

PROGRAMMING FOR PROBLEM SOLVING

I B.Tech: Common for all Branches								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
A5CS01	ESC	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 64		Tutorial Classes: 0		Practical Classes: 0		Total Classes: 64		
Course Objectives <ul style="list-style-type: none"> To provide the foundation of computation problem solving. To impart knowledge about problem solving and algorithmic thinking. To enable them how to implement conditional branching, iteration and recursion. To understand how to decompose a problem into functions and synthesize a complete program. To enable them to use arrays, pointers, strings and structures in solving problems. To understand how to solve problems related to matrices, Searching and sorting. To make them to understand the use files to perform read and write operations. 								
UNIT-I	INTRODUCTION - PROBLEM SOLVING AND ALGORITHMIC THINKING						Classes: 12	
Problem Solving and Algorithmic Thinking Overview – Problem Definition, logical reasoning, Algorithm definition, practical examples, properties, representation, algorithms vs programs. Algorithmic Thinking – Constituents of algorithms - Sequence, Selection and Repetition, input-output; Computation – expressions, logic; Problem Understanding and Analysis – problem definition, variables, name binding, data organization: lists, arrays etc. algorithms to programs.								
UNIT-II	OPERATORS, EXPRESSIONS AND CONTROL STRUCTURES						Classes: 15	
Introduction to C language: Structure of C programs, data types, data inputs, output statements, Operators, precedence and associativity, evaluation of expressions, type conversions in expressions. Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements.								
UNIT-III	ARRAYS AND FUNCTIONS						Classes: 17	
Arrays: Concepts, One dimensional array, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi dimensional arrays, Basic Searching Algorithms: Linear and Binary search Functions: User defined and built-in Functions, storage classes, Parameter passing in functions, call by value, call by reference, Passing arrays to functions, Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Towers of Hanoi etc.								
UNIT-IV	STRINGS AND POINTERS						Classes: 10	
Strings: Arrays of characters, variable length character strings, inputting character strings, character library functions, string handling functions. Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, functions returning pointers, Dynamic memory allocation.								
UNIT-V	STRUCTURES AND FILE HANDLING						Classes: 10	
Structures and unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, self-referential structures, unions, typedef, enumerations. File handling: command line arguments, File modes, basic file operations read, write and append, example programs								
Text Books:								

1. Riley DD, Hunt K.A. Computational Thinking for the Modern Problem Solver. CRC press, 2014 Mar 27.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
3. Byron Gottfried, "Programming with C", Schaum's Outlines Series, McGraw Hill Education, 3rd edition, 2017.

Reference Books:

1. Ferragina P, Luccio F. Computational Thinking: First Algorithms, Then Code. Springer; 2018.
2. Beecher K. Computational Thinking: A beginner's guide to Problem-solving and Programming. BCS Learning & Development Limited; 2017.
3. Curzon P, McOwan PW. The Power of Computational Thinking: Games, Magic and Puzzles to help you become a computational thinker. World Scientific Publishing Company; 2017.
4. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education, 6th Edition, 2012.
5. W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd Edition, 1988.
6. Yashavant Kanetkar, "Exploring C", BPB Publishers, 2nd Edition, 2003.
7. Schildt Herbert, "C: The Complete Reference", Tata McGraw Hill Education, 4th Edition, 2014.
8. R. S. Bichkar, "Programming with C", Universities Press, 2nd Edition, 2012.
9. Dey Pradeep, Manas Ghosh, "Computer Fundamentals and Programming in C", Oxford University Press, 2nd Edition, 2006.
10. Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.

Web References:

1. https://en.wikipedia.org/wiki/Computational_thinking
2. <https://www.khanacademy.org/computing/computer-programming>
3. <https://www.edx.org/course/programming-basics-iitbombayx-cs101-1x-0>
4. <https://www.edx.org/course/introduction-computer-science-harvardx-cs50x>

E-Text Books:

1. https://www.416pgk.com/scripts/un981c6l?a_aid=5756ae7b&a_bid=c28f910b&chan=new&data1=computational+thinking+for+the+modern+problem+solver+by+david+d+riley&data2=main&p=af
2. <http://www.freebookcentre.net/Language/Free-C-Programming-Books-Download.htm>
3. <http://www.imada.sdu.dk/~svalle/courses/dm14-2005/mirror/c/>
4. <http://www.enggnotebook.weebly.com/uploads/2/2/7/1/22718186/ge6151-notes.pdf>

MOOC Course

1. <https://www.coursera.org/learn/computational-thinking-problem-solving>
2. https://onlinecourses.nptel.ac.in/noc18_cs33/preview
3. <https://www.alison.com/courses/Introduction-to-Programming-in-c>
4. <http://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s096-effective-programming-in-c-and-c-january-iap-2014/index.htm>

Course Outcomes

At the end of the course, student will be able to:

- Apply algorithmic thinking to understand, define and solve problems
- Design and implement algorithm(s) for a given problem
- Implement conditional branching, iteration and recursion.
- Decompose a problem into functions and synthesize a complete program.
- Use arrays, pointers, strings and structures to formulate algorithms and programs.
- Apply programming to solve problems related to matrices, Searching and sorting.
- Use files to perform read and write operations.

