BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
Instruction Division

SECOND SEMESTER 2015-2016

Course Handout Part II

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

LEGENDS USED: The course is offered in all three Indian campuses of BITS, Pilani. Most of this handout is similar for all campuses. However, campus specific details are given using the following color codes:

	BITS Pilani, Pilani Campus
	BITS Pilani, K K Birla Goa campus
	BITS Pilani, Hyderabad campus

Course No. : CS F111
Course Title: Computer Programming

BITS Pilani, Pilani Campus
Instructor-in-Charge: VISHAL GUPTA (email: vishalgupta@pilani.bits-pilani.ac.in)

Instructors:

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K Hari Babu	khari	TBA
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BITS Pilani, K K Birla Goa Campus

Instructor-in-Charge: A. BASKAR (Email:) abaskar@goa.bits-pilani.ac.in

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BITS Pilani, Hyderabad Campus

Instructor-in-Charge: ARUNA MALAPATI (email: arunam@hyderabad.bits-pilani.ac.in)

Instructors:

Name	EMail@	Chamber Consultation Hour
Aruna Malapati	arunam@	
Anand M Narsimha Murthy	anand	
Sanjeev Kumar Singh	sanjeev	
Tathagat Ray	rayt	
Mrs. Prafulla K	prafulla	

1. Objective:

The primary goals of the course are to introduce:

- Basic representation of data and how to process data using the representation inside a computer.
- Techniques for specifying data, operations on data, and problem solving using a programming language.
- Systematic techniques and approaches for constructing programs.

2. Scope:

The course covers the following topics: Basic Model of a Computer; Problem Solving – Basic Computing Steps and Flow Charting (Assignment, Sequencing, Conditionals, Iteration). Programming Constructs – Expressions, Statements, Conditionals, Iterators/Loops, Functions/Procedures; Data Types – Primitive Types, Tuples, Choices (Unions or Enumerations), Lists/Arrays, Pointers and Dynamically Allocated Data. Input output and Files.

While the topics are taught using a specific language, the intent of the course is to teach a programming methodology, and not a programming language. There is also a laboratory component that involves development and testing of iterative and procedural programs using bounded and unbounded iterations, function composition, random access lists, sequential access lists, dynamically allocated lists, and file access.

3. Text and Reference:

3 (a) Text Book:

TB1. J.R. Hanly and E.B. Koffman, *Problem Solving and Program Design in C*. 5th Edition. Pearson Education 2007.

3 (b) Reference Books:

RB1. Yale Patt, Sanjay Patel. *Introduction to Computing Systems: From bits & gates to C & beyond*, Second edition, McGraw Hill.

RB2. Behrouz A Forouzan & Richard F Gilberg . *Computer science A structured programming approach using C*. Cengage Learning 3rd Edition

RB3. Brian W. Kernighan, Dennis Ritchie. *The C Programming Language*. Prentice Hall. 2nd Edition.

4. Teaching Pedagogy

To improve upon the teaching pedagogy, the course will be offered using *flipped classroom*. It is a form of blended learning in which students will learn new content online by watching video lectures, and what used to be homework (assigned problems) will now be done in class with instructor offering more personalized guidance and interaction with students, instead of lecturing.

The recorded content will be available on Edx portal. Edx will serve as a platform for making online content available to the students.

Other than recorded content, for each student, each (logical) week will have following interactive sessions:

1. **Two Lecture classes/sessions (50 mins each)**: Each Lecture will focus on further strengthening the concepts covered in recorded content. The video lectures for each Lecture class will be uploaded

ahead of time; ***Students should listen and understand the recorded lectures before coming to classes*** and solve problems under the supervision of instructor.

2. **Lab session (2 hours)**: For Pilani and Goa campus, there will be one lab session of 2 hours. For Hyderabad campus, there will be 2 lab sessions of 1 hour each. Here, under the supervision of lab instructors, students will solve problems on computers.

5. Course Plan

5(a): Modules

Module	Theme	Learning Objectives
I	Basic data, data types, and data representation	To understand how to define, represent, and process basic data.
II	Analyzing, designing, and managing a process or program for any given problem.	To diagrammatically understand and visualize an algorithm using boxes of various kinds. This representation gives a step by step insight to a solution of a given problem.
III	Basic Problem Solving – Structured Programming	To understand constructs of structured programming including conditionals and iterations
IV	Advanced Problem Solving – Program Structuring and Structured Data	To understand how to structure complex data and how to systematically structure large programs
V	User Defined Data and Dynamic Data	To understand how users can define the structure and operations of new forms of data using known forms
VI	Advanced Topics – File I/O and Recursion	To understand recursive programming and to understand how to access files and contents of files

5(b) Recorded lecture schedule [Legends: RL- Recorded Lecture; LS - Lecture Session; TB - Text Book; RB - Reference Book (as mentioned in 3(b) above)]

Week Number	Module Number	Topic	Recorded Lecture Number	Reference	Lecture Number
1		Introduction to the subject; teaching pedagogy	Intro_lec		Self Learning
	I (a)	Basics of Computing – Data and Computation. Model of a computer	RL 1.0	**RB1:** 1.1 to 1.7	Self Learning
	I (b)	Binary number system; Data representation: Unsigned Integers	RL 1.1	**RB1:** 2.1, 2.2.1	LS1
	I (d)	Data Representation: Signed Integers; Binary representation in (a) Sign magnitude, (b) one's complement, and (c) two's complement.	RL 1.2	**RB1:** 2.2.1, 2.3	
	I (e)	Advantages, disadvantages, sign extension, and range of signed integers in all three respective representations.			
	I (f)	Overflow in two's complement form.	RL 1.3	**RB1:** 2.5.3	
	I (g)	Floating point number representation	RL 1.4.1	**RB1:** 2.7.2	LS2
	I (h)	Character, string, and other data representation.	RL 1.4.2	**RB1:** 2.7.3	
	I (i)	Conversions among decimal, binary, hexadecimal, and octal number systems (for signed, unsigned, and floating point numbers)	RL 1.5	**RB1:** 2.4, 2.7.4	
	I (j)	Arithmetical and logical operations on binary numbers	RL 1.6	**RB1:** 2.5, 2.6	

2	III (a)	Memory and Variables – Locations, Addresses, Definitions and Declarations; Program structure	RL 3.1	**TB1:** 2.1, 2.2, 2.3, 2.4	LS1
	III (b)	Data types	RL 3.2.1	**TB1:** 2.5	
	III (c)	Operators, and expressions	RL 3.2.2	**TB1:** 7.3	
	III (d)	Expression evaluation: Operator Precedence and Associativity	RL 3.3	**TB1:** 2.5	LS2
	III (e)	Expression evaluation with different data types: type conversion (implicit and explicit)	RL 3.4	**TB1:** 2.5	
3	III ()	Flow Charts: Graphical Symbols, Examples	RL 2.1	Recorded Lecture	LS1
	III ()	Flow Charts: Sequential and Conditional constructs	RL 2.2	Recorded Lecture	
	III (f)	Relational, Equality, and Logical operators	RL 4.1	**TB1:** 4.1, 4.2	
	III (g)	Sequential and Conditional execution; Control Statements (different forms of conditional statements).	RL 4.2	**TB1:** 4.3	
	III (h)	Conditional statements: different forms of nested conditional constructs.	RL 4.3	**TB1:** 4.7	LS2
	III (i)	Multi way branching: selection control mechanism using switch statement	RL 4.4	**TB1:** 4.8	
	III ()	Flow Charts: Loops; Searching and	RL 2.3	Recorded	

4		Sorting		Lecture	LS1
	III (j)	Problem solving using Iterative Constructs: While statement	RL 5.1	**TB1:** 5.1, 5.2	
	III (k)	Problem solving using Iterative Constructs: For statement	RL 5.2	**TB1:** 5.4, 5.5	
	III (l)	Problem solving using Iterative Constructs: Do-while statement	RL 5.3	**TB1:** 5.8	LS2
	III (m)	Problem solving using Nested iterative constructs	RL 5.4	**TB1:** 5.6, 5.7	
5	Problem Solving on LOOPS / NESTED LOOPS				
6	IV (a)	Structure data: One dimensional random access lists: declaring, initializing, and accessing list elements	RL 6.1	**TB1:** 8.1, 8.2, 8.3	LS1
	IV (b)	Structure data: Multi-dimensional random access lists: declaring, initializing, and accessing array elements	RL 6.2	**TB1:** 8.7	
	IV (c)	Searching: Linear Search	RL 6.3.1	**TB1:** 8.6	LS2
		Searching: Binary search	RL 6.3.2		
	IV (d)	Sorting: selection sort	RL 6.4.1	**TB1:** 8.6	
		Sorting: Insertion sort	RL 6.4.2		
7	IV (e)	Modularity and reuse: Functions	RL7.1	**TB1:** 3.1, 3.4, 3.5	LS1

	IV (f)	Functions: Declaration, Definition, and reuse.	RL 7.2	**TB1:** 6.1, 6.2, 6.3, 6.4	
	IV (g)	Functions: Scope of data	RL 7.3	Recorded Lectures	
	IV (h)	Functions: Problem Solving	RL 7.4	Recorded Lectures	
	IV (i)	Introduction to pointers	RL 7.5	Recorded Lectures	LS2
	IV	Argument passing to functions: by value and by reference	RL 7.6	TB1	
	IV	Arithmetic using pointers	RL 7.7	TB1	
	IV	Random access lists and pointers	RL 7.8	TB1	
8	IV (j)	Random access lists - passing arrays to functions: syntax and semantics	RL 8.1	**TB1:** 6.1	LS1
	IV	Random access lists - passing arrays to functions: Problem solving	RL 8.2	Recorded Lectures	LS1
9		Multidimensional arrays and functions: Syntax and Semantics	RL 9.1	**TB1:** 9.1, 9.2, 9.3, 9.4	LS1
	IV (n)	Character Arrays	RL 9.2	**TB1:** 9.5, 9.6, 9.7	
	V(a)	Standard Library string functions: design and implementation	RL 9.3	**TB1:** 11.1, 11.2, 11.3	LS2
	V	Multi-dimensional arrays AND strings	RL 9.4	**TB1**	

10	V (a)	Memory Layout – Implicit vs. Explicit Allocation; Static vs. Dynamic Allocation; Motivation for Dynamic Allocation	RL 10.1, RL 10.2, RL 10.3	**TB1:** 14.1, 14.2	LS1
	V (b)	User defined types: typedef	RL 10.4	**TB1:** 14.3	
	V	Tuples/structures: Need, syntax, and semantics	RL 10.5	**TB1:** 14.4	LS2
	V	Pointer to structure	RL 10.6	**TB1**	
	V	Random access lists and structures	RL 10.7	**TB1**	
	V	Tuples: Union - its need, syntax, and semantics	RL 10.8	**TB1**	
11	V (c)	Enumerated data types	RL 11.1	**TB1:** 14.4	LS1
	V (d)	Self referential structures	RL 11.2	**TB1:** 14.4	
	V	Random access list vs Sequential access list	RL 11.3		
	V	Linked List: creating a node and empty list	RL 11.4		LS2
	V	Linked list: Inserting a node	RL 11.5		
12	V	Linked List: Searching a sequential access list	RL 12.1		LS1, LS2
	V	Linked List: Deleting a node from a sequential access list	RL 12.1		
	V	Linked List: Example	RL 12.1		

13	VI (a)	Files and File I/O: External Storage, Files and File Systems; File Operations and I/O Operations;	RL 13.1 RL 13.2	**TB1:** 12.1, 12.2	LS1
	VI (b)	Divide and Conquer – Design using Recursion ; Recursive procedures; Recursion vs. Iteration	RL 13.3 RL 13.4	**TB1:** 10.1, 10.2, 10.3, 10.4	LS2

6. Evaluation Scheme: [Legends: OB - Open Book, CB - Closed Book]

BITS Pilani, Pilani Campus					
S. No.	**Component**	**CB/OB**	**Time**	**Weight**	**Date**
1	Mid Semester Test	OB	90 Mins	25%	-
2.	*Online Quizzes	OB	--	5%	*(Mostly) Every Week
3.	#Evaluated Labs	OB	--	5%	#During Lab Sessions
4.	Online Test 1	OB	TBA	17.5 %	TBA
5.	Online Test 2	OB	TBA	17.5 %	TBA
6.	Comprehensive Exam	OB	120 Mins	30 %	8/5 AN

- *Our (logical) week will be from Monday to Saturday. The recorded lectures for the n^{th} week will be uploaded on each Wednesday in $(n-1)^{th}$ week. On each Sunday, a Quiz will appear on Edx at 9 AM in the morning and Students have to attempt this Quiz by 9 PM on the same day. Each such Quiz will be weighted for 0.5% marks and will be based on the recorded content for the next week (i.e. n^{th} week).
- # You are required to attend the scheduled lab sessions as per your Time Table. For each Lab session, corresponding Lab Instructor will give you marks out of 0.5% (or 1.5 marks).

MAKE UP POLICY

- Out of **N** number of online quizzes, best **(N-1)** will be considered for final grading. Similarly, out of **M** number of Lab sessions, best **(M-1)** will be considered in final grading. ***No additional Make-up will be granted for online Quizzes and Evaluated Labs***

under any condition.

- There will be ***one make up*** (for both the online tests put together), i.e. a student can take a make up for at most one Online test out of both the tests. The make up will be conducted after the conduct of Online test 2 and syllabus for it will be announced later.
- Prior Permission of the Instructor-in-Charge is required to get make-up for the mid-term test, and/or online tests. Only on producing documentary proof of possible absence, which proves that student would be physically unable to appear for the test/exam, the decision of granting the make-up will be taken.
- Prior Permission of Dean, Instruction Division is required to get make-up for the comprehensive exam.
- Instructor / Dean's decision in the matter of granting Make-up would be final.

BITS Pilani, K K Birla Goa Campus					
S. No.	**Component**	**CB/OB**	**Time**	**Weight**	**Date**

BITS Pilani, Hyderabad Campus					
S. No.	**Component**	**CB/OB**	**Time**	**Weight**	**Date**

- *Our (logical) week will be from Tuesday to Monday. The recorded lectures for the n^{th} week will be uploaded in $(n-1)^{th}$ week. On each Monday, a Quiz will appear on Edx at 8 AM in the morning and Students have to attempt this Quiz by 8 PM. Each such Quiz will be weighted for 1% marks and will be based on the recorded content for the next week.
- # There will be 6 evaluated announced Lab sessions for 2% weight each.

MAKE UP POLICY

- Out of **N** number of online quizzes, best **(N-1)** will be considered for final grading. Similarly, out of 6 number of Evaluated Lab components, best 5 will be considered for final grading. No additional Make-up will be granted for online Quizzes and Evaluated Labs under any condition.
- Prior Permission of the Instructor-in-Charge is required to get make-up for the mid-term test. Only on producing documentary proof of possible absence, which proves that student would be physically unable to appear for the test/exam, the decision of granting the make-up will be taken.
- Prior Permission of Dean, Instruction Division is required to get make-up for the comprehensive exam.
- Instructor / Dean's decision in the matter of granting Make-up would be final.

7.

8. Consultation Hours: See course website

9. Notices: All notices concerning this course will be displayed on Edx webpage. Optionally, if there is a need, email would be used on short notice – only BITS Pilani mail would be used.

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CS F111(Computer Programming)