involvement and conflicting requirements	Involve diverse groups of stakeholders with widely varying needs

XII – Mapping of CO Assessment Method and Rubric

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

COs	Description	Mapped POs	Assessment Method	Assessment Rubric
CO1	Illustrate a solution for a complex problem using the principles of existing computational models	PO-c-3	Term Exam	Rubric for Term Exam
CO2	Analyze methods to automate compiler construction.	PO-c-3	Term Exam	Rubric for Term Exam
CO3	Evaluate your designed deterministic machine based on compiler construction methods	PO-g-2	Term Exam	Rubric for Term Exam
CO4	Compare parse table from a context free grammar for any given language.	PO-g-2	Quiz/ Term Exam	Rubric for Term Exam/Quiz

XIII – Evaluation and Assessment Criteria

CO1: Design a solution for a complex problem using the principles of existing computational models

Assessment Criteria	Not Attended/ Incorrect (0)	Inadequate (1-2)	Average (3)	Good (4)	Excellent (5)
Evaluation Criteria	**Evaluation Definition**				
Problem Analysis	Student knows the proper definition/ usage of a different phases of a compiler.				
Socio-cultural Impact	Student can relate the theory with the given problem statement.				
Related Solutions and Studies	Student can provide a real-life example.				

CO2: Apply methods to automate compiler construction.					
Assessment Criteria	**Not Attended/ Incorrect (0)**	**Inadequate (1-2)**	**Average (3)**	**Good (4)**	**Excellent (5)**
Evaluation Criteria	**Evaluation Definition**				
Methods	Student can define method of the automata theory.				
Relevant Arguments	Student can follow relevant arguments for a given problem.				
Relevant Examples	Student can relate the with the conventions for a given problem.				

CO3: Evaluate your designed deterministic machine based on compiler construction methods					
Assessment Criteria	**Not Attended/ Incorrect (0)**	**Inadequate (1-2)**	**Average (3)**	**Good (4)**	**Excellent (5)**
Evaluation Criteria	**Evaluation Definition**				
Content knowledge	Demonstrates full knowledge of the principles of compiler construction methods & tools.				
Selection and Argumentation	Articulates a position or argument for the choosing the correct practice and principles of compiler design				

CO4: Create parse table from a context free grammar for any given language.					
Assessment Criteria	**Not Attended/ Incorrect (0)**	**Inadequate (1-2)**	**Average (3)**	**Good (4)**	**Excellent (5)**
Evaluation Criteria	**Evaluation Definition**				
Definition	Briefly elaborate the background information of the problem area.				
Methodology	Apply proper methodology to implement a compiler using syntax-directed translation methods.				
Results	Apply synthesized and inherited attributes concept to construct a compiler for parsing.				

XI- Course Requirements

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

XV – Evaluation & Grading System*

The following grading system will be strictly followed in this course.

Mid-term	**Final term**

Class Attendance: 10% Quizzes: 30% Lab Evaluation: 10% Term Exam: 50%	Class Attendance: 10% Quizzes: 30% Lab Evaluation: 10% Term Exam: 50%
Total Midterm Marks: 40%	**Total Final term marks: 60%**
Grand Total: 100 Marks	

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

** The evaluation system will be strictly followed as par with the AIUB grading policy.*
** CO attainment will be achieved with 60% of the evaluation marks.*

XIII – Teaching Methods

Maximum topics will be covered from the textbook. For the rest of the topics, reference books will befollowed. 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 studyup to the last lecture before coming to the class and it is suggested that they should go through the relevantchapter before coming to the class. Just being present in the class is not enough- students must participatein classroom discussions.

XIV – Textbook/ References

1. Compilers-Principles, Techniques and Tools (2nd Edition) V. Aho, Sethi and D. Ullman
2. Principles of Compiler Design (2nd Revised Edition 2009) A. A. Puntambekar
3. Basics of Compiler Design Torben Mogensen.

XVII - List of Faculties Teaching the Course

FACULTY NAME	SIGNATURE
MD. MASUM BILLAH	
K. M. IMTIAZ-UD-DIN	
Nazmus Sakib Shan	
Aiman Lameesa	

XVIII – Verification

Prepared by: --- **Md Masum Billah** *Course Convener* Date:.....	**Moderated by:** --- **Dr. M. Mahmudul Hasan** *Point Of Contact* *OBE Implementation Committee* Date:.....	**Checked by:** --- **Dr. Akinul Islam Jony** *Head (Undergraduate Program)* *Department of Computer Science* Date:.....
Verified by: ..... **Dr. Md. Abdullah-Al-Jubair** *Director* *Faculty of Science & Information Technology* Date:.....	**Certified by:** ..... **Prof. Dr. Dip Nandi** *Associate Dean,* *Faculty of Science & Information Technology* Date:.....	**Approved by:** ..... **Mr. Mashiour Rahman** *Dean,* *Faculty of Science & Information Technology* Date:.....