SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

FACULTY OF ENGINEERING AND TECHNOLOGY

SCHOOL OF COMPUTING

COURSE PLAN

18CSC304J- COMPILER DESIGN, JANUARY – MAY 2024

Revision History:

Date	Version	Modification done	Modified by	Reviewed by	Authorized by
10/1/2024	1.0	Initial Release	Dr. G.ABIRAMI	Dr.S.S.Sridhar	

Table of Contents

1.0 General Details

Course Code: 18CSC304J

Course Title: Compiler Design

Course Time: JANUARY – MAY 2024

Slot: C

Day	Batches			
	Batch 1		Batch 2	
	Hour	Timing	Hour	Timing
Day order 1	-	-	-	–
Day order 2	-	-	-	-
Day order 3	1,2	8:00 am - 09.40 am	6,7	12.30 pm - 2.15 pm
Day order 4	10	4.00 pm - 4.50 pm	5	11.35 am - 12.25 am
Day order 5	3	9.45 am - 10.35 am	8	2.20 pm - 3.10 pm

Location: University Building, Tech Park *SRM Institute of Science and Technology,*

Tutorial Assessment Hour: Batch 1: Day order - 10th Hour & Batch2: Day order 5 - 8th Hour

2.0 Reference Books

1. Alfred V Aho, jeffery D Ullman, Ravi Sethi, " Compilers, PrinciplesTechniques, and Tools", pearson , Education 2011.
2. S.Godfrey Winster S. Aruna Devi, R. Sujatha, "Compiler Design", Yesdee publishing pvt. ltd, 2016.
3. William M. Waite and Gerhardgoos, compiler construction, springer- verlog, NewYork, 2013.
4. K.Muneeswaran, " Compiler Design", Oxford Higher Education, Fourth edition 2015.
5. David Galles, " Modern Compiler Design", pearson Education, reprint 2012.
6. Raghavan V, " Principles of Compiler Design", Tata Mc Graw Hill Education pvt.,Ltd, 2010.

3.0 Prerequisites

18CSC301T-Finite Language Automata

4.0 Instructional Objectives

1. Utilize the mathematics and Engineering principles for the design of compiler.
2. Acquire knowledge of lexical Analyzer from a specification of language's lexical rules.
3. Acquire knowledge of syntax Analyzer for parsing the sentences in a compiler grammar.

4. Gain knowledge to translate a system into various intermediate code.
5. Analyze the method of implementing a code generating for compiler.
6. Analyze and design the method of developing a code optimizer.

o

5.0 Overall Assessment Plan

#	Component	Type	Marks
1	Cycle Test - I & CLA-P1	Written Test	5
		Lab Exercises 1&2 and Viva	5
2	Cycle Test - II & CLA-P2	Written Test	7.5
		Lab Exercises 3-5 & HackerRank	7.5
3	Cycle Test - III & CLA P3	Written Test	7.5
		Lab Exercises 7-9 & Lab Test	7.5
4	CLA - IV & CLA-P4	Quiz, Worksheet $ Activities	5
		Lab Exercises 10-12, Viva	5
Total Marks			50

6.0 Tentative Test Schedule

#	Tentative date	Test	Marks	Portion	Duration
1	1-02-2024	Cycle Test - I	5	Unit 1	50 minutes
2	18-03-2024	Cycle Test - II	7.5	Unit 2 & 3	100 minutes
3	24-04-2024	Cycle Test - III	7.5	Unit 4 & 5	100 minutes

7.0 Detailed Test Plan

Test	Tentative Date	Type	Marks	Mode
Cycle Test - I	01-02-2024	Written Test	Total: 25 Marks Convert to 5: Exam Pattern: MCQs - 5*1 =5 Concept Understanding Questions - 2*4=8 (out of 3) Scenario based / HOTs Questions - 1 * 12=12 (either or)	Physical Exam
	04-02-2024	Lab practicals	Total : 5 Exercise 1 & 2 2*1 =2 Marks Viva 1.5*2 = 3	Practicals
Cycle Test - II	18-03-2024	Written Test	Total: 50 Marks Convert to 7.5: Exam Pattern: MCQs -10*1=10 Concept Understanding Questions - 4 *4=16 (out of 5) Scenario based / HOTs Questions - 2 *12=24 (either or)	Physical Exam
	22-03-2024	lab practicals	Total; 7.5 Excercies 4*1=4 hacherrank 3.5	Practicals
Cycle Test - III	24-04-2024	Written Test	Total: 50 Marks Exam Pattern: MCQs -10*1=10 Concept Understanding Questions - 4 *4=16 (out of 5) Scenario based / HOTs Questions - 2 *12=24 (either or) Total:7.5 Excercise 3*1=3 ; Lab Test:4.5	Physical Exam
	24-04-2024	Lab practicals		Lab Test
CLA-IV & CLA P4	25-04-2024	Tutorials LAb Practicals	Total:5 Quiz =2 , Worksheet Activities:3 Total: 5 Excer:3, viva ;2	Tutorials & lab

8.0 HackerRank Split-up

Test	Tentative date of evaluation	Marks	Split-up
Hacker Rank	25 -03-2024	Coding & Badges >3 Total: 3 marks	Medium / hard questions only from Parsing and intermediate code Parsing -2 marks Intermediate Code- 3 marks

9.0 Quiz/Puzzles/Activities

Total marks – 5. Five activities will be conducted. One for each unit-wise and score will be calculated for 5 marks.

Test	Tentative Date	Portion
Quiz/Puzzles/Review Questions/Flipped Classroom 5 activities will be conducted unit-wise and score will be converted for 5 marks	30-01-2024	Unit 1
	20-02-2024	Unit 2
	12-03-2024	Unit 3
	02-04-2024	Unit 4
	22-04-2024	Unit 5

10.0 Lab Exercises

1. Write a simple calculator program in C/C++/JAVA.

Scanner & Parser:

2. Write a program using FLEX.
3. Implementation of scanner by specifying Regular Expressions.
4. Write a program using BISON.
5. Write a program for Top Down Parsing - predictive parsing table (Removal of Left recursion/Left factoring and Compute FIRST & FOLLOW).
6. Write a program for Bottom Up Parsing - SLR Parsing.

Intermediate Code Generation:

7. Introduction to basic Java - Programs in java
8. Write a program to traverse syntax trees and perform action
9. Write an Intermediate code generation for If/While.

arithmetic operations.

Code Generation:

10. Introduction to MIPS Assembly language- (Teach spim mips simulator).
11. Write a program to generate machine code for a simple statement.
12. Write a program to generate machine code for an indexed assignment statement.

11.0 Detailed Session Plan

#	Topics to be covered	Hours	Ref	Teaching method	Testing method
Unit 1					
1	Analysis of Sources in compiler, Phases of compiler, grouping of compiler, construction tools	1	1	BB	Illustration using example
2	Role of Lexical Analyser,Input Buffering, specification of tokens	2	1	BB	Illustration using example
3	Finite Automata, Thomsons Construction, Conversion of RE to NFA,	2	1,2	BB	Illustration using example

4	NFA to DFA, NFA to DFA Direct Method	2	1,2	BB	Illustration using example
5	Minimization of DFA	1	1,2	BB	Illustration using example
6	Lab 1- Simple Calculator by C++	2	1	Lab	Lab Practical
7	Lab 2- Program On Flex	2	1	Lab	Lab Practicals
8	Tutorial/Quiz	1	1	Activities	Discussion
Unit 2					
9	Syntax Analysis Definition, Grammar, Syntax Error Handling.	1	1	BB	Illustration using example
10	Elimination of ambiguity, Left Recursion and left Factoring	2	1,2	BB	Illustration using example
11	Top-Down Parsing: Computation of First & Follow	2	1,2	BB	Illustration using example
12	Recursive Descent Parsing Predictive Parsing	2	1,2	BB	Group discussion, Illustration using example
13	Lab 3: Program for scanner through specifying regular expression	2	1	BB & lab	Practice
14	Lab 4: Program Using Bison,	2	1	Lab	Practice
Unit 3					
15	Bottom Up parsing, Reduction, Handle Pruning	1	1,2	BB	Illustration using example
16	Shift Reduce Parsing- Problems, Conflicts	1	1,2	BB	Illustration using example, Group discussion

17	LR(0) Parsing, Computation of Leading Training	1	1,2	BB	Illustration using example, Group discussion
18	SLR Parsing	2	1,2	BB	Illustration using example, Group discussion, problem Solving
19	CLR Parsing LALR	2	1,2	BB	Illustration using example, Group discussion, problem Solving
20	Operator Precedence Parsing	2	1,2	BB	Illustration using example, Group discussion, problem Solving
21	Lab 5: Top Down Parsing – LL(1)parsing	2	1	Lab-Code	Lab Practice
22	Lab 6: Bottom Parsing : SLR/CLR	2	1	Lab	
	Unit 4				
23	Intermediate Code Generator- Prefix , Postfix	1	1	BB	Illustration using example, Group discussion
24	Three Address code Quadruples Code, Triples, Indirect	1	1	BB	Illustration using example, Group discussion
25	Syntax Tree Evaluation of Expression – Address Code, Synthesized Attribute & Inherited Attribute	2	1	BB	Illustration using example, Group discussion
26	Intermediate Language – Assignment statement	1	1	BB	Illustration using example, Group discussion
27	Boolean Expression , Case Statement	2	1	BB &PPT	Illustration using example, Group discussion
28	Back Patching	2	1,2	BB &ppt	Illustration using example, Group discussion
29	Code Generation-Register and Address Descriptor	1	1	BB	Illustration using example
30	Cross Compiler, issues in Cross Compiler and Tutorial	1	1	BB	Illustration using example
31	Lab 7: Simple Java Concepts	2	1	Lab	Lab
32	Lab 8:Syntax Tree to perform Arthmetic expression	2	1	Lab	Lab-Prcatice

33	Lab 9: Intermediate Code Generation IF/WHILE	2	1	Lab	Lab
Unit 5					
34	Code Optimization -Principal Sources of optimization	2	1	BB	Illustration using example, Group discussion
35	Function Preserving Transformation -Loop Optimization	1	1,2	BB	Illustration using example, Group discussion
36	Basic Building blocks & DAG	1	1,2	BB	Illustration using example, Group discussion
37	Peephole optimization	1	1,2	BB	Illustration using example, Group discussion
38	Flow Graph, Next use Information	1	1,2	BB	Illustration using example, Group discussion
39	Introduction to Global Data Analysis	1	1	BB	Illustration using example, Group discussion
40	Computation of Gen and Kill, in and out	2	1	BB	Group discussion, Illustration using example
41	Tutorial/Quiz	1	1	Activities	Solving by example
42	Lab 10: Implementation of assembly language	2	1	Lab	Lab practice
43	Lab 11: Generation of Machine Code 1	2	1	Lab	Lab Practice
44	Lab 12 : Generate Machine Code	2	1	Lab	Lab Practice

12.0. Overall Execution Plan:

#	Activity	Target Dates	Responsibilities	Assigned to
1	Video Content Preparation	20-01-2024	Select the list of topics unit-wise to prepare compiler design concepts, assign topics to team members. **Guidelines for video preparation:** 1. Each video should cover separate topic 2. Duration of video to be from 7 to 10 mins only. 3. Video should cover - Introduction about the topic, Overview, Problem explanation	All faculties. Team Heads
2	Lab Program Exercises Questions Preparation	11-01-2024	1. *SRM Institute of Science and Technology,* 2. Follow list of exercise and teach accordingly. 3. Conduct webinar on FLEX and BISON. 4. Complete programs by providing home assignment Teach simulator for MIPS assembler	All faculties.
3	Worksheet Preparation	12-2-2024	1. Each faculty to prepare for the respective units assigned. 2. Questions have to be framed on own and not to be taken as such from any other source. Other sources can be referred, but the question has to be modified, say with different example program, and so on. 3. Solution is required for all questions. 4. Scenario based / HOTs Questions - 1 Team Heads are responsible for distributing topics to team members and no topics are missed.	All faculties. Team Heads
4	Quiz and Hackerrank questions	10-02-2024 15-02-2024	1. Check for the standard of the questions 2. Ensure there are no repetitions. 3. Coordinate with CC.	SPOC Team
5	Cycle Test	30-01-2024 13-03-2024 18-04-2024	1. Share the QP to audit professor for review 2. Plan for cycle tests, question paper printing, print and distribute. 3. Coordinate with CC.	SPOC Team
6	Course File Preparation	10/2/2024 19/3/2024 25/4/2024	1. Responsible for the preparation of the course file as per the checklist. 2. At the end of each CT exam, files should be updated and	SPoCs Course File Team

			verified from the Team Head. 3. Participate in result analysis activity. 4. Course Files are to be prepared for each department and the faculties listed are responsible for the preparation including CO-PO Mapping, attainment of Cos, etc. 5. Coordinate with CC.	
7	Feedback Collection and Minutes of Meeting	17-02-2024 17-03-2024 14-04-2024 18-05-2024 30-05-2024	1. Prepare minutes of meeting for all meetings conducted. 2. Share the MoM to CC and Audit professors on the same day or the next of meeting.	Team

SRM Institute of Science and Technology,

Audit Professor

[Prof. S.S. SRIDHAR]