

ITM(SLS)BarodaUniversity
SchoolofComputerScience,EngineeringandTechnology
B.Tech - Semester III

Course Name: System Software

Course Code: C2310C3

CourseType: Core

TeachingScheme :

TeachingScheme			Credits	ExaminationMarks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				External	Internal	External	Internal	
3	0	2	4	40	60	0	50	150

Preamble:

This course is concerned with those software tools and utilities which are an essential part of a ComputerSystem which supports application software development. In order to apply a computer system to solve problems and provide computational services for a wide variety of human activities we need ApplicationSoftware, e.g. an Accounting System package. However, to develop such an application package we needSystem Software like text Editors, Language processors - Compilers, Interpreters and Assemblers, several utilities like Linkers and program Loaders, and File Systems. Out of these the File System is generally studied as a part of Operating Systems, due to its close links with components of Operating System and computer Hardware. The Rest Forms part of the present course.

What Is System Software?

Systems Programming is the activity of writing and maintaining system software.

System software is the layer between the hardware and application software;

it controls the hardware, and provides services to applications.

The primary distinguishing characteristic of systems programming when compared to application programming is that application programming aims to produce software which provides services to the user directly(e.g.word processor), Systems programming is the design, implementation, and maintenance of all of the programs like Operating System, assembler, linker, kernel, Bios, MacroProcessor, Loader, Assembler Etc.

Prerequisite: Basis of Data Structures and Basic Concepts Of Operating System

Course Learning Outcome:

After Completing The Course, the student shall be able to:

	Course Outcome	Bloom's Level
CO1	Ability to understand Software and its types and use text editors	Understanding
CO2	Ability to understand the Overview of Language Processors	Understanding
CO3	Ability to understand the concept of Compiler	Understanding
CO4	Ability to understand the Assembler & Implement Linker and Loaders	Applying
CO5	Ability to use and Implement Macro & Macro Processor	Application
CO6	Ability to understand Utility of Interpreter and Debugger	Application

Course Syllabus:

Tasks#	Topics (Programs) to be Completed	Total Hrs.
1	Overview of System Software and Text Editors: Introduction, Software, Software Hierarchy, Systems Programming Tools, Life Cycle Source Program, Levels of System Software. Text Editors: Overview of Editing Process, User Interface, Editor Structure, Text Editors - line - by - line (exampled) ,file-oriented WYSIWYG (example)	6
2	Overview of Language Processors: Programming Languages and Language Processors, Language Processing Activities, Program Execution, Fundamental of Language Processing, Symbol Tables Data Structures for Language Processing: Search Data structures, Allocation Data Structures.	6
3	Assemblers: Elements of Assembly Language Programming ,Design of the Assembler, Assembler Design Criteria, Types of Assemblers, Two - Pass Assemblers, One Pass Assemblers. Macro and Macro Processors Introduction, Macro Definition and Call, Macro Expansion, Nested Macro Calls, Advanced Macro Facilities, Design of a Macro Pre-processor, Design of a Macro Assembler, Functions of a Macro Processor, Basic Tasks of Macro Processor, Design Issues of Macro Processors	10
4	Overview of the Compiler: A Simple Compiler, Difference between interpreter, assembler and compiler. Types of Compiler, Analysis of the Source Program, The Phases of a Compiler, parsing techniques, The Grouping of Phases. Frontend and backend of compiler, Parsing Techniques, Code optimization Techniques.	10

5	Interpreter & Debuggers: Benefits Interpretation, Overview of Interpretation, The Java Language Environment, JavaVirtualMachine, Types of Errors, Debugging Procedures, Classification of Debuggers, Dynamic/Interactive Debugger.	
6	Linker & Loader: Introduction, Relocation of Linking Concept, Design of Linker, Self-Relocating Programs, linking in Linux, Linking Overlay Structured Programs, Dynamic Linking, Loaders, Different Loading Schemes, Sequential and Direct Loaders, Compile-and-Go Loaders.	
	Total	42

References:

TextBooks:

Sr.No Book Name

1. System Software– An Introduction to Systems Programming ril Lel and Beck, 3rd Edition, Pearson Education Asia, 2000
2. System Software by Santanu Chattopadhyay, Prentice-Hall India,2007

References:

Sr.No Book Name

1. “Compilers-Principles and Practice”,P.H.Dave and H.B.Dave, Pearson Education.
2. “System Programming and Operating System”, 2nd Ed, D.M.Dhamdhare, Tata McGraw Hill.
3. System Programming by Srimanta Pal OXFORD Publication.
4. System Programming and Compiler Construction by R.K.Maurya & A.Godbole.

RequiredSoftware:

1. GNUC Compiler:<https://gcc.gnu.org/>
2. For working with embedded system corresponding architecture toolchain: Assembler, Linkeditor, etc.

WebResources:

1. <https://texteditors.org/cgi-bin/wiki.pl>
2. <https://www.geeksforgeeks.org/editors-types-system-programming/>
3. <https://www.quora.com/p/8931/write-a-brief-note-on-design-of-an-editor-2/>

4. <https://www.programming1011.com/2019/04/short-note-on-editors-in-system.html>
5. http://www.tezu.ernet.in/~utpal/course_mat/ss_editor.html

CaseStudies:

Sr. No	CaseStudies	Evaluation
C1	Various compiler tools like GNU toolchain	1. Identification of algorithm. 2. Report Preparation. 3. Presentation with VIVA
C2	Lexical Analyzer And YACC tools	

OtherVideosLinks:

Sr.No	AboutVideo	Link
01	Grammar and Its types	https://www.coursera.org/lecture/nand2tetris2/unit-4-3-grammar-s-rtIKX
02	Syntax Analysis	https://www.coursera.org/lecture/nand2tetris2/unit-4-1-syntax%20analysis-5pC2Z
03	Lexical Analysis	https://www.coursera.org/lecture/nand2tetris2/unit-4-2-lexical%20analysis-QM0IZ
04	Assembler construction by NPTEL-NOC IITM	https://www.youtube.com/watch?v=LEKDkhvUKjA
05	Frontend loader by NPTEL IITGuwahati	https://www.youtube.com/watch?v=DBTkILIZmSc

Related MOOCs courses

Sr.No	Course
M1	Introduction to System Software by Prof.S. Raman, Department of Computer Science and Engineering, IITMadras. For More details NPTEL visit

Lab Experiments:

S.No	Program Statement	Hrs
PS1	Write a C program to identify whether a given line is a comment or not.	1
PS2	Write a C program to test whether a given identifier is valid or not.	1
PS3	Write a C program to simulate lexical analyzer for validating operators.	1
PS4	Implement following programs using Lex. <ol style="list-style-type: none"> Program to count the number of characters, words, spaces and lines in a given input file. Program to count the numbers of comment lines in a given C program. Also Eliminate Them and copy the resulting program into a separate file. Program to recognize a valid arithmetic expression and to recognize the identifiers and operators present. Print them separately. Program to recognize whether a given sentence is a simple or compound. Program to recognize and count the number identifier negative input file. 	2
PS5	Use Macro Features Of C language	2
PS6	Write A Program To Left factor the given grammar	2
PS7	Lex program to Print out all numbers from given file.	2
PS8	Write a program to remove the Left Recursion from a given grammar	2
PS9	Write a program which generates Quadruple Table for the given post fix String	2
PS10	Write a C program to parse a given string using Predictive parsing for given grammar. Type \rightarrow simple \uparrow id array[simple] of type simple \rightarrow integer char num dot dot num	2
PS11	Write a program to remove the Left Recursion from a given grammar	2
PS12	Write a Program identify all the tokens from the source code	2
PS13	Write a Program for first pass and second pass Assembler.	2
PS14	Write A program to show linker.	2
PS15	Write a C program to generate in triple intermediate code for assignment statement.	2
	TOTAL	27

MiniProjects:

Sr. no.	
MP1	C Program To Generate Triple For Assignment Statement.
MP2	Lex Program To Identify The Capital strings from a given input string.
MP3	Lex code for lexical analyser to eliminate whitespaces & collecting no's from input data.
MP4	Lex program for simple Desktop calculator.
MP5	Lex Program To Print out all HTML Tag from a given file.