	ITER, SIKSHA 'O' ANUSANDHAN (Deemed to be University)		LESSON PLAN
Programme	**B.Tech.**	Academic Year	**2024-25**
Department	**CSE,CSIT**	Semester	**6th**
Credit	**3**	Grading Pattern	**6**
Subject Code	**CSE 3739**		
Subject Name	**Compilers: Principles, Techniques and Tools**		
Weekly Course Format	**3L-0P**		
Instructor	**Dr. Lambodar Jena**		

Text Books(s):

(1) Compilers: Principles, Techniques and Tools by A. V. Aho, Pearson India (Aho).

Course Outcomes	Students will be able to	
	CO1	Understand the overview of programming languages, language processors and the structure of a compiler.
	CO2	Acquire knowledge in theory of computation and their role in designing different types of tokens generated by lexical analyzer.
	CO3	Understand the role of Parser(s) (LL, SLR, CLR and LALR) and its types i.e. Top-down and Bottom-up parsers.
	CO4	Apply and evaluate syntax directed translation schemes, synthesized attributes, inherited attributes, and different techniques for symbol table organization.
	CO5	Analyze the generation of various intermediate codes and the process of their optimization.
	CO6	Understand the target machine's run time environment, and its instruction set for code generation and techniques used for code optimization.

Sl.No.	Lessons/Topics to be covered	Book Reference (sections)	Mapping with COs	Home Work/ Assignments/ Quizzes
1	Introduction to the course/subject: Lesson plan; Course Goal; Teaching methodology; Evaluation strategy etc.			
2	Introduction: Overview of Programming languages, Language processors.	Aho_1.1 (pg.1-4)	CO1	
3	The Structure of a Compiler,Translation of a simple assignment statement	Aho_1.2.1-1.2.7 (pg.4-11)	CO1	
4	The grouping of phases into passes, Compiler construction tools, Compilation, and Interpretation	Aho_1.2.8-1.3 (pg.11-13)	CO1	Exercise for Section 1.1 from Aho (Page No.3)
5	The evolution of Programming Languages, Application of Compiler Technology, Bootstrapping	Aho_1.3-1.5 (Pg.14-24)	CO1	Exercise for Section 1.3 from Aho (Page No. 14-15)
6	Programming Language Basics,Envornments and States, Static Scope and Dynamic Scope	Aho_1.6 (pg.25-35)	CO1	
7	Lexical Analysis: The role of the lexical analyzer, Tokens, patterns, and lexemes	Aho_3.1 (pg.109-112)	CO2	QUIZ - 1
8	Attribute for tokens, Lexical Errors, Input Buffering	Aho_3.1.3-3.2 (pg.113-118-37)	CO2	Exercise for Section 3.1 from Aho (Pg. No.114-115)
9	Specification of Tokens,Regular Expressions, Regular Definitions, Extensions of Regular Expressions	Aho_3.3 (Pg. No.116-124)	CO2	Exercise for Section 3.3 from Aho (Pg. No.125-126)
10	Recognition of Tokens, Transition Diagrams, Recognition of Reserved-words, and Identifiers	Aho_3.4 (pg.128-135)	CO2	Exercise for Section 3.4 from Aho (Pg. No.136-137)
11	Finite Automata, NFA, From RE to Automata	Aho_3.6 (pg.147-155)	CO2	Exercise for Section 3.6 from Aho (Pg. No.151-152)

Sl.No.	Lessons/Topics to be covered	Book Reference (sections)	Mapping with COs	Home Work/ Assignments/ Quizzes
12	Syntax Analysis: The role of parser, Representative Grammars, Syntax error handling, Error recovery strategy.	Aho_4.1-5.4 (pg.191-196)	**CO3**	
13	Context-Free Grammars: Definition, notational conventions, parse trees and derivations	Aho_4.2-4.2.4 (pg.197-203)	**CO3**	
14	Context-Free Grammars: Ambiguity, Eliminating Ambiguity, Elimination left recursion and Left factoring	Aho_4.2.5-4.3 (pg.193-206)	**CO3**	Exercise for Section 4.2 and 4.3 from Aho (Pg. No.206-208 and Pg. No.216-217)
15	Top-down parsing, Recursive descent parsing	Aho_4.4 (pg. 217-220)	**CO3**	
16	FIRST and FOLLOW, Examples solved	Aho_4.4 (pg. 220-222)	**CO3**	
17	LL(1) Grammars, Non-recursive Predictive Parsing, Error recovery in Predicting Parsing	Aho_4.4.3-4.4.5 (pg.222-228)	**CO3**	Exercise for Section 4.4 from Aho(Pg. No.231-233)
18	Bottom-Up Parsing: Reductions, Handle Pruning	Aho_4.5 (pg.233-236)	**CO3**	**QUIZ - 2**
19	Shift-Reduce Parsing, Conflicts During Shift-Reduce Parsing	Aho_4.5.3 (pg.236-240)	**CO3**	Exercise for Section 4.5 from Aho(Pg. No.241-242)
20	Introduction to LR Parsing: Simple LR, Why LR parsers? Items and the LR (0) Automaton	Aho_4.6 (pg.241-247)	**CO3**	**Assignment-1**

21	The LR-Parsing Algorithm, Constructing SLR-Parsing Tables, Viable prefixes	Aho_4.6.3 (pg.245-256)	**CO3**	Exercise for Section 4.6 from Aho(Pg. No.257-259)
22	More Powerful LR Parsers: Canonical LR (1) Items, Constructing LR (1) Sets of Items	Aho_4.7 (pg.259-264)	**CO3**	
23	Canonical LR (1) Parsing Tables, Examples,	Aho_4.7.3 -4.7.4 (pg. 265- 266)	**CO3**	
24	Constructing LALR parsing Tables, Examples	Aho_4.7.4 (pg. 266-270)	**CO3**	
25	Efficient Construction of LALR parsing Tables, Compaction of LR Parsing Tables	Aho_4.7 .5 (pg.270-276)	**CO3**	Exercise for Section 4.7 from Aho(Pg. No.277-278)
26	Using Ambiguous Grammars: Precedence and Associativity to Resolve Conflicts	Aho_4.8 (pg.278-281)	**CO3**	
27	The "Dangling-Else" Ambiguity, Error Recovery in LR Parsing.	Aho_4.8.2 (pg.281-285)	**CO3**	**QUIZ - 3**
28	Syntax-Directed Translation: Syntax-Directed Definitions, Inherited and Synthesized Attributes	Aho_5.1 (pg.303-309)	**CO4**	Exercise for Section 5.1 from Aho(Pg. No.309-310)
29	Evaluation Orders for SDD's: Dependency Graphs, Ordering the Evaluation of attributes, S-Attributed Definitions, L-Attributed Definitions	Aho_5.2 (pg.310-317)	**CO4**	Exercise for Section 5.2 from Aho(Pg. No.317)
30	Applications of Syntax-Directed Translation: Construction of Syntax Trees, Postfix Translation Schemes, Symbol Table organization	Aho_5.3 (pg.318-327)	**CO4**	
31	Intermediate Code Generation: Variants of Syntax Trees, DAG for Expressions	Aho_6.1 (pg.357-362)	**CO5**	

32	Three-Address Code: Address and instructions, Quadruples, Triples, Static Single-assignment Form	Aho_6.2 (pg.363-369)	**CO5**	Exercise for Section 6.2 from Aho(Pg. No.370)
33	Run-time Environments: Storage Organization, Stack Allocation of Spaces	Aho_7.1 (pg.427-438)	**CO6**	**Assignment-2**
34	Code Generation: Issues in the Design of a Code Generator, The Target Language	Aho_8.1 -8.2 (pg.505-516)	**CO6**	**Quiz-4**
35	Basic Blocks and Flow Graphs, Optimization of Basic Blocks	Aho_8.4 -8.5 (Pg. No.525-541)	**CO6**	Exercises for Section 8.4 from Aho (Pg. No.531-532)
36	A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment	Aho_8.6 -8.8 (pg. 542-557)	**CO6**	