

Course Code	21CSC304J	Course Name	COMPILER DESIGN	Course Category	C	PROFESSIONAL CORE				L	T	P	C
										2	0	2	3

Pre-requisite Courses	Nil	Co- requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	School of Computing	Data Book / Codes / Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:		Program Outcomes (PO)												Program Specific outcomes		
CLR-1:	Outline the implementation of Lexical Analyzer	CLR-2:	To learn the various parsing techniques	1	2	3	4	5	6	7	8	9	10	11	12	PSO-1	PSO-2	PSO-3
CLR-3:	Familiarize the intermediate code generation and run-time environment	CLR-4:	To learn the implementation of code generator	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning			
CLR-5:	Identify the various methods for Code Optimizer																	
Course Outcomes (CO):		At the end of this course, learners will be able to:																
CO-1:	Acquire knowledge of Lexical Analyzer from a specification of a language's lexical rules	CO-2:	Apply different parsing algorithms to develop the parsers for a given grammar	3	2	-	-	2	-	-	-	-	-	-	-	-	1	-
CO-3:	Gain knowledge to translate a system into various intermediate codes	CO-4:	Analyze the methods of implementing a Code Generator for compilers	3	3	-	-	2	-	-	-	-	-	-	-	-	1	-
CO-5:	Design the methods of developing a Code Optimizer			3	2	-	3	-	-	-	-	-	-	-	-	-	1	-

<b>Unit-1 - Introduction</b>	<b>12 Hour</b>
Compilers-Phases of Compiler-Cousins of the Compiler-Grouping of Phases-Compiler construction tools- Lexical Analysis-Role of Lexical Analyzer-Input Buffering -Specification of Tokens -LEX -Finite Automata-Regular Expressions to Automata -Minimizing DFA.	
<b>Unit-2 – Top Down Parsing</b>	<b>12 Hour</b>
Role of Parser-Grammars-Error Handling-Context-Free Grammars-Writing a grammar- Elimination of Ambiguity-Left Recursion- Left Factoring-Top Down Parsing — Recursive Descent Parser- Predictive Parser- LL(1) Parser- Computation of FIRST-Computation of FOLLOW-Construction of a predictive parsing table-Predictive Parsers LL(1) Grammars- Predictive Parsing Algorithm- Problems related to Predictive Parser - Error Recovery in Predictive Parsing-.	
<b>Unit-3 – Bottom-Up Parsing</b>	<b>12 Hour</b>
Bottom Up Parsing-Reductions-Handle Pruning-Shift Reduce Parser-Problems related to Shift Reduce Parsing-Operator Precedence Parser, LEADING, TRAILING -LR Parser- LR Parsers- Need of LR Parsers-LR (0)Item-Closure of Item Sets- Construction of SLR Parsing Table -Problems related to SLR-Construction of Canonical LR(1)- Problems related to CLR - LALR Parser — Problems related to LALR-YACC.	
<b>Unit-4 – Code Generation</b>	<b>12 Hour</b>
Intermediate Code Generation- prefix – postfix notation- Quadruple - triple - indirect triples Representation- Syntax tree- Evaluation of expression - Three-address code- Synthesized attributes – Inherited attributes - Intermediate languages – Declarations- Assignment Statements- Boolean Expressions- Case Statements- Back patching – Procedure calls- Code Generation- Issues in the design of code generator- The target machine – Runtime Storage management- A simple Code generator- Code Generation Algorithm- Register and Address Descriptors.	
<b>Unit-5 – Code Optimization</b>	<b>12 Hour</b>
Code optimization -Principal Sources of Optimization- Function Preserving Transformation- Loop Optimization- Peephole optimization — DAG- Basic Blocks- Flow Graphs- Global Data Flow Analysis — Efficient Data Flow Algorithm- Runtime Environments- Source Language issues- Storage Organization- Activation Records- Storage Allocation strategies.	

<b>Lab Experiments</b>	
Lab 1 - Implementation of Lexical Analyzer Lab 2 conversion from Regular Expression to NFA Lab 3 Conversion from NFA to DFA Lab 4 Elimination of Ambiguity, Left Recursion and Left Factoring Lab 5 -FIRST AND FOLLOW computation Lab 6 Predictive Parsing Table Lab 7 - Shift Reduce Parsing Lab 8- Computation of LEADING AND TRAILING	Lab9 Computation of LR (0) items Lab 10-Intermediate code generation – Postfix, Prefix Lab 11 Intermediate code generation – Quadruple, Triple, Indirect triple Lab 12: A simple code Generator Lab 13 Implementation of DAG Lab 14: Implementation of Global Data Flow Analysis Lab 15: Implement any one storage allocation strategies (heap, stack, static)

<b>Learning Resources</b>	1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, <i>Compilers: Principles, Techniques and Tools</i> , Second Edition, Pearson Education, 2011.	4. David Galles, <i>Modern Compiler Design</i> , Pearson Education, Reprint 2012.
	2. S. Godfrey Winster, S. Aruna Devi, R.Sujatha, <i>Compiler Design</i> , Yesdee Publishing Pvt.Ltd, 2016. 3. K.Muneeswaran, <i>CompilerDesign</i> , Oxford Higher Education, Fourth Edition, 2015.	5. Raghavan V., <i>Principles of CompilerDesign</i> , Tata McGraw Hill Education Pvt. Ltd., 2010.

Learning Assessment							
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA)				Summative Final Examination (40% weightage)	
		Formative CLA-1 Average of unit test (45%)		Life-Long Learning CLA-2 (15%)			
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	-	15%	15%	-
Level 2	Understand	25%	-	-	20%	25%	-
Level 3	Apply	30%	-	-	25%	30%	-
Level 4	Analyze	30%	-	-	25%	30%	-
Level 5	Evaluate	-	-	-	10%	-	-
Level 6	Create	-	-	-	5%	-	-
	Total	100 %		100 %		100 %	

<b>Course Designers</b>		
<b>Experts from Industry</b>	<b>Experts from Higher Technical Institutions</b>	<b>Internal Experts</b>
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	2. Dr. M. Shyamala Devi, Professor, Department of Computer Science and Engineering, Vel Tech Rangarajan Dr. Sagunthala R & D Institute of Science and Technology, Chennai.	2. Dr. Godfrey Winster S SRMIST