



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

SECOND SEMESTER 2022-23
COURSE HANDOUT

Date: 07.01.2024

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 F111
Course Title	:	Computer Programming
Instructor-in-Charge	:	Dr. Amitesh Singh Rajput
Instructor(s)	:	Dr. Amitesh Singh Rajput (amitesh.singh@pilani.bits-pilani.ac.in) Prof. Kamlesh Tiwari (kamlesh.tiwari@pilani.bits-pilani.ac.in) Dr. Vinti Agarwal (vinti.agarwal@pilani.bits-pilani.ac.in) Dr. L. Rajya Lakshmi (rajya.lakshmi@pilani.bits-pilani.ac.in)
Practical Instructors	:	Vikas Kumawat (p20210020@pilani.bits-pilani.ac.in) Trishna Paul (p20210082@pilani.bits-pilani.ac.in) Sunil Yadav (p20210403@pilani.bits-pilani.ac.in) Pasunti Prasanjith (pasunti.prasanjith@pilani.bits-pilani.ac.in) Anish Khan (p20210083@pilani.bits-pilani.ac.in) Mohit (p20210472@pilani.bits-pilani.ac.in) Laxmi Divya Chibbar (p20210023@pilani.bits-pilani.ac.in) Swetha Valavarasu (p20230083@pilani.bits-pilani.ac.in)

1. Course Description: 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 C programming language.
- Systematic techniques and approaches for constructing programs.

2. Scope and Objective of the Course: The course covers the following topics: Basic Model of a Computer; Problem Solving – Basic Computing Steps and Flow. Programming Constructs – Expressions, Statements, Conditionals, Iterators/Loops, Functions/Procedures; Data Types – Primitive Types, Tuples, Lists/Arrays, Pointers and Dynamically Allocated Data, Linked Lists and its variants, Input output and Files.

3. Text Books:

T1: Hanly, J.R. and E.B. Koffman. *Problem Solving and Program Design in C(7/e)*. Pearson Education, 2013.

4. Reference Books:

R1: Patt, Yale. Introduction to Computing Systems: From bits & gates to C & beyond (2/e). McGraw Hill Education, 2017.

The authors take a bottom-up approach to introduce computers and computing.

R2: Forouzan, B.A. and Richard F. Gilberg . Computer science A structured programming approach using C (3/e). Cengage Learning, 2007.

The book gives a fairly comprehensive overview of C, with several example programs.



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R3: Gottfried, B.S. and Jitender Chhabra. Programming with C (Schaum's Outlines Series, 3/e). McGraw Hill Education, 2017.

Another beginner's book on C programming, with lots of drill exercises and programs.

R4: Kernighan, B.W and Dennis Ritchie. The C Programming Language (2/e). Pearson Education India, 2015.

Considered the ultimate treatise on C, it conveys the philosophy and practice of C very tersely, but is pitched at an advanced beginner level.

R5: Das, S. Unix: Concepts and Applications (4/e). McGraw Hill Education, 2017.

Provides a great introduction to using Unix commands.

R6: Das, Sumitabha. Computer Fundamentals and C Programming. New Delhi, India: McGraw Hill Education. (2018)

5. Course Plan:

Module No.	Lecture Session	Reference	Learning outcomes
01	L1 Introduction to programming; need for programming; overview of computers and computing	T1: 1.1-1.3	Students get the motivation behind programming, and understand a broad overview of computing, computer organization
02	L2 How to express a problem using flowcharts and algorithms	Class Notes	Students can write simple C programs, compile, and execute them in a Unix environment
03	L3 - L4 Programming example(s) using standard input and output	T1: 2.4; Class notes	
04	L5 - L7 Internal representation of data; IEEE floating-point representation	R1: 2.7.2	Students will understand, how data is represented and stored in Computers
05	L8 - L10 Data types; variables; constants; operators and expressions	T1: 2.1-2.2	Students can evaluate arithmetic expressions and specify the exact internal data representation.
06	L11 - 13 Statements – if... else, if... else... if, switch; Loops – while; do...while; for; break and continue	T1: 4.1-4.3, 4.7-4.8, 5.1-5.2, 5.4-5.8	Given an iterative or conditional, students would be able to use the loop constructs / if-else construct appropriately.
07	L14 - 16 Functions and program structure; return types; scope rules; function arguments; call by value; stack vs heap memory	T1: 3.1, 3.4-3.5, 6.1-6.4, 9.1-9.5, 10.1-10.4	Given a complex problem statement, students will be able to logically break down into simpler modules and solve them using functions. They will learn recursion and recursive programming style. They will also
08	L17 - L21 Arrays, multidimensional arrays, searching and sorting, string operations	T1: 6.1, 2.3 Class Notes	



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09	L22 - L24 Structures, type definitions, array of structures	T1: 10.1 – 10.4 Class Notes	be able to store and process groups of related data records together using arrays and strings in C. They will also be able to store data of multiple datatypes together using structures and process them.
10	L25 - L28 Pointers; call by reference; pointer arithmetic; arrays of pointers	T1: 8.1-8.5 T1: 7.8-7.9, 13.7	Students will be able to create user-defined data types pertaining to a given problem, and create and manipulate data structures using dynamic memory management. They will also learn about linked lists, operations on linked lists and file handling in C.
11	L29 - L32 Dynamic memory management, multidimensional arrays; pointers vs. multidimensional arrays	Class Notes	
12	L33 - 36 Linked lists and operations	T1: 13.1-13.4 Class Notes	
13	L37 File handling	Class Notes T1: 9.1-9.5	
14	L38 - 40 C pre-processor, performance efficiency of a C Program, case studies	T1:11.1 Class Notes	Students will be able to understand macros in C, ways of profiling a C program and making it efficient

6. Plan for laboratory sessions:

Lab Session No.	Broad topics to be covered
Lab 1	Introduction to Operating System, Unix, Basic Unix Commands
Lab 2	Some more Unix Commands and Introduction to a text editor
Lab 3	Basic C programs, compiling and executing them
Lab 4	More complex C programs with multiple data types, variables and type conversions
Lab 5	Control Flow: branching, decision making, looping
Lab 6	Storage Classes, Functions
Lab 7	Arrays – Searching and Sorting and other problems, passing arrays to functions
Lab 8	Multi-file Compilation with makefile
Lab 9	Structures in C
Lab 10	Pointers, Pointer Arithmetic, Call by reference
Lab 11	Dynamic Memory Allocation – variables, arrays, arrays of structures
Lab 12	Linked Lists
Lab 13	File Handling, and Command-Line Arguments



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7. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of component (Close Book/ Open Book)
Mid-Semester Test	90 min.	25	-	Closed book
Comprehensive Examination	3 hours	35	-	Open/Closed book
Quiz	30-40 min.	10	-	Closed book
Programming Test/ Quiz	1-2 hour	20	-	Open book
Laboratory Sessions	2 hours each	10	---	---

8. Consultation Hour:

Dr. Amitesh Singh Rajput – W 4 - 5 PM (Prior email approval for flexible dates)
Prof. Kamlesh Tiwari –
Dr. Vinti Agarwal – M 5 – 6 PM
Dr. L. Rajya Lakshmi –

9. Notices: All announcements will be done through the Nalanda portal.

10. Make-up Policy: Make-ups are generally considered only for medical emergencies leading to hospitalization (or a personal emergency of similar nature). The decision by the Instructor-in-Charge regarding granting make-up shall be final. Make-ups are allowed for Mid Semester Test, Lab Test, Quiz and Comprehensive Examination. No makeup for weekly laboratory sessions. **The best 8 out of last 10 labs (i.e., from lab sheet 4 to lab sheet 13) will be considered for grading.**

11. Note: Award of grades would be guided in general by the histogram of marks. If a student does not give sufficient opportunity for being assessed, either by missing a component entirely or by not applying oneself to the task seriously, he/she may be awarded an ‘NC’ report.

Instructor-in-Charge
CS F111