Raja N. L. Khan Women's College (Autonomous)

SyllabusFor
B.Sc. (Honours) Computer
ScienceChoiceBasedCreditSystem
(CBCS)

The Objectives and Outcome of the Course:

The BSc Computer Science helps to develop a widely applicable skill set in computing with strong programming and mathematics skills, as well as wide ranging skills in project management, effective presentations and teamwork. Graduate with a portfolio of work fit to present to potential employers. Depending on the chosen pathway, you can focus on particular areas of interest such as machine learning, web development, data science and video games. The explosive and ever-growing use of technology in business and commerce means that there's a whole range of different career possibilities for computing graduates. In terms of job opportunities and salaries, the IT sector is well ahead of most other industrial and commercial sectors.

With the BSc Computer Science, Students will able to apply for a range of computational and mathematical jobs in the creative industries, business, finance, education, medicine, engineering and science. Typical job titles include:

- Application Programmer
- Software Developer
- Systems Analyst
- Database Manager
- Mobile App Developer
- Web Developer
- Video game Developer
- Film special effects and post-production
- Computer music/sound engineer
- Interface designer

1st Semester

Course	Course Type/ Nature	Course Code	NameoftheSubject	Teaching Scheme in hourperweek			Credit	Marks
				L	T	P		
CC-1	Core Course - 1	C1T	Programming Fundamentalsusing C/C++	4	0	0	4	75
		C1P	Programming FundamentalsusingC/ C++LAB	0	0	4	2	
CC-2	Core Course - 2	C2T	ComputerSystemArchitecture	4	0	0	4	75
		C2P	ComputerSystemArchitectureLAB	0	0	4	2	
GE-1	GenericElective-1	GE1T	ComputerFundamentals	4	0	0	4	75
		GE1P	ComputerFundamentalsLAB	0	0	2	2	
AEC-1	AbilityEnhancementCompulsory Course-1		English	1	0	2	2	50
1stSemesterTotal							20	275

2nd Semester

Course	Course Type/ Nature	Course Code	NameoftheSubject	TeachingScheme inhour perweek			Credit	Marks
				L	T	P		
CC-3	CoreCourse –3	C3T	ProgramminginJAVA	4	0	0	4	75
		C3P	ProgramminginJAVALAB	0	0	4	2	
CC-4	CoreCourse - 4	C4T	DataStructures	4	0	0	4	75
		C4P	DataStructuresLAB	0	0	4	2	
GE-2	GenericElective-2	GE2T	IntroductiontoProgramming	4	0	0	4	75
		GE2P	IntroductiontoProgrammingLAB	0	0	2	2	
AEC-2	AbilityEnhancementCompulsory Course-2		EnvironmentalScience	1	0	2	2	50
2ndSemesterTotal							20	275

3rd Semester

Course	Course Type/ Nature	Course Code	NameoftheSubject	Teaching Scheme in hourperweek			Credit	Marks
				L	T	P		
CC-5	CoreCourse - 5	C5T	DiscreteStructures	4	0	0	5	75
		C5P	DiscreteStructuresTutorial	0	1	0	1	
CC-6	CoreCourse - 6	C6T	OperatingSystems	4	0	0	4	75
		C6P	OperatingSystemsLAB	0	0	4	2	
CC-7	CoreCourse - 7	C7T	ComputerNetworks	4	0	0	4	75
		C7P	ComputerNetworks LAB	0	0	4	2	
GE-3	GenericElective-3	GE3T	Computer Fundamentals and PythonProgramming	4	0	0	4	75
		GE3P	PythonProgrammingLAB	0	0	2	2	
SEC-1	SkillEnhancement Course-1		SEC-1	1	0	2	2	50
3rd SemesterTotal							26	350

4thSemester

Course	Course Type/ Nature	Course Code	NameoftheSubject	TeachingSchemeinhour perweek			Credit	Marks
				L	T	P		
CC-8	CoreCourse - 8	C8T	DesignandAnalysisofAlgorithms	4	0	0	6	75
		C8P	DesignandAnalysisofAlgorithmsLAB	0	0	4		
CC-9	CoreCourse - 9	C9T	SoftwareEngineering	4	0	0	6	75
		C9P	SoftwareEngineeringLAB	0	0	4		
CC-10	CoreCourse - 10	C10T	DatabaseManagementSystem	4	0	0	6	75
		C10P	DatabaseManagementSystemLAB	0	0	4		
GE-4	GenericElective-4	GE4T	DataStructure	4	0	0	4	75
		GE4P	DataStructureLAB	0	0	2	2	
SEC-2	SkillEnhancement Course-2		SEC-2	1	0	2	2	50
4thSemesterTotal							26	350

5thSemester

Course	Course Type/ Nature	Course Code	NameoftheSubject	Teaching Scheme in hourperweek			Credit	Marks
				L	T	P		
CC-11	CoreCourse –11	C11T	InternetTechnologies	4	0	0	4	75
		C11P	InternetTechnologiesLAB	0	0	4	2	
CC-12	CoreCourse - 12	C12T	TheoryofComputation	4	0	0	5	75
		C12P	TheoryofComputationTutorial	0	4	0	1	
DSE-1	Discipline Specific Elective-1		DSE-1	4	0	0	4	75
			DSE-1Lab	0	0	4	2	
DSE-2	Discipline SpecificElective-2		DSE-2	4	0	0	4	75
			DSE-2Lab	0	0	2	2	
5thSemesterTotal							24	300

6thSemester

Course	Course Type/ Nature	Course Code	NameoftheSubject	Teaching Scheme in hourperweek			Credit	Marks
				L	T	P		
CC-13	CoreCourse –13	C13T	ArtificialIntelligence	4	0	0	4	75
		C13P	ArtificialIntelligenceLAB	0	0	4	2	
CC-14	CoreCourse –14	C14T	ComputerGraphics	4	0	0	4	75
		C14P	ComputerGraphicsLAB	0	0	4	2	
DSE-3	Discipline Specific Elective-3		DSE-3	4	0	0	4	75
			DSE-3Lab	0	0	2	2	
DSE-4	Discipline Specific Elective-4		ProjectWork/Dissertation	0	0	4	4	75
			Practical/Tutorial	0	0	2	2	
6thSemesterTotal							24	300

Skill Enhancement Courses (2 Papers to be selected) – SEC 1, SEC 2:

1. Android Programming (2 Credit)
2. Programming in MATLAB (2)
3. HTML Programming (2)
4. Programming in Python (2)
5. PHP Programming (2)
6. R Programming (2)
7. UNIX / LINUX Programming (2)

Semester - III

Skill Enhancement Courses (Credit: 02 each) – SEC 1 (ANY ONE)

1. Android Programming (1) + Lab (2)
2. Programming in MATLAB (1) + Lab (2)
3. HTML Programming (1) + Lab (2)

In SEC-1 paper, students would carry out one outreach program where they would pass on the knowledge and skill they learnt in SEC-1 to the school students. The outreach program is of minimum ten (10) hours duration. One question can be given in their SEC1T end semester examination from outreach program organization technicality and experiences.

Semester - IV

Skill Enhancement Courses (Credit: 02 each) – SEC 2 (ANY ONE)

4. Programming in Python (1) + Lab(2)
5. PHP Programming (1) + Lab (2)
6. UNIX/LINUX Programming (1) + Lab (2)
7. R Programming (1) + Lab (2)

In SEC-2 paper, students would carry out one outreach program where they would pass on the knowledge and skill they learnt in SEC-2 to the school students. The outreach program is of minimum ten (10) hours duration. One question can be given in their SEC2T end semester examination from outreach program organization technicality and experiences.

Discipline Specific Elective Papers:(Credit:06 each)(3paperstobeselected) –
DSE1

1.InformationSecurity(4)+ Lab(4)
2.Microprocessor(4)+Lab(4)

DSE 2

3. ComputationalLinguistics(4)+Lab (4)
4. Digital ImageProcessing(4)+Lab(4)
5. MachineLearning(4) +Lab(4)

DSE 3

6. IntroductiontoDataSciences (4)+ Lab(4)
7. CloudComputing(4)+ Lab (4)
8. NumericalMethods(4)+Lab(4)
9. SystemProgramming(4)+Lab(4)
10.DataMining(4)+ Lab(4)
11.BigData Analytics(4)+ Lab(4)
12. SoftComputing(4)+Lab(4)

DSE 4

ProjectWork/Dissertation

B.Sc. (Computer Science) Semester-I

Course Title: - C-1 Programming Fundamentals using C/C++

COURSE OBJECTIVE:

- Enables students to develop logics which will help them to create programs, applications in C.
- Provides students with a strong foundation in basic programming constructs so that they can easily switch over to any other programming language in future.

COURSE OUTCOME

- Illustrate the flowchart and design an algorithm for a given problem to develop a c programs using operators.
- Develop conditional and iterative statements to write c programs.
- Exercise user defined functions to solve real time problems.
- Inscribe c programs that use pointers to access arrays ,strings and functions.
- Exercise user defined datatypes including structures and unions to solve problems.
- Inscribe c programs using pointers and to allocate memory using dynamic memory management functions.
- Exercise files concept to show input and output of files in c

Theory:60Lectures

1. IntroductiontoCandC++ (3 Lectures)

History of C and C++, Overview of Procedural Programming and Object-OrientationProgramming,Usingmain()function,CompilingandExecutingSimpleProgramsin C++.

2. DataTypes,Variables,Constants,OperatorsandBasicI/O (5Lectures)

Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants,Keywords,DataTypes,Casting of DataTypes,Operators(Arithmetic,LogicalandBitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putcharetc),Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h,iostream.h,conio.hetc).

3. Expressions,ConditionalStatementsandIterativeStatements (5Lectures)

Simple Expressions in C++ (including Unary Operator Expressions, Binary OperatorExpressions), Understanding Operators Precedence in Expressions, Conditional Statements (ifconstruct, switch-case construct), Understanding syntax and utility of Iterative Statements(while, do-while, and for loops), Use of break and continue in Loops, Using NestedStatements(Conditionalas well asIterative)

4. Functions and Arrays (10Lectures)

Utility of functions, Call byValue, Call byReference, Functions returningvalue, Voidfunctions, Inline Functions, Return data type of functions, Functions parameters,Differentiating between Declaration and Definition of Functions, Command LineArguments/ParametersinFunctions,FunctionswithvariablenumberofArguments.

Creating and Using One Dimensional Arrays (DeclaringandDefiningan Array,Initializingan Array, Accessing individual elements in an Array, Manipulating array elements usingloops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, WorkingwithRows and Columns), Introduction to Multi-dimensional arrays

5. DerivedDataTypes(StructuresandUnions) (3 Lectures)

Understanding utility of structures and unions, Declaring, initializing and using simplestructuresandunions,Manipulatingindividualmembers ofstructures and unions, ArrayofStructures, Individual data members as structures, Passing and returning structures fromfunctions,Structurewithunionas members, Unionwith structures asmembers.

6. PointersandReferencesinC++ (7Lectures)

Understanding a Pointer Variable, Simple use of Pointers (Declaring and DereferencingPointerstosimplevariables),PointerstoPointers,Pointerstostructures,Proble mswith

Pointers,Passingpointersasfunctionarguments,Returningapointerfrom afunction,usingarrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring andinitializingreferences,Usingreferencesasfunctionargumentsandfunctionreturnvalues

7. Memory AllocationinC++ (3Lectures)

Differentiating between static and dynamic memory allocation, use of malloc, calloc and freefunctions, use of new and delete operators, storage of variables in static and dynamic memoryallocation

8. FileI/O,PreprocessorDirectives (4Lectures)

Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes),Readingandwriting
TextFiles,Usingput(),get(),read()andwrite()functions,Randomaccessinfiles, Understandingthe Preprocessor Directives (#include, #define, #error, #if,#else,#elif,#endif, #ifdef, #ifndef and #undef),Macros

9. UsingClassesin C++ (7Lectures)

PrinciplesofObject-
OrientedProgramming,Defining&UsingClasses,ClassConstructors,ConstructorOverloading, Function overloading in classes, Class Variables &Functions,Objects as parameters, Specifying the Protected and Private Access, CopyConstructors,Overviewof Template classes andtheir use.

10. Overviewof FunctionOverloadingandOperatorOverloading (5Lectures)

Needof Overloadingfunctionsandoperators,Overloading functionsbynumberandtypeofarguments, Looking at an operator as a function call, Overloading Operators (includingassignmentoperators, unaryoperators)

11. Inheritance,PolymorphismandExceptionHandling (8 Lectures) Introduction to Inheritance (Multi-Level Inheritance, Multiple Inheritance), Polymorphism(Virtual Functions, Pure Virtual Functions), Basics Exceptional Handling (using catch andthrow, multiple catch statements), Catching all exceptions, Restricting exceptions, Rethrowingexceptions.

ReferenceBooks

1. HerbtzSchildt,"C++:TheCompleteReference",FourthEdition,McGrawHill.2003
2. BjarneStroustrup,"TheC++ProgrammingLanguage",4th Edition, Addison-Wesley,2013.
3. BjarneStroustroup,"Programming--PrinciplesandPracticeusingC++",2ndEdition,Addison-Wesley2014.
4. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-HillEducation,2008.
5. PaulDeitel,HarveyDeitel,"C++Howto Program",8thEdition,Prentice Hall,2011.
5. JohnR.Hubbard,"ProgrammingwithC++",Schaum'sSeries,2ndEdition, 2000.
6. AndrewKoeni, Barbara,E. Moo, "AcceleratedC++", PublishedbyAddison-Wesley,2000.
7. ScottMeyers,"Effective C++",3rdEdition,PublishedbyAddison-Wesley,2005.
8. Harry,H.Chaudhary, "HeadFirstC++Programming:TheDefinitiveBeginner'sGuide",FirstCreatespaceInc, O-D Publishing,LLCUSA.2014
9. WalterSavitch,"ProblemSolvingwithC++",PearsonEducation,2007.
10. Stanley B. Lippman, JoseeLajoie, Barbara E. Moo, "C++ Primer", Published by Addison-Wesley,5th Edition,2012

LAB (C-1): Programming Fundamentals using C/C++ Lab(UsingGCC/Visual C++ compiler)
Practical:60Lectures

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1. WAPtoprintthesumand productofdigitsofaninteger.

2. WAPto reverseanumber.

3. WAPto computethe sumof thefirst nterms ofthefollowingseriesS=1+1/2+1/3+1/4+……

4. WAPto computethe sumof thefirst nterms ofthefollowingseriesS=1-2+3-4+5…….

5. Writeafunction thatchecks whether a given stringisPalindromeor not. Usethisfunctionto find whetherthestring entered byuseris Palindromeornot.

6. Writeafunctionto findwhetheragivenno. isprimeornot. Usethesame togeneratetheprimenumbers less than100.

7. WAPtocomputethefactorsofa givennumber.

8. Writeamacrothat swapstwonumbers.WAP touseit.

9. WAPto print a triangle of starsas follows (takenumberof lines fromuser):

```
*
***
*****
*******
*********
```

10. WAPto perform followingactions onan arrayentered bytheuser:
    i) Printtheeven-valuedelements
    ii) Printtheodd-valuedelements
    iii) Calculateand printthe sumand averageoftheelementsofarray
    iv) Printthemaximumand minimumelement ofarray
    v) Remove theduplicates from thearray
    vi) Printthearrayinreverseorder

    Theprogram should present a menu to theuser and ask foroneof theoptions.Themenushould also includeoptionsto re-enter arrayand toquit theprogram.

11. WAPthatprints atableindicatingthenumberof occurrencesofeach alphabetinthetextentered as commandlinearguments.

12. Writeaprogram that swapstwo numbers usingpointers.

13. Writeaprogramin whichafunctionis passedaddress of twovariables andthen alteritscontents.

14. Write a program which takes the radius of a circle as input from the user, passes it to anotherfunction that computes the area and the circumference of the circle and displays the value ofarea and circumferencefrom the main()function.

15. Writeaprogramtofindsumofnelementsenteredbytheuser.Towritethisprogram,

allocatememorydynamicallyusingmalloc()/calloc()functions ornewoperator.

16. Writeamenudrivenprogramto performfollowingoperationsonstrings:

    a) Showaddressofeachcharacterinstring
    b) Concatenatetwostringswithoutusingstrcatfunction.
    c) Concatenatetwostringsusingstrcatfunction.
    d) Comparetwostrings
    e) Calculatelength of thestring(usepointers)
    f) Convertalllowercasecharacterstouppercase
    g) Convertall uppercasecharacterstolowercase
    h) Calculatenumberofvowels
    i) Reversethestring

17. Giventwoorderedarrays ofintegers,write aprogramtomergethetwo-arraystogetanordered array.

18. WAPto displayFibonacci series(i)usingrecursion, (ii) usingiteration

19. WAPtocalculate Factorialof anumber(i)using recursion,(ii) usingiteration

20. WAPtocalculateGCD oftwonumbers (i)withrecursion(ii) withoutrecursion.

21. CreateMatrixclassusingtemplates.Writeamenu-drivenprogramtoperformfollowingMatrix operations(2-D arrayimplementation):
    a)Sum b)Differencec)Product d)Transpose

22. Create the Person class. Create some objects of this class (by taking information from theuser). Inherit the class Person to create two classes Teacher and Student class. Maintain therespective information in the classes and create, display and delete objects of these two classes(UseRuntimePolymorphism).

23. CreateaclassTriangle. Includeoverloadedfunctionsforcalculatingarea. Overloadassignmentoperatorandequalityoperator.

24. CreateaclassBoxcontaininglength,breathandheight.Includefollowingmethods init:
    a) CalculatesurfaceArea
    b) CalculateVolume
    c) Increment,Overload++ operator(bothprefix&postfix)
    d) Decrement,Overload -- operator(bothprefix &postfix)
    e) Overloadoperator ==(tocheck equalityoftwoboxes),asafriendfunction
    f) OverloadAssignmentoperator
    g) Checkif it is a Cube orcuboid

    Writeaprogram whichtakes inputfromtheuserforlength,breathand heightto testtheaboveclass.

25. CreateastructureStudent containingfields forRoll No.,Name, Class,Year andTotalMarks.Create10 students and storethem in afile.

26. Write a program to retrieve the student information from file created in previous question andprintit in followingformat:
    RollNo.NameMarks

27. Copythe contentsof one textfiletoanother file,after removingallwhitespaces.

28. Writeafunctionthat reversesthe elements ofanarrayin place.Thefunction mustaccept onlyonepointer value and returnvoid.

29. Write a program that will read 10 integers from user and store them in an array. Implementarrayusingpointers. Theprogram will print the arrayelements inascendingand descendingorder.

COMPUTERSCIENCE(C-II):Computer System Architecture

COURSE OBJECTIVES:

- Discuss the basic concepts and structure of computers.
- Understand concepts of register transfer logic and arithmetic operations.
- Explain different types of addressing modes and memory organization.
- Learn the different types of serial communication techniques.
- Summarize the Instruction execution stages.

COURSE OUTCOMES:

- Understand the theory and architecture of central processing unit.
- Analyze some of the design issues in terms of speed, technology, cost, performance.
- Design a simple CPU with applying the theory concepts.
- Use appropriate tools to design verify and test the CPU architecture.
- Learn the concepts of parallel processing, pipelining and interprocessor communication.
- Understand the architecture and functionality of central processing unit.
- Exemplify in a better way the I/O and memory organization.
- Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

Theory:60Lectures

1. Introduction (8lectures)

Logic gates, boolean algebra, combinational circuits, circuit simplification, flip-flops andsequentialcircuits, decoders,multiplexers, registers,counters andmemoryunits.

2. DataRepresentationandBasicComputerArithmetic (10 lectures) Numbersystems,complements,fixedandfloatingpointrepresentation,characterrepresentation,addition,subtraction,magnitude comparison,multiplicationanddivisionalgorithms forintegers

3. BasicComputerOrganizationandDesign (13 lectures) Computerregisters,bussystem,instructionset,timingandcontrol,instructioncycle,memoryreference,input-outputandinterrupt,InterconnectionStructures,BusInterconnectiondesignof basiccomputer.

4. CentralProcessingUnit (15lectures)

Registerorganization,arithmeticandlogicalmicro-operations,stackorganization,microprogrammedcontrol.Instructionformats,addressingmodes,instructioncodes,machinelanguage, assembly language, input output programming, RISC, CISC architectures, pipeliningandparallelarchitecture.

5. MemoryOrganization (6lectures)

Cachememory,Associativememory,mapping.

6. Input-OutputOrganization (8lectures)

Input/Output:ExternalDevices,I/OModules,ProgrammedI/O, Interrupt-DrivenI/O,DirectMemoryAccess,I/O Channels.

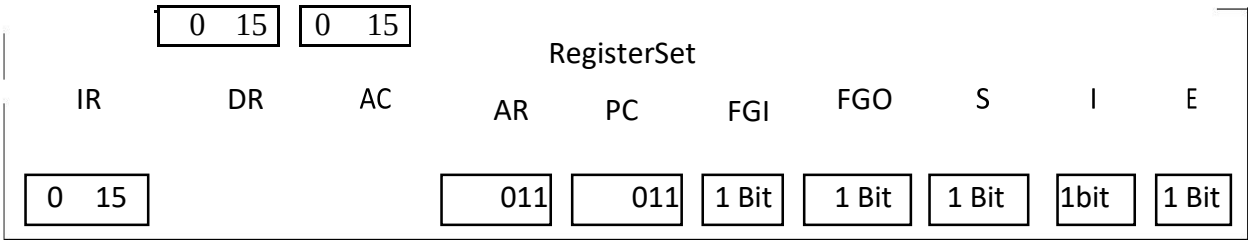
RecommendedBooks:

1. M.Mano,ComputerSystemArchitecture,Pearson Education1992
2. A.J.DosReis, AssemblyLanguageand Computer ArchitectureusingC++andJAVA, CourseTechnology, 2004
3. W.Stallings,ComputerOrganizationandArchitectureDesigningforPerformance,8th Edition, PrenticeHall ofIndia,2009
4. M.M.Mano,DigitalDesign,Pearson EducationAsia,2013
5. CarlHamacher,ComputerOrganization,Fifthedition,McGrawHill,2012.

COMPUTERSCIENCELAB(C-II):ComputerSystemArchitectureLabPractical: 60 Lectures

(Practicalexercisesbasedonconceptslistedintheory)

1.Createamachinebasedonthefollowing



Memory 4096words 16bits perword	Instructionformat 0 3 4 15 Opcode | Adc ress

BasicComputerInstructions

MemoryReference			RegisterReference		Input-Output	
Symbol	Hex		Symbol	Hex	Symbol	Hex
AND	0xxx		CLA	E800	INP	F800
ADD	2xxx		CLE	E400	OUT	F400
LDA	4xxx	Direct	CMA	E200	SKI	F200
STA	6xxx	Addressing	CME	E100	SKO	F100
BUN	8xxx		CIR	E080	ION	F080
BSA	Axxx		CIL	E040	IOF	F040
ISZ	Cxxx		INC	E020		
AND_I	1xxx		SPA	E010		
ADD_I	3xxx		SNA	E008		
LDA_I	5xxx	IndirectAd	SZA	E004		
STA_I	7xxx	dressing	SZE	E002		
BUN_I	9xxx		HLT	E001		
BSA_I	Bxxx					
ISZ_I	Dxxx					

RefertoChapter-5ofMorrisManofordescriptionofinstructions.

2. Createthemicrooperationsandassociatewithinstructionsasgiveninthechapter

   (except interrupts). Design the register set, memory and the instruction set. Use thismachinefortheassignments of this section.

3. CreateaFetchroutineof theinstructioncycle.

4. Simulatethemachinetodeterminethecontentsof AC,E,PC,ARandIRregistersinhexadecimal aftertheexecutionofeach offollowingregister referenceinstructions:

a.CLA	e.CIR	i.SNA
b.CLE	f.CIL	j.SZA
c.CMA	g.INC	k.SZE
d.CME	h.SPA	l.HLT

   Initializethe contentsofAC to$(A937)_{16}$, that ofPC to $(022)_{16}$and E to1.

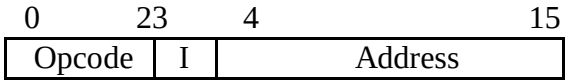
5. Simulate the machine for the following memory-reference instructions with I= 0 andaddress part = 082. The instruction to be stored at address 022 in RAM. Initialize thememory word at address 082 with the operand B8F2 and AC with A937. Determine thecontentsof AC, DR,PC, AR andIRin hexadecimal afterthe execution.

   a. ADD
   b. AND
   c. LDA
   d. STA
   e. BUN
   f.BSA
   g. ISZ

6. Simulate the machine for the memory-reference instructions referred in above question withI=1andaddresspart=082.Theinstructiontobestoredataddress026inRAM.Initializethe memory word at address 082 with the value 298. Initialize the memory word at address298 with operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR andIRin hexadecimalafter theexecution.

7. Modifythe machinecreated inPractical 1accordingtothefollowinginstructionformat:

Instructionformat



   a. The instruction format contains a 3-bit opcode, a 1-bit addressing mode and a 12-bitaddress. There are only two addressing modes, I = 0 (direct addressing) and I = 1(indirectaddressing).
   b. Createanew register Iof1bit.
   c. Createtwonewmicroinstructionsasfollows:
      i. Check the opcode of instruction to determine type of instruction (MemoryReference/RegisterReference/Input-Output)andthenjumpaccordingly.

ii. ChecktheIbitto determine the addressing modeand then jumpaccordingly.

COMPUTERSCIENCE(C-III):Programming in Java

COURSE OBJECTIVES:

- To understand the basic concepts and fundamentals of platform independent object oriented language.
- To demonstrate skills in writing programs using exception handling techniques and multithreading.
- To understand streams and efficient user interface design techniques.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

- Use the syntax and semantics of java programming language and basic concepts of OOP.
- Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
- Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
- Design event driven GUI and web related applications which mimic the real word scenarios.

Theory:60Lectures

1. IntroductiontoJava (4Lectures)

Java Architecture and Features, Understanding the semantic and syntax differences betweenC++ and Java, Compiling and Executing a Java Program, Variables, Constants, Keywords DataTypes, Operators (Arithmetic, Logical and Bitwise) and Expressions, Comments, Doing BasicProgram Output, Decision Making Constructs (conditional statements and loops) and Nesting,Java Methods (Defining, Scope, Passing and Returning Arguments, Type Conversion and TypeandChecking, Built-in JavaClass Methods),

2. Arrays,StringsandI/O (8Lectures)

Creating & Using Arrays (One Dimension and Multi-dimensional), Referencing ArraysDynamically, Java Strings: The Java String class, Creating & Using String Objects,Manipulating Strings, String Immutability & Equality, Passing Strings To & From Methods,StringBufferClasses.Simple I/OusingSystem.outandtheScanner class,ByteandCharacterstreams,Reading/Writingfrom consoleandfiles.

3. Object-OrientedProgrammingOverview (4Lectures)

Principles of Object-Oriented Programming, Defining & Using Classes, Controlling Access toClassMembers,ClassConstructors,MethodOverloading,ClassVariables&Methods,Objectsaspara meters, finalclasses, Objectclass,GarbageCollection.

3. Inheritance,Interfaces, Packages,Enumerations,AutoboxingandMetadata(14lectures)

Inheritance:(SingleLevelandMultilevel,MethodOverriding,DynamicMethodDispatch,Abstract Classes), Interfaces and Packages, Extending interfaces and packages, Package andClassVisibility,UsingStandardJavaPackages(util,lang,io,net),WrapperClasses,Autoboxing/Un boxing,Enumerations and Metadata.

4. Exception Handling, Threading, Networking and Database Connectivity(15 Lectures) Exception types, uncaught exceptions, throw, built-in exceptions, Creating your own exceptions;Multi-threading: The Thread class and Runnable interface, creating single and multiple threads,Thread prioritization, synchronization and communication, suspending/resuming threads. Usingjava.net package, Overview of TCP/IP and Datagram programming. Accessing and

manipulatingdatabasesusingJDBC.

5. AppletsandEventHandling (15Lectures)

JavaApplets:Introduction toApplets,WritingJavaApplets,WorkingwithGraphics,

Incorporating Images & Sounds. Event Handling Mechanisms,Listener Interfaces, Adapter andInnerClasses.ThedesignandImplementationofGUIsusingtheAWTcontrols,Swingcomponents of Java Foundation Classes such as labels, buttons, textfields, layout managers,menus, events and listeners; Graphic objects for drawing figures such as lines, rectangles, ovals,usingdifferent fonts. Overview ofservlets.

ReferenceBooks

1. KenArnold,JamesGosling,DavidHomes, "TheJavaProgrammingLanguage",4thEdition, 2005.
2. JamesGosling,BillJoy,GuyLSteeleJr,GiladBracha,AlexBuckley"TheJavaLanguageSpecification,JavaSE8Edition(JavaSeries)",PublishedbyAddisonWesley,2014.
3. JoshuaBloch,"Effective Java"2nd Edition,Publisher:Addison-Wesley,2008.
4. CayS.Horstmann,GaryCornell, "CoreJava2 Volume1,9th Edition,PrinticeHall.2012
5. Cay S. Horstmann, Gary Cornell, "Core Java 2 Volume 2 - Advanced Features)", 9th Edition,PrinticeHall.2013
6. BruceEckel,"ThinkinginJava",3rdEdition,PHI,2002.
7. E.Balaguruswamy,"ProgrammingwithJava",4thEdition,McGrawHill.2009.
8. PaulDeitel,HarveyDeitel,"Java:HowtoProgram",10thEdition,PrenticeHall,2011.
9. "HeadFirstJava", OriellyMediaInc.2nd Edition,2005.
10. David J. Eck, "Introduction to Programming Using Java", Published byCreateSpace IndependentPublishingPlatform,2009.
11. JohnR.Hubbard,"ProgrammingwithJAVA",Schaum's Series,2ndEdition,2004.

COMPUTERSCIENCELAB(C-III): Programmingin JavaLab

Practical:60Lectures

1. Tofind thesum of anynumberof integersentered as command linearguments
2. Tofindthefactorial ofagivennumber
3. To learn useofsingle dimensional arraybydefiningthe arraydynamically.
4. Tolearn useof .lenth incaseofatwo dimensionalarray
5. Toconvert adecimal tobinarynumber
6. To check ifanumberis primeornot, bytakingthenumberas input from thekeyboard
7. Tofind thesumof anynumberofintegers interactively, i.e., enteringeverynumber from thekeyboard,whereasthe totalnumberof integersisgiven asa commandlineargument
8. Writeaprogram thatshowworkingofdifferent functionsofStringandStringBufferclassslikesetCharAt(, setLength(), append(),insert(), concat()andequals().
9. Writeaprogramtocreatea—distance‖classwithmethodswheredistanceiscomputedinterms offeetandinches, howto create objectsofaclassand to see the use ofthispointer
10. Modify the —distance‖ class by creating constructor for assigning values (feet and inches)to the distance object. Create another object and assign second object as reference variableto another object reference variable. Further create a third object which is a clone of thefirstobject.
11. Writeaprogram toshow that duringfunctionoverloading, ifnomatchingargumentis found,thenjavawill applyautomatic type conversions(from lower to higher datatype)
12. Writeaprogram toshowthedifferencebetweenpublicandprivateaccess specifiers.Theprogram should also show that primitive data types are passed by value and objects arepassedbyreferenceand to learn useoffinalkeyword
13. Writeaprogram toshowtheuseofstaticfunctions andto passvariablelength argumentsinafunction.
14. Writeaprogram to demonstrate theconcept of boxingandunboxing.
15. Create amulti-file program wherein onefile astringmessageis taken asinput from theuser

And the function to display the message on the screen is given in another file(makeuseofScannerpackagein this program).

16. Write a programto createa multilevel package and also createsareusableclass togenerateFibonacci series, where the function to generate fibonacii series is given in a different filebelongingto thesamepackage.
17. Write a program that creates illustrates different levels of protection in classes/subclassesbelongingto samepackageor differentpackages
18. Writeaprogram—DivideByZero‖thattakestwonumbersaandbasinput, computesa/b,andinvokesArithmeticExceptionto generateamessagewhenthedenominatoriszero.
19. Write a program to show the use of nested try statements that emphasizes the sequence ofcheckingfor catch handlerstatements.
20. Write a program to create your own exception types to handle situation specific to yourapplication(Hint:Definea subclass ofException which itselfis a subclassofThrowable).
21. Writeaprogram todemonstrate prioritiesamongmultiplethreads.
22. Write a program to demonstrate multithread communication by implementingsynchronizationamongthreads(Hint:youcanimplementasimpleproducerandconsumerproblem).
23. Write a program to create URL object, create a URLConnection using the openConnection()methodandthenuseitexaminethedifferentcomponentsoftheURLandcontent.
24. Writeaprogramtoimplementasimpledatagramclientandserverinwhichamessagethatistyped into theserver window issent to theclientside whereitisdisplayed.
25. Writeaprogram thatcreatesa Bannerandthencreatesathread toscrollsthemessageinthebannerfromleft torightacross theapplet_swindow.
26. Write a program to get the URL/location of code (i.e. java code) and document(i.e.htmlfile).
27. Write a program to demonstrate different mouse handling events like mouseClicked(),mouseEntered(),mouseExited(),mousePressed,mouseReleased()andmouseDragged().
28. Writeaprogramtodemonstrate differentkeyboardhandlingevents.
29. Writeaprogram togenerate awindowwithout an applet windowusingmain()function.
30. Writeaprogram to demonstrate theuse of pushbuttons.

COMPUTERSCIENCE(C-V):Data Structures

COURSE OBJECTIVES:

- To impart the basic concepts of data structures and algorithms
- To understand concepts about searching and sorting techniques
- To Understand basic concepts about stacks,queues,lists,trees and graphs
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

COURSE OUTCOMES:

- Ability to analyze algorithms and aalgorithm correctness.
- Ability to summarize searching and sorting techniques
- Ability to describe stack,queue and linked list operation.
- Ability to have knowledge of treeand graphs concepts.

Theory:60Lectures

1. **Arrays** **(5Lectures)**
   SingleandMulti-dimensionalArrays,SparseMatrices(Arrayand LinkedRepresentation)

2. **Stacks** **(5Lectures)**
   Implementingsingle/multiplestack/sinanArray; Prefix, Infix andPostfix expressions, Utilityand conversion oftheseexpressions from onetoanother; Applications of stack; LimitationsofArrayrepresentationofstack

3. **LinkedLists** **(10Lectures)**
   Singly,DoublyandCircularLists(ArrayandLinkedrepresentation); NormalandCircular representationofStackin Lists;SelfOrganizingLists;Skip Lists

4. **Queues** **(5Lectures)**
ArrayandLinkedrepresentationofQueue,De-queue,PriorityQueues

5. **Recursion** **(5lectures)**
DevelopingRecursive DefinitionofSimpleProblemsandtheirimplementation;Advantages and LimitationsofRecursion;UnderstandingwhatgoesbehindRecursion(InternalStack Implementation)

6. **Trees** **(20Lectures)**
IntroductiontoTreeasadatastructure; BinaryTrees(Insertion,Deletion,Recursiveand IterativeTraversalson BinarySearch Trees);Threaded BinaryTrees (Insertion,Deletion, Traversals);Height-BalancedTrees(VariousoperationsonAVLTrees).

7. **SearchingandSorting** **(5Lectures)**
LinearSearch,BinarySearch,ComparisonofLinearand BinarySearch,SelectionSort, InsertionSort, Insertion Sort,ShellSort,ComparisonofSortingTechniques

8. **Hashing** **(5Lectures)**
IntroductiontoHashing,DeletingfromHashTable,EfficiencyofRehashMethods,Hash TableReordering,ResolvingcollusionbyOpenAddressing,CoalescedHashing,Separate Chaining,Dynamic andExtendibleHashing,ChoosingaHashFunction,PerfectHashing Function

ReferenceBooks:

1. AdamDrozdek, "DataStructuresandalgorithminC++",ThirdEdition,Cengage Learning,2012.
2. SartajSahni, Data Structures, "Algorithms and applications in C++", Second Edition,UniversitiesPress,2011.
3. AaronM.Tenenbaum, MosheJ.Augenstein,YedidyahLangsam, "DataStructuresUsingCandC++:, Second edition, PHI,2009.
4. Robert L.Kruse,"DataStructuresandProgramDesign inC++",Pearson,1999.
5. D.SMalik,DataStructureusingC++,Secondedition,CengageLearning,2010.
6. MarkAllenWeiss, "DataStructuresandAlgorithmsAnalysisinJava",PearsonEducation,3rdedition, 2011
7. Aaron M. Tenenbaum, Moshe J. Augenstein, YedidyahLangsam, "Data Structures UsingJava, 2003.
8. RobertLafore,"DataStructuresandAlgorithmsinJava,2/E",Pearson/MacmillanComputerPub,2003
9. JohnHubbard,"DataStructureswithJAVA",McGrawHillEducation(India)PrivateLimited;2 edition,2009
10. Goodrich,M.andTamassia,R."DataStructuresandAlgorithmsAnalysisinJava",4thEdition,Wiley,2013
11. HerbertSchildt,"JavaTheCompleteReference (English)9thEditionPaperback",TataMcGraw Hill,2014.
12. D.S.Malik,P.S.Nair, "DataStructuresUsingJava",CourseTechnology,2003.

COMPUTERSCIENCELAB(CV):DataStructures

LabPractical:60 Lectures

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1. Writeaprogram tosearch anelement fromalist.Giveuserthe optionto performLinearorBinarysearch. UseTemplatefunctions.
2. WAP using templates to sort a list of elements. Give user the option to perform sortingusingInsertion sort, Bubble sort or Selection sort.
3. ImplementLinkedList usingtemplates.Include functions forinsertion, deletion andsearchof a number, reverse the list and concatenate two linked lists (include a function and alsooverloadoperator +).
4. ImplementDoublyLinkedListusingtemplates.Includefunctionsforinsertion,deletionandsearch of anumber, reversethelist.
5. Implement Circular Linked List using templates. Include functions for insertion, deletionandsearch of anumber, reversethelist.
6. PerformStackoperationsusingLinked Listimplementation.
7. PerformStackoperationsusingArrayimplementation.UseTemplates.
8. PerformQueues operationsusingCircularArrayimplementation.UseTemplates.
9. CreateandperformdifferentoperationsonDouble-ended QueuesusingLinkedList implementation.
10. WAPtoscanapolynomialusinglinkedlistandaddtwopolynomial.
11. WAPtocalculatefactorialandtocomputethefactorsofagivenno.(i)usingrecursion, (ii)usingiteration
12. (ii) WAP to displayfibonacci series (i)usingrecursion, (ii) usingiteration
13. WAPtocalculateGCDof2number(i)with recursion(ii)withoutrecursion
14. WAPto createa BinarySearchTreeandincludefollowingoperationsintree:
    (a) Insertion(RecursiveandIterativeImplementation)
    (b) Deletionbycopying
    (c) Deletion byMerging
    (d) Searchano.inBST
    (e) Displayitspreorder, postorderandinorder traversalsRecursively
    (f) Displayits preorder, postorderand inorder traversalsIteratively
    (g) Displayitslevel-by-leveltraversals
    (h) Countthenon-leafnodesandleafnodes
    (i) Displayheight oftree
    (j) Createamirrorimageoftree
    (k) CheckwhethertwoBSTs areequalornot
15. WAPtoconvert theSparseMatrixinto non-zeroform andvice-versa.
16. WAPtoreversetheorderoftheelements inthe stackusingadditionalstack.
17. WAPtoreversetheorderoftheelementsin thestack usingadditionalQueue.
18. WAPtoimplementDiagonal Matrixusingone-dimensionalarray.
19. WAPtoimplementLowerTriangular Matrixusingone-dimensionalarray.
20. WAPtoimplementUpper TriangularMatrixusingone-dimensionalarray.
21. WAPtoimplementSymmetricMatrixusingone-dimensionalarray.
22. WAPtocreateaThreadedBinaryTreeasperinordertraversal,andimplementoperationslikefind ingthesuccessor/predecessorofanelement, insertanelement,inordertraversal.

23. WAPtoimplementvariousoperationsonAVLTree.

COMPUTERSCIENCE(C-V):Discrete Structures Theory:60Lectures

COURSE OBJECTIVES:

- To introduce the concepts of mathematical logic
- To introduce the concepts of sets, relations, and functions.
- To perform the operations associated with sets, functions, and relations.
- To introduce generating functions and recurrence relations.
- To relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context. To use Graph Theory for solving problems

COURSE OUTCOMES:

- Students completing this course will be able to express a logic sentence in terms of predicates, quantifiers, and logical connectives.
- Students completing this course will be able to apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.
- Students completing this course will be able to use tree and graph algorithms to solve problems.
- Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.

1. **Introduction:** (15 Lectures) Sets - finite and Infinite sets, uncountably Infinite Sets; functions,relations,PropertiesofBinaryRelations,Closure,PartialOrderingRelations;counting-PigeonholePrinciple, Permutationand Combination;Mathematical Induction,PrincipleofInclusionandExclusion.

2. **Growthof Functions**: (8Lectures) AsymptoticNotations,Summationformulasandproperties,BoundingSummations,approximationby Integrals

3. **Recurrences**: (10 Lectures) Recurrence Relations, generating functions, Linear RecurrenceRelationswith constant coefficients andtheir solution, Substitution Method,RecurrenceTrees,MasterTheorem

4. **Graph Theory** (15 Lectures) Basic Terminology, Models and Types, multigraphs andweighted graphs, Graph Representaion, Graph Isomorphism, Connectivity, Euler andHamiltonianPathsandCircuits,PlanarGraphs, GraphColoring,Trees, BasicTerminologyandpropertiesofTrees,Introduction toSpanning Trees

5. **PrepositionalLogic** (12Lectures)
LogicalConnectives,Well-formedFormulas,Tautologies,Equivalences, InferenceTheory

RecommendedBooks:

1. C.L.Liu,D.P.Mahopatra,Elements ofDiscrete mathematics,2nd Edition,TataMcGraw Hill, 1985,
2. KennethRosen,DiscreteMathematicsandItsApplications,SixthEdition,McGraw Hill2006
3. T.H. Coremen, C.E. Leiserson, R. L. Rivest, Introduction to algorithms, 3rd editionPrenticeHall onIndia, 2009
4. M.O.AlbertsonandJ.P.Hutchinson,DiscreteMathematicswithAlgorithms,John wileyPublication,1988
5. J.L.Hein,DiscreteStructures, Logic,andComputability,3rdEdition,JonesandBartlettPublishers,2009
6. D.J.Hunter,Essentials ofDiscreteMathematics,Jones andBartlett Publishers,2008

COMPUTERSCIENCELAB(C-V):DiscreteStructuresTutorial

Tutorial:15lectures

COMPUTERSCIENCE(C-VI): Operating Systems

COURSE OBJECTIVES:

- To understand the services provided by and the design of an operating system.
- To understand the structure and organization of the file system.
- To understand what a process is and how processes are synchronized and scheduled.
- To understand different approaches to memory management.
- Students should be able to use system calls for managing processes, memory and the file system.
- Students should understand the data structures and algorithms used to implement an OS.

COURSE OUTCOMES:

- Know basic components of an operating system.
- comprehend how an operating system virtualises CPU and memory
- discuss various scheduling and swapping policies
- learn basic concurrent programming in C and assembly code
- explain how a simple file system organizes data in the hard disk
- understand how the file system in Linux-based operating systems is structured
- get to know how an operating system protects the computer system

Theory:60Lectures

1. **Introduction** (10Lectures)

Basic OS functions,resource abstraction,types of operating systems–multiprogramming systems, batch systems , time sharing systems; operating systems for personal computers &workstations,process control &real timesystems.

2. **OperatingSystemOrganization** (6Lectures)

Processorandusermodes,kernels,systemcallsandsystemprograms.

3. **ProcessManagement** **(20**Lectures)

Systemviewoftheprocessandresources,processabstraction,processhierarchy,threads,threadingissues,threadlibraries;ProcessScheduling,non-pre-emptiveandpre-emptivescheduling algorithms; concurrent and processes, critical section, semaphores, methods for inter-processcommunication;deadlocks.

4. **MemoryManagement** (10Lectures)

Physicalandvirtualaddressspace;memoryallocationstrategies-fixedandvariablepartitions,

paging,segmentation,virtual memory

5. FileandI/OManagement (10Lectures)

Directorystructure,file operations, file allocation methods,device management.

6. ProtectionandSecurity (4Lectures)

Policymechanism,Authentication,Internal access Authorization.

RecommendedBooks:

1. ASilberschatz,P.B.Galvin,G.Gagne,OperatingSystemsConcepts,8th Edition, JohnWileyPublications2008.
2. A.S.Tanenbaum, ModernOperatingSystems, 3rd Edition, PearsonEducation2007.
3. G.Nutt,OperatingSystems:AModernPerspective,2nd EditionPearsonEducation1997.
4. W.Stallings,OperatingSystems,Internals&DesignPrinciples,5th Edition, PrenticeHallofIndia. 2008.
5. M.Milenkovic,OperatingSystems-Conceptsand design,TataMcGraw Hill1992.

COMPUTERSCIENCELAB(C-VI):OperatingSystemsLabPractical:60 Lectures

C/C++programs

1. WRITE A PROGRAM (using *fork()* and/or *exec()* commands) where parent and childexecute:
   a) sameprogram,samecode.
   b) sameprogram,different code.
   c) beforeterminating, theparent waits for thechild to finish itstask.

2. WRITEAPROGRAMtoreportbehaviourofLinuxkernelincludingkernelversion,CPUtype and model. (CPUinformation)
3. WRITEAPROGRAMtoreportbehaviourof Linuxkernelincludinginformationonconfiguredmemory,amountof freeandused memory.(memoryinformation)
4. WRITEAPROGRAMtoprintfiledetails includingowneraccesspermissions,fileaccesstime, where file name isgivenasargument.
5. WRITEAPROGRAMtocopyfilesusingsystemcalls.
6. Writeprogramtoimplement FCFSschedulingalgorithm.
7. WriteprogramtoimplementRoundRobinschedulingalgorithm.
8. Writeprogram toimplement SJFschedulingalgorithm.
9. Writeprogramtoimplementnon-preemptiveprioritybasedschedulingalgorithm.
10. Writeprogram toimplement preemptiveprioritybasedschedulingalgorithm.
11. WriteprogramtoimplementSRJFschedulingalgorithm.
12. Writeprogramtocalculatesumofnnumbersusing*thread*library.
13. Writeaprogramtoimplementfirst-fit,best-fitandworst-fitallocationstrategies.

COMPUTERSCIENCE(C-VII):Computer Networks Theory:60Lectures

COURSE OBJECTIVES:

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
- Independently understand basic computer network technology.
- Identify the different types of network topologies and protocols.

COURSE OUTCOMES:

- Understand the concepts of Data Communication.
- Study the functions of OSI Layers.
- Familiarise with the Transmission Media, Flow Control and Error Detection & Correction.
- Understand fundamental concepts in Routing, Addressing & working of Transport Protocols.
- Gain familiarity with common networking & Application Protocols.
- Understand Wireless LANs & Wireless Sensor Networks Operation.
- Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.

1. **IntroductiontoComputerNetworks** (8 Lectures)Network definition; network topologies; network classifications; network protocol; layerednetwork architecture; overviewofOSIreference model; overviewofTCP/IP protocolsuite.
2. **DataCommunication FundamentalsandTechniques** (10Lectures)

Analog and digital signal; data-ratelimits; digital to digital line encoding schemes; pulse codemodulation;parallelandserialtransmission;digitaltoanalogmodulation-;multiplexingtechniques- FDM, TDM;transmission media.

3. **NetworksSwitchingTechniquesandAccess mechanisms** (10Lectures)

Circuitswitching;packetswitching-connectionlessdatagramswitching,connection-orientedvirtualcircuitswitching;dial-upmodems;digitalsubscriberline;cableTV fordatatransfer.

4. **DataLinkLayerFunctionsandProtocol** (10Lectures)

Error detection and error correction techniques;data-link control- framing and flow control; errorrecoveryprotocols-stopandwaitARQ, go-back-nARQ;PointtoPointProtocolonInternet.

5. **MultipleAccess ProtocolandNetworks** (5 Lectures)CSMA/CD protocols; Ethernet LANS; connectingLAN and back-bone networks-repeaters,hubs,switches, bridges, routerandgateways;

6. **NetworksLayerFunctionsandProtocols** (6 Lectures)Routing; routing algorithms; network layer protocolof Internet- IP protocol, Internet controlprotocols.

7. **TransportLayerFunctionsandProtocols** (6 Lectures)Transport services- error and flow control,Connection establishment and release-three wayhandshake;

8. **Overviewof Applicationlayerprotocol** (5Lectures)

OverviewofDNSprotocol;overviewofWWW &HTTPprotocol.

ReferenceBooks

1. B.A. Forouzan:DataCommunicationsandNetworking,Fourthedition,THM,2007.
2. A.S.Tanenbaum:Computer Networks**,**Fourthedition**,**PHI,2002

COMPUTER SCIENCE LAB (C-VII): Computer Networks

LabPractical:60 Lectures

1. Simulate CyclicRedundancyCheck(CRC) errordetection algorithmfornoisychannel.
2. Simulateandimplementstopand waitprotocolfor noisychannel.
3. Simulateandimplementdistancevectorroutingalgorithm
4. Simulateandimplement

Dijkstraalgorithmforshortestpathrouting.5.Writeaprogram forCreation ofsockets,
6.Write a programto communicate between TCP client & server7.,WriteaprogramtocommunicatebetweenUDPclient&socket8.Wri teasocket ProgramforEcho/Ping/Talkcommands

COMPUTERSCIENCE(C-VIII):Design and Analysis of Algorithms

COURSE OBJECTIVES:

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

- **COURSE OUTCOMES:**
  - Students who complete the course will have demonstrated the ability to do the following:
  - Argue the correctness of algorithms using inductive proofs and invariants.
  - Analyze worst-case running times of algorithms using asymptotic analysis.
  - Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
  - Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.
  - Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms, and analyze them.
  - Explain the major graph algorithms and their analyses. Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them.
  - Explain the different ways to analyze randomized algorithms (expected running time, probability of error). Recite algorithms that employ randomization. Explain the difference between a randomized algorithm and an algorithm with probabilistic inputs.
  - Analyze randomized algorithms. Employ indicator random variables and linearity of expectation to

perform the analyses. Recite analyses of algorithms that employ this method of analysis

Theory:60Lectures

1. Introduction (5Lectures)

BasicDesignandAnalysistechniquesofAlgorithms,CorrectnessofAlgorithm.

2. AlgorithmDesignTechniques (8Lectures)

Iterativetechniques,DivideandConquer,DynamicProgramming, GreedyAlgorithms.

3. SortingandSearchingTechniques (20 LecturesElementary sorting techniques–Bubble Sort, InsertionSort, Merge Sort, Advanced Sortingtechniques - Heap Sort, Quick Sort, Sorting in Linear Time - Bucket Sort, Radix Sort and CountSort, SearchingTechniques, Medians&Order Statistics, complexityanalysis;

34.LowerBoundingTechniques (5Lectures)

DecisionTrees

5.BalancedTrees (7Lectures)

Red-BlackTrees

6.AdvancedAnalysisTechnique (5Lectures)

Amortizedanalysis

7.Graphs (5Lectures)

GraphAlgorithms–BreadthFirstSearch,DepthFirstSearchanditsApplications,Minimum SpanningTrees.

8. StringProcessing (5Lectures)

StringMatching,KMPTechnique

RecommendedBooks:

1. T.H.Cormen,CharlesE. Leiserson,RonaldL.Rivest,CliffordStein Introductionto Algorithms,PHI,3 Edition 2009
2. Sarabasse&A.V.GelderComputerAlgorithm–IntroductiontoDesignandAnalysis, Publisher–Pearson3 Edition 1999

COMPUTERSCIENCELAB(C-VIII):Designand Analysis of AlgorithmsLabPractical:60 Lectures

1. i. ImplementInsertionSort(Theprogramshouldreportthenumberofcomparisons)
   ii.ImplementMergeSort(Theprogramshould reportthenumberofcomparisons)
2. ImplementHeapSort(Theprogramshouldreportthenumberofcomparisons)
3. ImplementRandomizedQuicksort(Theprogramshouldreportthenumberofcomparisons)
4. ImplementRadixSort
5. CreateaRed-Black Tree and performfollowingoperations onit:
   i. Insertanode
   ii. Deleteanode
   iii. Searchfor anumber&alsoreport the colorof the nodecontainingthisnumber.
6. Writeaprogramtodeterminethe LCSoftwogivensequences
7. ImplementBreadth-First Searchinagraph
8. ImplementDepth-FirstSearchin agraph
9. Writeaprogram todeterminetheminimum spanningtreeof agraph

For the algorithms at S.No 1 to 3 test run the algorithm on 100 different inputs of sizes varyingfrom 30 to 1000. Count the number of comparisons and draw the graph. Compare it with a graph ofnlogn.

COMPUTERSCIENCE(C-IX): Software EngineeringTheory:60Lectures

1.Introduction (8Lectures)

TheEvolvingRoleofSoftware,SoftwareCharacteristics,ChangingNatureofSoftware,Software EngineeringasaLayeredTechnology,SoftwareProcessFramework,FrameworkandUmbrella

2.RequirementAnalysis (10Lectures)

SoftwareRequirementAnalysis, InitiatingRequirementEngineeringProcess,RequirementAnalysis andModelingTechniques,FlowOriented Modeling,NeedforSRS,Characteristicsand Component sof SRS.

3.Software ProjectManagement (8Lectures)

EstimationinProjectPlanningProcess,ProjectScheduling.

SoftwareRisks,RiskIdentification,RiskProjectionandRiskRefinement,RMMMPlan.

5. QualityManagement (8Lectures)

QualityConcepts,SoftwareQualityAssurance,SoftwareReviews,Metrics forProcessandProjects.

6. DesignEngineering (10Lectures)

DesignConcepts,ArchitecturalDesignElements, SoftwareArchitecture,DataDesignatthe ArchitecturalLevel andComponent Level,MappingofDataFlowintoSoftwareArchitecture,ModelingComponentLevel Design.

7. Testing Strategies & Tactics (8 Lectures) Software Testing Fundamentals, Strategic ApproachtoSoftwareTesting,TestStrategiesforConventionalSoftware,ValidationTesting,Systemtest ing,

Black-BoxTesting,White-Box Testingandtheirtype, BasisPathTesting.

RecommendedBooks:

1 .R.S.Pressman,SoftwareEngineering:APractitioner_sApproach(7thEdition),McGraw-Hill,2009.
2.P.Jalote,AnIntegratedApproachtoSoftwareEngineering(2ndEdition),NarosaPublishingHouse, 2003.
K.K.AggarwalandY.Singh,SoftwareEngineering(2ndEdition),NewAgeInternationalPublishers,2008.
1. I.Sommerville,SoftwareEngineering(8th edition),AddisonWesley,2006.
2. D.Bell,SoftwareEngineeringforStudents (4thEdition),Addison-Wesley,2005.
3. R.Mall,FundamentalsofSoftwareEngineering(2nd Edition),Prentice-HallofIndia, 2004.

COMPUTER SCIENCE LAB (C-IX): Software Engineering
LabPractical:60 Lectures

S.No	PracticalTitle
1.	• ProblemStatement, • ProcessModel
2.	RequirementAnalysis: • CreatingaDataFlow • DataDictionary,UseCasesProjectManagement:
3.	• ComputingFP • Effort • Schedule,RiskTable,Timelinechart
4.	DesignEngineering: • ArchitecturalDesign • DataDesign,ComponentLevelDesign
5.	Testing: • BasisPathTesting

SampleProjects:

1. **CriminalRecordManagement**:Implementacriminalrecordmanagementsystemforjailers,policeofficersand CBIofficers

2. **DTCRouteInformation**: Onlineinformation about the busroutes and theirfrequencyandfares

3. **CarPooling**:Tomaintainawebbasedintranet applicationthatenablesthe corporate

Employees with in an organization to avail thef acilityofcarpoolingeffectively.

4. PatientAppointmentandPrescriptionManagement System
5. OrganizedRetailShoppingManagementSoftware
6. OnlineHotelReservation ServiceSystem
7. ExaminationandResultcomputationsystem
8. AutomaticInternalAssessmentSystem
9. ParkingAllocationSystem
10. WholesaleManagement System

COMPUTER SCIENCE : Database Management Systems Theory:

COURSE OBJECTIVES:

The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

COURSE OUTCOMES:

Upon successful completion of this course, students should be able to:

- Describe the fundamental elements of relational database management systems
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- Design ER-models to represent simple database application scenarios
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
- Improve the database design by normalization.

60Lectures

1.Introduction (6 Lectures)

Characteristicsofdatabaseapproach,datamodels,databasesystemarchitectureanddata independence.

2.Entity Relationship(ER) Modeling (8Lectures)

Entitytypes, relationships,constraints.

3.Relation data model (20 Lectures)

Relationalmodelconcepts,relationalconstraints,relationalalgebra,SQLqueries

4.Database design (15 Lectures)

Mapping ER/EER model to relational database, functional dependencies,Losslessdecomposition,Normalforms(uptoBCNF).

5.TransactionProcessing (3 Lectures)

ACIDproperties, concurrencycontrol

6. File Structure and Indexing (8Lectures)

Operations on files, File of Unordered and ordered records, overview of File organizations,Indexing structures for f+iles(Primaryindex,secondaryindex,clusteringindex),Multilevel

indexingusingB andB+trees.

BooksRecommended:

1. R.Elmasri,S.B.Navathe,Fundamentals ofDatabaseSystems6th Edition,Pearson Education,2010.
2. R.Ramakrishanan,J.Gehrke,DatabaseManagementSystems3 Edition,McGraw-Hill, 2002.

3. A.Silberschatz,H.F.Korth,S.Sudarshan,DatabaseSystemConcepts6 Edition,McGrawHill, 2010.
4. R.Elmasri,S.B$_{t\cdot h}$NavatheDatabaseSystemsModels,Languages,Designandapplication

Programming,6 Edition,PearsonEducation,2013.

COMPUTERSCIENCELAB(C-X):Database ManagementSystemsLab
Practical:60Lectures

Structured QueryLanguage

1. CreatingDatabase
CreatingaTable
Specifying Relational Data
TypesSpecifyingConstraints
CreatingIndexes

2. Table and Record Handling

INSERT statement
Using SELECT and INSERT
togetherDELETE,UPDATE,TRUNCATEstatementsDROP,ALTER
statements

3. Retrieving Dataf rom a Database

The SELECT statementUsingthe WHERE clause
UsingLogicalOperatorsintheWHEREclause
UsingIN, BETWEEN, LIKE,ORDERBY,GROUPBYandHAVING Clause
Using Aggregate
FunctionsCombining Tables
Using JOINSSubqueries

4. Database Management

CreatingViews
Creating Column
AliasesCreating Database
UsersUsingGRANT and
REVOKE

COMPUTERSCIENCE(C-XI):Internet Technologies Theory:60Lectures

COURSE OBJECTIVES:

This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the 'language of the Web' – HTML, the fundamentals of how the Internet and the Web function, a basic understanding of graphic production with a specific stress on creating graphics for the Web, and a general grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web publishing.

COURSE OUTCOMES:

The student will be able to:

- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas.
- Build interactive web applications using AJAX

Java **(5lectures)**

Use of Objects,Array and Array List class

JavaScript **(15lectures)**

Data types,operators,functions,control structures,events and event handling.

JDBC **(10lectures)**

JDBC Fundamentals, Establishing Connectivity and working with connection interface, Working with statements,Creating and Executing SQLStatements, Workingwith Result Set Objects.

JSP **(20lectures)**

Introduction to JavaServer Pages, HTTP and Servlet Basics, The Problem with Servlets, TheAnatomy of a JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSPEnvironment,ImplicitJSPObjects,ConditionalProcessing,DisplayingValues,Usinganexpressio ntoSetanAttribute,DeclaringVariablesandMethods,ErrorHandlingandDebugging,SharingDataBet weenJSPPages, Requests,andUsers, DatabaseAccess.

JavaBeans **(10lectures)**

Java Beans Fundamentals, JARfiles,Introspection, Developingasimple Bean,ConnectingtoDB

RecommendedBooks:

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html,Dhtml,javascript,Perl Cgi , BPBPublications,2009.
2. CayHorstmann, BIG Java, WileyPublication , 3rd Edition.,2009
3. HerbertSchildt , Java7,TheComplete Reference, ,8th Edition,2009.
4. JimKeogh ,TheComplete ReferenceJ2EE, TMH,,2002.
5. O'Reilly,JavaServerPages,HansBergsten,ThirdEdition,2003.

Read n numbers.Count the number of negative numbers,positive numbers and zeros in the list.

COMPUTERSCIENCE(C-XII):Theory of Computation

COURSE OBJECTIVES:

- To understand the concept of machines: finite automata, pushdown automata, linear bounded automata, and Turing machines.
- To understand the formal languages and grammars: regular grammar and regular languages, context-free languages and context-free grammar; and introduction to context-sensitive language and context-free grammar, and unrestricted grammar and languages.
- To understand the relation between these formal languages, grammars, and machines.
- To understand the complexity or difficulty level of problems when solved using these machines.
- To understand the concept of algorithm.
- To compare the complexity of problems.

COURSE OUTCOMES:

- Once the student has undergone the course of Theory of Computation, and met the requirements of assignments, midterm and end-term examination, she/he will be:
- able to design Finite Automata machines for given problems;
- able to analyze a given Finite Automata machine and find out its Language;
- able to design Pushdown Automata machine for given CF language(s);
- able to generate the strings/sentences of a given context-free languages using its grammar;
- able to design Turing machines for given any computational problem.

Theory:60Lectures

1. Languages (8Lectures)

Alphabets,string,language, BasicOperationsonlanguage,Concatenation,KleeneStar

2. Finite Automata and RegularLanguages (20Lectures)

Regular Expressions, Transition Graphs, Deterministics and non-deterministic finite automata,NFAtoDFAConversion,Regularlanguagesandtheirrelationshipwithfiniteautomata,Pumpinglemma and closureproperties ofregularlanguages.

3. Context free languages (17Lectures)

Context free grammars, parse trees, ambiguities in grammars and languages, Pushdown automata(Deterministic and Non-deterministic), Pumping Lemma, Properties of context free languages,normalforms.

4.Turing Macines and Models of Computations (15Lectures)

RAM,TuringMachineasamodelofcomputation,UniversalTuringMachine,Languageacceptability, decidability, halting problem, Recursively enumerable and recursive languages,unsolvabilityproblems.

RecommendedBooks:

1. DanielI.A.Cohen,Introductiontocomputertheory, JohnWiley,1996
2. Lewis&Papadimitriou, Elementsof thetheoryofcomputation ,PHI1997.
3. Hoperoft,Aho,Ullman,IntroductiontoAutomatatheory,Language &Computation–**3rd** Edition,Pearson Education.2006
4. P. Linz,An IntroductiontoFormal LanguageandAutomata4th editionPublicationJones Bartlett,2006

COMPUTERSCIENCE(C-XIII):Artificial Intelligence

Theory:60Lectures

COURSE OBJECTIVES:

This course provides an introduction to the fundamentals of artificial intelligence. It contains a theory component about the concepts and principles that underlie modern AI algorithms, and a practice component to relate theoretical principles with practical implementation. The course divides into four parts. The first part of the course discusses search algorithms (BFS, DFS, UCS, A*, Min-Max trees). The second part of the course discusses probability as a mathematical tool, Bayesian networks and hidden Markov models. The third part of the course overviews machine learning algorithms both supervised and unsupervised. An introduction to learning by reinforcement is included as well. The last part concerns logic and planning algorithms such as value iteration for MDP. Along the course we highlight application domains such as robotics (e.g. particle filters for perception) and natural language processing. The objective is to give an overall idea about the field without delving into advanced details whenever possible.

COURSE OUTCOMES:

- Understand the informed and uninformed problem types and apply search strategies to solve them.
- Apply difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing.
- Design and evaluate intelligent expert models for perception and prediction from intelligent environment.
- Formulate valid solutions for problems involving uncertain inputs or outcomes by using decision making techniques.
- Demonstrate and enrich knowledge to select and apply AI tools to synthesize information and develop models within constraints of application area.
- Examine the issues involved in knowledge bases, reasoning systems and planning

1. Introduction (06Lectures)

Introduction to Artificial Intelligence, Background and Applications, Turing Test and Rational Agent approaches to AI, Introduction to Intelligent Agents, their structure, behavior andenvironment.

2. ProblemSolvingandSearchingTechniques (20Lectures)

Problem Characteristics, Production Systems, Control Strategies, Breadth First Search, Depth FirstSearch, Hill climbing and its Variations, Heuristics Search Techniques: Best First Search, A*algorithm, Constraint Satisfaction Problem, Means-End Analysis, Introduction to Game Playing,Min-Max and Alpha-Beta pruning algorithms.

3. KnowledgeRepresentation (20Lectures)

IntroductiontoFirstOrderPredicateLogic,ResolutionPrinciple,Unification,SemanticNets,Conceptual Dependencies, Frames, and Scripts,Production Rules, ConceptualGraphs.

ProgramminginLogic(PROLOG)

4. DealingwithUncertaintyandInconsistencies (08Lectures)

TruthMaintenanceSystem,DefaultReasoning,ProbabilisticReasoning,BayesianProbabilisticInference,Possible World Representations.

5. UnderstandingNaturalLanguages (06Lectures)

ParsingTechniques,Context-FreeandTransformationalGrammars,RecursiveandAugmentedTransitionNets.

BOOKSRECOMMENDED:

1. DAN.W.Patterson, IntroductiontoA.IandExpertSystems–PHI,2007.

2. R$_n$u$_d$ssell&Norvig,ArtificialIntelligence-AModernApproach**,**LPE,PearsonPrenticeHall,2 ndedition, 2005.
3. Rich&Knight,ArtificialIntelligence –TataMcGrawHill,2nd edition,1991.
4. W.F.ClocksinandMellish,ProgramminginPROLOG,NarosaPublishingHouse, 3rdedition, 2001.
5. IvanBratko,PrologProgrammingforArtificialIntelligence,Addison-Wesley,PearsonEducation,3rdedition, 2000.

COMPUTER SCIENCE LAB (C-XIII): Artificial Intelligence

LabPractical:60 Lectures

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1. Write a prolog program to calculate thesum of two numbers.
2. Writeaprologprogram to find themaximum of two numbers.
3. Write a prolog program to calculate the factorialof a given number.
4. Writeaprologprogram to calculate thenthFibonaccinumber.
5. Writeaprologprogram,insert_nth(item, n,into_list,result)thatasserts that result is the list into_list with It eminsertedasthen_thelementintoeverylistatalllevels.
6. Write a Prolog program to remove the Nth item from alist.
7. Write a Prolog program, remove-nth(Before, After) that asserts the After list is the Beforelistwiththeremovalofeveryn_thitemfromeverylistat alllevels.
8. Writea Prologprogram to implementappend fortwolists.
9. WriteaProlog program to implement palindrome(List).
10. Write a Prologprogram to implement max(X,Y,Max) sothat Max isthe greater of two numbersXandY.
11. WriteaPrologprogramtoimplementmaxlist(List,Max)sothatMax isthegreatestnumberinthelist of numbersList.
12. Write a Prolog program to implement sum list(List,Sum)so that Sum is the sum of a given list of numbers List.
13. Write a Prolog program to implement two predicates even length(List)and odd length(List)sothattheyaretrueif their argument is alistof even or odd length respectively.
14. Write a Prolog program to implement reverse(List,ReversedList)that reverses lists.

15. Write a Prolog program to implement maxlist(List,Max)sothatMax isthegreatestnumberinthelist of numbersList usingcutpredicate.

16. Write a Prologp rogram to implement GCD of two numbers.

17. Write a prolog program that implementsSemantic Networks/FrameStructures.

COMPUTERSCIENCELAB(C-XIV):Computer Graphics

COURSE OBJECTIVES:

- The main objective of the course is to introduce students with fundamental concepts and theory of computer graphics.
- It presents the important drawing algorithm, polygon fitting, clipping and 2D transformation curves and an introduction to 3D transformation.
- It provides the basics of OpenGL application programming interface which allows students to develop programming skills in CG.

COURSE OUTCOMES:

Upon the completion of the course students will be able to :-

- Explain the applications, areas, and graphic pipeline, display and hardcopy technologies.
- Apply and compare the algorithms for drawing 2D images also explain aliasing, anti aliasing and half toning techniques.
- Discuss OpenGL application programming Interface and apply it for 2D & 3D computer graphics.
- Analyze and apply clipping algorithms and transformation on 2D images.
- Solve the problems on viewing transformations and explain the projection and hidden surface removal algorithms.
- Explain basic ray tracing algorithm, shading, shadows, curves and surfaces and also solve the problems of curves.

Theory:60Lectures

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1. Introduction (5Lectures)

Basicelements ofComputergraphics,ApplicationsofComputerGraphics.

2. GraphicsHardware (8Lectures)

ArchitectureofRasterandRandomscandisplaydevices,input/outputdevices.

3. FundamentalTechniquesinGraphics (22Lectures)

Raster scan line, circle and ellipse drawing, thick primitives, Polygon filling, line and polygonclipping algorithms, 2D and 3D Geometric Transformations, 2D and 3D Viewing Transformations(Projections-Parallel andPerspective),Vanishingpoints.

4. GeometricModeling (10Lectures)

Representingcurves &Surfaces.

5. VisibleSurfacedetermination (8Lectures)

Hiddensurfaceelimination.

6. Surfacerendering (7Lectures)

IlluminationandshadingmodelsBasiccolormodelsandComputerAnimation.

BooksRecommended:

1. J.D.Foley, A.Van Dan, Feiner, Hughes Computer Graphics Principles & Practice 2nd editionPublication Addison Wesley1990.
2. D.Hearn,Baker:ComputerGraphics,Prentice Hallof India2008.
3. D.F.RogersProceduralElementsforComputerGraphics,McGrawHill1997.
4. D.F.Rogers, Adams Mathematical Elements for Computer Graphics, McGraw Hill 2nd edition 1989.

COMPUTER SCIENCE LAB (C-XIV): Computer Graphics

LabPractical:60 Lectures

1. Write a program to implement Bresenham_s linedrawingalgorithm.
2. Write a program to implement mid-point circle drawing algorithm.
3. Write a program to clip a line using Cohenand Sutherland lineclipping algorithm.
4. Write a programtoclipa polygonusingSutherlandHodgemanalgorithm.
5. Write a program to applyvarious 2D transformations ona2D object (usehomogenouscoordinates).
6. Write a program to applyvarious 3D transformations on a3Dobject and thenapplyparallelandperspectiveprojection onit.
7. Write a programtodraw Hermite/Beziercurve.

Discipline Specific Elective Papers COMPUTER SCIENCE:(Credit:06each)(4papers to be selected)– DSE 1 -4

I.Information Security

Theory: 60Lectures

1. Introduction
Security, Attacks,Computer Criminals,Security Services,Security Mechanisms.

2. Cryptography
Substitutionciphers, Transpositions Cipher ,Confusion, diffusion, Symmetric, Asymmetric Encryption.DES Modes of DES,Uses of Encryption,Hashfunction,keyexchange,Digital Signatures,Digital Certificates.

3. ProgramSecurity
Secure programs, Non malicious Program errors,Malicious codes virus,Trapdoors,Salami attacks,Covert channels,Control againstprogram

4. Threats.
Protection in OS:Memory and Address Protection,Accesscontrol,File Protection,User Authentication.

5. DatabaseSecurity
Requirements,Reliability,Integrity,Sensitivedata,Inference,MultilevelSecurity.

6. SecurityinNetworks
Threatsin Networks, Security Controls, firewalls,Intrusion detection systems,Securee-mails

7. AdministratingSecurity
Security Planning, Risk Analysis, Organisational Security Policy, Physical Security. Ethical issues in Security: Protecting Programs and data.Information and law.

RecommendedBooks:

1. C.P.Pfleeger,S.L.Pfleeger; Securityin Computing, PrenticeHall ofIndia,2006
2. W.Stallings;NetworkSecurityEssentials: Applicationsand Standards,4/E,2010

InformationSecurityLab

1. Demonstrate the use of Network tools:ping,ipconfig,ifconfig,tracert,arp, netstat,whois
2. Use of Password cracking tools :John theRipper, Ophcrack.Verify the strength of passwords using these tools.
3. Perform encryptionan dd ecryption of Caesarcipher.Write a script for performing these operations.
4. Perform encryption and decryption of a Railfencecipher.Write a script forperfor mingthese operations.
5. Usenmap/zenmaptoanalysea remotemachine.
6. Use Burpproxy to capture and modify the message.
7. Demonstratesendingof aprotected worddocument.
8. Demonstratesendingof adigitallysigneddocument.
9. Demonstratesendingofaprotectedworksheet.
10. Demonstrateuseofsteganographytools.
11. Demonstrateuseof gpgutilityfor signingandencryptingpurposes.

MicroprocessorTheory:60Lectures

COURSE OBJECTIVES:

Students will be able to.

- Outline the history of computing devices.
- Describe the architecture of 8086 microprocessors.
- Develop programs for microprocessor and microcontrollers
- Compare microprocessors and microcontrollers
- Understand 8051 microcontroller concepts, architecture and programming

COURSE OUTCOMES:

: At the end of the course, students will develop ability to

- Define the history of microprocessors
- Describe the architectures of 8085 and 8086 microprocessors.

- Draw timing diagram
- Write programs using 8086 and 8051
- Distinguish between the different modules of operation of microprocessors.
- Interface peripherals to 8086 and 8051
- Evaluate the appropriateness of a memory expansion interface based on the address reference with particular application.
- Apply the above concepts to real world electrical and electronics problems and applications.

Microprocessorarchitecture: Internal architecture,system bus architecture,memory andI/O interfaces.

Microprocessor programming: Register Organization, instruction formats, assembly languageprogramming.

Interfacing: Memory addressd ecoding, cache memory and cache controllers,I/Ointerface, keyboard, display, timer, interrupt controller, DMA controller, video controllers, communication interfaces.

RecommendedBooks:

1. BarryB. Brey:The Intel Microprocessors:Architecture,Programming and Interfacing.Pearson Education, Sixth Edition,2009.

2. WalterATriebel,Avtar Singh;The8088 and 8086 Microprocessors Programming,Interfacing,Software,Hardware,andApplications.PHI,FourthEdition2 005.

MicroprocessorLab

Practical:60Lectures

ASSEMBLY LANGUAGEPROGRAMMING

1. Write aprogram for32-bit binarydivision andmultiplication
2. Writeaprogram for32-bitBCD additionandsubtraction
3. Writeaprogram forLinearsearch andbinarysearch.
4. Writeaprogramtoaddandsubtracttwoarrays
5. Write aprogram forbinaryto asciiconversion
6. Writeaprogramfor asciitobinaryconversion

IV. Computational Linguistics

Theory:60Lectures

Introduction Computers in linguistics and NaturalLanguageProcessing Thenatureanduseoftext corpora

Introduction to python programming and NLTK, Regular expressions Pattern matchingCorpussearchand counting

RegularlanguagesFinite-stateautomataOperationsandclosurepropertiesPumpingLemma,Finite-statelinguistics Transducers Morphologicalanalysis

N-grams LanguagemodelingSmoothingEvaluation

Part-of-Speech Tagging, Word classes and tagsets Rule-based and stochastic POS taggingHiddenMarkovModelsEvaluation

WordmeaningSemantic ambiguitySemanticrelationsSemanticroles

Computational lexical semantics, (Un)supervised word sense disambiguation ClassifiersVector-spacesemantics

References:

1. Jurafsky,D.andJ.H.Martin,Speechandlanguageprocessing:AnIntroductiontoNaturalLangua ge Processing, Computational Linguistics, and Speech Recognition (2nd Edition).Prentice-Hall,2008.

2. Charniak,E.:StatisticalLanguageLearning.TheMITPress.1996.

3. J.Allen:NaturalLanguageUnderstanding.Benjamin/Cummins.1995.

Computational LinguisticsLab Practical:60 Lectures

Practical exercises based on concepts listed in theory.

V. Digital Image Processing

COURSE OBJECTIVES:

- To introduce the concepts of image processing and basic analytical methods to be used in image processing. To familiarize students with image enhancement and restoration techniques, To explain different image compression techniques. To introduce segmentation and morphological processing techniques.

COURSE OUTCOMES:

- Learns the fundamentals of image processing.
- Explains human visual perception.
- Explains how images are acquired.
- Explains the basic relationships between pixels.
- Applies transformations on images.
- Explains histograms and changes histograms of images.
- Realizes smoothing and sharpening in both spatial and frequency domains.
- Defines image processing methods.
- Explains image segmentation.
- Expresses image compression methods.
- Realizes image recognition process.
- Recognizes morphological image processing techniques.
- Processes color images.
- Explains color models.
- Constructs color images.
- Extracts the gray-level components of a color image.
- Applies image processing methods to color images.

Theory:60Lectures

1. Introduction (6Lectures)

Light, Brightness adaption and discrimination, Pixels, coordinate conventions, ImagingGeometry,PerspectiveProjection,SpatialDomainFiltering,samplingand quantization.

2. SpatialDomainFiltering (7Lectures)

Intensitytransformations,contraststretching,histogramequalization,Correlationand

convolution,Smoothing filters,sharpening filters, gradientand Laplacian.

3. FilteringintheFrequencydomain (8 Lectures) HotellingTransform,FourierTransformsandproperties, FFT(DecimationinFrequencyandDecimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete CosineTransform,Frequencydomain filtering.

4. ImageRestoration (8Lectures)

Basic Framework, Interactive Restoration, Image deformation and geometric transformations,image morphing, Restoration techniques, Noise characterization, Noise restoration filters,Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions,Restorationfrom projections.

5. ImageCompression (10Lectures)

Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy ofan information source, Shannon's 1st Theorem, Huffman Coding, Arithmetic Coding, GolombCoding, LZW coding, Transform Coding, Sub-image size selection, blocking artifacts, DCTimplementationusingFFT,Runlengthcoding,FAXcompression(CCITTGroup-3andGroup-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding,ThresholdCoding,JPEG,Losslesspredictivecoding,Lossypredictivecoding,MotionCompensation

6. WaveletbasedImageCompression (5 Lectures) Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinementequation,Waveletseriesexpansion,DiscreteWaveletTransform(DWT),Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding,DigitalImageWatermarking.

7. MorphologicalImageProcessing (7 Lectures) Basics,SE,Erosion,Dilation,Opening,Closing,Hit-or-MissTransform,BoundaryDetection,Holefilling,Connectedcomponents,convexhull,thinning,thickening,skeletons,pruning,Geodesic Dilation, Erosion, Reconstruction bydilation and erosion.

8. ImageSegmentation (9Lectures)

Boundary detection based techniques, Point, line detection, Edge detection, Edge linking,localprocessing,regionalprocessing,Houghtransform,Thresholding,Iterativethresholding,Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation,Watershedalgorithm, Useof motionin segmentation

ReferenceBooks

1. RCGonzalez,REWoods,DigitalImageProcessing,3rdEdition,PearsonEducation.2008.
2. AKJain,Fundamentals ofDigitalimageProcessing,PrenticeHallof India.1989.
3. KRCastleman,DigitalImageProcessing,PearsonEducation.1996
4. Schalkoff,DigitalImageProcessingandComputerVision,JohnWileyandSons.1989.
5. RafaelC.Gonzalez,RichardE.Woods,StevenEddins,'DigitalImageProcessingusingMATLAB',Pearson Education,Inc.,2004.

Digital Image Processing
LabPractical:60 Lectures

1. Writeprogram toreadanddisplaydigital imageusingMATLABorSCILAB
   a. BecomefamiliarwithSCILAB/MATLABBasiccommands
   b. ReadanddisplayimageinSCILAB/MATLAB

c. Resizegivenimage
d. Convertgivencolorimageinto gray-scaleimage
e. Convertgivencolor/gray-scaleimageintoblack&whiteimage
f. Drawimageprofile
g. Separate colorimageinthreeRG &Bplanes
h. Createcolor imageusing R,G andBthreeseparateplanes
i. FlowcontrolandLOOPinSCILAB
j. Writegiven 2-Ddata inimagefile

2. Towriteand executeimageprocessingprogramsusingpointprocessingmethod
   a. ObtainNegativeimage
   b. ObtainFlipimage
   c. Thresholding
   d. Contraststretching

3. Towriteandexecuteprogramsforimage arithmeticoperations
   a. Additionoftwoimages
   b. Subtractoneimagefromotherimage
   c. Calculatemean value ofimage
   d. DifferentBrightnessbychangingmeanvalue

4. Towriteandexecuteprogramsforimagelogicaloperations
   a. ANDoperationbetween twoimages
   b. ORoperationbetweentwoimages
   c. Calculateintersectionoftwoimages
   d. WaterMarkingusingEX-ORoperation

e. NOToperation(Negativeimage)

5. Towriteaprogramforhistogramcalculationandequalization using
   a. StandardMATLABfunction
   b. ProgramwithoutusingstandardMATLABfunctions
   c. CProgram

6. Towriteandexecuteprogramfor geometrictransformationofimage
   a. Translation
   b. Scaling
   c. Rotation
   d. Shrinking
   e. Zooming

7. Tounderstandvarious imagenoisemodels andtowriteprogramsfor
   a. imagerestoration
   b. RemoveSaltand PepperNoise
   c. MinimizeGaussiannoise
   d. MedianfilterandWeinerfilter

8. Writeandexecuteprogramstoremovenoiseusingspatialfilters
   a. Understand1-Dand2-D convolutionprocess
   b. Use3x3 Mask forlowpass filter and high passfilter

9. Writeandexecute programsforimagefrequencydomainfiltering
   a. ApplyFFTongivenimage
   b. Performlow pass andhigh passfilteringin frequencydomain
   c. ApplyIFFTtoreconstructimage

10. WriteaprograminCandMATLAB/SCILABfor edgedetectionusingdifferent edgedetectionmask
11. Writeandexecuteprogramforimagemorphologicaloperationserosionanddilation.
12. To write and execute program for wavelet transform on given image and perform inversewavelettransform to reconstructimage.

VI. Machine

LearningTheory:60Lectures

COURSE OBJECTIVES:

- The aim of Artificial Intelligence & Machine Learning course is to prepare students for career in computer science & engineering where knowledge of AI & ML techniques leading to the advancement of research and technology. Artificial Intelligence and Machine Learning are the terms of computer science.Machine Learning is the learning in which machinecan learn by its own without being explicitly programmed. It is an application of AI that provide system the ability to automatically learn and improve from experience.

COURSE OUTCOMES:

After completing this course the student will be able to:

- Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems.
- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- Demonstrate proficiency in applying scientific method to models of machine learning.
- Discuss the basics of ANN and different optimizations techniques.

Introduction: Concept of Machine Learning,Applications of MachineLearning, Keyelements of Machine Learning, Supervised vs. Unsupervised Learning, Statistical Learning:Bayesian Method, TheNaive Bayes Classifier

Softwares for Machine Learning and Linear Algebra Overview:Plotting o fData, Vectorization,Matricesand Vectors:Addition,Multiplication,Transposeand InverseusingavailabletoolsuchasMATLAB.

LinearRegression: PredictionusingLinearRegression,GradientDescent,Linear

Regression with one variable,LinearRegression with multiple variables,PolynomialRegression,FeatureScaling/Selection.

LogisticRegression: Classification using Logistic Regression, Logistic Regressionvs.Linear Regression, Logistic Regression with one variable and with multiple variables.

Regularization: Regularization and its utility: The problem of Overfitting,Application of Regularization in Linear and Logistic Regression,Regularization and Bias/Variance.

Neural Networks: Introduction, Model Representation, Gradient Descent vs. PerceptronTraining, Stochastic Gradient Descent, Multilayer Perceptrons, Multiclass Representation,Backpropagation Algorithm.

SuggestedBooks:

1. EthemAlpaydin, "IntroductiontoMachine Learning"2ndEdition,TheMITPress,2009.

2. Tom M. Mitchell, "Machine Learning", First Edition by Tata McGraw-Hill Education,2013.

3. ChristopherM.Bishop,"PatternRecognitionand Machine Learning"bySpringer,2007.

4. MevinP.Murphy, "MachineLearning:AProbabilisticPerspective"byTheMITPress,2012.

Machine Learning

LabPractical:60Lecturs

For practical Labs for Machine Learning, students may use softwares like MABLAB/Octaveor Python. For later exercises, students can create/use their own datasets or utilize datasetsfrom online repositories like UCI Machine Learning Repository(http://archive.ics.uci.edu/ml/).

1. PerformelementarymathematicaloperationsinOctave/MATLABlikeaddition,multiplication,division andexponentiation.
2. Perform elementary logical operations in Octave/MATLAB (like OR, AND,CheckingforEquality, NOT,XOR).
3. Create,initializeanddisplaysimplevariablesandsimple stringsandusesimpleformattingforvariable.
4. Create/Definesingledimension/multi-dimensionarrays,andarrayswithspecificvalues like array of all ones, all zeros, array with random values within a range, or adiagonal matrix.
5. Use command to compute the size of a matrix, size/length of a particular row/column,load data from a text file, store matrix data to a text file, finding out variables and theirfeaturesin thecurrentscope.
6. Performbasicoperationsonmatrices(likeaddition,subtraction,multiplication)and

displayspecific rows or columns of thematrix.

7. Perform other matrix operations like converting matrix data to absolute values, takingthe negative of matrix values, additing/removing rows/columns from a matrix, findingthe maximum or minimum values in a matrix or in a row/column, and finding the sumofsome/all elements in amatrix.
8. Createvarioustypeofplots/chartslikehistograms,plot based on sine/cos inefunctionbasedondatafroma matrix.Furtherlabeldifferent axesina plotand datain aplot.
9. Generate different subplots from a given plotandcolorplotdata.
10. Useconditionalstatements anddifferent typeof loopsbased onsimpleexample/s.
11. Perform vectorized implementation of simple matrix operation like finding thetransposeofamatrix, adding,subtracting or multiplyingtwomatrices.
12. Implement Linear Regression problem. For example, based on a dataset comprising ofexisting set of prices and area/size of the houses, predict the estimated price of a givenhouse.
13. Based on multiple features/variables perform Linear Regression. For example, basedonanumberof additional featureslikenumberof bedrooms,servantroom,number of balconies, number of houses of years a house has been built – predict the price of ahouse.
14. Implement a classification/ logistic regression problem. For example based on differentfeatures of students data, classify, whether a student is suitable for a particular activity.Based on the available dataset, a student can also implement another classificationproblemlikecheckingwhetheranemail is spam ornot.
15. Usesomefunctionforregularizationofdatasetbasedonproblem14.
16. Uses ome functionforneuralnetworks,like Stochastic Gradient Descentorbackpropagation - algorithm to predict the value of a variable based on the dataset ofproblem 14.

VII. Introduction to Data

ScienceTheory:60Lectures

Data Scientist's Tool Box: Turning data into actionable knowledge, introduction to the toolsthat willbeusedinbuildingdataanalysissoftware:version control,markdown, git,GitHub, R, and RStudio.

R Programming Basics:OverviewofR,Rdatatypesandobjects,readingandwritingdata, Control structures, functions, scoping rules, dates and times, Loop functions,debuggingtools, Simulation, codeprofiling

Getting and Cleaning Data: Obtaining data from the web, from APIs, from data bases and from colleague in various formats.basics of data cleaningand makingdata―tidy‖.

Exploratory Data Analysis: Essential exploratory techniques for summarizing data, appliedbefore formalmodelingcommences, eliminatingorsharpeningpotentialhypothesesabout theworldthatcanbe addressedbythedata, commonmultivariate statisticaltechniquesusedto

visualizehigh-dimensionaldata.

Reproducible Research: Concepts and tools behind reporting modern data analyses in areproduciblemanner,TowriteadocumentusingRmarkdown,integrateliveRcodeinto aliterate statistical program, compile R markdown documents using knitr and related tools,andorganizeadataanalysis so that itis reproducibleand accessibleto others.

ReferenceBooks

1.Rachel Schutt,CathyO'Neil,"DoingDataScience: StraightTalk fromtheFrontiline"bySchroff/O'Reilly, 2013.

2. FosterProvost,TomFawcett,"DataScienceforBusiness"WhatYouNeedtoKnowAboutDataMining andData-Analytic Thinking"by O'Reilly,2013.

3. John W. Foreman, "Data Smart: Using data Science to Transform Information intoInsight"by JohnWiley &Sons,2013.

4. Ian Ayres, "Super Crunchers: Why Thinking-by-Numbers Is the New Way to BeSmart"IstEditionby Bantam,2007.

5.EricSeigel,"PredictiveAnalytics:ThePowertoPredictwhoWillClick,Buy,Lie,or Die", 1st Edition,byWiley, 2013.

6.MatthewA.Russel,"MiningtheSocialWeb:DataminingFacebook,Twitter,Linkedln,Goole+,

GitHub,andMore",SecondEdition,byO'ReillyMedia,2013.

IntroductiontoDataScienceLabP

ractical:60 Lectures

1. Writeaprogramthatprints_HelloWorld_tothescreen.
2. Writeaprogramthat asksthe userforanumbernand printsthe sumof the numbers 1ton
3. Writeaprogramthat printsa multiplicationtablefornumbers upto12.
4. Writeafunction thatreturns thelargest elementin alist.
5. Writeafunction thatcomputes the runningtotalofalist.
6. Write afunction that tests whetherastringis apalindrome.
7. Implementlinearsearch.
8. Implementbinarysearch.
9. Implementmatricesaddition,subtractionandMultiplication
10. Fifteenstudentswereenrolledinacourse.Thereageswere:20

    20 20 20 20 21 21 21 22 22 22 22 23 23 23

    i. Findthemedianageofallstudentsunder 22yearsii. Findthemedianageofallstudents

    iii. Find the mean age of allstudents iv. Find the modal age forallstudents

    v. Two more students enter the class. The age of both students is 23. What is nowmean,mode and median?

11. Followingtable gives afrequencydistribution of systolicblood pressure.Computeallthemeasuresofdispersion.

Midpoint	95.5	105.5	115.5	125.5	135.5	145.5	155.5	165.5	175.5
Number	5	8	22	27	17	9	5	5	2

12. Obtain probability distribution of , where X is number of spots showing when a six-sidedsymmetricdie(i.e. all six faces of thedie areequallylikely) is rolled. Simulate randomsamplesofsizes 40, 70 and 100 respectivelyand verifythefrequencyinterpretation ofprobability.
13. Make visual representations of data using the base, lattice, and ggplot2 plotting systems in R,applybasicprinciples ofdatagraphics tocreaterichanalyticgraphics fromavailabledatasets.
14. UseGit /Github softwareto createGithub account.Also, create arepousingGithub.

VIII. Cloud Computing

COURSE OBJECTIVES:

- the fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges;
- the basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations;
- different CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage (SDS);
- cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage;
- the variety of programming models and develop working experience in several of them.

COURSE OUTCOMES

- Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple datacenters to build and deploy cloud applications that are resilient, elastic and cost-efficient.
- Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model.
- Illustrate the fundamental concepts of cloud storage and demonstrate their use in storage systems such as Amazon S3 and HDFS.
- Analyze various cloud programming models and apply them to solve problems on the cloud.

Overview of ComputingParadigm (8 lectures)Recent trends in Computing : Grid Computing, Cluster Computing, DistributedComputing,

UtilityComputing,Cloud Computing,

IntroductiontoCloudComputing (7lectures)

Introduction to Cloud Computing, History of Cloud Computing,Cloud service providers,Benefits and limitations of Cloud Computing,

Cloud Computing Architecture (20 lectures) Comparison with traditionalcomputing architecture (client/server), Services provided at various levels, ServiceModel InfrastructureasaService(IaaS),PlatformasaService(PaaS),SoftwareasaService(SaaS), How Cloud ComputingWorks,Deployment Models-Publiccloud, Private cloud, Hybridcloud, Communitycloud, CasestudyofNIST architecture.

CaseStudies (13 lectures)

Case study of Service model using Google App Engine, Microsoft Azure, AmazonEC2, Eucalyptus.

Service Managementin Cloud Computing (7lectures)

ServiceLevelAgreements(SLAs), Billing&Accounting,ComparingScalingHardware: Traditionalvs.Cloud,Economicsofscaling.

Cloud Security (5lectures)

Infrastructure Security- Network level security, Host level security, Application levelsecurity,Data security and Storage-Data privacy and security Issues,Jurisdictional issues raised by Datalocation, Authentication in cloud computing.

ReferenceBooks

1. *CloudComputingBible,*BarrieSosinsky,*Wiley-India,*2010
2. *Cloud Computing: Principles and Paradigms,* Editors: RajkumarBuyya,JamesBroberg,Andrzej M.Goscinski,*Wile,*2011
3. *Cloud Computing: Principles, Systems and Applications, Editors:* NikosAntonopoulos,LeeGillam, *Springer,* 2012
4. *CloudSecurity:AComprehensiveGuidetoSecure CloudComputing,*RonaldL.Krutz,Russell Dean Vines,*Wiley-India,*2010
5. GautamShroff,*EnterpriseCloudComputingTechnologyArchitectureApplications* ,AdobeReaderebooksavailablefromeBooks.com,2010
6. Toby Velte, Anthony Velte, Robert Elsenpeter, *Cloud Computing, A PracticalApproach*,McGraw Hills,2010.
7. DimitrisN.Chorafas, *Cloud ComputingStrategies,*CRC Press,2010

CloudComputingLab

1. Createvirtualmachinesthataccessdifferentprogramsonsameplatform.
2. Createvirtualmachinesthataccessdifferentprogramsondifferentplatforms.
3. Workingon tools used incloud computingonline-
    a) Storage
    b) Sharingofdata
    c) manageyourcalendar,to-do lists,
    d) adocument editingtool
4. ExploringGooglecloud
5. Exploringmicrosoftcloud
6. Exploringamazoncloud

Numerical MethodsTheory:60Lectures

COURSE OBJECTIVES:

- This course is an introduction to a broad range of numerical methods for solving mathematical problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis, and use of these numerical methods, along with a rudimentary understanding of finite precision arithmetic and the conditioning and stability of the various problems and methods.

COURSE OUTCOMES:

- On completion of this subject, students should:
- Understand the significance and role of both roundoff error and truncation error in some standard problems in scientific computing;
- Be able to write simple numerical programs that utilize a numerical Problem-Solving Environment such as Matlab or NumPy;
- Appreciate the role of computer simulation, as a third method in science, distinct from theory and experiment
- Understand the distinction between the simulation of stochastic and deterministic models
- Be able to use appropriate numerical techniques when undertaking a mathematical or modelling investigation

Floating point representation and computer arithmetic, Significant digits, Errors: Round-offerror, Local truncation error, Global truncation error, Order of a method, Convergence andterminalconditions, Efficient computations

Bisectionmethod,Secantmethod,Regula−Falsimethod Newton−Raphson method,Newton_smethod for solving online arsystems Gauss elimination method(withrowpivoting) and Gauss−Jordan method,Gauss Thomas method for tridiagonal systems Iterative methods:Jacobiand Gauss-Seidelit erative methods Interpolation:Lagrange_sformandNewton_sform Finite differen ceoperators,Gregory Newton forward and backward differences Interpolation Piecewise polynomial interpolation: Linear interpolation, Cubic spline interpolation (onlymethod), Numerical differentiation: First derivatives and second order derivatives,Richardson extrapolation Numerical integration: Trapezoid rule,Simpson_srule(onlymethod),Newton−CotesopenformulasExtrapolationmethods:Rombergintegratio n,Gaussianquadrature,Ordinary differentialequation:Euler_smethod

ModifiedEuler_smethods:HeunmethodandMid-pointmethod,Runge-Kuttasecondmethods:Heunmethodwithoutiteration,Mid-pointmethodandRalston_smethod

Classical 4th orderRunge-Kuttamethod,FinitedifferencemethodforlinearODE

REFERNCEBOOKS:

[1] Laurence V. Fausett, Applied Numerical Analysis, Using MATLAB, Pearson, 2/e(2012)

[2] M.K.Jain,S.R.K.IyengarandR.K.Jain,NumericalMethodsforScientific andEngineeringComputation,New AgeInternational Publisher,6/e(2012)

[3] Steven C Chapra, Applied Numerical Methods with MATLAB for Engineers andScientists,TataMcGrawHill, 2/e(2010)

Numerical Methods
LabPractical:60lectures

1. Find the roots of the equation by bisection method.
2. Find the roots of the equation bysecant/Regula−Falsimethod.
3. Find the roots of the equation byNewton_smethod.
4. Find the solution of asystemofnonlinearequationusingNewton_smethod.
5. Find the solution of tridiagonal systemusingGaussThomasmethod.
6. Find the solutionofsystem of equations using Jacobi/Gauss-Seidelmethod.
7. Find th ecubic splineinterpolatingfunction.
8. Evaluate the approximate value of finiteintegralsusingGaussian/Rombergintegration.
9. Solvetheboundaryvalue problem usingfinitedifferencemethod.

Note:Programming is to be donein anyoneof Computer AlgebraSystems:MATLAB/ MATHEMATICA/ MAPLE.

X. SystemsProgramming

Theory:60lectures

COURSE OBJECTIVES:

The general objective of this course is to introduce students basic concepts, techniques and skills for systems programming. Specific objectives include:

- Understand basic concepts in systems programming.
- Understand basic concepts in UNIX file systems and process control.
- Understand UNIX system calls.
- Develop skills to write programs using system services.
- Learning Outcomes:
- Upon completion of this course, students are be able to:
- Explain basic concepts in systems programming.

- Describe UNIX file systems and process control.
- Utilize UNIX system services in application develpment.
- Design and implement system utility programs.

Assemblers&Loaders, Linkers: 10L

Onepassandtwopassassembler,design of an assembler,Absolute loader,relocation and linkingconcepts, relocatingloader and DynamicLinking.

Introduction: 2L

Overviewofcompilation,Phasesofacompiler

LexicalAnalysis: 6L

Roleofa Lexicalanalyzer,Specificationandrecognitionoftokens,Symboltable,lex

Parsing: 10L

Bottomupparsing-LRparser,yacc.

Intermediate representations 10L

Threeaddresscodegeneration,syntaxdirectedtranslation,translationoftypes,control statements

Storage organization: 5L

Activationrecords,stack allocation

Code Generation: 5L

Objectcodegeneration

ReferenceBooks

1. SantanuChattopadhyaya,*SystemsProgramming*, PHI, 2011.
2. AlfredV.Aho,MonicaS.Lam,RaviSethi, JeffreyD.Ullman,*Compilers:Principles, Techniques,andTools*,2nd edition,PrenticeHall,2006.
3. D.M.Dhamdhere,*SystemsProgramming*,TataMcGrawHill,2011.
4. LelandBeck,D.Manjula,*SystemSoftware:AnIntroductiontoSystemProgramming*, 3rdedition,Pearson Education,2008.
5. GruneD,VanReeuwijk.K,BalH.E,Jacobs CJH, Langendoen K,*ModernCompiler Design*,2nd edition,Springer,2012

SYSTEMSPROGRAMMINGLAB
Practical:60lectures

[1] Toimplementanassemblerforahypotheticallanguage.

[2] Toget familiar withlex:write a program to recognizenumbers,identifiers.

[3] Toget familiarwithyacc:write a deskcalculator.

XI. Operational ResearchTheory:60Lectures

COURSE OBJECTIVES:

- To understand the methodology of OR problem solving and formulate linear programming problem.
- To develop formulation skills in transportation models and finding solutions
- To understand the basics in the field of game theory and assignment problems
- To know how project management techniques help in planning and scheduling a project
- To know the basics of dynamic programming and simulation.

COURSE OUTCOMES:

- recognize the importance and value of Operations Research and linear programming in solving practical problems in industry
- Interpret the transportation models' solutions and infer solutions to the real-world problems.
- recognize and solve game theory and assignment problems.
- gain knowledge of drawing project networks for quantitative analysis of projects
- know when simulation and dynamic programming can be applied in real world problems.

Introduction to Operational Research (OR): Origin & Development, Different Phases ofORstudy,MethodologyofOR,ScopeandLimitationsof OR,ApplicationsofOR.

Linear Programming: Linearly independent / dependent vectors, Basis, Convex sets,Extreme points.Graphical method.Simplex method,Artificial variabletechniques-Two

PhaseMethod;M-CharnesMethod,Specialcases inLPP.

Duality: Definition of the dual problem, Primal-dual relationships, Economic Interpretation of Duality,Dual simplexMethod.

Sensitivityanalysis: Changesincostandresourcevector

ReferenceBooks

1. **G.Hadley:LinearProgramming.Narosa,2002 (reprint).**

2. **A. Ravindran, D. T. Phillips and James J. Solberg:** Operations Research-PrinciplesandPractice, John Wiley&Sons,2005.

3. **Hamdy A. Taha:** Operations Research-An Introduction, Prentice Hall, 8th Edition,2008.

4. **F.S. Hillier. G.J. Lieberman**: Introduction to Operations Research- Concepts andCases,9th Edition, Tata McGrawHill.2010.

Operational Research
LabPractical:60Lectures

[1] To Solve Linear ProgrammingProblem usingGraphicalMethod with Unbounded solution In feasiblesolution Alternative or multiple solutions.

[2] SolutionofLPPwithsimplex method.
[3] ProblemsolvingusingM-Charnesmethod.

[4] ProblemsolvingusingTwoPhasemethod.

[5] IllustrationoffollowingspecialcasesinLPPusingSimplex methodUnrestrictedvariables

Unbounded solutionInfeasiblesolution

Alternativeormultiplesolution

[6] ProblemsbasedonDualsimplexmethod.

[7] Problemsbasedonsensitivityanalysis.

XII. Data Mining

Theory:60lectures

COURSE OBJECTIVES:

- To introduce students to the basic concepts and techniques of Data Mining
- To develop skills of using recent data mining software for solving practical problems.
- To gain experience of doing independent study and research.
- To study the methodology of engineering legacy databases for data warehousing and data mining to derive business rules for decision support systems
- Develop and apply critical thinking, problem-solving, and decision-making skills.
- Develop and apply enthusiasm for learning. Class participation is encouraged in this course. Enriching
- Class room discussions and learning by communicating interest, suggestions for improvements, additional readings and Internet resources, is a major goal. Express diligence, enthusiasm, patience, and thoroughness in dealing with complicated analysis and procedures and less-than-perfect-constantly evolving technology.

COURSE OUTCOMES:

1.Understand data mining principles and techniques: Introduce DM as a cutting edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modelling, and identifying new trends and behaviours. Learning objectives include:

2. Building basic terminology.

3. Learning how to gather and analyze large sets of data to gain useful business understanding.

4. Learning how to produce a quantitative analysis report/memo with the necessary information to make decisions.

5. Describing and demonstrating basic data mining algorithms, methods, and tools

6. Identifying business applications of data mining

7. Overview of the developing areas - web mining, text mining, and ethical aspects of data mining.

Overview: Predictive and descriptive datamining techniques, supervised and unsupervised Learning techniques, process of knowledge discovery in databases, pre-processing methods

DataMiningTechniques: Association Rule Mining,classification and regression techniques, clustering, Scalability and data management issues in data mining algorithms,measures of interestingness

BooksRecommended:

1. PangNingTan,MichaelSteinbach,VipinKumar,Introduction to Data Mining,Pearson Education.2005.

2. Richard Roiger, Michael Geatz, Data Mining: A Tutorial Based Primer, PearsonEducation2003.

3. G.K.Gupta,Introduction to Data Mining with Case Studies,PHI,2006.

4. SomanKP,DiwakarShyam,AjayV InsightIntoDataMining:TheoryAndPractice, ,PHI,2006

Data Mining LabPractical:60lectures

Practical exercises based on concepts list edin theory.

XIII. Discipline Specific Elective:Dissertation/Projectwork

Thisoption to beofferedonlyin 6th Semester.
The students willbe allowed to work on any project based on the concepts studied in core/ electiveor skill based electivecourses. The group size should be maximum of three(03) students. Each group will be assigned a teacher as a supervisor who will handle both their theoryaswell lab classes.

Amaximumof Four(04) projects would be assigned to one teacher.

Skill Enhancement Courses (any two) (Credit: 02 each) – SEC1 to SEC2 Theory: 01,Labs: 02

Android Programming

COURSE OBJECTIVES:

In this course, you will learn about:

- Creating robust mobile applications and learn how to integrate them with other services
- Creating intuitive, reliable mobile apps using the android services and components
- Create a seamless user interface that works with different mobile screens

COURSE OUTCOMES:

After completing this course, you will be able to:

- Build enterprise level mobile applications with Kotlin on Android
- Understand both the basic and advanced concepts of Kotlin
- Understand why use Kotlin over Java
- Install and configure Android Studio
- Explain and use key Android programming concepts
- Deploy the application on Google Play
- Become a certified Android developer

Introduction: History of Android,Introduction to Android Operating Systems,Android DevelopmentTools, Android Architecture.

(2L)

OverviewofobjectorientedprogrammingusingJava:OOPs Concepts:Inheritance,Polymorphism, Interfaces, Abstract class, Threads, Overloading and Overriding, Java VirtualMachine. (4L)

DevelopmentTools: Installing and using EclipsewithADTplug-in,InstallingVirtualmachine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creatingaandroid project
–Hello Word, runon emulator, Deployiton USB-connected Android device.

(5L)

User Interface Architecture: Application context, intents, Activity life cycle, multiple screensizes.

(2L)

User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons,Spinners(Comboboxes),Images, Menu, Dialog.

(2L)

Database:Understanding of SQL itedatabase,connecting with the database.

BookRecommended:

1. Android application development for java programmers.ByJamesC.Sheusi.Publisher:CengageLearning,2013.

ONLINEREADING/SUPPORTINGMATERIAL:

1. http://www.developer.android.com
2. http://developer.android.com/about/versions/index.html
3. http://developer.android.com/training/basics/firstapp/index.html
4. http://docs.oracle.com/javase/tutorial/index.htm(Availablein the form of freedownloadableebooks also).
5. http://developer.android.com/guide/components/activities.html
6. http://developer.android.com/guide/components/fundamentals.html
7. http://developer.android.com/guide/components/intents-filters.html.
8. http://developer.android.com/training/multiscreen/screensizes.html
9. http://developer.android.com/guide/topics/ui/controls.html
10. http://developer.android.com/guide/topics/ui/declaring-layout.html
11.

SoftwareLabBasedonAndroidProgramming:

1. Create ―Hello World‖ application. That will display ―Hello World‖ in the middle ofthe screen in the emulator. Also display ―Hello World‖ in the middle of the screen inthe
   AndroidPhone.
2. Createan applicationwithloginmodule.(Checkusernameandpassword).
3. Createspinnerwithstringstakenfromresourcefolder(res>>valuefolder)andonchangin gthe spinner value,Imagewillchange.
4. Createamenu with5 options and andselected option should appearin textbox.
5. Createalistof allcoursesinyourcollegeandon selectingaparticular courseteacher-

in-charge of that course should appear at the bottom of the screen.

6. Create an application with three option buttons, on selecting a button colour of thescreenwillchange.
7. CreateandLoginapplicationasabove.Onsuccessfullogin,popupthemessage.
8. CreateanapplicationtoCreate, Insert,update,Deleteandretrieveoperationonthedatabase.

2. Programming in MATLAB (1+2Labs)

UnitI- Introductionto Programming:Components of a computer, working with numbers,Machine code,Softwarehierarchy. (2L)

UnitI-Programming Environment:MATLAB Windows,AFirstProgram,Expressions,Constants, Variablesandassignmentstatement,Arrays. (3L)

UnitIII-GraphPlots:Basicplotting,Builtinfunctions,Generatingwaveforms,Soundreplay,load andsave. (2L)

UnitIV-ProceduresandFunctions:Argumentsandreturnvalues,M-files, Formattedconsole input-output,Stringhandling. (3L)

Unit V-Control Statements: Conditional statements: If, Else, Else-if, Repetition statements:While, forloop. (2L)

UnitVI-ManipulatingText:Writingtoa text file,Readingfrom a text file, Randomisingand sortingalist, searchingalist. (2L)

UnitVII-GUIInterface: Attachingbuttonstoactions,GettingInput,SettingOutput. (2L)

RecommendedBooks:

1. MATLAB:AnIntroductionwithApplications,byAmosGilat,2ndedition,Wiley,2004,
2. C.B.Moler,NumericalComputingwithMATLAB,SIAM,2004.

Software Lab Based on MatLab:

1. Write a program to assign the following expressions to a variable A and then to print outthevalue ofA.
   a.(3+4)/(5+6)
   b. $2\pi^2$
   c. $\sqrt{2}$
   d.$(0.0000123+5.67\times10^{-3})\times0.4567\times10^{-4}$
2. Celsius temperatures can be converted to Fahrenheit by multiplying by 9, dividing by 5,and adding 32. Assign a variable called C the value 37, and implement this formula toassignavariableFtheFahrenheitequivalent of 37Celsius.
3. Set up a vector called N with five elements having the values: 1, 2, 3, 4, 5.Using N,createassignment statements foravector Xwhichwill resultin X havingthesevalues:
   a. 2, 4, 6, 8, 10
   b. 1/2, 1, 3/2, 2, 5/2
   c. 1, 1/2, 1/3, 1/4, 1/5
   d. 1, 1/4, 1/9, 1/16, 1/25

4. A supermarket conveyor belt holds an array of groceries. The price of each product (inpounds) is [0.6, 1.2 ,0.5, 1.3] ; while the numbers of each product are [3, 2 ,1 ,5]. UseMATLABto calculate thetotalbill.
5. The sortrows(x) function will sort a vector or matrix X into increasing row order. Use thisfunctionto sort a list ofnames intoalphabeticalorder.
6. The―identity‖matrixisasquarematrixthathasonesonthediagonalandzeroselsewhere. You can generate one with the eye() function in MATLAB. Use MATLAB tofindamatrixB,suchthatwhenmultipliedbymatrixA=[12;-10]theidentitymatrixI=[1 0; 0 1] is generated. That isA*B=I.
7. Create an array of N numbers. Now find a single MATLAB statement that picks out fromthat array the 1,4,9,16,…,√Nth entries, i.e. those numbers which have indices that aresquarenumbers.
8. Drawa graphthatjoinsthepoints(0,1),(4,3),(2,0)and(5,-2).
9. The seeds on a sunflower are distributed according to the formula below. Plot a smallcircleateach of thefirst1000 co-ordinates :

$$r_n = \sqrt{n}$$

$$\theta_n = \frac{137.51}{180}\pi n$$

10. Calculate10approximatepointsfromthe functiony=2xbyusingtheformulae:
    i. $x_n = n$
    ii. $y_n = 2n + \text{rand} - 0.5$

    Fita line of bestfitto these pointsusing the functionpolyfit() withdegree=1,andgenerate co-ordinates from the line of best fit using polyval(). Use the on-line help to findouthow to use thesefunctions. Plottheraw dataand the line ofbestfit.
11. Calculate and replay 1 second of a sinewave at 500Hz with a sampling rate of 11025Hz.Savethe sound to afilecalled "ex35.wav". Plotthe first 100samples.
12. Calculate andreplay a2secondchirp.Thatis,a sinusoidthatsteadilyincreasesinfrequencywith time, from say250Hzat thestart to 1000Hz at theend.
13. Buildasquarewavebyaddingtogether10oddharmonics:1f,3f,5f,etc.Theamplitudeofthenthharmonicshouldbe1/n.Displayagraphofonecycleoftheresultsuperimposedon the individualharmonics.
14. Write a function called FtoC (ftoc.m) to convert Fahrenheit temperatures into Celsius.Make sure the program has a title comment and a help page. Test from the commandwindowwith:
    i. FtoC(96)
    ii. lookforFahrenheit
    iii. helpFtoC
15. Write a program to input 2 strings from the user and to print out (i) the concatenation ofthe two strings with a space between them, (ii) a line of asterisks the same length as theconcatenatedstrings, and(iii)thereversed concatenation.Forexample:
    i. Enterstring1:Mark
    ii. Enterstring2:Huckvale
    iii. MarkHuckvale
    iv. **********
    v. elavkcuHkraM

•

HTMLProgramming

- **Unit-I:Introduction** (1L)
- **Unit-II:TheBasics** (2L)
  - oTheHead, theBody
  - o Colors,Attributes
  - oLists,ordered and unordered
- **Unit-III:Links** (3L)
  - o Introduction
  - oRelative Links,AbsoluteLinks
  - o LinkAttributes
  - oUsingthe ID AttributetoLinkWithin aDocument
- **Unit-IV:Images** (2L)
  - oPuttinganImageonaPage
  - oUsingImagesasLinks
  - oPuttinganImageintheBackground
- **UnitV:–Tables** (4L)
  - o CreatingaTable
  - o TableHeaders
  - o Captions
  - o SpanningMultiple Columns
  - o StylingTable
- **UnitVI–Forms** (3L)
  - o BasicInputandAttributes
  - o OtherKindsofInputs o StylingformswithCSS
  - o WhereTo Go FromHere

BookRecommended:

1. Virginia DeBolt , Integrated HTML and CSS A Smarter, Faster Way to LearnWiley/ Sybex,2006
2. CassidyWilliams,Camryn Williams Introduction to**HTML**andCSS,O'Reilly,2015

SoftwareLab Basedon HTML:

CreateanHTMLdocumentwiththefollowingformattingoptions:

I. Bold
II. ItalicsIII. Underline
IV. Headings(UsingH1 toH6 headingstyles)
V. Font(Type,SizeandColor)
VI. Background(Coloredbackground/Imageinbackground)
VII. Paragraph
VIII. LineBreak
IX. HorizontalRule
X. Pretag

I. Ordered List
II. UnorderedListIII. NestedList
IV. Image

CreateanHTMLdocument whichconsistsof:

XYZ Ltd's Update

1. Introduction
2. Company Financial Update
    - First Quarter
    - Second Quarter
    - Third Quarter
    - Fourth Quarter
3. Advertising Update
    - Result of Newspaper Campaign
    - Additions to staff
    - New Thoughts on Television
4. Human Resources Update

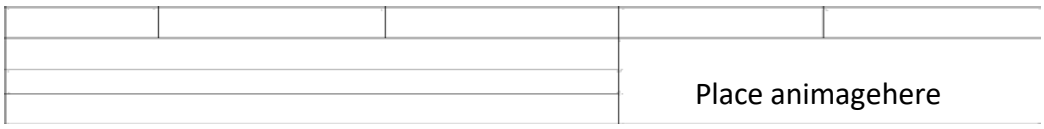
A. Saftey Considerations
    1. Body substance isolation
    2. Sense safty
    3. Initial size-up
B. Intitial Patient Assessment
    1. General Impression
    2. Unresponsiveness
        i. Alert to person, place and time
        ii. Verbal response to audible stimuli
        iii. Pain evokes verbal or physical response
        iv. Unresponsive to all stimuli
C. Patient Critical Needs
    1. Airway
    2. Breathing
        i. Use oxygen if indicated
        ii. Consider use of assisting with bag value mask
    3. Circulation
    4. Bleeding

Create an HTML document which implements Internal linking as well as External linking.
Q.4Q4CreateatableusingHTMLwhichconsistsofcolumnsforRollNo.,Student_snameandgrade.

Result		
RollNo.	Name	Grade

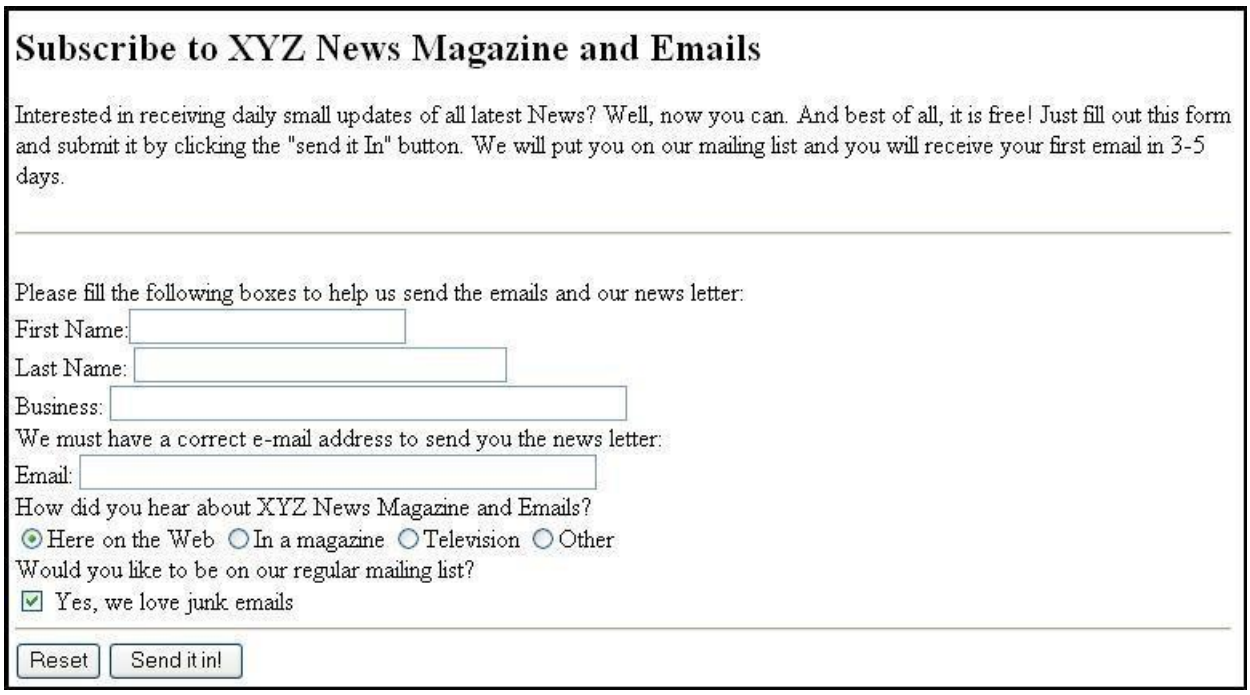
CreateaTablewith thefollowingview:

Q.6

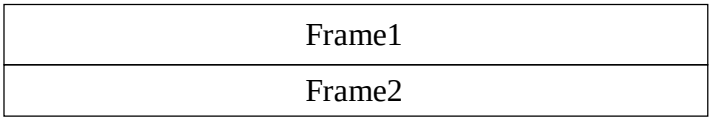


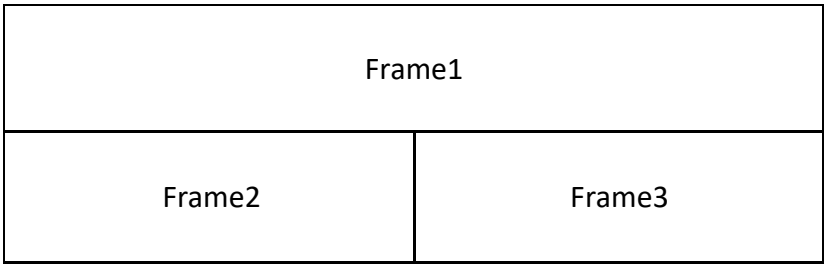
Createa formusingHTMLwhichhas the followingtypes ofcontrols:

I. TextBox
II. Option/radio buttons
III. Checkboxes
IV. ResetandSubmitbuttons



Q.7 CreateHTMLdocuments(havingmultiple frames)in the followingthreeformats:





4. XMLProgramming

Introduction: Understanding Mark-up Languages, Introduction to XML and itsGoals.(3L)

XMLBasics:XMLStructureandSyntax,Document classesandRules.(5L)

Other XML Concepts: Scripting XML, XML as Data, Linking with XML.(4L)

XMLwith Style:XSL–StyleSheetBasics, XSLbasics,XSLstylesheets.(3L)

BooksRecommended

1. XMLinactionwebtechnologybyWilliamJ.Pardi
2. Step byStepXMLbyMichael J.Young

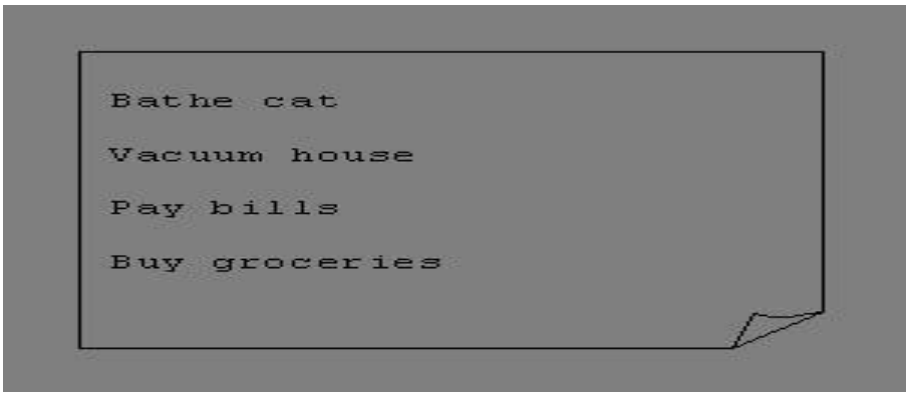
SoftwareLabBasedonXML:

Exercise#1 –InformationStructure

Inthisexercise,studentwillpracticeidentifyingthestructureofan informationobject.Forthe sampledocument provided below:

Labeltheinformationstructuresyousee,includingcontainingstructures.

1.Draw atreerepresentationofthestructure.



Exercise2#DeconstructinganXMLDocument

In this exercise, student will practice identifying the explicit structure within an XML document. Ina sense, this is the reverse of what you did in Exercise #1. For the sample XML markup below,create a document-like representation (or a simple drawing) for the content contained within theXMLtags:

<book>

<coverInfo>

<title>TheXMLHandbook</title>

<author>CharlesF.Goldfarb</author>

<author>PaulPrescod</author>

<edition>Second</edition>

<description>ThedefinitiveXMLresource:applications,products,andtechnologies.Revisedandexpanded—over600new pages.
</description>

</coverInfo>

</book>

Exercise#3 –CreatingXMLMarkup

In this exercise, create some XML markup based on the tree representation from Exercise #1above,and thecontent from theoriginal sampledocument.

Exercise#4–Well-Formedness

This exercise checks your understanding of the constraints for well-formedness. Are the followingdocumentinstances well-formed?Explain anyNOanswers.

<list><title>Thefirstlist</title><item>Anitem</list>

<item>Anitem</item><item>Anotheritem</item>

<para>Bathingacat isa<emph>relatively</emph>easytaskaslong as the cat is willing.</para>

<bibl><title>HowtoBatheaCat<author></title>MerlinBauer<author></bibl>

Exercise#5-WellFormedness

This exercise is a bit more challenging than the previous example. Here is a fragment of an XMLdocumentinstance.Identifyalltheplaceswhereitfailstomatchtheconstraintsforwell-formedness.

<PROCEDURE><TITLEHowtoBatheaCat</TITLE>

<OVERVIEW>

This procedure tells you how to bathe a cat. <WARNING></OVERVIEW>Cats don't like to takebaths. You could get hurt doing this. Be sure to obtain all the required protective gear before youstart. </WARNING><EQUIPEMENT><ITEM>Hockey Mask <ITEM>Padded Full-body KevlarArmor</ITEM><ITEM>Tub full of warm water</ITEM><ITEM>Towels </ITEM><ITEM>FirstAidkit</ITEM><ITEM>CatShampoo</ITEM><EQUIPMENT><INSTRUCTIONS><STEP>
Locate the cat, who by now is hiding under the bed.</STEP><STEP>Place the cat in the tub ofwater.</STEP><ITEM>UsingtheFirstAidkit,repairthedamagetoyourheadandarms.</STEP><STEP>Place the cat back in the tub and hold it down.</STEP><STEP>Wash itreally fast, then make an effort to dry it with the towels.</STEP><STEP>Decide not to do thisagain.</STEP></INSTRUCTIONS>

Note:Covermore exercisesbasedonXMLProgrammingtheory concepts.

5. Oracle(SQL/PL-SQL) (1+2 Lab)

Introduction to Oracle as RDBMS

SQLVs. SQL*Plus:

SQLCommandsandDatatypes,Operators andExpressions,IntroductiontoSQL*Plus.(2L)
ManagingTablesandData:

- CreatingandAlteringTables(Includingconstraints)
- DataManipulationCommandlikeInsert,update,delete
- SELECTstatementwithWHERE,GROUPBYandHAVING,ORDERBY,DISTINCT,Specialoperatorlike IN,ANY,ALL BETWEEN,EXISTS, LIKE
- Join,Built infunctions (4L)

OtherDatabaseObjects

- View
- Synonyms, Index (2L)

TransactionControlStatements

- Commit,Rollback,Savepoint (2L)

IntroductiontoPL/SQL

- SQLv/sPL/SQL
- PL/SQLBlockStructure
- LanguageconstructofPL/SQL(Variables,BasicandCompositeDatatype,Conditionsloopingetc.)
- %TYPE and %ROWTYPE
- UsingCursor(Implicit,Explicit) (5L)

BooksRecommended:

1. IvanBayross,"SQL,PL/SQLtheProgramming LanguageofOracle Paperback",BPBPublicatins, 2010.

2. StevenFeuerstein,Bill Pribyl ,"Oracle PL/SQLProgramming",6th Edition, O'ReillyMedia,2014.

3. RajeebC.Chatterjee,"LearningOracleSQLandPL/SQL:AsimplifiedGuide",PHI,2012.

4. RonHardman,MichaelMclaughlin,"ExpertOraclePL/SQL",OraclePress,2005.

5. MichaelMclaughlin,"OracleDatabase11gPL/SQLProgramming",OraclePress,2008.

6. JohnWatson, RoopeshRamklass, "OCAOracleDatabase11gSQLFundamentalsIExamGuide",Oracle Press,2008.

SoftwareLabBasedonSQL/PL-SQL:

[SQLCOMMANDS]

1) SQL*formattingcommands
2) Tocreateatable,alter anddrop table.
3) Toperform select,update, insert anddelete operation inatable.
4) Tomakeuseofdifferentclausesvizwhere,groupby,having,orderby,unionandintersection,
5) Tostudydifferentconstraints.

[SQLFUNCTION]

6) Touseoraclefunctionviz aggregate,numeric,conversion,stringfunction.
7) Tounderstand use and workingwithjoins.
8) Tomakeuseoftransaction controlstatementviz rollback, commitandsavepoint.
9) Tomakeviews ofatable.
10) To makeindexes of atable.

[PL/SQL]

11) Tounderstandworkingwith PL/SQL

12) Toimplement Cursoron atable.
13) Toimplementtriggeron a table

6.Programming in Python

Planning the ComputerProgram: Concept of problem solving,Problem definition,Programdesign,Debugging,Types of errors in programming,Documentation. (2L)

Techniques of Problem Solving : Flowcharting, decisiontable, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-upp rogramming.

(2L)

Overviewof Programming: Structure of a Python Program,Elements of Python

(3L)

Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Indentation. Atoms, Identifiers and keywords ,Literals, Strings, Operators (Arithmetic operator,Relationa loperator,Logicalor Boolean operator,Assignment,Operator,Ternary operator,Bitwise operator, IncrementorDecrementoperator). (4L)

Creating Python Programs : Input and Output Statements, Control statements(Branching,Looping,Conditional Statement,Exitfunction,Difference between break,continue and pass.),Defining Functions, default arguments.

(4L)

ReferenceBooks

1. T.Budd, ExploringPython, TMH, 1st Ed,2011
2. Python Tutorial/Documentationwww.python.or2015
3. AllenDowney,JeffreyElkner,Chris Meyers, Howto thinklikeacomputer scientist:learningwith Python ,Freelyavailableonline.2012
4. http://docs.python.org/3/tutorial/index.html
5. http://interactivepython.org/courselib/static/pythonds
6. http://www.ibiblio.org/g2swap/byteofpython/read/

SoftwareLabBasedonPython:

Section:A (Simpleprograms)

1. Write a menu driven program to convert the given temperature from Fahrenheit toCelsiusand viceversadependingupon userschoice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each ofthe three subjects are to be input by the user. Assign grades according to the followingcriteria:

   GradeA:Percentage>=80

   GradeB:Percentage>=70and <80 Grade C: Percentage>=60and <70 Grade D: Percentage>=40and<60GradeE :Percentage<40
3. Write a menu-driven program, using user-defined functions to find the area ofrectangle,square,circleand triangle byacceptingsuitable input paramters fromuser.
4. WAPto displaythe firstn terms ofFibonacciseries.
5. WAPtofindfactorialof thegivennumber.
6. WAPto find sum of thefollowingseriesforn terms:1– 2/2!+3/3! ---------- n/n!
7. WAPtocalculate thesumand productoftwo compatiblematrices.

Section:B(VisualPython):

Alltheprogramsshouldbewrittenusinguserdefinedfunctions,whereverpossible.

1. Writeamenu-drivenprogramtocreatemathematical3DobjectsI. curve
   II. sphere
   III. cone
   IV. arrow
   V. ring
   VI. cylinder.
2. WAPto readn integersand displaythem asahistogram.
3. WAPtodisplaysine,cosine,polynomial and exponentialcurves.
4. WAPtoplotagraphofpeoplewithpulseratepvs.heighth.Thevaluesofpandharetobeentered bytheuser.
5. WAP to calculate the mass m in a chemical reaction. The mass m (in gms) disintegratesaccording to the formula m=60/(t+2), where t is the time in hours. Sketch a graph for t vs.m, wheret>=0.
6. A population of 1000 bacteria is introduced into a nutrient medium. The population pgrowsas follows:

   P(t)=(15000(1+t))/(15+*e)*

   where the time t is measured in hours. WAP to determine the size of the population atgiventimet and plotagraph for Pvs t forthespecifiedtime interval.
7. Input initial velocity and acceleration, and plot the following graphs depicting equations ofmotion:
   I. velocitywrt time(v=u+at)
   II. distancewrttime(s=u*t+0.5*a*t*t)
   III. distancewrt velocity(s=(v*v-u*u)/2*a)
8. WAPto show aball bouncingbetween2walls.(Optional)

7.PHP Programming

COURSE OBJECTIVES:

In this course, you will learn:

- How to use PHP's built-in server to serve static resources
- How to use PHP to add some dynamic aspects to our pages
- How to use HTML forms
- The difference between GET and POST requests
- How to use cookies to store some data in the browser and pass it to the next request
- How to use a session cookie to store data on the server instead of in the browser
- How to build an authentication system
- How to restructure the project
- How to build a full CRUD interface for creating, reading, updating, and deleting tours that we will show on our website

COURSE OUTCOMES:

- Analyze PHP scripts and determine their behavior.
  Construct PHP scripts to create dynamic web content.
  Create PHP scripts capable of inserting and modifying data in a MySQL database.
  Design web pages with the ability to retrieve and present data from a MySQL database.

(1+2Lab)

IntroductiontoPHP: **(3L)**

PHP introduction,inventions and versions,important to ols and softwarerequirements(likeWebServer, Database, Editorsetc.)

PHP with other technologies, scope of

PHPBasicSyntax,PHPvariablesandconstant

s

TypesofdatainPHP,Expressions, scopesofavariable(local,global)

PHP Operators : Arithmetic, Assignment, Relational , Logical operators, Bitwise , ternaryandMODoperator.

PHPoperatorPrecedence and associativity

HandlingHTMLformwithPHP **(2L)**

CapturingFormData

GET and POST form

methodsDealing with multi value

fieldsRedirectingaformaftersubmiss

ion

PHPconditionaleventsandLoops **(3L)**

PHP IFEl seconditional statements(Nested IFandElse)
Switch case, while, Forand DoWhile Loop
Goto,Break ,Continueand exit

PHP Functions: **(3L)**

Function,Need of Function,declaration and calling of a function

PHP Function with arguments, Default Arguments in
FunctionFunction argument withcall byvalue,call byreference
Scope of Function Global and Local

StringManipulationandRegularExpression:

(3L)

Creating and accessing String , Searching & Replacing String Formatting,joining andsplittingString, StringRelated Library functionsUseand advantageof regular expression over in builtfunction Useofpreg_match(),preg_replace(),preg_split()functions in regularexpression

Array: **(3L)**

Anatomyof anArray,Creatingindexbased andAssociativearray,AccessingarrayLooping with Index based array, with associative array using each() and foreach()SomeusefulLibraryfunction

ReferenceBooks:

1. StevenHolzner,"PHP:TheCompleteReferencePaperback",McGrawHillEducation(India),2007.

2. Timothy Boronczyk, Martin E. Psinas, "PHP and MYSQL (Create-Modify-Reuse)", Wiley IndiaPrivate Limited, 2008.

3. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", 3rd Edition Paperback,O'reilly, 2014.

4. LukeWelling, LauraThompson,PHPandMySQLWebDevelopment",4th Edition,AdditionPaperback,Addison-WesleyProfesssional,2008.

5. DavidSklar,AdamTrachtenberg,"PHPCookbook:Solutions&ExamplesforPHPProgr ammers", 2014.

Software Lab Based on PHP:

1. Createa PHP page using functions for comparing three integers and print the largest number.
2. Write a function to calculate the factorial of a number(non-negative integer).Thefunction accept the numbers and argument.
3. WAPto checkwhetherthegivennumberis prime ornot.
4. CreateaPHP pagewhichacceptsstringfromuser.Aftersubmission thatpagedisplaysthereverseof providedstring.

5. WriteaPHP function thatchecks if astringis all lowercase.
6. WriteaPHPscriptthatcheckswhetherapassedstringispalindromeornot?(Apalindromeis word, phrase, or sequence that reads the same backward as forward, e.g., madam or nursesrun)
7. WAPtosortanarray.
8. WriteaPHPscript thatremoves thewhitespaces fromastring.
   Sample string : 'The quick " "
   brownfox'Expected Output :
   Thequick""brownfox
9. WriteaPHP script thatfinds out thesumof first n oddnumbers.
10. Create a login page having user name and password. On clicking submit, a welcome messageshould be displayed if the user is already registered (i.e.name is present in the database)otherwiseerrormessageshould bedisplayed.
11. WriteaPHP script that checks if astringcontains anotherstring.
12. Createasimple'birthdaycountdown'script,thescript willcount thenumberofdaysbetweencurrent dayand birthday.
13. Createascriptto constructthefollowingpattern, usingnested forloop.

*

* *

* * *

* * * *

* * * * *

14. WriteasimplePHPprogramtocheckthatemailsarevalid.
15. WAPtoprint firstn even numbers.
16. $color=array('white','green','red")
    Write aPHP script whichwill displaythecolors inthe followingway
    : Output :white,green, red,green,red,white
17. Usings witch case and dropdown list
    displaya—Hello‖messagedependingonthelanguageselectedin drop downlist.
18. WriteaPHPprogram toprintFibonacci seriesusingrecursion.
19. WriteaPHPscript toreplacethe first'the'ofthefollowingstring with'That'.

    Sample:'thequick brownfoxjumpsover thelazydog.'
    ExpectedResult: Thatquickbrownfoxjumpsoverthelazydog.

8.Linux/Unix Programming Syllabus (1+2Labs)

Introduction **(5 L)**

Whatislinux/unix Operatingsystems
DifferencebetweenlinuxandotheroperatingsystemsFeaturesandArchitecture
VariousDistributionsavailableinthemarketInstallation, Bootingand shutdown process ystem processes (an overview)External and internal commands

Creationofpartitionsin OS
Processesanditscreationphases–Fork,Exec,wait

User Management and the File System

Types of Users,Creating users,Grant ingrights Usermanagement commands File quota and various filesystems available File System Management and Layout, File permissionsLoginprocess, Managing Disk Quotas Links(hardlinks, symboliclinks)

introductionScriptingandShell (6L)

Whatisshellandvarioustypeof shell,Various editors present in linux

Different modes of operation in vi editor

What is shell script,Writing and executing the

shellscriptShellvariable(user definedand systemvariables)

System calls, Using system

callsPipesand Filters

Decision making in Shell Scripts(Ifelse,switch),

LoopsinshellFunctions

Utility programs (cut, paste, join, tr , uniq

utilities)Patternmatchingutility(grep)

ReferenceBooks:

1. Sumitabha,Das,UnixConceptsAndApplications,TataMcGraw-HillEducation,2006
2. Michael Jang RHCSA/ RHCE Red Hat Linux Certification: Exams (Ex200 & Ex300) (CertificationPress),2011
3. NemethSynder &Hein,LinuxAdministration Handbook,Pearson Education,2nd Edition,2010
4. W.RichardStevens,BillFenner,AndrewM.Rudoff,UnixNetwork

Programming,Thesockets NetworkingAPI, Vol. 1, 3rd Edition,2014

SoftwareLabBasedon Linux:

1. Writeashellscript tocheck ifthenumberenteredatthecommandlineisprimeornot.
2. Writeashellscriptto modify—call‖ comm. And to display calendars of the specified months.
3. Writeashellscripttomodify—call‖command todisplaycalendars ofthespecifiedrangeofmonths.
4. Writeashellscripttoacceptaloginname.Ifnotavalidloginnamedisplaymessage– —Enteredloginnameisinvalid‖.
5. Writeashell script to displaydate in the mm/dd/yyformat.
6. Writeashellscripttodisplayonthescreensorted outputof—who‖commandalongwiththetotal numberof users .

7. Write ashell scriptto displaythe multiplicationtable anynumber,
8. Writeashellscript to comparetwo files andif found equalasks theuser to deletetheduplicatefile.
9. Writeashellscript tofind thesumof digitsof agivennumber.

10. Write a shell script to merge the contents of three files, sort the contents and then displaythem pagebypage.
11. Writeashellscripttofindthe LCD(leastcommondivisor)oftwonumbers.
12. Writeashellscript toperform thetasks ofbasiccalculator.
13. Writeashellscript tofind thepower of agivennumber.
14. Writeashell script to find thebinomial coefficient C(n ,x).
15. Writeashell script tofind thepermutationP(n,x).
16. Writeashell script tofind thegreatest numberamongthe threenumbers.
17. Writeashell scripttofind thefactorialofa givennumber.
18. Writeashell scriptto check whetherthenumber isArmstrongornot.
19. Writeashell scriptto checkwhether thefilehave all thepermissionsornot.

Program to show the pyramid of special character

—*‖.9.R-Programming (1+2Labs)

Introduction: Overviewand HistoryofR,Getting Help,DataTy pes,Subsetting, Vectorized Operations,ReadingandWritingData. **(5L)**

ControlStructures, Functions, lapply,tapply,split,mapply,apply,CodingStandards. **(5L)**

ScopingRules,DebuggingTools,Simulation, RProfiler. **(5L)**

ReferenceBooks

1. William N. Venables and David M. Smith, An Introduction to R. Edition. 2nd NetworkTheoryLimited.2009
2. Norman Matloff, The Art of R Programming - A Tour of Statistical Software Design,NoStarch Press.2011

SoftwareLabBasedonRProgramming

1. Writeaprogramthatprints_HelloWorld_tothescreen.
2. Writeaprogramthat asksthe userforanumbernandprints thesum of the numbers 1ton
3. Writeaprogramthat printsa multiplicationtablefornumbers upto12.
4. Writeafunction thatreturns thelargest elementin alist.
5. Writeafunction thatcomputes the runningtotalofalist.
6. Write afunction that tests whetherastringis apalindrome.
7. Implementthefollowingsortingalgorithms:Selectionsort,Insertionsort,BubbleSort
8. Implementlinearsearch.
9. Implementbinarysearch.
10. Implementmatricesaddition,subtractionand Multiplication

10. Software Testing (1+2Labs)

Introduction **(4L)**

Strategic Approach to Software Testing,Test Strategies for Conventional Software, ValidationTesting,System Testing,BasicTerminologies,V Shaped Software Lifecycle Model

FunctionalTesting\Black-boxTesting **(5L)**

BoundaryValueAnalysis,Equivalence ClassTesting,DecisionTableBasedTesting

StructuralTesting\White-boxTesting **(6L)**

Basis Path Testing: Program Graph, DD Path graph, Cyclomatic Complexity, Graph Matrices,ControlFlowTesting:StatementCoverage,BranchCoverage,ConditionCoverage,PathCover age

BooksRecommended:

1. RogerS.Pressman,SoftwareEngineering:APractitioner_sApproach,SeventhEdition,McGraw HillEducation.2009

2. YogeshSingh,Software Testing,Cambridge UniversityPress.2011.

Computer Lab Based on Software Testing:

1. Write a program tha ttake three inputs(a,b&c)that represent the sides of a triangle,and the output is one of the below four:
    a. Notatriangle
    b. Scalenetriangle
    c. Isoscelestriangle
    d. Equilateraltriangle

    Generate test cases using Boundary Value Analysis, Equivalence Class Partitioning and Decision TableTesting.
    Generate test cases using Basispathtesting.Runcodecoveragetool.
2. Write a program that determines the nature of roots of a quadratic equation. Output shouldbeoneof thefollowing:-
    - Notaquadraticequation.
    - Complexroots
    - Realroots
    - Singleroots

    I. Generate test cases using Boundary Value Analysis, Equivalence Class PartitioningandDecision TableTesting.

    II. GeneratetestcasesusingBasispathtesting.

    III. Runcodecoveragetool

3. Writeaprogram thatchecks whetherthenumberis even or odd.Run codecoveragetoolandfind theamount of codebeingcovered.

4. Writeaprogram thatdynamicallyallocates memoryto10 integersusingmalloc()or calloc()and
    - Do not free memory leading to memory leaks.Verify the sameusingValgrind.
    - Now,free memory using free()at theend ofthe program to avoid memory leaks. Verify the same usingValgrind.
5. Use LoadUIloadtesting tool to test the webapplication performance.

Syllabus

For

General Elective (GE)(Minor–Computer Science)

(Choice Based CreditSystem)

GeneralElectivePapers(GE)(Minor–ComputerScience)

GE1:

Computer

FundamentalsComputerFund

amentalsLAB

GE2:

Introduction to

ProgrammingIntroductiontoProgr

ammingLAB

GE3

ComputerFundamentalsandPythonProgramming

FundamentalandProgramminginPythonLab

GE4:

Data Structure

usingPythonDataStructure LAB

Computer FundamentalsTheory:60 lectures

Introduction: Introductiontocomputersystem,uses,types. **6L**

DataRepresentation: Numbersystemsandcharacterrepresentation,binary **12L**

arithmetic

Human Computer Interface:Types of software,Operating system asuser interface,utility programs **6L**

Devices: Input and output devices(withconnectionsandpracticaldemo),keyboard,mouse, joystick,scanner, OCR, OMR, bar code reader, web camera, monitor, printer,plotter **6L**

Memory: Primary ,secondary ,auxiliary memory,RAM,ROM,cache memory,harddisks,optical disks

Computer Organisation and Architecture: C.P.U., registers, system bus, main memoryunit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces,expansioncards, ribboncables, memorychips,processors. **12L**

OverviewofEmergingTechnologies: Bluetooth,cloud computing, bigdata, datamining, mobile computing and embedded ystems. **8L**

ReferenceBooks:

1. A.Goel,ComputerFundamentals,PearsonEducation,2010.
2. P.Aksoy, L.DeNardis,Introductionto InformationTechnology,CengageLearning,2006
3. P.K.Sinha,P.Sinha,FundamentalsofComputers, BPBPublishers,2007

Computer Fundamentals
LabPractical:60 lectures
Practical exercises based on MSOffice/Open Office tools using document preparation and spreadsheet handling packages.
MSWord

1. Prepare**agrocery list**havingfour columns(Serial number,Thenameoftheproduct,quantityand price) for themonth of April,06.

    - Fontspecifications forTitle(GroceryList):14-point Arialfont inbold anditalics.
    - Theheadings of thecolumns shouldbe in 12-point andbold.
    - Therest of thedocumentshouldbein 10-pointTimes NewRoman.
    - Leavea gapof12-pointsafterthetitle.

2. Createa **telephonedirectory**.
    - Theheadingshould be16-point Arial Font inbold
    - Therest of the documentshould use10-point fontsize
    - OtherheadingsshouldUse10-pointCourierNewFont.
    - Thefootershould show thepagenumber as wellas the date lastupdated.

3. Design a**time-tableform**foryourcollege.
    - Thefirstlineshould mentionthename ofthecollegein16-pointArial Fontandshould bebold.
    - □Thesecondlineshouldgivethecoursename/teacher_sname andthe departmentin14-pointArial
    - Leavea gapof12-points.
    - Therest ofthe documentshoulduse10-pointTimes NewRomanfont.
    - ThefootershouldcontainyourspecificationsasthedesignerandDateofcreation.

4. BPBPublicationsplanstoreleaseanewbookdesignedasperyoursyllabus.Designthe **First page of the book**asperthegivenspecifications.

- Thetitleof thebook should appearin bold using20-point Arialfont.
- Thename oftheauthor and hisqualifications should bein thecenterof the pagein16-pointArial font.
- Atthebottomofthedocumentshouldbethenameofthepublisherand addressin16-point Times NewRoman.
- Thedetails ofthe offices ofthe publisher(onlylocation) shouldappearin thefooter.

5. Createthefollowingone pagedocuments.
   a. Compose a note inviting friends to a get-together at your house,Including a listofthings to bringwiththem.
   b. Designacertificatein landscapeorientationwithaborder aroundthedocument.
   c. Design aGarageSalesign.
   d. Makeasign outliningyourrules foryourbedroomat home,usinganumberedlist.

6. Createthefollowingdocuments:
   (a) Anewsletterwithaheadlineand2columnsinportraitorientation,includingatleast one imagesurrounded bytext.
   (b) Useanewsletterformattopromoteupcomingprojectsoreventsinyourclassr oomorcollege.

7. Convertfollowingtext toatable,usingcommaasdelimiterTypethefollowingas shown (do notbold).

Color, Style,
ItemBlue, A980,
VanRed, X023,
CarGreen,YL724,Tr
uckName, Age,Sex

Bob, 23, M

Linda,46,F

Tom, 29, M

9. Enterthe followingdata intoa table given onthenextpage.

Salesperson	Dolls	Trucks	Puzzles
Kennedy,Sally	1327	1423	1193
White,Pete	1421	3863	2934
Pillar,James	5214	3247	5467
York,George	2190	1278	1928
Banks,Jennifer	1201	2528	1203
Atwater,Kelly	4098	3079	2067
Pillar,James	5214	3247	5467
York,George	2190	1278	1928

Banks,Jennifer	1201	2528	1203
Atwater,Kelly	4098	3079	2067

AddacolumnRegion (values:S,N, N,S,S,S)betweentheSalesperson andDollscolumnsto the given table Sort your table data by Region and within Region by Salesperson inascendingorder:

In this exercise,you will add a new row to your table,place the word "Total"at the bottom of the Salesperson column,and sum the Dolls, Trucks,and Puzzles columns.

10. Wrappingoftextaroundtheimage.

11.FollowingfeaturesofmenuoptionmustbecoveredFILE

Completemenu

EDIT	Completemenu
VIEW	Completemenu
INSERT	Completemenu
FORMAT	Completemenu
TABLE	Completemenu
WINDOW	Completemenu
HELP	Completemenu
TOOLS	All options except Onlinecollaboration,ToolsonMacro,Templates

MSExcel

1. EntertheFollowingdatain ExcelSheet

REGIONALSALES PROJECTION

State	Qtr1	Qtr2	Qtr3	QTR4	QtrTotal	RateAmount
Delhi	2020	2400	2100	3000	15	
Punjab	1100	1300	1500	1400	20	
U.P.	3000	3200	2600	2800	17	
Haryana	1800	2000	2200	2700	15	
Rajasthan	2100	2000	1800	2200	20	

TOTALAV ERAGE

(a) Apply Formatting as follow:I.Title inTIMES NEWROMAN

ii. FontSize-14

iii. Remainingtext-ARIAL,Font Size-10

iv. StatenamesandQtr.HeadingBold,ItalicwithGrayFillColor.

v. Numbersintwodecimalplaces.

vi. Qtr.HeadingincenterAlignment.

vii. ApplyBorderto wholedata.

(b) CalculateStateandQtr.Total

(c) CalculateAverage foreachquarter

(d) CalculateAmount =Rate *Total.

2.Giventhefollowingworksheet

	A	B	C	D
1	RollNo.	Name	Marks	Grade
2	1001	Sachin	99	
3	1002	Sehwag	65	
4	1003	Rahul	41	
5	1004	Sourav	89	
6	1005	HarBhajan	56	

Calculatethe gradeofthesestudents onthebasisoffollowingguidelines:

IfMarks	ThenGrade
>=80	A+
>=60 <80	A
>=50 <60	B
<50	F

3.Giventhefollowingworksheet

	A	B	C	D	E	F	G
1	**Salesman**			**Salesin (Rs.)**			
2	No.	Qtr1	Qtr2	Qtr3	Qtr4	Total	Commission
3	S001	5000	8500	12000	9000		
4	S002	7000	4000	7500	11000		
5	S003	4000	9000	6500	8200		
6	S004	5500	6900	4500	10500		
7	S005	7400	8500	9200	8300		
8	S006	5300	7600	9800	6100		

Calculatethecommissionearned bythesalesmenonthebasis offollowingCandidates:

IfTotal Sales	**Commission**
< 20000	0% ofsales
> 20000and <25000	4% ofsales
> 25000and <30000	5.5%ofsales
> 30000and <35000	8%ofsales
>=35000	11%ofsales

Thetotalsales issum ofsalesofallthe fourquarters.

4. A company XYZ Ltd. pays a monthly salary to its employees which consists of basicsalary,allowances&deductions.Thedetailsofallowancesanddeductionsareasfollows:

Allowances

- HRADependentonBasic

  30%ofBasicifBasic<=1000

25%ofBasicifBasic>1000&Basic<=300020

%ofBasic ifBasic >3000

- DAFixedforallemployees,30%ofBasic
- Conveyance Allowance Rs. 50/- if Basic is
  <=1000Rs.75/-ifBasic >1000&Basic<=2000
  Rs.100ifBasic>2000
- EntertainmentAllowanceNILif Basicis
  <=1000Rs. 100/-if Basic >1000

Deductions

- ProvidentFund 6% ofBasic
- Group Insurance Premium Rs. 40/- if Basic is
  <=1500Rs.60/-if Basic>1500&Basic<=3000
  Rs.80/-

ifBasic>3000Calculatethefollowi

ng:

GrossSalary

=Basic+HRA+DA+Conveyance+EntertainmentTotal

deduction =ProvidentFund +GroupInsurancePremium

Net Salary =Gross Salary– TotalDeduction

5. Create PaymentTablefor afixedPrincipalamount,variablerate ofinterestsandtimeintheformatbelow:

No.ofInstalments	5%	6%	7%	8%	9%
3	XX	XX	XX	XX	XX
4	XX	XX	XX	XX	XX
5	XX	XX	XX	XX	XX
6	XX	XX	XX	XX	XX

6. UseanarrayformulatocalculateSimple Interestforgiven principalamountsgiven therateof Interest and time

Rateof Interest	8%
Time	5Years
Principal	Simple
Interest1000	?
18000	?
5200	?

7. Thefollowingtable givesyear wisesalefigureof fivesalesmeninRs.

Salesman	2000	2001	2002	2003
S1	10000	12000	20000	50000
S2	15000	18000	50000	60000
S3	20000	22000	70000	70000
S4	30000	30000	100000	80000
S5	40000	45000	125000	90000

(*a*) Calculatetotalsaleyear wise.

(*b*) Calculatethenet salemadebyeach salesman

(*c*) Calculatethemaximum sale madebythe salesman

(d) Calculatethecommission foreach salesmanunder thecondition.
(*i*) If total sales>4,00,000 give 5%commissionon total salemadebythe salesman.

(*ii*)Otherwise give2%commission.

(*e*) Draw abargraphrepresentingthe salemadebyeach salesman.

(*f*) Draw apiegraphrepresentingthesale madebysalesmanin 2000.

8. Enterthefollowingdatain ExcelSheet

PERSONAL BUDGET FOR FIRST QUARTER

MonthlyIncome(Net):1,475

EXPENSES	**JAN**	**FEB**	**MARCH**	**QUARTER TOTAL**	**QUARTER AVERAGE**
Rent600.00	600.00	600.00			
Telephone	48.25	43.50	60.00		
Utilities	67.27	110.00	70.00		
CreditCard	200.00	110.00	70.00		
Oil	100.00	150.00	90.00		
AVto Insurance	150.00				
CableTV	40.75	40.75	40.75		
MonthlyTotal					

CalculateQuartertotalandQuarteraverage.

(a) CalculateMonthlytotal.

(b) Surplus =Monthlyincome-Monthlytotal.

(c) What would betotal surplus ifmonthlyincome is1500.

(d) HowmuchdoestelephoneexpenseforMarchdifferfromquarteraverage.

(e) Createa3Dcolumngraphfortelephone andutilities.

(f) Create apie chart for monthlyexpenses.

9. Enterthefollowingdatain ExcelSheet

TOTALREVENUEEARNEDFORSAM'SBOOKSTALL

Publishername	**1997**	**1998**	**1999**	**2000**	**total**
A	Rs.1,000.00	Rs.1100.00	Rs. 1,300.00	Rs. 800.00	
B	Rs.1,500.00	Rs. 700.00	Rs. 1,000.00	Rs. 2,000.00	
C	Rs. 700.00	Rs. 900.00	Rs. 1,500.00	Rs. 600.00	
D	Rs.1,200.00	Rs. 500.00	Rs. 200.00	Rs. 1,100.00	
ERs	800.00	Rs.1,000.00	Rs.3,000.00	Rs. 560.00	

(a) Computethetotal revenueearned.

(b) Plotthelinecharttocomparethe revenueofallpublisherfor4years.

(b) ChartTitleshouldbe_TotalRevenueofsam_sBookstall(1997-2000)_

(c) Giveappropriatecategoriesandvalue axis title.

10. Generate25randomnumbers between0&100andfind theirsum,averageandcount.Howmanyno.arein range50-60

IntroductiontoProgramming

Theory:60 lectures

Introduction to C and C++ **(5Lectures)**

History of C and C++, Overview of Procedural Programming and Object-OrientationProgramming, Using main() function, Compiling and Executing Simple Programs inC++.

DataTypes,Variables,Constants,OperatorsandBasicI/O **(10Lectures)**

Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants,Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise),UsingCommentsinprograms,CharacterI/O(getc,getchar,putc,putcharetc),Formatteda ndConsole I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h,conio.hetc).

Expressions,Conditional Statements and Iterative Statements (10 Lectures) Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions),Understanding Operators Precedence in Expressions, Conditional Statements (if construct,switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements(ConditionalaswellasIterative)

Functions and Arrays (10Lectures)

Utility of functions, Call byValue, Call byReference, Functions returningvalue, Voidfunctions, Inline Functions, Return data type of functions, Functions parameters,Differentiating between Declaration and Definition of Functions, CommandLineArguments/ParametersinFunctions,FunctionswithvariablenumberofArg uments.

CreatingandUsingOneDimensionalArrays (DeclaringandDefiningan Array,Initializingan Array, Accessing individual elements in an Array, Manipulating array elements usingloops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, WorkingwithRows and Columns), Introduction to Multi-dimensional arrays

DerivedDataTypes(StructuresandUnions) (5 Lectures)

Understanding utility of structures and unions, Declaring, initializing and using simplestructuresandunions,Manipulatingindividualmembers ofstructures and unions, ArrayofStructures, Individual data members as structures, Passing and returning structures fromfunctions,Structurewithunionas members, Unionwith structures asmembers.

FileI/O,PreprocessorDirectives (8Lectures)

Opening and closing a file (use of fstream header file, ifstream, ofstream and fstream classes),ReadingandwritingTextFiles,Usingput(), get(), read()andwrite()functions,Randomaccessin files, Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif,#endif,#ifdef, #ifndef and #undef), Macros

UsingClassesinC++ (8Lectures)

Principles of Object-Oriented Programming, Defining & Using Classes, Class Constructors,ConstructorOverloading, Functionoverloadingin classes,ClassVariables&Functions,Objectsas parameters, Specifying the Protected and Private Access, Copy Constructors, Overview ofTemplateclassesand their use.

InheritanceandPolymorphism (4Lectures)

IntroductiontoInheritanceand Polymorphism

1. HerbtzSchildt, "C++: The Complete Reference", Fourth Edition, McGraw Hill.2003BjarneStroustrup, "The C++ Programming Language", 4th Edition, Addison-Wesley ,2013.
2. Addison-Wesley2014.
3. E Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-HillEducation,2008.
4. PaulDeitel,HarveyDeitel,"C++HowtoProgram",8thEdition,Prentice Hall,2011.JohnR.Hubbard,"ProgrammingwithC++",Schaum'sSeries,2ndEdition,2000 .
5. FirstCreatespaceInc.O-DPublishing,LLCUSA.2014
6. WalterSavitch,"ProblemSolvingwithC++",PearsonEducation,2007.
7. StanleyB.Lippman,JoseeLajoie,BarbaraE.Moo,"C++ Primer",PublishedbyAddison-

Introductiontoc/c++ProgrammingLab

Practical:60lectures

1. Write a program to find greatest of three numbers.
2. Write a program to find gross salary of a person
3. Write a program to find grade of a student given his marks.
4. Write a program to find divisor orfactorial ofa given number.
5. Write a program to printfirst tennaturalnumbers.
6. Write a program to printfirst teneven andoddnumbers.
7. Write a program to find grade of alist of students given their marks.
8. Create Matrix class. Write a menu-driven program to perform followingMatrixoperations (2-D arrayimplementation):
   a) Sum b)Differencec)Product d)Transpose

ComputerFundamentalsandPythonProgramming

Theory:60lectures

Introduction: Introduction to computer system,uses,types.

DataRepresentation:Number systems and character rrepresentation,binaryarithmetic

Human Computer Interface: Types of software, Operating system as user interface, utility programsMachinelanguage, Assemblylanguage, High level language

Devices & Memory: Input and output devices Primary, secondary, auxiliary memory, RAM, ROM,cache memory, hard disks, optical disks

Computer Organisation and Architecture: C.P.U., registers, system bus, main memory unit, cachememory, BIOS,UtilityPrograms,File Maintenance,Language processors,Assembler,CompilerAnd Interpreter.

Introduction to Python: Python Interpreter, Using Python as calculator, Python shell,Indentation. Atoms, Identifiers and keywords, Literals, Strings, Operators(Arithmeticoperator, Relational operator, Logical or Boolean operator, Assignment, Operator,Ternaryoperator, Bitwiseoperator,IncrementorDecrement operator)

Creating Python Programs:Input and Output Statements,Control statements(Branching, Looping, Conditional Statement, Exit function, Difference between break, continueandpass.),DefiningFunctions,defaultarguments,ErrorsandExceptions.

Iteration and Recursion: Conditional execution, Alternative execution, Nested conditionals, The return statement, Recursion, Stack diagrams for recursive functions,Multiple assignment, The while statement, Tables, Two-dimensional tables Strings andLists.

Strings and Lists: String as a compound data type, Length, Traversal and the forloop,Stringslices,Stringcomparison,Afindfunction, Loopingand counting,Listvalues, Accessing elements, List length, List membership, Lists and for loops, Listoperations,List deletion. Cloninglists, Nestedlists

Object Oriented Programming: Introduction to Classes, Objects and Methods, StandardLibraries.

FundamentalandProgramminginPythonLabPr actical: 60lectures

Basic Assignments on Office,Exceland Powerpoint

1. Using for loop, print a table of Celsius/Fahrenheit equivalences.Let c be theCelsius temperatures ranging from 0 to 100, for each value of c, print the correspondingFahrenheit temperature.
2. Using while loop, produce a table of sins, cosines and tangents. Make a variable x in rangefrom0 to 10 in steps of0.2. For each value of x, print the value of sin(x), cos(x) and tan(x).
3. Write a program that read sanintegervalueandprints—leapyear‖or—notaleapyear‖.
4. Writeaprogram thattakes apositiveinteger nand thenproducesn linesof outputshownasfollows.
   Forexampleenter asize: 5
   *
   **
   ***
   ****
   *****
5. Writeafunctionthattakesaninteger_n_asinputandcalculatesthevalueof1
   +1/1! +1/2!+1/3!+… +1/n
6. Writeafunctionthat takes aninteger inputandcalculates thefactorial ofthatnumber.
7. Writeafunctionthattakesastringinputandchecksifit_sapalindromeornot.
8. Writealistfunctiontoconvertastringintoalist,asinlist(_abc_)gives[a,b,c].
9. WriteaprogramtogenerateFibonacciseries.
10. Writeaprogramto checkwhethertheinput numberis evenorodd.

11. Writeaprogramto comparethreenumbersandprint thelargestone.
12. Writeaprogramto printfactorsofa givennumber.
13. Writeamethod to calculate GCD oftwonumbers.
14. Writeaprogram to createStack Class andimplement all its methods. (UseLists).
15. Writeaprogramto createQueue Classand implementall itsmethods. (UseLists)
16. Writeaprogramto implementlinear andbinarysearchonlists.
17. Writeaprogramto sort a list usinginsertion sort andbubble sort andselectionsort.

Data Structureusing Python
Practical:60lectures

Module01:

Informal introduction to programming,algorithms and data structures,variables,operations,controlflow-assignments, conditionals, loops, functions.

Module02

Scopein Python:local,global,nonlocalnames,Nested functions|Datastructures:Arrays,stack,queue, Heaps.

Module03
Python: types, expressions, strings, lists, tuples , Python memory model: names, mutable andimmutable values , List operations: slices etc - Binary search | Inductive function definitions:numericalandstructural induction,Elementary in ductive sorting:selection and insertion sort,In-placesorting, | Mergesort,Quicksort,Stablesorting.

Module04
Basicalgorithmicanalysis:inputsize,asymptoticnotations,complexity.

Module05

Dictionaries| More on Python functions: optional arguments, default values |Passing functions as arguments|Higher order functions on lists:map, iter, listcomprehension.

Module06

Abstract datatypes|Classes and objects inPython|"Linked"lists:Find, insert,delete |Binary searchtrees: Find, insert,delete|Height-balanced binary search trees.

Module07

Exception handling|Basic input/output |Handlingfiles|Stringprocessing.

References:
3. T.Budd, ExploringPython, TMH, 1st Ed, 2011
4. Howto thinklike acomputer scientist: learningwith Python/ AllenDowney,JeffreyElkner, Chris Meyers. 1stEdition –Freelyavailable online.2012
1. http://docs.python.org/3/tutorial/index.html
2. http://interactivepython.org/courselib/static/pythonds

Data Structure using PythonLab:

Practical 60Lectures

Write Python programs for implementing the following searching techniques.

a.Linear search

b.Binary searchc.

c.Fibonaccisearch

Write Python programs for implementing the following sorting techniques to arrange a list of integersin ascending order.

a.Bubblesort

b.Insertionsort

c.Selectionsort

Write Python programs for implementing the following sorting techniques to arrange a list of integers in ascending order.

a.Quicksort

b.Mergesort

Write Python programs to

a.Design and implement Stack and its operations using List.b.Design and implement Queue and it soperations using List.

WritePythonprogramsforthefollowing:

a.Uses Stack operations to convert infix expression into postfix expression.b.UsesStack operations for evaluating the postfix expression.

a. Write Python programs for the following operations on Single Linked List.(i)Creation(ii)insertion(iii)deletion(iv)traversal

b. To store a polynomial expression in memory using single linked list.

Writea Python program to perform the following:

a.Create a binary search tree.

b.Traverse the above binary search tree recursively in pre-order, post-order and in-order.

c.Count the number of nodes in the binary searchtree

LISTOFREFERENCEBOOKS:

1.Y Daniel Liang, –Introduction to ProgrammingusingPython‖, Pearson.

2.Benjamin Baka,David Julian, –Python Data Structuresand Algorithms‖, Packt Publishers,2017.

3.Rance D.Necaise, –Data Structures and Algorithms usingPython‖, Wiley Student Edition.

4.MartinJones,—Python forCompleteBeginners‖,2015.

5.ZedA. Shaw, –Learn Python the Hard Way: a very simple introduction to the terrifyingly beautiful world of computers and code‖,3e,Addison-Wesley, 2014.

6.HemantJain,—Problem Solvingin Data Structures and Algorithms using Python:programming interview guide‖, 2016.