



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3154106

Semester – V

Subject Name: System Programming

Type of course: Professional Elective Course

Prerequisite: NA

Rationale: System Programming is fundamental course for Robotics and Automation engineers to understand designed with loaders and compiler. This course is essential for basics of LEXICAL ANALYSIS, MACRO LANGUAGE error detection and recovery code generation.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	Assemblers:- General Design procedures – Design of an Assembler – data structures – format of databases algorithm – flow chart – PASS structures – modular functions. MACRO LANGUAGE AND MACRO PROCESSORS: Macro instructions, features of a macro facility –implementation.	10
2	Loaders:- Loader schemes compile and go loaders, general load scheme absolute loaders direct linking loaders and their design. Other loading schemes: linking loaders, overlays, dynamic binders.	6
3	Compilers:- Introduction Structure of a compiler phases of a compiler - compiler writing tools. LEXICAL ANALYSIS: Role of a lexical analyzer finite automata regular expression to finite automata minimizing the number of states of a deterministic finite automata implementation of a lexical analyzer.	10
4	Parsing Techniques:- Context free grammars – derivations and parse trees – ambiguity – capabilities of context free grammars. Top down and bottom up parsing – handles – shift reduce parsing operator precedence parsing – recursive descent parsing – predictive parsing.	6
5	Intermediate Code Generation:- Postfix notation, Quadruples, triples, indirect triples – Representing information in a symbol table introduction to code optimization basic blocks DAG representation error detection and recovery code generation.	7



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3154106

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15%	25%	35%	25%	-	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Leland Beck - "System Software – An Introduction to Systems Programming", Third Edition, Pearson Education, Inc., 2008
2. Srimanta Pal, "Systems Programming", Oxford University Press, 2011.
3. Dhamdhare D M, "Systems Programming", Tata McGraw Hill, 2001.
4. Dhamdhare D M, "Compiler Construction Principles and Practice", Macmillan Company, 1997.
5. Holub Allen I, "Compiler Design in C", Prentice Hall, 2001

Course Outcomes: After learning the course the students should be able to:

Sr. No.	CO statement	Marks % weightage
CO-1	Identify the key activities in managing a software project.	25%
CO-2	Compare different process models	15%
CO-3	Concepts of requirements engineering and Analysis Modelling	25%
CO-4	Apply systematic procedure for software design and deployment	15%
CO-5	Compare and contrast the various testing and maintenance	20%

List of Experiments:

1. Write a program to implement the lexical analyzer.
2. Write a Lexical Analyzer (using lex utility for UNIX).
3. Write a program to left factor the given grammar.
4. Aim: Implement Recursive Descendent Parsing for the given Grammar.
E -> T + E / T
T -> F * T / F
F -> (E) / i
5. Implement Predictive Parser for the given grammar.
E -> T + E / T
T -> F * T / F
F -> (E) / i



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering Subject Code: 3154106

6. Implement Predictive Parser for the given grammar.
 $E \rightarrow T + E / T$
 $T \rightarrow F * T / F$
 $F \rightarrow (E) / i$
7. Use macro features of C language.
8. Write a program which generates Quadruple Table for the given postfix String.
9. Write a C program to parse a given string using Predictive parsing for given grammar.
10. Write a C program to parse a given string using Predictive parsing for given grammar.

List of Open Source Software/learning website:

- www.cs.jhu.edu/~scott/pl/lectures/parsing.html
- www.en.wikipedia.org/wiki/System_programming