

SEMESTER S6

SYSTEMS LAB

Course Code	PCCSL607	CIE Marks	50
Teaching Hours/Week (L: T:P: R)	0:0:3:0	ESE Marks	50
Credits	2	Exam Hours	2 Hrs 30 Min.
Prerequisites (if any)	None	Course Type	Lab

Course Objectives:

1. To introduce the fundamental concepts of compiler design, including lexical analysis, syntax analysis, and code generation.
2. To equip students with practical skills to design and implement the components of a compiler using tools like LEX and YACC.
3. To teach students the basic and advanced techniques of virtual machine instantiation and management using open-source hypervisors / public cloud platforms.

Expt. No.	Experiments
1	Design and implement a lexical analyzer using C language to recognize all valid tokens in the input program. The lexical analyzer should ignore redundant spaces, tabs and newlines. It should also ignore comments.
2	Write a lex program to display the number of lines, words and characters in an input text.
3	Generate a YACC specification to recognize a valid arithmetic expression that uses operators +, -, *, / and parenthesis.
4	Implementation of Calculator using LEX and YACC
5	Convert the BNF rules into YACC form and write code to generate abstract syntax tree.
6	Write a program to find First and Follow of any given grammar.
7	Design and implement a recursive descent parser for a given grammar.
8	Construct a Shift Reduce Parser for a given language.
9	Write a program to perform constant propagation.

10	Implement Intermediate code generation for simple expressions.
11	Implement the back end of the compiler which takes the three address code and produces assembly language instructions that can be assembled and run using a corresponding assembler. The target assembly instructions can be simple move, add, sub, jump etc.
12	Instantiation of VMs with image file using open-source hypervisors / public cloud platforms.
13	Virtual machine Cluster set up using open-source hypervisors / public cloud platforms.
14	Setting host name for virtual machine nodes in cluster and ssh set up for remote login.
15	Copy a file from one virtual machine to another virtual machine.

Course Assessment Method
(CIE: 50 marks, ESE: 50 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Preparation/Pre-Lab Work experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment)	Internal Examination	Total
5	25	20	50

End Semester Examination Marks (ESE):

Procedure/ Preparatory work/Design/ Algorithm	Conduct of experiment/ Execution of work/ troubleshooting/ Programming	Result with valid inference/ Quality of Output	Viva voce	Record	Total
10	15	10	10	5	50

- **Submission of Record:** Students shall be allowed for the end semester examination only upon submitting the duly certified record.
- **Endorsement by External Examiner:** The external examiner shall endorse the record

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Implement lexical and syntax analyzer using the tools LEX and YACC	K3
CO2	Develop Top-Down and Bottom-Up parsers.	K3
CO3	Implement intermediate code for expressions.	K3
CO4	Experiment with a cluster of virtual machines in a virtualized environment.	K3
CO5	Demonstrate the data sharing and communication between virtual machines.	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO- PO Mapping (Mapping of Course Outcomes with Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	3	3					2		3
CO2	2	2	3	3	3				2	2		3
CO3	2	2	3	3	3				2	2		3
CO4			3	3	3				2	2		3
CO5					3				2	2		3

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Engineering a Compiler	Keith D. Cooper Linda Torczon	Katey Birtcher	3/e, 2023
2	Lex and Yacc	John R Levine, Tony Mason& Doug Brown	O'Reilly Media, Inc	2/e, 2013
3	Distributed and Cloud Computing: From Parallel Processing to the Internet of Things	Kai Hwang, Jack Dongarra, Geoffrey C. Fox	Morgan Kaufman	1/e, 2018
4	Virtual Machines	Manan Shah, Charusmita Shah	Lambert Academic Publishing	1/e, 2018

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Compilers Principles Techniques and Tools	Aho A Ravi Sethi and J D Ullman	Addison Wesley	2/e, 2013
2	Compiler Construction Principles and Practice	Kenneth C Louden	Cenage Learning Indian Edition	1/e, 2007
3	System programming and operating system	D M Dhamdhare	Tata McGraw Hill & Company	1/e, 2013
4	The Theory and Practice of Compiler Writing	Tremblay and Sorenson	Tata McGraw Hill & Company	1/e, 1985

Video Links (NPTEL, SWAYAM...)	
No.	Link ID
1	https://archive.nptel.ac.in/courses/106/105/106105190/
2	https://www.virtualbox.org/

Continuous Assessment (25 Marks)

1. Preparation and Pre-Lab Work (7 Marks)

- Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
- Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

2. Conduct of Experiments (7 Marks)

- Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
- Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
- Teamwork: Collaboration and participation in group experiments.

3. Lab Reports and Record Keeping (6 Marks)

- Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
- Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

4. Viva Voce (5 Marks)

- Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.

Evaluation Pattern for End Semester Examination (50 Marks)

1. Procedure/Preliminary Work/Design/Algorithm (10 Marks)

- Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
- Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.

- Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
- Creativity and logic in algorithm or experimental design.

2. Conduct of Experiment/Execution of Work/Programming (15 Marks)

- Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

3. Result with Valid Inference/Quality of Output (10 Marks)

- Accuracy of Results: Precision and correctness of the obtained results.
- Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

4. Viva Voce (10 Marks)

- Ability to explain the experiment, procedure results and answer related questions
- Proficiency in answering questions related to theoretical and practical aspects of the subject.

5. Record (5 Marks)

- Completeness, clarity, and accuracy of the lab record submitted

SEMESTER 7

**COMPUTER SCIENCE AND
ENGINEERING**