K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SESSION: 2022-2023

CO-PO Mapping

Course: SYSTEM SOFTWARE AND COMPILERS	
Type: Core	Course Code: 18CS61

No of Hours

Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total Teaching Hours
4	0	4	50

Marks

Internal Assessment	Examination	Total	Credits
40	60	100	4

Aim/Objectives of the Course

1. Outline the architecture of SIC and SIC/XE machine. Illustrate the concept of Application software and system software such as assemblers, Loaders.
2. Infer the various phases of compiler and apply these phases to build an application.
3. Identify the methods and strategies for parsing techniques.
4. Identify the tool to produce a parser for given grammar.
5. Devise and perform syntax directed translation schemes for compiler and analyze the optimized code generated after the synthesis phase.

Course Learning Outcomes
After completing the course, the students will be able to

CO1	**Use** the architecture of Simplified Instructional Computer, functions of assembler, Loader Functionsand **Write** the object code for assembly programs.	Applying (K3)
CO2	**Interpret** the tokens and patterns. **Apply**the lexical analyzer for real world problems.	Applying (K3)
CO3	**Identify**and **apply**the different Parsing level techniques to solve grammar.	Applying(K3)
CO4	**Identify** different Regular expression and **use** Lex andYacc tool to build scanner and parser respectively.	Applying(K3)
CO5	**Build** the syntax tree by associating synthesis phase with analysis phase for better optimization and performance.	Applying (K3)

Syllabus Content

Module1: Introduction to System Software, Machine Architecture of SIC and SIC/XE. **Assemblers:** Basic assembler functions, machine dependent assembler features, machine independent assembler features, assembler design options. Basic Loader Functions.	**CO1** **10hrs** PO1-3 PO2-3

LO: At the end of this session the student will be able to, 1. Identify the importance of SIC and SIC/XE. 2. Outline the function of assembler with algorithm. 3. Apply feature of SIC and XE to obtain the object Programme and Explain the basic function of Loader.	PO3-2 PO4 -1 PO9 - 2 PO11 -1 PO12 -1 PSO1-2 PSO2-2

Module 2: **Introduction:** Language Processors, The structure of a compiler, The evaluation of programming languages, The science of building compiler, Applications of compiler technology. **Lexical Analysis:** The role of lexical analyzer, Input buffering, Specifications of token, recognition of tokens. LO: At the end of this session the student will be able to, 1. Outline the structure of compiler and application of it. 2. Making use of compiler stages generate machine code for input strings. 3. Design lexical phase for input problems.	**CO2** **10hrs.** PO1-3 PO2-3 PO3-3 PO4 -2 PO5 -2 PO11 -2 PSO1-2 PSO2-2
Module 3: Syntax Analysis: Introduction, Context Free Grammars, Writing a grammar, Top-Down Parsers, Bottom-Up Parsers. LO: At the end of this session the student will be able to, 1. Infer the role of Parser for syntax analysis and CFG. 2. Contrast the importance Top-down parser and bottom-up parser 3. Apply different methods to check grammar is ambiguous or not and generate parse tree.	**CO3** **10hrs** PO1-3 PO2-3 PO3-3 PO4 -2 PO5 -2 PO11 -2 PSO1-2 PSO2-2
Module 4: Lex and Yacc –The Simplest Lex Program, Grammars, Parser-Lexer Communication, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers, Using LEX - Regular Expression, Examples of Regular Expressions, A Word Counting Program, Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and	**CO4** **10hrs** PO1-3 PO2-3 PO3-3 PO4 -2 PO5 -3

Ambiguity. LO: At the end of this session the student will be able to, 1. Infer the role of Lexer and parser. 2. Contrast the structure of Lex and Yacc. 3. Apply shift/ reduce parsing with different approaches.	PO11 -2 PSO1-2 PSO2-3
Module 5: Syntax Directed Translation, Intermediate code generation, Code generation LO: At the end of this session the student will be able to, 1. Making use of Syntax directed definition construct annotated parse tree. 2. Construct directed acyclic graphs for expressions. 3. Generate intermediate code generator by making use of different addressing modes.	**CO5** 10hrs PO1-3 PO2-3 PO3-2 PO4 -2 PO5 -2 PO11 -2 PSO1-2 PSO2-2
Text Books: - (specify minimum two foreign authors text books) 1. System Software by Leland. L. Beck, D Manjula, 3rd edition, 2012 2. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers-Principles, Techniques and Tools, Pearson, 2nd edition, 2007 3. Doug Brown, John Levine, Tony Mason, lex &yacc, O'Reilly Media, October 2012.	
Reference Books: 1. Systems programming – Srimanta Pal, Oxford university press, 2016 2. System programming and Compiler Design, K C Louden, Cengage Learning 3. System software and operating system by D. M. Dhamdhere TMG 4. Compiler Design, K Muneeswaran, Oxford University Press 2013.	
Useful Websites: https://nptel.ac.in/courses/106/104/106104123/ https://www.tutorialspoint.com/compiler_design/index.html https://www.javatpoint.com/compiler-tutorial	
Useful Journals • Advances in Compiler Technology. • Special Issue on Languages, Compilers and Tools for Embedded Systems (SI:LCTES18) • Compiler Design - Syntactic and Semantic Analysis **Ph.D. Thesis:** Language Support for Programming High-Performance Code: Leißa, R. Ph.D. Thesis, Saarland University, Saarbrücken, Germany, 2017. [url] [bib]	
Teaching and Learning Methods: 1. Lecture class: 50 hrs. 2. Self-study: --- 3. Field visits/Group Discussions/Seminars: 3hrs. 4. Practical classes: --	
Assessment: Type of test/examination: Written examination **Continuous Internal Evaluation (CIE):** 40 marks (Average of total three tests will be	

considered)
Semester End Exam (SEE): 60 marks (students have to answer all main questions)
Test duration: 1 :30 hr
Examination duration: 3 hrs

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Society **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Mngmt& Finance **PO12:**Lifelong Learning

PSO1: Understand fundamental and advanced concepts in the core areas of Computer Science and Engineering to analyze, design and implement the solutions for the real-world problems.

PSO2: Utilize modern technological innovations efficiently in various applications to work towards the betterment of society and solve engineering problems.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PS O2
18CS61	K-Level														
CO1	K3	3	3	2	1					2		1	1	2	2
2	K3	3	3	3	2	2						2		2	2
CO3	K3	3	3	3	2	2						2		2	2
CO4	K3	3	3	3	2	3						2		2	3
CO5	K3	3	3	2	2	2						2		2	2

Course In charge

Head of the Department

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