Birla Institute of Technology & Science, Pilani
Hyderabad Campus

FIRST SEMESTER 2019-2020
Course Handout Part II

01/08/2019

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : *CS F301*
Course Title : *Principles of Programming Languages*
Instructor-in-Charge : *Dr. Aruna Malapati (*arunam@bits-hyderabad.ac.in*)*
Dr. Jabez J Christopher, Ms.Rajitha

1.Scope and Objectives of the Course:
Programming languages are the medium through which we describe computations. More specifically, we use the model provided by a programming language to discuss concepts, formulate algorithms, and reason about problem solutions. Programming languages define models tailored to thinking about and solving problems in intended application areas. This course covers the design and implementation of modern general-purpose programming languages.

It covers, in detail, the semantics of the features of programming languages –Control Abstraction, Data Types and Data Abstraction, Scope and Parameter passing and Concurrency related features. It covers various aspects of runtime environments like global and local data, code, function call stacks, dynamically allocated data, runtime features for exceptions and threads. Introduction to programming paradigms. Functional paradigm – formal elements of lambda calculus, introduction to syntax of common functional programming languages and programming exercises that explore the functional paradigm. Logic programming paradigm - formal elements of logic programming and programming tasks that explore the logic paradigm. Scripting as a paradigm. Domain specific languages. Assignments and case study focus on a variety of programming languages to facilitate exposure to language design and related implementation issues.

➢ Able to write and describe formal syntax for a programming language
➢ Compare the features and programming languages
➢ Identify the memory models based on the types of features
➢ Solve problems using different programming paradigms
➢ Evaluate the pro and cons of programming paradigms and suggest the best language to use for a given problem domain.

2. Pre requisites: C and Java programming
3.aTextbooks:
1. T1. Robert Sebesta , Concepts of programming languages 10th Edition
3.bReference books
1. R1 Ravi Sethi, Programming Languages - Concepts and Constructs Pearson Education. 2nd Edition.
2. R2 Michael L.Scott, Programming Language Pragmatics 3rd edition
3. R3 David A. Watt, Programming Language Design Concepts- John Wiley & Sons.
4. R4 Aho, Lam, Sethi and Ullman, "Compilers Principles, Techniques, and Tools". Pearson Education. Low Price Edition. 2004

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4.Course Plan:

Lecture No.	Learning Outcomes	Topics to be covered	Chapter in the Text Book
1	• List the objectives of this course	Introduction and Motivation	
2-4	• List the characteristics of programming paradigms and express algorithms in: Object-oriented languages, Imperative languages, Functional languages, Logic programming languages and Parallel or concurrent languages • Evaluate the features of a programming language.	Language Paradigms, Imperative vs. Declarative Styles of Programming; Programming Languages that support these styles, Compilers. Features of a Programming Language, compilers	Chapter 2 (T1) Chapter 1 (R1)
5-6	• Express formal syntax of programming language using BNF	Language Description using BNF: Arithmetic Expressions, Program constructs like IF, Loops, Functions etc.	Chapter 3,7,8(T1) Chapter 2,3(R1)
7-9	• Identify the needs for different data types and their characteristics. • Compare different implementation of data types	Types: Data Representation, Primitive and Structured Data types, ADTs;	Chapter 6 (T1) Chapter 4 (R1)
10-13	• Analyze and evaluate the design choices to implement derived data types for programming languages • Apply type checking using name and structural equivalence	Data Layout models: Primitive Data, Structured Data (Arrays/Lists, Records/Structures, Variants/Unions) Type checking vs. Type Inferencing, Type Equivalence and Subtyping.	Chapter 6 (T1) Chapter 4 (R1)
14-17	• Analyze how run time memory model changes with respect to the features of a programming language.	Basic Runtime Environments: Code vs. Data, Global vs. Local Data, Functions and Call Stacks, Dynamically allocated data and heaps;	Chapter 4,9 & 10 (T1) Chapter 5 (R1)
18-20	• Evaluate the impact of different parameter passing mechanism, Scope and Binding	Procedures: Introduction to procedures, Recursion, Parameter Passing Methods, Call-by-Value, Call-by-Reference, Call by Value Result. Scope rules for names, static and dynamic scope rules, nested scope, Activation Records, Lexical Scope, Dangling Pointers, Tail Recursion Elimination	Chapter 9 & 10 (T1) Chapter 5 (R1)
21-23	• Compare different implementations of Heap and Garbage collection algorithms	Introduction to Heap allocation, Garbage collections algorithms	Class Notes
24-27	• Formulate problems using functional programming	Pure Lambda Terms, Substitutions, Number systems, Program Constructs using Lambda terms, Introduction to Scheme Programming	Chapter 15(T1) Chapter 8 (R1)
28-30	• Formulate problems using Logic programming	Logic Programming: Relations, First	Chapter

| | | | | Order Logic, Logic Programming and Horn-Clause Programming, Unification, Deduction and Search as a strategy for deduction, Indexing, Pruning, Definite Clause Grammars. | 16(T1) Chapter 11(R1) |

5.Evaluation Scheme:

Component	Duration	Weightage	Date & Time	Nature of Component
Programming Assignments / case study	-	25%		Take Home Open Book
Quiz-1	30 mins	7.5%	7/9/2019 2 - 2.30 PM	Closed Book
Quiz-2	30 mins	7.5%	2/11/2019 2-2.30 PM	Closed Book
Mid Sem Exam	90 mins	25%	3/10/2019 1.30 -- 3.00 PM	Closed Book
Comprehensive	3 hours	35%	10/12/2019 FN	Closed Book

6.Chamber Consultation Hour: To be announced

7.Notices: All notices related to the course will be displayed on **CMS and/or CSIS Notice Board**.

8. Make-up Policy:
Make ups for Mid sem Exam shall be granted by the I/C on prior permission and only to genuine cases with the permission of the warden concerned.
No Makeups will be granted for Quizzes.
Make-up for comprehensive examination will be decided and scheduled by the Instruction Division.

9.Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

INSTRUCTOR-IN-CHARGE
CS F301