

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
1st Year Curriculum Structure for B.Tech courses in Engineering & Technology
(Applicable from the academic session 2018-2019)

Course Code : ES-CS201	Category : Engineering Science Courses
Course Title : Programming for Problem Solving	Semester : Second
L-T-P : 3-0-0	Credit :3
Pre-Requisites:	

Detailed contents

Unit 1: Introduction to Programming (4 lectures)

- Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) - **(1 lecture)**.
- Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. **(1 lecture)**
- From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code- **(2 lectures)**

Unit 2: Arithmetic expressions and precedence (2 lectures)

Unit 3: Conditional Branching and Loops (6 lectures)

- Writing and evaluation of conditionals and consequent branching **(3 lectures)**
- Iteration and loops **(3 lectures)**

Unit 4: Arrays (6 lectures)

- Arrays (1-D, 2-D), Character arrays and Strings

Unit 5: Basic Algorithms (6 lectures)

- Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Unit 6: Function (5 lectures)

- Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Unit 7: Recursion (4 -5 lectures)

- Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit 8: Structure (4 lectures)

- Structures, Defining structures and Array of Structures

Unit 9: Pointers (2 lectures)

- Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Unit 10: File handling (only if time is available, otherwise should be done as part of the lab)

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Course Outcomes

The student will learn

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

Learning Resources:

1. R. S. Salaria, Computer Concepts and Programming in C, Khanna Publishers
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

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1st Year Curriculum Structure for B.Tech courses in Engineering & Technology
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Course Code : ES-CS291	Category : Engineering Science Courses
Course Title : Programming for Problem Solving	Semester : Second
L-T-P : 0-0-4	Credit:2
Pre-Requisites:	

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:

Lab 12: File operations

Laboratory Outcomes

- To formulate the algorithms for simple problems
- To translate given algorithms to a working and correct program
- To be able to correct syntax errors as reported by the compilers
- To be able to identify and correct logical errors encountered at run time
- To be able to write iterative as well as recursive programs
- To be able to represent data in arrays, strings and structures and manipulate them through a program
- To be able to declare pointers of different types and use them in defining self-referential structures.
- To be able to create, read and write to and from simple text files.



B. P. Poddar Institute of Management & Technology
Department of Electronics & Communication Engineering



Course: Programming for Problem Solving (ES-CS201)
Academic Year: 2018-19 (Even Semester)

Course Outcomes

On successful completion of the course student will be able to

COs	Course Outcomes	Cognitive Level
C111.1	Outline algorithms to solve logical & numerical problems through programs with correct syntax, operators and expressions.	Apply
C111.2	Classify different control structures to implement solution to a given problem in C language.	Analyze
C111.3	Develop user defined C functions with or without recursive statements to serve specific purposes.	Create
C111.4	Illustrate the concept of memory organization of arrays and pointers.	Analyze
C111.5	Evaluate the basic searching and sorting algorithms with order of complexity.	Evaluate
C111.6	Construct C programs using different logical structures and files for complex problems.	Create

CO-PO-PSO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C111.1	2	1	-	-	-	-	-	-	-	-	-	1	1	1
C111.2	2	3	1	-	-	-	-	1	-	-	-	1	2	1
C111.3	2	3	2	2	-	-	-	1	2	-	-	1	2	1
C111.4	3	3	2	1	-	-	-	1	-	-	-	1	1	1
C111.5	2	2	2	3				1				2	1	1
C111.6	3	3	3	3				1	2			1	2	1
C111	2.33	2.50	2	2.25	-	-	-	1	2	-	-	1.17	1.5	1

Prasenjit Kumar Mudi
(Course Faculty)

Dr. Ivy Majumdar
(HOD, ECE Dept.)



Lesson Plan with no. of hours/periods, TA/TM/ Text/Reference book

Course: Programming for Problem Solving (ES-CS 201)

Academic Year: 2018-19, Semester: Even

Lecture/ Tutorial No.	Topics to be Covered	References	Teaching Aid	Teaching Methodology
L1	Familiarization of the students with POs, PEOs, and COs			Discussion
Unit 1				
Introduction to Programming				
L2	Introduction to Computer, OS, Compilers	R1 , R2	GGB, Chalk & Duster	Discussion, Lecture
L3	Algorithm/Flowchart/Pseudo code with examples	R1 , R2	GGB, Chalk & Duster	Discussion, Lecture
L4	Implementation of algorithms into programs with examples, C character set	R1 , R2	GGB, Chalk & Duster	Discussion, Lecture
L5	Identifiers, keywords, data types & sizes	R1 , R2	GGB, Chalk & Duster	Discussion, Lecture
Unit 2				
Arithmetic Expressions & Precedence				
L6	Arithmetic Expressions	R1 , R2	GGB, Chalk & Duster	Lecture
L7	Operators & hierarchy, Associativity of operators	R1 , R2	GGB, Chalk & Duster	Lecture
Quiz-1				
Unit 3				
Conditional Branching & Loops				
L8	If-else, nested if-else, ternary operator, inter conversion between if-else and ternary operator	R1 , R2	GGB, Chalk & Duster	Lecture
L9	Switch-case statements, illustrations	R1 , R2	GGB, Chalk & Duster	Discussion, Lecture
L10	Looping statements: for, while, do-while	R1 , R2	GGB, Chalk & Duster	Lecture
L11	Nested for loop, break, continue statements, examples	R1 , R2	GGB, Chalk & Duster	Discussion, Lecture
L12	Example: Fibonacci, factorial, series expansion	R1 , R2	GGB, Chalk & Duster	Discussion, Lecture

Lecture/ Tutorial No.	Topics to be Covered	References	Teaching Aid	Teaching Methodology
L13	Example: pattern generation	R2	GGB, Chalk & Duster	Discussion, Lecture
Quiz-2				
Unit 6 Function				
L14	Introduction to functions, features of function, illustration with examples	R2	GGB, Chalk & Duster	Discussion, Lecture
L15	Actual & formal parameters, call by value, illustration	R1 , R2	GGB, Chalk & Duster	Lecture
L16	Auto, external, static and register variables, scope rules	R1	GGB, Chalk & Duster	Lecture
Unit 9 Pointers				
L17	Introduction of pointers and its memory organization	R2	GGB, Chalk & Duster	Lecture
L18	Illustration with examples using pointers	R2	GGB, Chalk & Duster	Discussion, Lecture
Unit 6 Function				
L19	Call by reference of functions	R2	GGB, Chalk & Duster	Lecture
L20	Implementation of user defined functions with problem examples	R1	GGB, Chalk & Duster	Discussion, Lecture
Quiz-3				
Unit 7 Recursion				
L21	Illustration of recursion phenomena in various ways with examples	R2	GGB, Chalk & Duster	Discussion, Lecture
L22	Development of recursive statements	R1, R3	GGB, Chalk & Duster	Lecture
L23	Example: Factorial calculation, Fibonacci series	R1	GGB, Chalk & Duster	Discussion, Lecture
L24	Example: Ackerman function, Quick Sort or Merge Sort	R1	GGB, Chalk & Duster	Discussion, Lecture
Quiz-4				
1 st Assignment will be given				
Unit 4 Arrays				
L25	Introduction to 1D array	R2, R3	GGB, Chalk & Duster	Lecture

Lecture/ Tutorial No.	Topics to be Covered	References	Teaching Aid	Teaching Methodology
L26	Storing elements into array, accessing elements from array, display elements of array	R2, R3	GGB, Chalk & Duster	Lecture
L27	Integer pointers with 1D array, features of pointers, concept of base address	R2, R3	GGB, Chalk & Duster	Lecture
L28	2D array and its memory organization, 2D array creation, accessing elements with/without integer pointers	R2, R3	GGB, Chalk & Duster	Lecture
L29	Illustration of matrix analysis using 2D array	R2	GGB, Chalk & Duster	Discussion, Lecture
L30	Concept of array pointer and array of pointers, matrix problems	R2, R3	GGB, Chalk & Duster	Discussion, Lecture
L31	Passing 1D array, 2D array to a function	R2, R3	GGB, Chalk & Duster	Lecture
L32	Character arrays & strings: read, display	R2, R3	GGB, Chalk & Duster	Lecture
L33	Pointers with strings, 2D array of characters	R2, R3	GGB, Chalk & Duster	Lecture
Quiz-5				
Unit 5				
Basic Algorithms				
L34	Searching algorithms: illustration	R1, R3	GGB, Chalk & Duster	Discussion, Lecture
L35	Sorting algorithms: Bubble sort, illustration	R1, R3	GGB, Chalk & Duster	Discussion, Lecture
L36	Insertion sort illustration	R1, R3	GGB, Chalk & Duster	Discussion, Lecture
L37	Selection sort illustration	R1, R3	GGB, Chalk & Duster	Discussion, Lecture
L38	Finding roots of an equation	R1, R3	GGB, Chalk & Duster	Discussion, Lecture
L39	Concept of order of complexity with examples	R1, R3	GGB, Chalk & Duster	Discussion, Lecture
Quiz-6				
Unit 8				
Structure				
L40	Introduction to structure, illustration of features with program execution	R2, R3	GGB, Chalk & Duster	Discussion, Lecture
L41	Array of structures	R2, R3	GGB, Chalk & Duster	Lecture
L42	Pointers in structures	R2, R3	GGB, Chalk & Duster	Lecture

Lecture/ Tutorial No.	Topics to be Covered	References	Teaching Aid	Teaching Methodology
L43	Illustrative examples	R2, R3	GGB, Chalk & Duster	Discussion, Lecture
Quiz-7				
Unit 10 File Handling				
L44	File Handling concepts	R2	GGB, Chalk & Duster	Lecture
L45	Different modes of file operation: illustration with program	R2	GGB, Chalk & Duster	Discussion, Lecture
L46	Different modes of file operation: illustration with program	R2	GGB, Chalk & Duster	Discussion, Lecture
Quiz-8				
2 nd Assignment will be given				

L= Lecture, T= Tutorial GGB= Green Glass Board

Course References:

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|--------------------|-------------------------------|-----------------|
| 1. Balagurusamy E. | Introduction To Computing:1/e | OUP |
| 2. Kanetkar Y. | Let us C:13/e | BPB Publication |
| 3. Gottfried | Programming with C:2/e | Schaum |

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Gaps identified with mapping to CO, PO/PSO

Academic Year: 2018-2019, Even Semester

Course: Programming for Problem Solving (ES-CS 201)

Gap within syllabus-mapping to CO, PO/PSO

Sl No.	Topics	Actions to be taken	Mapping to COs	Relevance to POs, PSOs	Level of Mapping
1.	Additional Features – Macros, Preprocessor, Enumeration etc.	To be discussed in theoretical/lab class	CO3	PO1, PSO1	PO1: 1, PSO1: 1
2.	2D Pattern Transformation	To be discussed in theoretical/lab class	CO4	PO1, PO2, PSO1	PO1: 1, PO2: 1, PSO1: 1
3.	2D Graphics Drawing	To be discussed in theoretical/lab class	CO6	PO1, PO2, PSO1	PO1: 1, PO2: 1, PSO1: 1

Gap beyond the syllabus-mapping to CO, PO/PSO

Sl. No.	Topic	Mapping to PO	Mapping to PSO	Level of Mapping
1.	Image Processing with C/C++/Embedded C/Python	PO3, PO4	PSO1, PSO2	PO3: 2, PO4: 2, PSO1: 1, PSO2: 1

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Web References

Academic Year: 2018-19

Course: Programming for Problem Solving (ES-CS 201)

Batch: ECE-B 1st Year

Sl. No.	Link	Topic	Recourse Person
1	http://nptel.ac.in/courses/106104128/	Multidimensional Arrays and Pointers	Dr. Satyadev Nandakumar, IIT Kanpur
2.	https://www.youtube.com/channel/UC7A7k9AedYGyMynZwqrG-aQ/videos?view_as=subscriber?&ab_channel=PRASENJITMUDI	Video Lectures of Course Teacher	Mr. Prasenjit Kumar Mudi, BPPIMT
3.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming-in-c-january-iap-2010/lecture-notes/	User-defined datatypes, structs, unions, bitfields.	Daniel Weller, Sharat Chikkerur
4.	http://nptel.ac.in/courses/106105085/4	Data Structure	Dr. P.P.Chakraborty

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List of Video Lectures
Academic Year: 2018-19
Course: Programming for Problem Solving (ES-CS 201)
Batch: ECE-B 1st Year

Sl. No.	Topic	Web Link
1	Operators & Expressions Part-I	https://www.youtube.com/watch?v=vkR1ISp4yxc
2.	Operators & Expressions Part-II	https://www.youtube.com/watch?v=Nx8nHgJW8os
3.	Control Structure Part-I	https://www.youtube.com/watch?v=mSXNVQIUhrM
4.	Control Structure Part-II	https://www.youtube.com/watch?v=w31-5dQCbrk
5.	Pattern Generation Part-I	https://www.youtube.com/watch?v=hLhFeG10zJA&t=479s
6.	Functions Part-I	https://www.youtube.com/watch?v=NpYKPZSrhkQ
7.	Functions Part-II	https://www.youtube.com/watch?v=y4qXGLywzJQ
8.	Functions Part-III	https://www.youtube.com/watch?v=oIZLrez-TSs
9.	Pattern Generation Part-II	https://www.youtube.com/watch?v=jBpKrq7-Gek
10.	Pointers Part-I	https://www.youtube.com/watch?v=kGPZuI2zjq0
11.	Pointers Part-II	https://www.youtube.com/watch?v=cKaWlBnZy2Q
12.	Numerical Integration: Trapezoidal Rule	https://www.youtube.com/watch?v=fxkXRp37ANc

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