COURSE TITLE	**COMPILER DESIGN**
COURSE CODE	**01AI0706**
COURSE CREDITS	**4**

Objective:

1 The purpose of this course is intended to teach the students about the basic techniques, theory and tools underlie the practice and act of Compiler Construction.

2 The purposive of this course is intended to teach the students about the basic techniques, theory and tools underlie the practice and act of Compiler Construction.

Course Outcomes: After completion of this course, student will be able to:

1 To understand and acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc (Understand)

2 Understand the parser and its types and apply Top-Down and Bottom-up parsing for construction of LL, SLR, CLR, and LALR parsing table. (Apply)

3 Understand about run time data structure and memory management in the compilers. (Understand)

4 Construct syntax tree, three address code and assembly code of intermediate codes and (Create)

5 Understand and apply Code optimization techniques on three address code. (Apply)

Pre-requisite of course: Programming fundamentals, Data Structure and Theory of Computation

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction to Compiler** Translators-Compilation and Compiler, Interpreter and Assembler, Overview of linker and loader , The Phases of Compiler-Errors Encountered in Different Phases, Compiler Construction Tools - Programming Language basics, pass structure	5
2	**Scanner** Role of Lexical Analyzer-Lexical Errors, Tokens-Regular Expressions, A Language for Specifying Lexical Analyzer, Defining relations and conversion process between Finite Automata and Regular Expression, Minimization of DFA, Introduction to LEX, Design of Lexical Analyzer for a sample Language	7

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Contents : Unit	Topics	Contact Hours
3	**Parsing** Top-down Parsing, Predictive parsing, non-recursive predictive parsing, First and Follow set, LL(1) grammar, error handling for LL (1), Bottom-up parsing, handle pruning, shift reduce parsing, operator precedence parser, LR(0) parser, SLR(1) Parser, Canonical LR(1) Parser, LALR(1) Parser, error detection and recovery in LR Parser, Parser generators(Yacc & Lex)	10
4	**Intermediate Code Generation** Introduction, Intermediate Languages, Types of intermediate forms, Three Address Statements, , Syntax Directed Translation Attributes and Mechanism, Directed Acyclic Graph, Static Single Assignment	5
5	**Memory Management** Introduction, Importance of Memory Management, , Organization for storage purpose, Static allocation, stack allocation, dynamic allocation, Different methods of parameter passing, Activation record, symbol table	5
6	**Code Optimization** Introduction of Code Optimization, Advantage of code optimization, Types of Code Optimization, Block and Loop Optimization, Global Data Flow Analysis	5
7	**Code Generation** Issues, flow graph, basic block, basic block optimization, Register allocation, simple code generator, Directed acyclic graph representation, code generation from directed acyclic graph, Peephole optimization, generators of code generator, Dynamic code generation algorithm	5
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Practical 1** WAP to verify that the given input is valid identifier or keyword	2
2	**Practical 2** Report for Lex, Flex and Yet Another Compiler Compiler Tool.	2
3	**Practical 3** Working and Installation of Lex tool in windows/Ubuntu.	2
4	**Practical 4** Lex Program to count words, characters, lines, Vowels and consonants from given input.	2
5	**Practical 5** Implementation of Finite Automata and string validation.	2
6	**Practical 6** Lex Programs to generate string ending with zero.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
7	**Practical 7** Lex Program to check given number	2
8	**Practical 8** WA Lex Program to count the total number of printf and scanf statement in given C file.	2
9	**Practical 9** WAP to remove Left Recursion from the grammar.	2
10	**Practical 10** WAP to remove Left Factoring from the grammar.	2
11	**Practical 11** WAP to compute FIRST and FOLLOW Set of the given grammar.	2
12	**Practical 12** WAP with the help of Lex and Yacc file to implement Calculator which performs basic operations like addition, subtraction, multiplication and division.	2
13	**Practical 13** YACC Program to generate Calculator.	2
14	**Practical 14** Three tuple intermediate code for given infix expression.	2
Total Hours		**28**

Textbook :

1 Compilers: Principles, Techniques and Tools , Aho, Lam, Sethi, and Ullman , Pearson , 2014

References:

1 Compilers: Principles, Techniques and Tools, Compilers: Principles, Techniques and Tools, Aho, Lam, Sethi, and Ullman , Pearson, 2014

2 Systerm Programming, Systerm Programming, D. M. Dhamdhere, Mc Graw Hill Publication, -

3 Modern Compiler Design , Modern Compiler Design , Dick Grune, Henri E. Bal, Jacob, Langendoen, Wiley India Publication, -

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
5.00	17.00	33.00	19.00	16.00	10.00

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Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
3. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
4. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1. http://nptel.ac.in
2. https://online.stanford.edu/courses/soe-ycscs1-compilers

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