Dr. A.P.J. Abdul Kalam University, Indore

Semester–I

COURSE	Subject Title	Subject Code
B.Sc.(Major)	Computer Science (Computer System Architecture)-I	BSCS101T

CourseLearningOutcomes(CLO)

Oncompletionofthiscourse,learnerswillbeableto:

1. Understandthebasicstructure,operationandcharacteristicsofdigitalcomputer.
2. Beabletodesignsimplecombinationaldigitalcircuitsbasedongivenparameters.
3. Familiaritywithworkingof arithmeticandlogic unit aswellastheconceptofpipelining
4. Knowabouthierarchicalmemorysystemincludingcachememoriesandvirtual memory.
5. Understandconceptandadvantagesofparallelism.threading,multiprocessorsandmulticoreprocessors.
6. Knowthe contributionsofIndians inthefieldof computerarchitecture andrelatedtechnologies.

CONTENT

Unit -I

Fundamentals of Digital Electronics: Data Types, Complements, Fixed-Point Representation, Floating-PointRepresentation,Binary andother Codes, ErrorDetectionCodes.

Logic Gates, Boolean Algebra, Map Simplification. Combinational Circuits, Sequential Circuits, simplecombinationalcircuit designproblems.

Circuits- Adder- Subtractor, Multiplexer, Demultiplexer. Decoders, Encoders Flip-Flops, Registers,Counters.

Unit-II

Basic Computer Organization: Instruction codes, Computer Registers, Computer Instructions, Timing &Control, Instruction Cycles, Memory ReferenceInstruction. Input-Output & Interrupts, CompleteComputerDescription&DesignofBasic Computer.

Unit -III

Instructions - Instruction formats, Addressing modes, Instruction codes, Machine language, Assemblylanguage.

Register Transfer and Micro operations - Register Transfer language, Register Transfer, Bus & MemoryTransfer,ArithmeticMicro-operations,LogicMicro-operations, ShiftMicro-operations.

Unit-IV

Processor and Control Unit - Hardwired vs. Micro programmed Control Unit, General RegisterOrganization, Stack Organization, Instruction Format, Data Transfer & Manipulation, Program Control,Introductory Format, Data Transfer & Manipulation, Program Control, Introductory concept of RISC, CISC,advantagesanddisadvantagesofboth.

Pipelining - concept of pipelining, introduction to pipelined data path and control - Handling Datahazards&Controlhazards.

Unit-

VMemoryandI/OSystem-PeripheralDevices, I/OInterface.,

DataTransferSchemes-Programcontrol,Interrupt,DMATransfer.I/OProcessor.

Memory Hierarchy, Processor vs. Memory Speed, High-Speed Memories, Main memory, Auxiliarymemory,CacheMemory,AssociativeMemory,Interleaving,VirtualMemory,MemoryManagement.

Unit - VI

Parallelism - meaning, types of parallelism, introduction to Instruction- level-parallelism, Parallelprocessingchallenges,Applications.

Flynn'sclassification-IntroductiontoSISD,SIMD,MISD,MIMD

Hardwaremultithreading-Introduction,types,advantagesandapplications.

Multicoreprocessors -Introduction,advantages,differencefromMultiprocessor.

Unit -VII

Indian contribution to the field - Contributions of reputed scientists of Indian origin - like - Dr. VinodDham - Father of Intel Pentium Processor, Dr. Ajay Bhat - Co-Inventor of USB Technology, Dr. VinodKhosla- co-founder of Sun Microsystems, Dr. Vijay P Bhatkar - architect of India's national initiative insupercomputing,andmanyothers.

Parallel Computing projects of India - PARAM, ANUPAM, FLOSOLVER, CHIPPS etc.Other relevantcontributorsandcontributions.

Practical

SuggestivelistofPracticals

1. Tostudybasicgates(AND,OR.NOT)andverifytheirtruthtables.

2. To convert a given binary number to Gray code using IC

7486.3.To study andverifyNAND asUniversalgateusingIC7400.

4. Tostudy halfadderusingbasicgatesandverifyits truthtable.

5. To studyFullAdderusingbasicgatesandverifyitstruthtable.

6. Torealize basicgates(AND,OR,NOT)fromUniversalgates(NAND andNOR).

7. Toverifytruthtableof4-bit adder usingIC 7483.

8. TodesignandconstructRSflipFlopusinggates andverifythetruth

9. TodesignandconstructJK flipFlopusinggatesandverifythetruth

10. ToverifyDeMorgan'sTheorem.

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Semester-I

COURSE	SubjectTitle	Subject Code
B.Sc.(Minor)	**Computer Science (Programming Methodologies & Data Structures)- II**	BSCS-102T

CourseLearningOutcomes(CLO)

Oncompletionofthiscourse,learnerswillbeableto:
1. Develop simple algorithms and flow charts to solve a problem with programming using top downdesignprinciples.
2. Writingefficientandwell-structuredcomputeralgorithms/programs.
3. Learntoformulateiterative solutionsandarrayprocessingalgorithmsforproblems.
4. Userecursive techniques,pointersandsearchingmethodsinprogramming.
5. Will be familiar with fundamental data structures, their implementation; become accustomed to thedescriptionofalgorithms inboth functional andproceduralstyles
6. Haveknowledgeofcomplexityofbasicoperationslikeinsert,delete,searchonthesedatastructures.
7. Possessabilitytochooseadatastructureto suitablymodelanydatausedincomputerapplications.
8. Design programs using various data structures including hash tables, Binary and general search trees,heaps, graphsetc.
9. Assessefficiencytradeoffsamongdifferentdatastructureimplementations.
10. Implementandknowtheapplicationsofalgorithmsfor searchingandsortingetc.
11. Know thecontributionsofIndians inthe fieldof programminganddatastructures.

CONTENT

Unit–1

Introduction to Programming;- Program Concept, Characteristics of Programming, Stages in ProgramDevelopment,Algorithms,Notations,Design,Flowcharts, TypesofProgrammingMethodologies

Introduction to C++ Programming:-Basic Program Structure In C++, Data Types, Variables, Constants,OperatorsandBasic I/O.

Variables - Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants,Keywords, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise). Using Comments inprograms, Character I/O (gete, getchar, pute, putchar etc.). Formatted and Console I/O (printf(), scanf(),cin,cout). UsingBasic Header Files(stdio.h.iostream.h.conio.hetc.)

Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions),UnderstandingOperatorsPrecedenceinExpressions

ConditionalStatementsifconstruct,switch-caseconstruct.

Unit–2

Iterative Statements while, do-while, and for loops, Use of break and continue in Loops, Using NestedStatements(Conditional aswell as Iterative)

Functions Top-Down Design, Pre-defined Functions, Programmer- defined Functions, Local Variablesand Global variables, Functions with Default Arguments, Call-By-Value and Call-By-ReferenceParameters,Recursion.

Introduction to Arrays - Declaration and Referring Arrays, Arrays in Memory, Initializing Arrays.ArraysinFunctions,Multi-Dimensional Arrays.

Unit–3

Structures-MemberAccessing.Pointersto Structures,StructuresandFunctions,ArraysofStructures.

Unions -DeclarationandInitialization.

Strings - Reading and Writing Strings.Arrays of Strings.String and Function, Strings and Structure,StandardStringLibraryFunctions.

SearchingAlgorithms-LinearSearch,BinarySearch.

FileHandling -Useoffilesfordatainput andoutput,mergingandcopyingfiles.

Unit- 4

DataStructure-Basicconcepts,LinearandNon-Lineardatastructures

AlgorithmSpecification-Introduction,Recursivealgorithms,DataAbstraction,Performanceanalysis.

Linked List - Singly Linked Lists, Operations, Concatenating, circularly linked lists-Operations forCircularlylinkedlists,DoublyLinked Lists- Operations.

Array-Representation of single, two dimensional arrays, sparse matrices-array and linkedrepresentations.

Stack- Operations, Array and Linked Implementations, Applications- Infix to Postfix Conversion, PostfixExpressionEvaluation.Recursion

Unit-5

Queue - Definition, Operations, Array and Linked Implementations.Xon Implementation. CircularQueue-Insertion and Deletion Operations, Dequeue (Double Ended Queue), Priority Queue-Implementation.

Trees - Representation of Trees, Binary tree. Properties of Binary Trees, Binary Tree Representations-ArrayandLinkedRepresentations,BinaryTreeTraversals.Threaded BinaryTrees.

Heap-Definition,Insertion,Deletion.

Unit -6

Graphs - Graph ADT. Graph Representations, Graph Traversals,

Searching**Hashing-** Introduction, Hash tables, Hash functions, Overflow

Handling.**SortingMethods-** ComparisonofSortingMethods,

SearchTrees –BinarySearchTrees, AVLTrees-DefinitionandExamples.

Unit–7

Indian Contribution to the field : Innovations in India, origin of Julia Programming Language, IndianEngineers who designed new programming languages, open source languages. Dr. SartajSahni-computerscientist - pioneerof datastructures.Otherrelevantcontributors andcontributions.

Suggestivelistofpracticals

1. OfficeTools

a. Usinga TextEditorTool

1. Createadocumentandapply differentEditingoptions.

2. CreateBannerforyourcollege.

3. DesignaGreetingCardusingWordArtfordifferentfestivals.

4. DesignyourBio dataandusepage bordersandshading.

5. Createadocumentandinsertheaderandfooter,pagetitle,date,time,applyvariouspageformattingfeatures etc.

6. ImplementMailMerge.

7. Insertatableintoadocumentandtrydifferentformattingoptionsforthetable.

b. UsingaSpreadsheetTool

1. DesignyourclassTimeTable.

2. Prepare aMarkSheetofyourclass result.

3. Prepare aSalarySlipofanemployeeofanorganization.

4. Prepare abarchart& pie chart foranalysisofElectionResults.

5. Preparea generic Billofa Super Market.

6. Workonthe followingexercisesonaWorkbook:

a. CopyanexistingSheet

b. RenametheoldSheet

c. InsertanewSheetintoanexistingWorkbook

d. DeletetherenamedSheet.

7. Prepare anAttendance sheetof10studentsforany6 subjectsofyoursyllabus.Calculatetheirtotalattendance,total percentageofattendanceofeach student &averageofattendance.

8. CreateaworksheetofStudentslistofany4facultiesandperformfollowingdatabasefunctionsonit.

a. SortdatabyName

b. FilterdatabyClass

c. Subtotalofno.ofstudentsbyClass.

c.UsingaPresentationTool

1. Design a presentation of your institute using auto content wizard, design template and blankpresentation.

2. Designapresentationillustratinginsertionofpictures, WordArtandClipArt.

3. Design a presentation, learn how to save it in different formats, copying and opening an existingpresentation.

4. Designapresentationillustratinginsertionofmovie, animationandsound.5.Illustrateuseofcustomanimationandslidetransition(usingdifferenteffects).

6.Designa presentationusingcharts andtablesof themarksobtainedinclass.

II. Given the problem statement, students are required to formulate problem, developflowchart/algorithm, write code in C++, execute and test it. Students should be given assignments onfollowing:

1. a. To learn elementary techniques involving arithmetic operators and mathematical expressions,appropriateuseofselection(if, switch,conditionaloperators)andcontrol structures

b.Learnhowtousefunctionsandparameterpassinginfunctions,writingrecursiveprograms.

2. Writeaprogram to swapthe contentsoftwovariables.

3. Writeaprogram forfindingthe rootsofaQuadraticEquation.

4. Writeaprogramto findareaofacircle,rectangle,squareusing

5. Writeaprogramto check whetheragivennumberisevenorswitchcaseodd.

6. Write aprogramto printtableofanynumber.

7. Writeaprogram toprintFibonacciseries.

8. Writeaprogram to findfactorialofagivennumber.

9. Writeaprogramtoconvertdecimal(integer)numberintoequivalentbinarynumber.

10. Writea programtocheckgiven stringispalindromeornot.

11. Writeaprogramtoperformmultiplicationsoftwomatrices.

12. Writeaprogramtoprintdigitsofentered numberinreverseorder.

13. Writea programtoprintsumoftwomatrices.

14. Writea programtoprintmultiplicationoftwomatrices.

15. Writeaprogramtogenerateeven/oddseries fromto100.

16. Writeaprogramwhether agivennumber isprimeornot.

17. Writeaprogramforcall byvalueandcallbyreference.

18. Writeaprogramtogenerateaseries1+1/11+2/2+3/3!+-

-+n/n!

19. Writeaprogramtocreateapyramidstructure

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20. Writeaprogramtocreateapyramidstructure

21. Writea programtocheck entered numberisArmstrongor not.

22. Writea programfortraversingan Array.

23. Writea programtoinput Nnumbers,addthemandfindaverage.

24. Writea programtofindlargestelementfromanarray.

25. Writea programforLinear search.

26. Writea programforBinary search.

27. Writea programforBubble sort.

28. WriteaprogramforSelectionsort.