Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2021-22

Course Information	
Programme	B.Tech. (Computer Science & Engineering)
Class, Semester	Third Year B. Tech., Sem V
Course Code	
Course Name	Compiler Design
Desired Requisites:	Formal Language and Automata Theory, Discrete Mathematics

Teaching Scheme		Examination Scheme (Marks)			
Lecture	3 Hrs/week	**T1**	**T2**	**ESE**	**Total**
Tutorial	-	20	20	60	100
Practical	-				
Interaction	-	**Credits: 3**			

Course Objectives	
1	To introduce fundamentals of compiler design and various tools used to design a compiler
2	To inculcate role of various phases involved during design of a compiler and impart in depth working of each phase
3	To exercise design of various phases of a compiler using compiler design tools and techniques

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

CO1	**Discuss** the need of compiler, fundamental concepts and various tools used to design a compiler.	Understanding
CO2	**Demonstrate** role and working of each phase involved during compilation.	Applying
CO3	**Analyze** the working of various phases of compiler.	Analyzing
CO4	**Assess** various phases of compiler using compiler design tools and techniques.	Evaluating

Module	Module Contents	Hours
I	**Module 1: Fundamentals of Compiler** Overview- Structure of a compiler, applications of compiler, one pass and two pass compiler. Lexical analysis - The role of a lexical analyzer, specification of tokens, recognition of tokens, LEX.	6
II	**Module 2 Syntax Analysis** Context-free grammar, writing grammars for context free environments, parse trees and ambiguity, role of parser, specification and recognition of tokens, top-down parsing, recursive descent and predictive parsers (LL), bottom-up parsing, operator precedence parsing, LR, SLR and LALR parsers.	9
III	**Module 3 Syntax Directed Translation & Run time environments** Syntax-directed definitions, evaluation orders for attributes of an SDD, S-attributed and L-attributed SDDs, construction of syntax tree, source language issues, storage organization and allocation strategies, parameter passing, symbol table organizations and generations, dynamic storage allocations.	6
IV	**Module 4 Intermediate Code Generation** Intermediate languages, declarations, different intermediate representations –quadruples, triples, trees, flow graphs, SSA forms, and their uses; assignment statements and Boolean expressions, case statements, back patching, procedure calls.	6

V	**Module 5 Code Optimization** Sources of optimization, basic blocks and flow graphs, optimization of basic blocks, loops in flow graphs, loop optimization, machine-independent optimization, machine-dependent optimization, dead-code Elimination, code improving transformations.	6
VI	**Module 6 Code Generation** Issues in the design of a code generator, run time storage management; simple code generator- register and address descriptors, code generation algorithm, design of the function getReg, DAG, peephole optimization, register allocation and assignment, selection of instruction, register allocation, parallel compilation, Just-in-Time compiler, study of compiler construction tools.	7

Text Books	
1	D.M. Dhamdhere, *"Systems Programming and Operating Systems"*, Tata McGraw- Hill Publishing Company limited, New Delhi, Second revised Edition, 2005.
2	A.V. Aho, R. Shethi and J.D. Ullman, *"Compilers - Principles, Techniques and Tools"*, Pearson Education, Second Edition, 2007.

References	
1	K Cooper, L Torczon, *"Engineering a Compiler"*, Morgan Kaufmann, Second Edition, 2011.
2	John J Donavan, *"System Programming"*, Tata McGraw- Hill Publishing Company limited, New Delhi.
3	Sumitabha Das, *"Unix Concepts and Administration"*, TMGH, 3rd Edition.
4	A.V. Aho, R. Shethiand J.D. Ullman, *"Compilers - Principles, Techniques and Tools"*, Addison Wesley Publishing Company, 2007.

Useful Links	
1	Compiler Design - Course (nptel.ac.in)
2	NPTEL :: Computer Science and Engineering - Compiler Design

CO-PO Mapping

	Programme Outcomes (PO)												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	3	-	-

The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High
Each CO of the course must map to at least one PO.

Assessment (for Theory Course)

The assessment is based on 2 in-semester examinations in the form of T1 (Test-1) and T2 (Test-2) of 20 marks each. Also there shall be 1 End-Sem examination (ESE) of 60 marks. T1 shall be typically on modules 1 and 2, T2 based typically on modules 3, 4 and ESE shall be on all modules with nearly 50% weightage on modules 1 to 4 and 50% weightage on modules 5, 6.

Assessment Plan based on Bloom's Taxonomy Level (Marks) For Theory Course					
Bloom's Taxonomy Level		**T1**	**T2**	**ESE**	**Total**
1	Remember				
2	Understand	15	10	15	40
3	Apply	5	5	20	30
4	Analyze		5	20	25
5	Evaluate			5	5
6	Create				
Total		**20**	**20**	**60**	**100**