Description of Course CSE 310

PART A: General Information

1	**Course Title**	: COMPILER SESSIONAL
2	**Type of Course**	: Sessional
3	**Offered to**	: DEPARTMENT OF CSE
4	**Pre-requisite Course(s)**	: N/A

PART B: Course Details

1. Course Content

Laboratory works based on

Basic issues, compiler structure, front end, optimizer, back end; Lexical Analysis: Tokens, patterns, and lexemes, transition diagrams, lexical-analyzer generator; Syntax Analysis: Top-down parsing, bottom-up parsing, LR parsing, parser generators; Syntax-Directed Translation: Syntax-directed definitions, dependency graphs, syntax trees, syntax-directed translation schemes; Intermediate-Code Generation: Directed acyclic graphs for expressions, three-address Code, quadruples, triples, static single-assignment form, types and declarations, type checking, control flow; Run-Time Environments: Storage organization, static versus dynamic storage allocation, activation trees, activation records, heap management and garbage collection; Code Generation: Basic blocks and flow graphs, optimization of basic blocks, peephole optimization, register allocation and assignment, instruction selection; Machine-Independent Optimizations: Principal sources of optimization;

Course Objectives

The students are expected to:

i. Understand the basic components of a compiler and the interaction among them.
ii. Use automated tools for lexical, syntax and semantic analysis.
iv. Construct a simple compiler.

2. Knowledge required

- Data structures and algorithms
- Programming language

3. Course Outcomes (COs)

CO No.	CO Statement After undergoing this course, students should be able to:	Corresponding PO(s)*	Domains and Taxonomy level(s)**	Delivery Method(s) and Activity(-ies)	Assessment Tool(s)
CO1	**Understand** the basic components of a compiler and the interaction among them	-	C2, A1, P1	Lecture, problem solving, coding and development	Online, offline assignments, viva, quiz
CO2	**Use** automated tools for lexical analysis, syntax analysis, and semantics analysis.	PO3, PO5	C3, A2, P3	Lecture, problem solving, coding and development	Online, offline assignments, viva, quiz
CO3	**Design** and **construct** a simple compiler	PO4, PO12	C5, A4, P5	Lecture, problem solving, coding and development	Online, offline assignments, viva

***Program Outcomes (POs)**

PO1: Engineering knowledge; PO2: Problem analysis; PO3: Design/development of solutions; PO4: Investigation; PO5: Modern tool usage; PO6: The engineer and society; PO7: Environment and sustainability; PO8: Ethics; PO9: Individual work and teamwork; PO10: Communication; PO11: Project management and finance; PO12: Life-long learning.

****Domains**

C-Cognitive: C1: Knowledge; C2: Comprehension; C3: Application; C4: Analysis; C5: Synthesis; C6: Evaluation
A-Affective: A1: Receiving; A2: Responding; A3: Valuing; A4: Organizing; A5: Characterizing
P-Psychomotor: P1: Perception; P2: Set; P3: Guided Response; P4: Mechanism; P5: Complex Overt Response; P6: Adaptation; P7: Organization

4. Mapping of Knowledge Profile, Complex Engineering Problem Solving and Complex Engineering Activities

COs	K1	K2	K3	K4	K5	K6	K7	K8	P1	P2	P3	P4	P5	P6	P7	A1	A2	A3	A4	A5
CO1		√														√				
CO2		√	√	√					√	√	√					√	√			
CO3		√		√	√	√		√	√	√	√					√		√		√

K-Knowledge Profile:

K1: A systematic, theory-based understanding of the natural sciences applicable to the discipline; **K2:** Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline; **K3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline; **K4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline; **K5:** Knowledge that supports engineering design in a practice area; **K6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline; **K7:** Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability; **K8:** Engagement with selected knowledge in the research literature of the discipline

P-Range of Complex Engineering Problem Solving:

P1: Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach; **P2:** Involve wide-ranging or conflicting technical, engineering and other issues; **P3:** Have no obvious solution and require abstract

thinking, originality in analysis to formulate suitable models; **P4:** Involve infrequently encountered issues; **P5:** Are outside problems encompassed by standards and codes of practice for professional engineering; **P6:** Involve diverse groups of stakeholders with widely varying needs; **P7:** Are high level problems including many component parts or sub-problems

A-Range of Complex Engineering Activities:

A1: Involve the use of diverse resources (and for this purpose resources include people, money, equipment, materials, information and technologies); **A2:** Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues; **A3:** Involve creative use of engineering principles and research-based knowledge in novel ways; **A4:** Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation; **A5:** Can extend beyond previous experiences by applying principles-based approaches

5. Lecture/ Activity Plan

Week	Lecture Topics	Corresponding CO(s)
Week 1, 2	Lecture on 'symbol table' assignment	CO1
Week 3, 4	Evaluation of 'symbol table' assignment Lecture on 'lexical analysis' assignment	CO1, CO3
Week 5, 6	Evaluation of 'lexical analysis' assignment Lecture on 'syntax and semantic analysis' assignment	CO2, CO3
Week 7, 8	Evaluation of 'syntax and semantic analysis' assignment Lecture on 'code generation and optimization' assignment	CO2, CO3
Week 9, 10	Evaluation of 'code generation and optimization' assignment – progress 1	CO3
Week 11, 12	Evaluation of 'code generation and optimization' assignment – final	CO3
Week 13, 14	Quiz	CO1, CO2

6. Assessment Strategy

- Class Attendance: Class attendance will be recorded in every class.
- Offline and online coding assignments: There will be four offline and online coding assignments on various phases and components of a compiler.
- Viva: Viva will be taken during evaluation of each assignment.
- Final quiz exam: A comprehensive written quiz exam will be held at the end of the semester.

7. Distribution of Marks

Offline and Online:	60-70%
Attendance:	5%
Quiz:	25-35%
Total:	100%

8. Textbook/ Reference

- Compilers: Principles, Techniques & Tools by ALFRED V. AHO, MONICA S. LAM, RAVI SETHI AND JEFFREY D. ULLMAN
- Flex & Bison, John R. Levine
- A Compact Guide to Lex & YACC, Thomas Niemann