



Department Vision

To provide valuable human resources to the society through Quality Technical Education and Research with moral values

Department Mission

To educate the students in Computer Science and Engineering by imparting Quality Technical Education and Research to meet the needs of profession and society with ethical values.

Programme Educational Objectives (PEOs)

- I.** A Graduate will be a successful IT professional and function effectively in multidisciplinary domains.
- II.** A Graduate will have the perspective of lifelong learning for continuous improvement of knowledge in Computer Science & Engineering, higher studies, and research.
- III.** A Graduate will be able to respond to local, national and global issues by imparting his/her knowledge of Computer Science & Engineering in Educational, Government, Financial and Private sectors.
- IV.** A Graduate will be able to function effectively as an individual, as a team member and as a team leader with highest professional and ethical standards.



Programme Outcomes (POs)

A graduate of the Computer Science and Engineering Program will demonstrate:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs)

Graduates will be able to

1. Computational skills: Apply the knowledge of Mathematics and Computational Science to solve societal problems in various domains.

2. Programming Skills: Design, Analyze and Implement various algorithms using broad range of programming languages.

3. Product Development Skills: Utilize Hardware and Software tools to develop solutions to IT problems.



Table of Contents

Sl. No.	Subject Code	Subject	Page No.
VII Semester			
1	17CS71	Web Technology and its applications	04
2	17CS72	Advanced Computer Architectures	22
3	17CS73	Machine Learning	38
4	17CS744	Unix System Programming	51
5	17CS754	Storage Area Networks	64
6	17CSL76	Machine Learning Laboratory	73
7	17CSL77	Web Technology Laboratory with mini project	74



WEB TECHNOLOGY AND ITS APPLICATIONS

Semester: VII

Year: 2017-18

Subject Title: WEB TECHNOLOGY AND ITS APPLICATIONS (CBCS)			
Subject Code	17CS71	CIE Marks	40
Number of Lecture Hours/Week	04	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS -04

Module-I

Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling.

10 Hours

Module-II

HTML Tables and Forms, Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Micro formats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multi column Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.

10 Hours

Module-III

JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, Java Script Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions.

10 Hours

Module-IV

PHP Arrays and Super globals, Arrays, \$_GET and \$_POST Super global Arrays, \$_SERVER Array, \$_FILES Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling.

10 Hours



Module-V

Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, Session State, HTML5 Web Storage, Caching, Advanced JavaScript and jQuery, JavaScript Pseudo-Classes, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services. **10 Hours**

TEXT BOOK:

- 1)Randy Connolly, Ricardo Hoar, "**Fundamentals of Web Development**", 1stEdition, Pearson Education India. (**ISBN:978-9332575271**)

REFERENCE BOOKS:

- 1) Robin Nixon, "**Learning PHP, MySQL &JavaScript with jQuery, CSS and HTML5**", 4thEdition, O'Reilly Publications, 2015. (**ISBN:978-9352130153**)
- 2) Luke Welling, Laura Thomson, "**PHP and MySQL Web Development**", 5th Edition, Pearson Education, 2016. (**ISBN:978-9332582736**)
- 3)Nicholas C Zakas, "**Professional JavaScript for Web Developers**", 3rd Edition, Wrox/Wiley India, 2012. (**ISBN:978-8126535088**)
- 4)David Sawyer Mcfarland, "**JavaScript & jQuery: The Missing Manual**", 1^s Edition, O'Reilly/Shroff Publishers & Distributors Pvt Ltd, 2014 (**ISBN:978-9351108078**)
- 5)Zak Ruvalcaba Anne Boehm, "**Murach's HTML5 and CSS3**" , 3rdEdition, Murachs/Shroff Publishers & Distributors Pvt Ltd, 2016.



WEB TECHNOLOGY AND ITS APPLICATIONS COURSE PLAN

Prerequisites:

1. Programming Fundamentals with C
2. Basic programming skills of any object oriented programming language.
3. Database Management System

Course Overview and its relevance to program:

World wide web has lots of effects on the day-to-day lives of people. The speed at which the thousands of web sites have appeared would seem to indicate the technologies used to build them were sitting on the shelf, fully developed and ready to use, even before the web was developed. The goal of this course is to provide a comprehensive introduction to the programming tools and skills required to build and maintain the server sites on the web. A wide variety of technologies are used in the construction of a web site.

This course contains the fundamentals of web, Internet and their applications. It introduces the study of markup languages like Extended Hyper Text Markup Language (XHTML) including links, lists, tables, frames and forms . Cascading Style Sheet (CSS) has quickly become a standard way of imposing style on the content specified. It includes the topics on levels of style sheets, specification formats, style classes, properties and values. The course also contains the core of Javascript, a powerful language that could be used for a variety of different applications. The topics relevant to Javascript like control statements, object arrays functions, constructors and pattern matching. The features of Javascript that are related to Hyper Text Markup Language (HTML) documents including the use of basic and Document Object Model (DOM) event and event handling model, which can be used in conjunction with the some of the elements of HTML documents are also studied. The most exciting and interesting application of Javascript are building dynamic HTML documents using DOM. It includes element positioning, moving elements, changing the visibility of elements, changing the color, style and size of text, changing the of tags, changing the stacking order of elements, etc.

It presents an introduction to Extensible Markup Language (XML), including syntax and document structure used by XML, Document Type Definitions (DTD), namespaces, schemas and display of XML documents. The course also introduces Perl, a general purpose as well as a web programming language. Basics of Perl, its syntax, control statement, pattern matching and its use in web based applications are also studied. Linking the web pages to the databases is also studied in this course.

This course provides the necessary skills required in web designing, an important aspect in the field of computer science. It helps to learn various web designing tools and their implementations with lots of examples.

Course Learning Objectives: The main objective of this course is to:

1. Provide the students with a comprehensive introduction to the web programming and skills required to build and maintain server sites on the web.
2. Provide the knowledge of fundamentals of Internet, world wide web, security and HTTP protocols.
3. Enable the students to design client side web sites using XHTML and other markup languages like XML.
4. Contemplate the core Javascript used for general purposes and also for web based application along with XHTML.
5. Provide enough knowledge to design dynamic documents by the concept of event handling
6. Aiming at providing the knowledge of using perl as a general purpose language.



7. Design Server side programs using scripting languages like PHP embedded with XHTML and able to develop the Web Application which is communicated with various Databases.
8. Enable the students to design Interactive Web Application by Ruby language using RAIL Framework.

Course Outcomes: At the end of this course students will be able to:

1. Illustrate Semantic Structure of HTML and CSS.
2. Compose forms and tables using HTML and CSS.
3. Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically
4. List the principles of object oriented development using PHP
5. Design web applications using HTML, CSS, Javascript, PHP and frameworks like jQuery, MVC, AJAX, etc.

Module-I
CHAPTER WISE PLAN

Chapter Number: 02,03	No. of Hours: 10
Title: Fundamentals to HTML ,CSS	

Learning Objectives: At the end of this chapter students will be able to:

1.	Explain the Evolution of Internet and HTML.
2.	Write Basic tags and syntax of HTML tags.
3.	Define Structure of HTML program.
4.	Introduction to CSS
5.	Box Model
6.	CSS Text Styling



Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L1	Introduction to HTML	PPT, Chalk and Board	1, 2, 3, 5, 9, 11, 12	1, 2, 3	1	T1/2, R5
L2	HTML Syntax, Structure of HTML	PPT & TPS(Think, Pair & Share)			1	T1/2, R5
L3	Inline Text Elements,Character Entity	PPT, Chalk and Board			1	T1/2, R5
L4	HTML5 Semantic Elements	Demo on System			1	T1/2, R5
L5	What is CSS and its strucure	Chalk and Board			1	T1/3, R5
L6	Selectors	PPT, Chalk and Board			1	T1/3, R5
L7	Style Interacts	PPT, Chalk and Board			1	T1/3, R5
L8	The box Model	PPT, Chalk and Board			1	T1/3, R5
L9	CSS Text Styling	PPT, Chalk and Board			1	T1/3, R5

T1: Text book No.1 in VTU Syllabus.

R5: Reference Book No.5 in VTU Syllabus.

Assignment Questions:

Assignment Questions	COs attained
Q1) Write and explain standard HTML document structure.	1
Q2) Write the tags for the following with explanation of syntax with example. a) Paragraph b)Line breaks and horizontal rule c) Headings	1
Q3) Explain how the special characters are represented in HTML with five entities at least.	1
Q4)Explain Structure of CSS .	1
Q 5)Explain CSS Text Styling.	1



MODULE-2
CHAPTER WISE PLAN

Chapter Number: 4,5	No of Hours: 10 Hours
Title: HTML-2, Advanced CSS Frameworks	

Learning Objectives: At the end of this chapter students will be able to:

1.	Write HTML Tags on image, links, lists and tables and their use.
2.	Analyze the Different form elements.
3.	Design the web page using above tags.
4.	Construct Multicolumn Layouts
5.	Create Different properties like font, color, list.
6.	Design of web page using CSS Frameworks.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L10	Lists, Tables	Chalk and Board	1, 2, 3, 5, 9, 11, 12	1,2,3	1,2	T1/4,R5/R1
L11	Forms, Form Control Element	Chalk and Board			1,2	T1/4,R5/R1
L12	Positioning Elements	Chalk and Board			1,2	T1/4,R5/R1
L13	Constructing multicolumn Layout	PPT			2	T1/4,R5/R1
L14	Approaches to CSS Layout	Chalk and Board			2	T1/5,R5
L15	Responsive Design	Chalk and Board			2	T1/5,R5
L16	Floating Elements	Chalk and Board			2	T1/5,R5
L17	CSS Frameworks	Chalk and Board			2	T1/5,R5

T1: Text book No.1 in VTU Syllabus .

R5/1: Reference Book No.5 and 1 in VTU Syllabus.



Assignment Questions:

Assignment Questions	COs attained												
Q1) What are the differences between HTML and XHTML?	1												
Q2) Write an HTML document that displays the following table. <table border="1" style="margin-left: auto; margin-right: auto;"><tr><th>Name</th><th>Roll No</th><th>Result</th></tr><tr><td>Xxx</td><td>12</td><td>72%</td></tr><tr><td>yyy</td><td>23</td><td>68%</td></tr><tr><td>zzz</td><td>68</td><td>64%</td></tr></table>	Name	Roll No	Result	Xxx	12	72%	yyy	23	68%	zzz	68	64%	1,2,5
Name	Roll No	Result											
Xxx	12	72%											
yyy	23	68%											
zzz	68	64%											
Q3) Explain the use of frames and their validation. Give an example.	1												
Q4) What is a CSS? Describe the different levels of style sheets and their precedence	2												
Q5) List and explain the variety of selector forms with example.	2,5												
Q6) Create and test an HTML document that describes an unordered list of at least 5 popular books. Use style sheet to define different list items to have different bullet types.	1,2,5												
Q7) Explain the different font properties used in style sheets with example.	2												
Q8) Create and test an HTML document that includes two images and enough text to flow around them (one on left and one on right) and continue after last image.	2,5												
Q9) Write an HTML document that has 6 short paragraphs of text that describe various aspects of Karnataka state. Define three styles p1, p2 and p3. The p1 style must use left and right margins of 20 pixels, a background color of pink and a foreground color of blue. The p2 style must use left and right margins of 30 pixels, a background color of black and a foreground color of yellow. The p3 style must use a text indent of 1cm, a background color of green and a foreground color of white. The first and fourth paragraph must use p1, the second and fifth must use p2 and the third and sixth must use p3.	1,2,5												



MODULE-3
CHAPTER WISE PLAN

Chapter Number: 06,08	No. of Hours: 10
Title: Javascript, PHP	

Learning Objectives: At the end of this chapter students will be able to:

1.	Differentiate between Java and Javascript.
2.	Explain the General Characteristics of Javascript.
3.	Syntax and Javascript Objects.
4.	Document Object Model,Javascript Events
5.	Server-side development with PHP.
6.	Web Server Responsibilities
7.	PHP Controls and Functions

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L18	Java Script Introduction	PPT		1,2,3	3	T1/6,R3/4
L19	Java Script Design Principles	Chalk and Board			3	T1/6,R3/4
L20	Types of JavaScritp (Inline,Embedded..),	PPT & TPS			3	T1/6,R3/4
L21	Syntax	Chalk and Board			3	T1/6,R3/4
L22	Javascript Objects	Chalk and Board			3	T1/6,R3/4
L23	Document Object Model	Chalk and Board			3	T1/6,R3/4
L24	Element Node Objects, Modifying Dom Element	Chalk and Board	1,2,3,5, 9,11,12		3	T1/6,R3/4
L25	Javascript Events	Chalk and Board			3	T1/6,R3/4
L26	Validating Forms	Chalk and Board			3	T1/6,R3/4
L27	Submitting Forms	Chalk and Board			3	T1/6,R3/4
L28	Server-side Development(PHP)	Chalk and Board			3	T1/8,R3
L29	Web Server Responsibilities	Chalk and Board			3	T1/8,R3
L30	Program Control and Function	Chalk and Board			3	T1/8,R3



T1: Text book No.1 in VTU Syllabus.

R3/4: Reference Book No.3 and 4 in VTU Syllabus

Assignment Questions:

Assignment Questions:	COs attained
Q1) Write HTML and javascript files for displaying a table of numbers from 5 to 15 their squares and cubes using alert.	1,3,5
Q2) Write javascript file for displaying a first n Fibonacci numbers. Read n using prompt.	3, 5
Q3) Write javascript file for reading 3 numbers using prompt. Display largest of three numbers using alert.	3,5
Q4) Write javascript file for reading a line of text using prompt. Display the words of input in alphabetical order.	3, 5
Q5) Write javascript file for finding the position of left most vowel in the given string.	3, 5
Q6) Write javascript file for finding the number with its digits in reverse order.	3,5
Q7) Explain Javascript Events in Detail	3, 5
Q8) Explain Server-side Development with PHP	3
Q9) Explain Program Control and Function of PHP	3

MODULE-4
CHAPTER WISE PLAN

Chapter Number: 09,10	No of Hours: 10
Title: PHP	

Learning Objectives: At the end of this chapter students will be able to:

1.	PHP Arrays and Superglobals
2.	PHP Files
3.	Classes and Objects in PHP
4.	Error Handling and Validation
5.	PHP Error and Exception Handling



Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L31	PHP Arrays	Chalk and Board	1,2,3,5,9,11,12	2,3	4	T1/9,R2
L32	\$_GET and \$_POST Superglobal Arrays	Chalk and Board			4	T1/9,R2
L33	Server Array	Chalk and Board			4	T1/9,R2
L34	File Handling	Chalk and Board			4	T1/9,R2
L35	PHP Classes and Objects	Chalk and Board			4	T1/10,R2
L36	Object Oriented Design	Chalk and Board			4	T1/10,R2
L37	What are Errors and Exception	Chalk and Board			4	T1/10,R2
L38	PHP Error Reporting	Chalk and Board			4	T1/10,R2
L39	PHP Error and Exception Handling	Chalk and Board			4	T1/10,R2

T1: Text book No.1 in VTU Syllabus.

R2: Reference Book No.2 in VTU Syllabus.

Assignment Questions:

Assignment Questions	COs attained
Q1) Explain the concept of PHP arrays with examples.	4,5
Q2) With the neat labeled diagram explain the logical structure of arrays.	4,5
Q3) Explain the various numeric and relational operators of PERL.	4,5
Q4) Write a PHP program to sort the arrays using asort, ksort and rsort functions.	4,5
Q5) Discuss the file operations in PHP.	4,5
Q6) Explain Error Handling and validation with an example.	4,5
Q7) Explain Error Exception Handling with an example	4,5



MODULE-5
CHAPTER WISE PLAN

Chapter Number: 13,15	No of Hours: 10
Title: AJAX,XML	

Learning Objectives: At the end of this chapter students will be able to:

1.	Web Application Problem Definition
2.	Passing information via Query Strings.
3.	HTML5 Web Storage
4.	Advanced Javascript
5.	JQuery Foundation
6.	Backbone MVC Frameworks
7.	XML Processing and Web Services
8.	XML Processing ,JSON

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L40	Passing Information via Query String in Details	PPT	1,2,3,5,9 ,11,12	1,2,3	5	T1/13,R5
L41	Cookie and Session With an Example	PPT			5	T1/13,R5
L42	Catching with an example	Chalk and Board			5	T1/13,R5
L43	Advanced JavaScript and JQuery	PPT			5	T1/13,R5
L44	Pseudo-classes	Chalk and Board			5	T1/13,R5
L45	JQuery Foundation	Chalk and Board			5	T1/13,R5
L46	Characteristics of Ajax	Chalk and Board			5	T1/15,R5
L47	Backbone of MVC Frameworks	Chalk and Board			5	T1/15,R5
L48	XML Processing	Chalk and Board			5	T1/15,R5
L49	Web Services				5	T1/15,R5
L50	Explain Overview of JSON	Chalk and Board			5	T1/15,R5

T1: Text book No.1 in VTU Syllabus.

R5: Reference Book No.5 VTU Syllabus

Assignment Questions:



Assignment Questions	COs attained
Q1) Explain Cookies and Session With An example	5
Q2) Explain HTML5 web Storage	5
Q3) Explain how entities are declared in XML?	5
Q4) What is XML name space? Give its declaration format with a complete example.	5
Q5) Explain JSON Structure	5
Q6) Explain in Detail MVC Frameworks	5
Q7) Explain Overview of Web Services	5
Q8) Explain the approaches of XML document processing.	5

WEB TECHNOLOGY AND ITS APPLICATIONS IA PORTION

I.A. TEST	UNITS	CO
IA Test -I	Module 1,Module 2	1,2,5
IA Test -II	Module 3,Module 4(5Hours)	3,4,5
IA Test -III	Module 4(5Hours),Module 5	4,5



12. WEB TECHNOLOGY AND ITS APPLICATIONS QUESTION PAPERS

USN

A	R	D	I	O	I	S	O	L	4	4
---	---	---	---	---	---	---	---	---	---	---

10CS73

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016

Programming the Web

Time: 3 hrs.

Max. Marks: 100

Note: Answer FIVE full questions, selecting at least TWO questions from each part.

PART – A

1. a. What is MIME? Explain its specifications. (04 Marks)
b. Write the General form of HTTP request and response. Explain. (08 Marks)
c. Illustrate with an example, each of the following XHTML tags
 - i) <pre>
 - ii) <blockquote>
 - iii) <a>
 - iv) <meta>(08 Marks)
2. a. Why are lists used on web pages? With an example, explain different types of lists available in XHTML. (06 Marks)
b. Explain with an example the concept of framesets and frames in building web pages (06 Marks)
c. What are selector forms? Explain with example different types of selector forms. (08 Marks)
3. a. With the help of an example, explain JavaScript's screen output and keyboard input methods. (08 Marks)
b. Explain the following objects available in JavaScript. List atleast 3 methods available with them.
 - i) Math object
 - ii) Number object
 - iii) Date object
 - iv) Array object.(08 Marks)
4. a. Discuss any two methods of Element Access in JavaScript. Give examples for both. (06 Marks)
b. With the help of an example, explain any one event associated with the following elements.
i) Body ii) Button iii)Textbox (06 Marks)
c. Explain different techniques to position elements in XHTML. What are the standard values for visibility property? How are they used? (08 Marks)

PART – B

5. a. What is DTD? What is the difference between External and Internal DTD's? Write the syntax and example for declaring elements, Attributes and Entities in a DTD. (08 Marks)
b. Illustrate with the help of a diagram the XSLT processing. (06 Marks)
c. Declare an XML document containing data of 3 Employee's (Emp_ID, Emp_Name, Emp_Desig, Emp_Age, Emp_Phone, Emp_Address) and display this XML data using CSS, with following rules:
Emp_ID in font-size 28 pts and color – Red
Emp_Name and Emp_Desig in font size 18 pts and color – Blue
Emp_Age, Emp_Phone and Emp_Address in font size 15pt and color – Black. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and / or equations written eg. $42+8=50$, will be treated as malpractice.



10CS73

- 6 a. Write a Perl program to read a number from standard input device and check if it is a prime number. Display appropriate massages. (06 Marks)

b. How are Array's declared in Perl? Demonstrate the use of 'foreach' statement on perl Array's. (06 Marks)

c. Write an XHTML and Perl program, the XHTML should define a form containing Book_AccNO, Book_Name, Book_Author, Book_Edn, and Book_Publish as textboxes and a submit and reset button. On submission to a Perl CGI, the Perl program should extract the book information and store it into the database in 'Book' table. Handle exceptions appropriately. (08 Marks)

7 a. Explain different functions available in php for handling files. Give examples for opening, closing, reading and writing to files. (08 Marks)

b. What is session tracking in web pages? With the help of an example php program demonstrate how session can be used to track number of web pages visited in a session. (08 Marks)

c. What is a Cookie? Why are they used? Which function is used in php to set a Cookie? Give an example and syntax. (04 Marks)

8 a. Explain keyboard input and screen output functions in Ruby. (04 Marks)

b. Write a Ruby program to declare an array, store in it 10 elements of type integer. Use 'for – in' statement to sum the array elements and display the sum. (06 Marks)

c. With a help of a diagram explain how rails responds to simple web requests. (04 Marks)

d. Write a note on the concept of classes and inheritance in Ruby. (06 Marks)

* * * * *



USN

--	--	--	--	--	--	--	--

10CS73

**Seventh Semester B.E. Degree Examination, June/July 2014
Programming the Web**

Time: 3 hrs.

Max. Marks:100

Note: Answer FIVE full questions, selecting atleast TWO question from each part.

PART – A

1. a. Explain HTTP and also explain web servers operation and general server characteristics. (08 Marks)
b. Explain MIME type specification in request/response transaction. Give the syntactic difference between HTML and XHTML. (08 Marks)
c. Discuss the following tags with syntax and examples : i) <pre> ii) <meta>. (04 Marks)
2. a. What are selector forms? Explain the different types of selector forms with example. (08 Marks)
b. Write document level style sheet to illustrate pseudo clauses. Discuss the conflict resolution in CSS. (08 Marks)
c. Create an XHTML document that includes atleast two images and enough text to precede the images, flow around them (one on left and one on right) and continue after the last image (Note : Use CSS tags). (04 Marks)
3. a. Explain Javascript arrays with examples. (08 Marks)
b. Write a Javascript that contains a function named validate – phoneno, which tests the phone number of the format ddd – dddd – dddddd <091 – 8256 – 1234567> and display whether the given number is valid or not using alert. (04 Marks)
c. Write a note on character and character classes. Describe briefly three major uses of javascript on the client side. (08 Marks)
4. a. Explain with example, the different approaches of addressing XHTML elements in Javascript. (05 Marks)
b. Explain the three phases of event processing in the DOM2 event model. (05 Marks)
c. Write a Javascript which displays the message when the mouse button is pressed no matter where it is on the screen. (05 Marks)
d. Explain the different types of positioning, with example. (05 Marks)

PART – B

5. a. What is the document type definition (DTD)? Describe the approach to declare elements, entities and attributer. (08 Marks)
b. Explain the purpose of XML parser. (06 Marks)
c. Describe briefly an XML name space. What are the two categories of user defined XML schema data type? (06 Marks)
6. a. Describe with example, the various types of variables in PERL. (08 Marks)
b. What is query string? How is it transmitted to the server with the GET and POST methods? (06 Marks)
c. Write a CGI program that collects the data from the form and writes it to a file (assume the form data). (06 Marks)



10CS73

- 7 a. Discuss arrays in PHP. (08 Marks)
b. Explain file operation in PHP. (06 Marks)
c. What is cookie and session tracking, how are they handled in PHP. (06 Marks)
- 8 a. With example, explain simple input and output functions in ruby. Explain code blocks and iterators. (10 Marks)
b. Discuss access – control in ruby. (05 Marks)
c. Write a ruby program to display the second smallest number in the list, along with its position in the list. (05 Marks)

* * * *



Seventh Semester B.E. Degree Examination, Dec. 2013/Jan. 2014

<http://www.pediawikiblog.com> g the Web

Time: 3 hrs.

Max. Marks: 100

Note: Answer FIVE full questions, selecting atleast TWO questions from each part.

PART – A

1. a. What is MIME? Explain his type specifications. (04 Marks)
b. Give the general form of HTTP request phase and also explain, in detail. (08 Marks)
c. Explain the different image formats, write XHTML document to illustrate use of (with all attributes). (08 Marks)

2. a. Explain the different levels of style sheets are available in CSS. (04 Marks)
b. Create XHTML document that contains student information viz name, usn, subject 1, subject 2 and subject 3. Insert values for each student in five rows. Also row background of each student should be in the different color. (08 Marks)
c. Explain following tags, with example :
i) Select ii) Frame iii) Textarea iv) Div. (08 Marks)

3. a. Explain the different primitive types in JavaScript. (06 Marks)
b. Write a JavaScript to validate the name, the name should be entered using prompt. The first and last name should note more than 10 characters and middle name must contain only initial. If so display validation corresponding name. The format is the first_name second_name third_name. There should be single white space between First_name Second_name and Third_name. (14 Marks)

4. a. Explain the different types of positioning elements, with example. (08 Marks)
b. Write XHTML and JavaScript script which has five buttons labeled five different colors. The even handler for these buttons must produce a message starting the chosen favorite color. The even handler must be implemented as a function. Whose name must be assigned to the onclick attribute of the radio button element. The chosen color must be sent to the event handler as a parameter use a onclick event to trigger a call to alert, which should display brief description of the selected color. (08 Marks)
c. Explain Navigator object, with an example. (04 Marks)

PART – B

5. a. What is DTD? What are the main advantages of XML schema over DTD s. (06 Marks)
b. Explain the three types that can be used to describe data in an element declaration, with an example each. (09 Marks)
c. How does an XSLT processor use an XSLT stylesheet with an XML document? (05 Marks)
For More Question Papers Visit - www.pediawikiblog.com

6. a. Explain the different categories of variables in Perl along, with an example. (09 Marks)
b. Write a Perl program to copy contents from one file to another. (04 Marks)
c. What is CGI? Explain CGI pm module, with an example. (07 Marks)



10CS73

- 7** a. Explain any six string functions in PHP. (06 Marks)
b. With an neat diagram, explain logical internal structure of array in PHP. (04 Marks)
c. Write a PHP functions that reads contents from a file and write into a file. (06 Marks)
d. Explain the different types of scalar types are available in PHP. (04 Marks)
- 8** a. Discuss the different pattern matching operations are available in ruby with example each. (09 Marks)
b. Explain keyboard input and screen output in ruby. (04 Marks)
c. Explain with a neat diagram, directory structure of rails 4 application. (07 Marks)

* * * *



ADVANCED COMPUTER ARCHITECTURES SYLLABUS

Semester: VII

Year: 2018-19

Subject Title: Advanced Computer Architectures	Subject Code: 15CS72
Total Contact Hours: 50	Duration of Exam : 03
SEE Marks: 60	CIE Marks : 40

Module – 1 Teaching

Hours

Theory of Parallelism: Parallel Computer Models, The State of Computing,Multiprocessors and Multicomputer ,Multivector and SIMD Computers ,PRAM and VLSI Models, Program and Network Properties ,Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanisms, System Interconnect Architectures, Principles of Scalable Performance, Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance

Laws, Scalability Analysis and Approaches. **10 Hours**

Module – 2

Hardware Technologies: Processors and Memory Hierarchy, Advanced ProcessorTechnology, Superscalar and Vector Processors, Memory Hierarchy Technology,Virtual MemoryTechnology.**10 Hours**

Module – 3

Bus, Cache, and Shared Memory ,Bus Systems ,Cache Memory Organizations,Shared Memory Organizations ,Sequential and Weak Consistency Models,Pipelining and Superscalar Techniques ,Linear Pipeline Processors ,NonlinearPipeline Processors ,Instruction Pipeline Design,Arithmetic Pipeline Design-**10 Hours**

Module – 4

Parallel and Scalable Architectures: Multiprocessors and Multicomputers,Multiprocessor System Interconnects, Cache Coherence and Synchronization,Mechanisms, Three Generations of Multicomputers ,Message-PassingMechanisms ,Multivector and SIMD Computers ,Vector Processing Principles,Multivector Multiprocessors ,Compound Vector Processing ,SIMD Computer Organizations (Upto 8.4),Scalable, Multithreaded, and Dataflow Architectures,Latency-Hiding Techniques, Principles of Multithreading, Fine-Grain Multicomputers, Scalable and Multithreaded Architectures, Dataflow and Hybrid Architectures--**10 Hours**

Module – 5

Software for parallel programming: Parallel Models, Languages, and Compilers,ParallelProgramming Models, Parallel Languages and Compilers ,DependenceAnalysis of Data Arrays ,Parallel Program Development and Environments,Synchronization and Multiprocessing Modes. Instruction and System Level,Parallelism, Instruction Level Parallelism ,Computer Architecture ,Contents,Basic Design Issues ,Problem Definition ,Model of a Typical Processor,Compiler-detected Instruction Level Parallelism ,Operand Forwarding ,Reorder Buffer, Register Renaming ,Tomasulo's Algorithm ,Branch Prediction, Limitations in Exploiting Instruction Level Parallelism ,Thread Level Parallelism. -**10 Hours**

Course outcomes: The students should be able to:

- Explain the concepts of parallel computing and hardware technologies



- Compare and contrast the parallel architectures
- Illustrate parallel programming concepts

Question paper pattern

The question paper will have ten questions.

There will be 2 questions from each module.

Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Kai Hwang and Naresh Jotwani, Advanced Computer Architecture (SIE): Parallelism, Scalability, Programmability, McGraw Hill Education 3/e. 2015

Reference Books:

1. John L. Hennessy and David A. Patterson, Computer Architecture: A quantitative approach, 5th edition, Morgan Kaufmann Elsevier,

2. ADVANCED COMPUTER ARCHITECTURES COURSE PLAN

Prerequisites:

1. Familiarity with computer organization
2. Basic concepts of cache memory and microprocessor

Course Overview and its relevance to program:

The term “architecture” in computer literature can be traced to the work of Lyle R. Johnson, Muhammad Usman Khan and Frederick P. Brooks, Jr., members in 1959 of the Machine Organization department in IBM’s main research center. Johnson had the opportunity to write a proprietary research communication about Stretch, an IBM-developed supercomputer for Los Alamos Scientific Laboratory. In computer science and computer engineering, computer architecture or digital computer organization is the conceptual design and fundamental operational structure of a computer system. It's a blueprint and functional description of requirements and design implementations for the various parts of a computer, focusing largely on the way by which the central processing unit (CPU) performs internally and accesses addresses in memory. It may also be defined as the science and art of selecting and interconnecting hardware components to create computers that meet functional, performance and cost goals.

Computer technology has made incredible progress in the roughly from last 55 years. This rapid rate of improvement has come both from advances in the technology used to build computers and from innovation in computer design.

Advanced computer architecture aims to develop a thorough understanding of high-performance and energy-efficient computers as a basis for informed software performance engineering and as a foundation for advanced work in computer architecture, compiler design, operating systems and parallel processing.

This course contains pipelined CPU architecture instruction set design and pipeline structure, dynamic scheduling using score boarding and Tomasulo's algorithm, register renaming, software instruction scheduling and software pipelining, superscalar and long-instruction-word architectures (VLIW, EPIC and Itanium), branch prediction and speculative execution.

The cache memory associativity, allocation and replacement policies, multilevel caches, cache performance issues. uniprocessor cache coherency issues are discussed with examples. Implementations of shared memory, the cache coherency problem. the bus-based 'snooping' protocol, scalable shared memory using directory-based cache coherency are explained with practical examples.



Course Learning Objectives:

The main objective of this course is to:

1. Analyze the fundamental knowledge in architecture design, pipelined processor design, and their impacts on performance.
2. Apply the fundamental knowledge in memory hierarchy.
3. Assess the communication and the computing possibilities of parallel system Architecture.

Course Learning Outcomes:

- Explain the concepts of parallel computing and hardware technologies
- Compare and contrast the parallel architectures
- Illustrate parallel programming concepts

Applications:

1. To understand various computer architectures currently used in market
2. To understand parallel programming.
3. To design new computer architectures



Module-1

Chapter Number: 1	No of Hours: 10
Module Title: Parallel computer models	

Learning Objectives: At the end of this chapter students will be able to:

1.	Describe Parallel computer models
2.	Classify Multiprocessors and Multicomputer, Multivector and SIMD Computers
3.	Explain Network Properties and Conditions of Parallelism
4.	Analyze Performance Metrics and Measures, Parallel Processing Applications
5.	Explain System Interconnect Architectures, Principles of Scalable Performance

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L1.	Theory of Parallelism: Parallel Computer Models, The State of Computing	Chalk & Board, ppt	1, 2, 4, 12	1	1	T/1
L2.	Multiprocessors and Multicomputer, Multivector and SIMD Computers	Chalk & Board, ppt		1	1	T/1
L3.	PRAM and VLSI Models	Chalk & Board, ppt		1	1	T/1
L4.	Program and Network Properties ,Conditions of Parallelism	Chalk & Board, ppt		1	1	T/1
L5.	Program Partitioning and Scheduling	Chalk & Board, ppt		1	1	T/1
L7	Program Flow Mechanisms	Chalk & Board, ppt		1	1	T/1
L8	System Interconnect Architectures, Principles of Scalable Performance	Chalk & Board, ppt		1	1	T/1
L9	Performance Metrics and Measures, Parallel Processing Applications	Chalk & Board, ppt		1	1	T/1
L10	System Interconnect Architectures, Principles of Scalable Performance, Performance Metrics and Measures,	Chalk & Board, ppt		1	1	T/1

T/1:Text book recommended in VTU syllabus and chapter 1 in that text book

Assignment Questions:



Assignment Questions	COs attained
Q1) Explain the growth in processor and computer performance using a graph.	1
Q2) Explain the different classes of computers.	1
Q3) Define computer architecture. Discuss the 7 dimensions of ISA.	1
Q4) Explain the meaning of following MIPS instructions and explain instruction formats.	1
Q5) List the most important functional requirements an architect faces.	1
Q6) Explain the different trends in technology.	1
Q7) Write the formulas for the following (i) Power _{dynamic} (ii) Energy _{dynamic} (iii) Power _{static}	1
Q8) Write the formulas for the following. (i) cost of IC (ii) cost of die (iii) dies per wafer (iv) die yield Find the die yield for a die that is 2.0 cm on a side, assuming a defect density of 0.3 per cm ² and α is 4.	1
Q9) Explain MTTF and MTTR. Calculate reliability of a redundant power supply if MTTF of Power supply is 5×10^5 hours and it takes on average 48 hours for a human operator to repair the system. Assume two power supplies are available.	1
Q10) Explain the different desktop and server benchmarks.	1



Module-2

Chapter Number: 4	No of Hours: 10
Module Title: Hardware Technologies:	

Learning Objectives: At the end of this chapter students will be able to:

1.	Explain Pipeline basics
2.	Identify different types of pipeline hazards
3.	Implement various pipeline techniques
4.	Explain the issues involved in implementing the pipeline

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L10	Hardware Technologies: Processors and Memory Hierarchy	Chalk & Board, ppt		1,2	1	T/4
L11	Advanced Processor Technology Design Space of Processors Instruction-Set Architectures , CISC Scalar Processors RISC Scalar Processors	Chalk & Board, ppt	1, 2, 3, 4,		1	T/4
L12	Instruction-Set Architectures	Chalk & Board, ppt	12		1	T/4
L13	CISC Scalar Processors	Chalk & Board, ppt			1	T/4
L14	RISC Scalar Processors	Chalk & Board, ppt			1	T/4
L15	SUPERSCALAR AND VECTOR PROCESSORS , Superscalar Processors,	Chalk & Board, ppt			1	T/4
L16	The VLIW Architecture	Chalk & Board, ppt			1	T/4
L17	Vector and Symbolic Processors	Chalk & Board, ppt			1	T/4



Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L18	MEMORY HIERARCHY TECHNOLOGY, Hierarchical Memory Technology	Chalk & Board, ppt			1	T/4
L19	Virtual Memory Models, TLB, Paging, and Segmentation	Chalk & Board, ppt			1	T/4
L20	Memory Replacement Policies	Chalk & Board, ppt			1	T/4

T/4: Text book recommended in VTU syllabus and 4 in that text book

Assignment Questions:

Assignment Questions	COs attained
Q1) What is pipelining? Explain the basics of RISC instruction set.	1
Q2) Explain the simple implementation of a RISC instruction set	1
Q3) Explain the classic five stage pipeline for RISC processor and explain the use	1
Q4) Assume that unpipelined processor has a 1ns clock cycle and that it uses 4 cycles for ALU operations and branches and 5 cycles for memory operations. Assume that the relative frequencies of these operations are 30%, 20% and 50% respectively. Suppose that due to clock skew and setup, pipelining the processor adds 0.3ns of overhead to the clock. Ignoring any latency impact, how much speedup in the instruction execution rate will we gain from a pipeline?	1
Q5) Explain the major hurdles of pipelining-pipeline hazards in brief.	1
Q6) Explain in detail the data hazard with an example.	1
Q7) Discuss branch hazards along with reducing pipeline branch penalties and scheduling branch delay slot.	1
Q8) Explain the simple implementation of MIPS with a neat diagram	1
Q9) Explain the basic pipeline for MIPS and discuss implementation of control for MIPS & branches.	1
Q10) Explain the five categories of exceptions.	1



Module-3

Chapter Number: 5	No of Hours: 10
Module Title Bus, Cache, and Shared Memory	

Learning Objectives: At the end of this chapter students will be able to:

1.	Explain ILP Concepts and challenges
2.	Explain basic compiler techniques for exposing ILP
3.	Explain Data Hazards with Dynamic Scheduling
4.	Explain Data Hazards with Hardware Based Speculation.
5.	Explain Reducing Branch Costs with Prediction.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L21	BUS SYSTEMS, Back plane Bus Specification, Arbitration Transaction and interrupt	Chalk & Board, ppt	1, 2, 3,	1,2	2	T/5
L22	Cache addressing Models, Direct Mapping and Associative Caches	Chalk & Board, ppt	4, 12		2	T/5
L23	Shared Memory Organizations ,Sequential and Weak Consistency Models ,Pipelining and Superscalar Techniques ,Linear Pipeline Processors ,Nonlinear Pipeline Processors ,Instruction Pipeline Design ,Arithmetic Pipeline Design	Chalk & Board, ppt			2	T/5
L24	Interleaved Memory Organization, Bandwidth and Fault:Tolerance	Chalk & Board, ppt			2	T/5
L25	Atomicity and Event Ordering, Sequential Consistency Model	Chalk & Board, ppt			2	T/5
L26	Linear PIPELINE PROCESSORS, Asynchronous and Synchronous Models	Chalk & Board, ppt			2	T/5
L27	NONLINEAR PIPELINE PROCESSORS, Reservation and Latency Analysis,	Chalk & Board, ppt			2	T/5
L28	Collision-Free Scheduling	Chalk & Board, ppt			2	T/5
L29	Pipeline Schedule Optimization	Chalk & Board,			2	T/5



Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
		ppt				
L30	The state transition diagram for a pipeline unit	Chalk & Board, ppt			2	T/5

T/5:Text book recommended in VTU syllabus and chapter 5 in that text book

Assignment Questions:

Assignment Questions:	COs attained
Q1) What is ILP? What are the ILP Concepts and challenges?	2
Q2) Discuss data dependences and hazards.	2
Q3) Discuss control dependences with examples .	2
Q4) Explain the basic Compiler Techniques for exposing ILP Examples.	2
Q5) Explain the methods for reducing branch costs with prediction.	2
Q6) Explain the method for overcoming Data hazards with Dynamic scheduling.	2
Q7) Explain the various fields in reservation station with an example.	2
Q8) Explain tomasulo algorithm using loop based example.	2
Q9) Explain hardware-based speculation and explain the basic structure of a FP	2



Module-4

Chapter Number: 7	No of Hours:10
Unit Title: Parallel scalable architectures	

Learning Objectives: At the end of this chapter students will be able to:

1.	Exploit ILP using multiple issue and static scheduling
2.	Exploit ILP using Dynamic scheduling
3.	Apply Advanced Techniques for Instruction delivery and Speculation
4.	Exploit ILP in Intel Pentium 4

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L31	Parallel and Scalable Architectures: Multiprocessors and Multicomputers,Multiprocessor System Interconnects	Chalk & Board	1, 2, 4, 12	1,2	2	T/7
L32	Cache Coherence and Synchronization,Mechanisms	Chalk & Board		2	T/7	
L33	Three Generations of Multicomputers ,Message-PassingMechanisms	Chalk & Board		2	T/7	
L33	Multivector and SIMD Computers	Chalk & Board		2	T/7	
L35	Vector Processing Principles,Multivector Multiprocessors	Chalk & Board		2	T/7	
L36	Compound Vector Processing ,SIMD Computer Organizations (Upto 8.3),	Chalk & Board		2	T/7	
L37	Scalable, Multithreaded, and Dataflow Architectures	Chalk & Board		2	T/7	
L38	Latency-Hiding Techniques, Principles of Multithreading	Chalk & Board		2	T/7	
L39	Fine-Grain Multicomputers, Scalable and Multithreaded Architectures	Chalk & Board		2	T/7	
L40	Dataflow and Hybrid Architectures	Chalk & Board		2	T/7	

T/7:Text book recommended in VTU syllabus and chapter 7 in that text book

Assignment Questions:



Assignment Questions		COs attained
Q1) List the five primary approaches in use for multiple-issue processors and their primary characteristics.		2
Q2) Explain the basic VLIW approach for exploiting ILP using an example.		2
Q3) Explain exploiting ILP using dynamic scheduling, multiple issue and speculation		2
Q4) Explain increasing instruction fetch bandwidth for instruction delivery and Speculation		2
Q5) Explain increasing instruction fetch bandwidth for instruction delivery and Speculation.		2
Q6) Explain the Pentium 4 micro architecture with a neat diagram		2
Q7) List the important characteristics of the Intel Pentium 4 640		2
Q8) Explain the analysis of the performance of the Pentium 4.		2

Module -5
CHAPTER WISE PLAN

Chapter Number: 10	No of Hours: 10
Title: Software for parallel programming	

Learning Objectives: At the end of this chapter students will be able to:

1) Explain Different Parallel programming techniques.
2) Compare and Contrast Various parallel programming methods.
3) Illustrate working of various softwares and parallel programming models.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L41	Software for parallel programming: Parallel Models, Languages, and Compilers	Chalk & Board	1,2,4,12	1	3	T/10
L42	Parallel Programming Models, Parallel Languages and Compilers	Chalk & Board			3	T/10
L43	Parallel Program Development and Environments	Chalk & Board			3	T/10
L44	Synchronization and Multiprocessing Modes. Instruction and System Level, Parallelism	Chalk & Board			3	T/10



Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Reference Book/ Chapter No.
L44	Synchronization and Multiprocessing Modes. Instruction and System Level, Parallelism;	Chalk & Board			3	T/10
L46	Instruction Level Parallelism, Computer Architecture	Chalk & Board			3	T/10
L47	Contents, Basic Design Issues, Problem Definition, Model of a Typical Processor	Chalk & Board			3	T/10
L48	Compiler-detected Instruction Level Parallelism, Operand Forwarding, Reorder Buffer	Chalk & Board			3	T/10
L49	Register Renaming, Tomasulo's Algorithm, Branch Prediction	Chalk & Board			3	T/10
L50	Limitations in Exploiting Instruction Level Parallelism, Thread Level Parallelism	Chalk & Board			3	T/10

T/10: Text book recommended in VTU syllabus and chapter 10 in that text book

Assignment Questions:

Assignment Questions	COs attained
Q1) Explain the taxonomy of parallel architectures and draw the basic structure of shared memory and distributed memory multiprocessor	3
Q2) Suppose you want to achieve a speedup of 80 with 100 processors. What fraction of the original computation can be sequential?	3
Q3) What is multiprocessor cache coherence? Explain with an example.	3
Q4) What are the basic schemes for enforcing coherence? Explain in brief.	3
Q5) Explain Snooping protocols and basic implementation techniques with an example	3



Assignment Questions	COs attained
Q6) Explain Performance of symmetric shared-memory multiprocessors for a commercial workload	3
Q7) Explain distributed shared memory and directory-based coherence with an example protocol.	3
Q8) Explain basics of synchronization	3
Q9) Explain Models of Memory Consistency	3

ADVANCED COMPUTER ARCHITECTURES IA PORTION

I.A. TEST	UNITS
IA Test –I	Module -I, Module-II
IA Test –II	Module-III ,Module-IV
IA Test –III	Module-V



VTU Question Papers

USN

--	--	--	--	--	--	--	--

10CS74

Seventh Semester B.E. Degree Examination, Dec. 2013/Jan. 2014 Advanced Computer Architecture

Time: 3 hrs.

Max. Marks: 100

Note: Answer FIVE full questions, selecting atleast TWO questions from each part.

PART – A

1. a. List and explain four important technologies which have led to the improvements in computer system. (10 Marks)
b. Give a brief explanation about trends in power in integrated circuits and cost. (10 Marks)
2. a. With a neat diagram, explain the classic five stage pipeline for a RISC processor. (10 Marks)
b. What are the major hurdles of pipelining? Illustrate the branch hazards, in detail. (10 Marks)
3. a. Mention the techniques used to reduce branch costs. Explain static and dynamic branch prediction used for same. (08 Marks)
b. What are data dependencies? Mention the different types of data dependencies. Explain name dependences, with example. (06 Marks)
c. What is correlating predictors? Explain with example. (06 Marks)
4. a. Explain the basic VLIW approach for exploiting ILP, using multiple issues. (08 Marks)
b. What are the key issues in implementing advanced speculation techniques? Explain in detail. (08 Marks)
c. Write a note on value predictors. (04 Marks)

PART – B

Important Note : 1. No referencing is allowed.
2. Any revealing of identification, appeal to evaluator and /or equations written e.g. $42+8 = 50$, will be treated as malpractice.

5. a. Explain the different taxonomy of parallel architecture. (08 Marks)
b. With a neat diagram, explain the basic structure of a centralized shared memory and distributed shared memory multiprocessor. (06 Marks)
c. Explain snooping with respect to cache – coherence protocol. (06 Marks)
6. a. Assume we have a computer where CPI is 1.0 when all memory accesses hit in the cache. The only data accesses are loads and stores, and these total 50% of the instructions. If the miss penalty is 25 cycles and miss rate is 2% how much faster would be computer if all instructions were cache hits? (08 Marks)
b. Briefly explain four basic cache optimization methods. (12 Marks)
7. a. Which are the major categories of advanced optimizations of cache performance? Explain any one in detail. (10 Marks)
b. Explain in detail, the architecture support for protecting processes from each other via virtual memory. (10 Marks)
8. a. Explain detecting and enhancing loop level parallelism for VLIW. (06 Marks)
b. Explain intel – IA – 64 architecture, with a neat diagram. (06 Marks)
c. Explain hardware support for exposing parallelism for VLIW and EPIC. (08 Marks)



USN

--	--	--	--	--	--	--

06CS81

Eighth Semester B.E. Degree Examination, June / July 2013
Advanced Computer Architecture

Time: 3 hrs.

Max. Marks: 100

Note: Answer any **FIVE** full questions, selecting atleast **TWO** question from each part.

PART - A

1. a. Define Computer Architecture. Illustrate the seven dimensions of an ISA. (08 Marks)
b. Assume a disk subsystem with the following components and MTTF.
i) 10 Disk, each rated at 1000000 – hours MTTF ii) 1 SCSI controller 500,000 – hours MTTF
iii) 1 power supply 200,000 – hours MTTF iv) 1 Fan 200,000 – hours MTTF
v) 1 SCSI cable 1,000,000 – hours MTTF. Using the simplifying assumptions that the life times are exponentially distributed and that failure are independent. Compute the MTTF of the system as a whole. (04 Marks)
c. We will run two applications on this dual Pentium but the resource requirements are not equal. The first application needs 80% of the resources and the other only 20% of the resources.
i) Given that 40% of the first application is parallelizable, how much speed up would you achieve with that application if run in isolation?
ii) Given that 99% of the second application is parallelizable, how much speed up would this application observe if run in isolation?
iii) Given that 40% of the first application is parallelizable, how much overall system speed up would you observe if you parallelized it?
iv) Given that 99% of the second application is parallelizable, how much overall system speedup would you get? (08 Marks)
2. a. What is pipelining? List pipeline hazards. Explain any one in detail. (10 Marks)
b. With a neat diagram, explain the classic five stage pipeline for RISC processor. (10 Marks)
3. a. Mention the techniques used to reduce branch costs. Explain static and dynamic branch prediction used for same. (08 Marks)
b. What is data dependencies? Mention the different types of data dependencies. Explain Name dependencies with example between two instructions. (06 Marks)
c. What is correlating predictors? Explain with examples. (06 Marks)
4. a. Explain the basic VLIW approach for exploiting ILP using multiple issues. (08 Marks)
b. Write a note on value prediction. (04 Marks)
c. Mention the key issues in implementing advanced speculation techniques. Explain. (08 Marks)

PART - B

5. a. Explain any two hardware primitives to implement synchronization, with example. (10 Marks)
b. Explain the basic schemes for enforcing Coherence in a shared memory multiprocessor system. (10 Marks)
6. a. Briefly explain four basic Cache optimization methods. (10 Marks)



- b. Assume we have a computer where the Clocks Per Instruction (CPI) is 1.0. When all memory accesses hit in the Cache. The only data accesses are loads and stores and these total 30% of the Instructions. If the miss penalty is 25 clock cycles and the miss rate is 2%. How much faster would the computer be if all the Instructions were Cache hits? (10 Marks)
- 7 a. Which are the major categories of advanced optimization of Cache performance? Explain any one in detail. (10 Marks)
b. Explain internal organization of 64MB DRAM, with neat figure. (05 Marks)
c. Briefly explain how memory protection is enforced via virtual memory. (05 Marks)
- 8 a. Explain in detail the hardware support for preserving exception behavior during speculation. (10 Marks)
b. Explain Intel IA - 64 Architecture. (10 Marks)



3. Machine Learning

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)

Semester: VII

Subject Code	15CS73	CIE Marks	40
Number of Lecture Hours/Week	3	SEE Marks	60
Total Number of Lecture Hours	50	Exam Hours	03
CREDITS – 03			

Course Objectives:

This course will enable students to:

- Define machine learning and problems relevant to machine learning.
- Differentiate supervised, unsupervised and reinforcement learning
- Apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in machine learning.
- Perform statistical analysis of machine learning techniques.

Module – 1	Teaching Hours
Introduction: Well posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning.	10 Hours
Text Book1, Sections: 1.1 – 1.3, 2.1-2.5, 2.7	
Module – 2	
Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.	10 Hours
Text Book1, Sections: 3.1-3.7	
Module – 3	
Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptrons, Backpropagation algorithm.	08 Hours
Text book 1, Sections: 4.1 – 4.6	
Module – 4	
Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm.	10 Hours



Text book 1, Sections: 6.1 – 6.6, 6.9, 6.11, 6.12	
Module – 5	
Evaluating Hypothesis: Motivation, Estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms.	12 Hours
Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased-based reasoning,	
Reinforcement Learning: Introduction, Learning Task, Q Learning	
Text book 1, Sections: 5.1-5.6, 8.1-8.5, 13.1-13.3	

Course Outcomes: After studying this course, students will be able to

C473.1: Define Well Posed Problem. And design the learning system for a specific type of problems of Machine learning.

C473.2: Design the algorithms for different types of Decision tree learning.

C473.3: Apply the concepts of Artificial Neural Network (ANNs) to tune network parameters to fit a training set of input-out pairs using BACKPROPAGATION algorithm.

C473.4: Make use of Bayesian Reasoning, Bayes Theorem and Concept Learning that provides basis for learning algorithms that directly manipulate probabilities.

C473.5: Compare learning algorithms, Evaluating Hypothesis and approximate real valued or discrete valued target function using K-nearest neighbor algorithm.

C473.6: Develop skills of using recent machine learning software for solving practical problems.

Question paper pattern:

The question paper will have ten questions. There will be 2 questions from each module.

Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Tom M. Mitchell, Machine Learning, India Edition 2013, McGraw Hill Education.

Reference Books:

- 1.Trevor Hastie, Robert Tibshirani, Jerome Friedman, h The Elements of Statistical Learning, 2nd edition, springer series in statistics.
- 2.Ethem Alpaydin, Introduction to machine learning, second edition, MIT press.



Machine Learning Course Plan

1.Prerequisites:

1. Artificial Neural Network and Artificial Intelligence
2. Probability and Statistics
3. Linear and Vector Algebra
4. Python Programming

2.Course overview and its relevance to programme:

Machine learning is employed in a range of computing tasks where designing and programming explicit algorithms with good performance is difficult or infeasible; example applications include email filtering, detection of network intruders or malicious insiders working towards a data breach, optical character recognition (OCR), learning to rank, and computer vision.

Machine learning is closely related to (and often overlaps with) computational statistics, which also focuses on prediction-making through the use of computers. It has strong ties to mathematical optimization, which delivers methods, theory and application domains to the field. Machine learning is sometimes conflated with data mining, where the latter subfield focuses more on exploratory data analysis and is known as unsupervised learning.[5]:vii[9] Machine learning can also be unsupervised and be used to learn and establish baseline behavioral profiles for various entities and then used to find meaningful anomalies.

Within the field of data analytics, machine learning is a method used to devise complex models and algorithms that lend themselves to prediction; in commercial use, this is known as predictive analytics. These analytical models allow researchers, data scientists, engineers, and analysts to "produce reliable, repeatable decisions and results" and uncover "hidden insights" through learning from historical relationships and trends in the data.

3.Applications:

1. Drug Discovery/Manufacturing
2. Finance for Fraud Detection
3. Predictions in retail marketing for production recommendation.
4. Design of Intelligent systems for weather forecasting



4.MODULE WISE PLAN

MODULE-1

Text Book1, Sections: 1.1 – 1.3, 2.1-2.5, 2.7	No. of Hours: 10
Module Title: Introduction, Concept Learning	

Learning Objectives: At the end of this module students will be able to:

1.	Define well posed problem
2.	Designing a Learning system, Perspective and Issues in Machine Learning.
3.	Learn Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	Reference Book/ Chapter No.
L1	Introduction: Well posed learning problems	Chalk and Board, PPT	1 2 3 5 12	1	T1/1, R1
L2	Designing a Learning system	Chalk and Board, PPT		1	T1/1.1, R1
L3	Designing a Learning system	Chalk and Board, PPT		1	T1/1.2, R1
L4	Perspective and Issues in Machine Learning	Chalk and Board, PPT		1	T1/1.3, R1
L5	Concept Learning: Concept learning task	Chalk and Board, PPT		1	T1/2.1, R1
L6	Concept learning as search	Chalk and Board, PPT		1	T1/2.2, R1
L7	Find-S algorithm	Chalk and Board, PPT		1,6	T1/2.3, R1
L8	Version space	Chalk and Board, PPT		1	T1/2.4, R1
L9	Candidate Elimination algorithm	Chalk and Board, PPT		1,6	T1/2.5, R1
L10	Inductive Bias	Chalk and Board, PPT		1	T1/2.7, R1

T1/1-1.3: Text book No.1 in VTU Syllabus and chapter No.1.1 to 1.3 in that text book.

T1/2.1 to 2.7: Text book No.1 in VTU Syllabus and chapter No.2.1 to 2.7 in that text book.

R1: Reference Book No.1 in VTU Syllabus.

Assignment Questions:

Assignment Questions	COs attained
1. Define well posed problem. Explain with example.	1
2. Write Find-S Algorithm	1,6
3. Write and Explain Candidate Elimination Algorithm	1,6



MODULE -2

Textbook-1: Ch3	No. of Hours: 10
Module Title: Decision Tree Learning	

Learning Objectives: At the end of this module students will be able to:

1.	Represent the Decision trees
2.	Explain Basic Decision tree algorithm
3.	Solve the examples on Decision tree
4.	Elucidate hypothesis space search in decision tree learning
5.	Explain issues in decision tree learning.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	Reference Book/ Chapter No.
L11	Decision Tree Learning: Decision tree representation	Chalk and Board, PPT		1,2	T1/3.2
L12	Appropriate problems for decision tree learning	Chalk and Board, PPT		1,2,6	T1/3.3
L13	Example	Chalk and Board, PPT	1	1,2,6	
L14	Basic decision tree learning algorithm	Chalk and Board, PPT	2	1,2,6	T1/3.4
L15	Example	Chalk and Board, PPT	3	1,2	
L16	hypothesis space search in decision tree learning	Chalk and Board, PPT	4	1,2	T1/3.5
L17	Example	Chalk and Board, PPT	5	1,2,6	
L18	Inductive bias in decision tree learning	Chalk and Board, PPT	9	1,2	T1/3.6
L19	Example	Chalk and Board, PPT	12	1,2,6	
L20	Issues in decision tree learning.	Chalk and Board, PPT		1,2	T1/3.7

T1/3.1-3.7: Text book No.1 in VTU Syllabus and chapter No.3 in that text book.



Assignment Questions:

Assignment Questions	COs attained																												
<p>1. Give decision trees to represent the following boolean functions:</p> <p>(a) A A -B (b) A V [B A C] (c) A XOR B (d) [A A B] v [C A D]</p> <p>Consider the following set of training examples:</p> <table border="1" style="margin-left: auto; margin-right: auto;"><thead><tr><th style="text-align: center;">Instance</th><th style="text-align: center;">Classification</th><th style="text-align: center;">a_1</th><th style="text-align: center;">a_2</th></tr></thead><tbody><tr><td style="text-align: center;">1</td><td style="text-align: center;">+</td><td style="text-align: center;">T</td><td style="text-align: center;">T</td></tr><tr><td style="text-align: center;">2</td><td style="text-align: center;">+</td><td style="text-align: center;">T</td><td style="text-align: center;">T</td></tr><tr><td style="text-align: center;">3</td><td style="text-align: center;">-</td><td style="text-align: center;">T</td><td style="text-align: center;">F</td></tr><tr><td style="text-align: center;">4</td><td style="text-align: center;">+</td><td style="text-align: center;">F</td><td style="text-align: center;">F</td></tr><tr><td style="text-align: center;">5</td><td style="text-align: center;">-</td><td style="text-align: center;">F</td><td style="text-align: center;">T</td></tr><tr><td style="text-align: center;">6</td><td style="text-align: center;">-</td><td style="text-align: center;">F</td><td style="text-align: center;">T</td></tr></tbody></table> <p>2.</p> <p>(a) What is the entropy of this collection of training examples with respect to the target function classification?</p> <p>(b) What is the information gain of a_2 relative to these training examples?</p>	Instance	Classification	a_1	a_2	1	+	T	T	2	+	T	T	3	-	T	F	4	+	F	F	5	-	F	T	6	-	F	T	2
Instance	Classification	a_1	a_2																										
1	+	T	T																										
2	+	T	T																										
3	-	T	F																										
4	+	F	F																										
5	-	F	T																										
6	-	F	T																										
True or false: If decision tree D2 is an elaboration of tree D1, then D1 is more general-than D2. Assume D1 and D2 are decision trees representing arbitrary boolean functions, and that D2 is an elaboration of D1 if ID3 could extend D1 into D2. If true, give a proof; if false, a counterexample	2																												
<p>ID3 searches for just one consistent hypothesis, whereas the CANDIDATEELIMINATION algorithm finds all consistent hypotheses. Consider the correspondence between these two learning algorithms.</p> <p>(a) Show the decision tree that would be learned by ID3 assuming it is given the four training examples for the Enjoy Sport? target concept shown in Table 2.1 of Chapter 2.</p> <p>(b) What is the relationship between the learned decision tree and the version space (shown in Figure 2.3 of Chapter 2) that is learned from these same examples? Is the learned tree equivalent to one of the members of the version space?</p> <p>(c) Add the following training example, and compute the new decision tree. This time, show the value of the information gain for each candidate attribute at each step in growing the tree.</p>	2																												



MODULE-3

Textbook-1: Ch 4	No. of Hours: 08
Module Title: Artificial Neural Networks	

Learning Objectives: At the end of this module students will be able to:

1.	Represent Neural Network
2.	Analyze and Explain Back propagation algorithm
3.	Design perception based on ANN

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	Reference Book/ Chapter No.
L21	Introduction, Neural Network representation	chalk and Board, PPT	1 2 3 5 12	1,3	T1/4.1-4.2
L22	Example	chalk and Board, PPT		1,3	T1/4.1-4.2
L23	Appropriate problems	chalk and Board, PPT		1,3	T1/4.3
L24	Perceptrons	chalk and Board, PPT		1,3	T1/4.4
L25	Perceptrons (Continued)	chalk and Board, PPT		1,3	T1/4.4
L26	Backpropagation algorithm (Continued)	chalk and Board, PPT		1,3	T1/4.5
L27	Backpropagation algorithm (Continued)	chalk and Board, PPT		1,3	T1/4.6
L28	Backpropagation algorithm (Continued)	chalk and Board, PPT		1,3	T1/4.6

T1/4.1-4.6: Text book No.1 in VTU Syllabus and chapter No.4 in that text book.



Assignment Questions:

Assignment Questions	COs attained
1. What are the values of weights w_0 , w_1 , and w_2 for the perceptron whose decision surface is illustrated in Figure 4.3? Assume the surface crosses the x_1 axis at -1, and the x_2 axis at 2.	3
2. Design a two-input perceptron that implements the boolean function A AND B. Design a two-layer network of perceptrons that implements A XOR B.	3
3. Implement the delta training rule for a two-input linear unit. Train it to fit the target concept $-2 + X_1 + 2X_2 > 0$. Plot the error E as a function of the number of training iterations. Plot the decision surface after 5, 10, 50, 100, . . . , iterations. (a) Try this using various constant values for η and using a decaying learning rate of $\eta_i = \eta / i$ for the i th iteration. Which works better? (b) Try incremental and batch learning. Which converges more quickly? Consider both number of weight updates and total execution time.	3
4. Consider a two-layer feedforward ANN with two inputs a and b, one hidden unit c, and one output unit d. This network has five weights (w_a , w_{ab} , w_b , w_c , w_{cd}), where w_x represents the threshold weight for unit x. Initialize these weights to the values (.1, .1, .1, .1, .1), then give their values after each of the first two training iterations of the BACKPROPAGATION algorithm. Assume learning rate $\eta = .3$, momentum $\alpha = 0.9$, incremental weight updates, and the following training examples: a b d 1 0 1 0 1 0	3



MODULE -4

Textbook-1: Ch 6	No. of Hours: 10
Module Title: Bayesian Learning	

Learning Objectives: At the end of this module students will be able to:

1.	Explain Bayes theorem, Concept Learning
2.	Elucidate ML and LS error hypothesis
3.	Design Naïve Bayes Classifier
4.	Write EM Algorithm

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	Reference Book/ Chapter No.
L29	Introduction, Bayes theorem,	chalk and Board, PPT	1 2 3 4 5 12	1,4	T1/6.1-6.2
L30	Bayes theorem	chalk and Board, PPT		1,4	T1/6.2
L31	Concept Learning	chalk and Board, PPT		1,4	T1/6.3
L32	Example	chalk and Board, PPT		1,4	
L33	ML and LS error hypothesis	chalk and Board, PPT		1,4	T1/6.4
L34	ML for predicting probabilities	chalk and Board, PPT		1,4	T1/6.5
L35	MDL principle	chalk and Board, PPT		1,4	T1/6.6
L36	Naive Bayes classifier	chalk and Board, PPT		1,4	T1/6.9
L37	Bayesian belief networks	chalk and Board, PPT		1,4	T1/6.11
L38	EM algorithm	chalk and Board, PPT		1,4	T1/6.12

T1/6.1-6.12: Text book No.1 in VTU Syllabus and chapter No.6 in that text book.



Assignment Questions:

Assignment Questions	COs attained
1. Consider again the example application of Bayes rule in Section 6.2.1. Suppose the doctor decides to order a second laboratory test for the same patient, and suppose the second test returns a positive result as well. What are the posterior probabilities of cancer and -cancer following these two tests? Assume that the two tests are independent.	4
2. In the example of Section 6.2.1 we computed the posterior probability of cancer by normalizing the quantities $P(+\text{cancer}) \cdot P(\text{cancer})$ and $P(+\text{I-cancer}) \cdot P(\text{-cancer})$ so that they summed to one, Use Bayes theorem and the theorem of total probability (see Table 6.1) to prove that this method is valid (i.e., that normalizing in this way yields the correct value for $P(\text{cancer} \text{+})$).	4
3. Consider the concept learning algorithm FindG, which outputs a maximally general consistent hypothesis (e.g., some maximally general member of the version space). (a) Give a distribution for $P(h)$ and $P(D h)$ under which FindG is guaranteed to output a MAP hypothesis. (b) Give a distribution for $P(h)$ and $P(D h)$ under which Fin dG is not guaranteed to output a MAP .hypothesis. (c) Give a distribution for $P(h)$ and $P(D h)$ under which FindG is guaranteed to output a ML hypothesis but not a MAP hypothesis.	4
4. In the analysis of concept learning in Section 6.3 we assumed that the sequence of instances $(x_1 \dots x_n)$ was held fixed. Therefore, in deriving an expression for $P(D h)$ we needed only consider the probability of observing the sequence of target values $(d_1 \dots d_m)$ for this fixed instance sequence. Consider the more general setting in which the instances are not held fixed, but are drawn independently from some probability distribution defined over the instance space X. The data D must now be described as the set of ordered pairs $\{(x_i, d_i)\}$, and $P(D h)$ must now reflect the probability of encountering the specific instance x_i , as well as the probability of the observed target value d_i . Show that Equation (6.5) holds even under this more general setting. Hint: Consider the analysis of Section 6.5.	4
5. Draw the Bayesian belief network that represents the conditional independence assumptions of the naive Bayes classifier for the PlayTennis problem of Section 6.9.1. Give the conditional probability table associated with the node Wind.	4



MODULE -5

Textbook-2: Ch 5,8,& 13	No. of Hours: 12
Module Title: Evaluating Hypothesis, Instance Based Learning, Reinforcement Learning	

Learning Objectives: At the end of this module students will be able to:

1.	Estimate Hypothesis accuracy
2.	Explain Basics of sampling theorem
3.	Difference in error of two hypothesis
4.	Compare learning algorithm
5.	Explain Different algorithm on regression

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	Reference Book/ Chapter No.
L39	Motivation	chalk and Board, PPT	1 2 3 4 5 9 12	5	T1/5.1
L40	Estimating hypothesis accuracy	chalk and Board, PPT		5	T1/5.2
L41	Basics of sampling theorem	chalk and Board, PPT		5	T1/5.3
L42	General approach for deriving confidence intervals,	chalk and Board, PPT		5	T1/5.4
L43	Difference in error of two hypothesis	chalk and Board, PPT		5	T1/5.5
L44	Comparing learning algorithms.	chalk and Board, PPT		5	T1/5.6
L45	Introduction, k-nearest neighbour learning	chalk and Board, PPT		5	T1/8.1-8.2
L46	Locally weighted regression	chalk and Board, PPT		5,6	T1/8.3
L47	radial basis function	chalk and Board, PPT		5	T1/8.4
L48	cased-based reasoning	chalk and Board, PPT		5,6	T1/8.5
L49	Introduction, Learning Task,	chalk and Board, PPT		5	T1/13.1-13.2
L50	Q Learning	chalk and Board, PPT		5	T1/13.3

T1/5.1-5.6: Text book No.1 in VTU Syllabus and chapter No.5 in that text book.

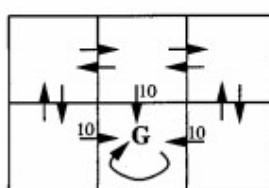
T1/8.1-8.5: Text book No.1 in VTU Syllabus and chapter No.8 in that text book.

T1/13.1-13.3: Text book No.1 in VTU Syllabus and chapter No.13 in that text book.



Assignment Questions:

Assignment Questions	COs attained
1. Suppose you test a hypothesis h and find that it commits $r = 300$ errors on a sample S of $n = 1000$ randomly drawn test examples. What is the standard deviation in errors(h)? How does this compare to the standard deviation in the example at the end of Section 5.3.4?	5
2. Consider a learned hypothesis, h , for some boolean concept. When h is tested on a set of 100 examples, it classifies 83 correctly. What is the standard deviation and the 95% confidence interval for the true error rate for Error(h)?	5
3. Give general expressions for the upper and lower one-sided N% confidence intervals for the difference in errors between two hypotheses tested on different samples of data. Hint: Modify the expression given in Section 5.5.	5,6
4. Explain why the confidence interval estimate given in Equation (5.17) applies to estimating the quantity in Equation (5.16), and not the quantity in Equation (5.14).	5,6
5. Derive the gradient descent rule for a distance-weighted local linear approximation to the target function, given by Equation (8.1)	5
6. Suggest a lazy version of the eager decision tree learning algorithm ID3 (see Chapter 3). What are the advantages and disadvantages of your lazy algorithm compared to the original eager algorithm?	5
7. Consider the deterministic grid world shown below with the absorbing goal-state G . Here the immediate rewards are 10 for the labeled transitions and 0 for all unlabeled transitions. (a) Give the V^* value for every state in this grid world. Give the $Q(s, a)$ value for every transition. Finally, show an optimal policy. Use $\gamma = 0.8$. (b) Suggest a change to the reward function $r(s, a)$ that alters the $Q(s, a)$ values, but does not alter the optimal policy. Suggest a change to $r(s, a)$ that alters $Q(s, a)$ but does not alter $V^*(s, a)$. (c) Now consider applying the Q learning algorithm to this grid world, assuming the table of Q values is initialized to zero. Assume the agent begins in the bottom left grid square and then travels clockwise around the perimeter of the grid until it reaches the absorbing goal state, completing the first training episode. Describe which Q values are modified as a result of this episode, and give their revised values. Answer the question again assuming the agent now performs a second identical episode. Answer it again for a third episode.	5





Machine Learning IA Portion

I.A. TEST	MODULES
IA Test -I	Module – 1, Module – 2(1st Half portion)
IA Test -II	Module – 2(2nd Half portion), Module – 3
IA Test -III	Module – 4, Module – 5



4. UNIX System Programming

[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018 -2019)

Semester: VII

Subject Code	15CS744	CIE Marks	40
Number of Lecture Hours/Week	3	SEE Marks	60
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03			

Course Objectives:

This course will enable students to:

- Explain the fundamental design of the UNIX operating system
- Familiarize with the systems calls provided in the UNIX environment
- Design and build an application/service over the UNIX operating system

Module – 1

08

Hours

Introduction: UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards. UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics.

Module – 2

08

Hours

UNIX Files and APIs: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links. UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.

Module – 3

08

Hours

UNIX Processes and Process Control: The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes. Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection. Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups.

Module – 4

08

Hours

Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.1b Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model

Module – 5

08

Hours



Interprocess Communication : Overview of IPC Methods, Pipes, popen, pcloseFunctions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores. Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions

Course Learning Outcomes:

The students should be able to:

- C474.1 Define the standards, file, process and signals in Unix OS.
- C474.2 Apply the use of APIs for handling different types of files.
- C474.3 Apply the use of APIs for handling different types of processes.
- C474.4 Discuss the process handling tasks, daemons and signals.
- C474.5 Apply and compare different inter process communication methods.
- C474.6 Construct the different OS and network-based applications.

Question paper pattern:

The question paper will have ten questions.

There will be 2 questions from each module.

Each question will have questions covering all the topics under a module.

The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

- 1. Unix System Programming Using C++ - Terrence Chan, PHI, 1999.
- 2. Advanced Programming in the UNIX Environment - W.Richard Stevens, Stephen A. Rago, 3rd Edition, Pearson Education / PHI, 2005.

Reference Books:

- 1. Advanced Unix Programming- Marc J. Rochkind, 2nd Edition, Pearson Education, 2005.
- 2. The Design of the UNIX Operating System - Maurice.J.Bach, Pearson Education / PHI, 1987.
- 3. Unix Internals - Uresh Vahalia, Pearson Education, 2001.



UNIX System Programming Course Plan

1.Prerequisites:

5. Operating System and Networking Concepts.
6. UNIX Kernel structure, Commands, and System calls.
7. ANSI C and C++ Programming techniques.

2.Course overview and its relevance to programme:

UNIX Systems Programming has truly become part of the computing mainstream. The UNIX environment is no longer exception; rather it is the usual practice for software applications. This course contains an advanced programming techniques using UNIX system calls and the ANSI C & C++ programming language concepts . This course promote users to write sophisticated & better understanding applications to manipulate system resources(e.g., files, processes, and System information), and to design new operating systems. And also it includes how to create network-based, multitasking, client/server applications which run on heterogeneous UNIX platforms.

3.Applications:

5. For developing different advanced network-based client/server applications.
6. For implementing operating systems, compilers, & distributed database systems.

4.MODULE WISE PLAN **MODULE-1**

Textbook-1: Ch 1, 5	No. of Hours: 08
Module Title: Introduction	

Learning Objectives: At the end of this module students will be able to:

1.	Express the history of the C, C++ programming language and various UNIX systems.
2.	Incorporate the UNIX, ANSI C & C++, and POSIX Standards.
3.	Analyze the difference between ANSIC and K&R C, ANSI C and C++.
4.	Evaluate the role of UNIX & POSIX APIs, Characteristics, and also special header files.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	Reference Book/ Chapter No.
L1	Introduction, UNIX and ANSI C Standards	Chalk and Board, PPT	1 2 3 4 5 9 12	1	T1/1, R1
L2	The ANSI/ISO C++ Standards, Difference between ANSI C & C++.	Chalk and Board, PPT		1	T1/1, R1
L3	The POSIX Standards,	Chalk and Board, PPT		1	T1/1, R1
L4	POSIX Feature Test Macros.	Chalk and Board, PPT		1	T1/1, R1
L5	The POSIX Compile time	Chalk and Board, PPT		1,2	T1/1, R1
L6	The POSIX Run time limits.	Chalk and Board, PPT		1,2	T1/1, R1
L7	The POSIX.1 FIPS & X/Open Standards, The UNIX and POSIX APIs.	Chalk and Board, PPT		1	T1/1, R1
L8	API Common Characteristics	Chalk and Board, PPT		1,2	T1/5, R1



T1/1: Text book No.1 in VTU Syllabus and chapter No.1 in that text book.

T1/5: Text book No.1 in VTU Syllabus and chapter No.5 in that text book.

R1: Reference Book No.1 in VTU Syllabus.

Assignment Questions:

Assignment Questions	COs attained
Q1) Explain the need for standardization of UNIX and C programming language. Bring out the major differences between ANSI C & K&R C with examples.	1
Q2) List out any five POSIX.1 and POSIX.1b defined system configuration limits in manifested constants with compile time limit, minimum value and meaning.	1,2
Q3) Write a note on POSIX.1 FIPS standard.	1
Q4) Define POSIX standard. Explain different subsets of POSIX standard. Write the structure of the program to filter-out non-POSIX compliant codes from a user program.	1
Q5) Explain the common characteristics of API and describe the error status codes.	1,2
Q6) Define the term feature test macros. Explain POSIX feature test macros.	1
Q7) Write a C/C++ POSIX complaint program that supported on any given system using feature test macros.	1,2
Q8) Define an API. Give the differences with the library functions. List the reasons, the APIs more time consuming than the library functions.	1,2
Q9) Differentiate between ANSI C and C++ standards.	1
Q10) Write a C++ program to check the following limits: i) Maximum number of child processes ii) Maximum number of files that can be opened simultaneously. iii) Maximum number of message queues that can be accessed. iv) Maximum number of real time signals. v) Maximum number of timers.	1,2



MODULE -2

Textbook-1: Ch 6,7	No. of Hours: 08
Module Title: UNIX Files and APIs	

Learning Objectives: At the end of this module students will be able to:

1.	Express the different file types and file System.
2.	Analyze the file attributes and inode concept.
3.	Evaluate the Kernel support for files.
4.	Construct the stream pointers & file descriptors and hard & symbolic links.
5.	Express the Directory file, Device file, FIFO file, & Symbolic link file APIs.
6.	Incorporate the importance of file class for Regular, Directory, FIFO, Device, & Symbolic link files.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	Reference Book/ Chapter No.
L9	File Types, The UNIX and POSIX File System.	Chalk and Board	1 2 3 4 5 9 12	1,2	T1/6
L10	THE UNIX & POSIX File Attributes, Inodes in UNIX System.	Chalk and Board		1,2	T1/6
L11	Application Program Interface to Files, UNIX Kernel Support for Files.	Chalk and Board		1,2	T1/6
L12	Relationship of C Stream Pointers and File Descriptors. Directory Files, Hard and Symbolic Links.	Chalk and Board		1,2	T1/6
L13	General File APIs	Chalk and Board		1,2	T1/7
L14	General File APIs Continued	Chalk and Board		1,2	T1/7
L15	File and Record Locking	Chalk and Board		1,2	T1/7
L16	Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.	Chalk and Board		1,2	T1/7

T1/6: Text book No.1 in VTU Syllabus and chapter No.6 in that text book.

T1/7: Text book No.1 in VTU Syllabus and chapter No.7 in that text book.



Assignment Questions:

Assignment Questions	COs attained
Q1) Explain UNIX kernel support for files with neat data structure.	2
Q2) Differentiate between hard link and symbolic links with an example.	2
Q3) Explain the different file types available in UNIX or POSIX systems.	2
Q4) List common set of attributes of a file with their meaning. List the commands needed to change the following file attributes. i) File size; ii) Last access time & modification time; iii) Hard link count; iv) User ID.	2
Q5) Define an inode. And explain inode system in detail.	2
Q6) Define named pipes. Explain with an example the use of lseek, link, and access APIs with their prototypes and arguments values.	1,2
Q7) Explain how <i>fcntl</i> API can be used for file and record locking.	2
Q8) Describe the stat structure used in stat or fstat API. Write a program to implement ls-l command.	2
Q9) Explain following APIs along with their prototype definitions: i) fstat ii) Chmod iii)creat iv)read v)write	2
Q10) Illustrate the usage of mknod and mkfifo system calls.	2



MODULE-3

Textbook-1: Ch 8	No. of Hours: 08
Textbook-2: Ch 7,8,9	
Module Title: UNIX Processes and Process Control	

Learning Objectives: At the end of this module students will be able to:

- | | |
|----|---|
| 1. | Evaluate the process initiation and termination, and also Command line arguments. |
| 2. | Express the data structure of Kernel support for processes. |
| 3. | Evaluate the race conditions, the need of exec functions. |
| 4. | Analyze the importance of process accounting & process times. |
| 5 | Incorporate the process relationships like process groups& sessions, and job control. |

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	Reference Book/ Chapter No.
L17	Introduction, main function, Process Termination. Command-Line Arguments, Environment List.	Chalk and Board	1 2 3 4 5 9 12	1,3	T2/7
L18	Memory Layout of a C Program. Shared Libraries, Memory Allocation, Environment Variables.	Chalk and Board		1,3	T2/7
L19	setjmp and longjmp Functions. getrlimit, setrlimit Functions. UNIX Kernel Support for Processes.	Chalk and Board		1,3	T2/7 T1/8
L20	Introduction, Process Identifiers, fork, v fork, and exit functions. wait, waitpid, wait3, wait4 Functions, Race Conditions.	Chalk and Board		1,3	T2/8
L21	Exec functions, Changing User IDs and Group IDs, Interpreter Files. System Function	Chalk and Board		1,3	T2/8
L22	Process Accounting. User Identification, Process Times, Process Relationships: Introduction, Terminal Logins.	Chalk and Board		1,3	T2/8,9
L23	Network Logins, Process Groups, Sessions, Controlling Terminal.	Chalk and Board		1,3	T2/9
L24	tcgetpgrp, tcsetpgrp, & tcgsetpgrp Functions, Job Control, Shell Execution of Program, Orphan process groups.	Chalk and Board		1,3	T2/9

T1/8: Text book No.1 in VTU Syllabus and chapter No.8 in that text book.

T2/7: Text book No.1 in VTU Syllabus and chapter No.7 in that text book.

T2/8: Text book No.2 in VTU Syllabus and chapter No.8 in that text book.



T2/9: Text book No.1 in VTU Syllabus and chapter No.9 in that text book.

Assignment Questions:

Assignment Questions	COs attained
Q1) Write a short note on environment list and environment variables.	3
Q2) Describe the UNIX kernel support for a process. Show related data structure.	3
Q3) With an example program, explain the use of setjmp & longjmp function.	3
Q4) Explain five different ways of process termination with neat diagram.	3
Q5) With a neat diagram, explain the memory layout of C program.	3
Q6) Explain getrlimit and setrlimit functions with prototype.	3
Q7) Explain different exec functions. WAP in C to demonstrate the exec functions.	3
Q8) Explain how process accounting is done in UNIX system. Write a program to generate accounting data and give its process structure.	3
Q9) Define job control. Summarize the job control features with the help of a figure.	3
Q10) Explain fork & vfork API with an example for each.	3
Q11) Define the zombie process. WAP in C/C++ to avoid zombie process by forking twice.	3
Q12) With neat diagram, explain the terminal login and network login in BSD UNIX.	3



MODULE -4

Textbook-1: Ch 9	No. of Hours: 08
Textbook-2: Ch 13	
Module Title: Signals and Daemon Processes	

Learning Objectives: At the end of this module students will be able to:

- | | |
|----|--|
| 1. | Express the how signals are generated, & data structure of Kernel support for signals. |
| 2. | Express the signal handling functions |
| 3. | Incorporate the concept of Interval & POSIX timers. |
| 4. | Analyze the daemon process characteristics & coding rules for it. |

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	Reference Book/ Chapter No.
L25	Signals Introduction, The UNIX Kernel Support for Signals.	Chalk and Board	1 2 3 4 5 9 12	1,4	T1/9
L26	Signal, Signal Mask, Sigaction functions.	Chalk and Board		1,4	T1/9
L27	The SIGCHLD Signal and the waitpid Function.	Chalk and Board		1,4	T1/9
L28	The sigsetjmp and siglongjmp Functions.	Chalk and Board		1,4	T1/9
L29	Kill, Alarm APIs.	Chalk and Board		1,4	T1/9
L30	Interval Timers, POSIX.lb Timers.	Chalk and Board		1,4	T1/9
L31	Daemon Processes: Introduction, Daemon Characteristics, Coding Rules.	Chalk and Board		1,4	T2/13
L32	Error Logging, Client-Server Model.	Chalk and Board		1,4	T2/13

T1/9: Text book No.1 in VTU Syllabus and chapter No.9 in that text book.

T2/13: Text book No.2 in VTU Syllabus and chapter No.13 in that text book.

Assignment Questions:

Assignment Questions	COs attained
Q1) Define signals. Mention the different sources of signals. List the three signal handling methods. Give any four signals with meaning. Write a program to setup signals handlers for SIGINT and SIGALARM signals.	4
Q2) Describe the API used to mask the signals. Define signal sets. List the functions that are used to manipulate the signal sets. WAP to demonstrate the use of sigprocmask and sigpending functions.	4
Q3) Define daemon process. Explain the characteristics & coding rules for creating daemon process. Write a program to create daemon process.	4
Q4) Define signal function. Explain its significance.	4



Q5) Explain with prototypes kill function, sigsetjmp & siglongjmp APIs.	4
Q6) Write a program in C to set up a real time clock internal time using alarm API.	4
Q7) Write a short note on Error logging facility in BSD UNIX.	4
Q8) Write a short note on Interval Timers.	4
Q9) Differentiate sigsetjmp & siglongjmp functions with setjmp & longjmp functions.	4
Q10) Explain UNIX kernel support for handling different signals.	4



MODULE -5

Textbook-2: Ch 14,15	No. of Hours: 08
Module Title: Inter-Process Communication	

Learning Objectives: At the end of this module students will be able to:

6.	Construct the process communication by Pipes.
7.	Analyze the need of popen & pclose functions..
8.	Express the concept of coprocesses, message queues, semaphores.
9.	Analyze the shared memory and sockets & its addressing.
10.	Construct the stream pipes and client-server connection.
11.	Express the open server concepts.

Lesson Plan:

Lecture No.	Topics Covered	Teaching Method	POs attained	COs attained	Reference Book/ Chapter No.
L33	Introduction and Pipes. popen. pclose Functions.	Chalk and Board		5	T2/14
L34	Coprocesses, FIFOs. XSI IPC.	Chalk and Board	1	5	T2/14
L35	Message Queues.	Chalk and Board	2	5	T2/14
L36	Semaphores.	Chalk and Board	3	5	T2/14
L37	Shared Memory. Client-Server Properties.	Chalk and Board	4	5	T2/14
L38	Stream Pipes.	Chalk and Board	5	5	T2/14
L39	Passing File Descriptors.	Chalk and Board	9	5	T2/15
L40	An Open Server-Version 1. Client-Server Connection Functions.	Chalk and Board	12	5,6	T2/15

T2/14: Text book No.2 in VTU Syllabus and chapter No.14 in that text book.

T2/15: Text book No.2 in VTU Syllabus and chapter No.15 in that text book.



Assignment Questions:

Assignment Questions	COs attained
Q1) Write a program to implement popen and pclose functions and also explain their prototypes.	5
Q2) Explain different systems calls available to create & manipulate semaphore	5
Q3) Define pipes. Explain their limitations. Explain how pipes are created and used in IPC with an example.	5,6
Q4) Define FIFO. Explain how it is used in IPC. Discuss with an example, client server communication using FIFOs.	5,6
Q5) Write a note on Coprocesses.	5
Q6) Define socket. Discuss how a socket is created and destroyed.	5
Q7) Explain the Shared memory concept.	5
Q8) Write a C program to illustrate the process of creating socket, initializing the socket address structure and establishing a connection from a client to server.	5,6
Q9) Discuss the properties of Client-Server.	5
Q10) Explain the connection functions of client-server.	5

UNIX System Programming IA Portion

I.A. TEST	MODULES
IA Test -I	Module – 1, Module – 2(1st Half portion)
IA Test -II	Module – 2(2nd Half portion), Module – 3
IA Test -III	Module – 4, Module – 5



UNIX SYSTEM PROGRAMMING QUESTION PAPERS

USN

--	--	--	--	--	--	--	--

10CS62

Sixth Semester B.E. Degree Examination, June/July 2016 **UNIX Systems Programming**

Time: 3 hrs.

Max. Marks: 100

Note: Answer any **FIVE** full questions, selecting atleast **TWO** questions from each part.

PART – A

1. a. Compare and explain : ANSI C and K and R C with examples. (08 Marks)
b. List and explain feature test macros in POSIX systems. (08 Marks)
c. Compare : execution of an API with execution of C library function. Also list any four error status codes with their meaning. (04 Marks)
2. a. What is file? Explain types of files with command examples. (06 Marks)
b. Explain UNIX Kernel support for files with a neat sketch. (08 Marks)
c. Write any three differences between :
i) Hard links and soft links ii) C steam pointer and File descriptor. (06 Marks)
3. a. Explain file and record locking with C/C++ program. (08 Marks)
b. Explain the following API's with their prototypes. :
i) open ii) read iii) write iv) close. (08 Marks)
c. Write a C/C++ program to rename a file [use mv command /link and unlink APIs]. (04 Marks)
4. a. With a neat diagram, explain about termination ways for a process. Also write a C/C++ programs to display :
i) Command line arguments ii) Environment variables. (10 Marks)
b. Explain setjmp and longjmp functions with their prototypes. (06 Marks)
c. With neat sketch, explain memory structure/ layout of a C/C++ program that is to be executed. (04 Marks)

PART – B

5. a. What is race condition? Mention and explain routines to avoid race condition. (06 Marks)
b. Explain the following :
i) orphaned process ii) zombie process iii) terminal login iv) network login. (10 Marks)
c. Explain : i) process group ii) session. (04 Marks)
6. a. What is daemon? Explain characteristics and coding rules. (10 Marks)
b. Write a C/C++ program to show the use of alarm API. (06 Marks)
c. Define and explain : i) SIGCHLD signal ii) waitpid function. (04 Marks)
7. a. What is inter-process communication? List any 4 mechanisms (IPC). Also write a C/C++ program that creates a child process to print a message. (08 Marks)
b. Write a C/C++ program(s) to implement inter-process communication using FIFO file. (06 Marks)
c. Explain briefly with examples : i) Message queues ii) semaphores. (06 Marks)
8. a. Explain shared memory as an inter-process mechanism (IPC). (08 Marks)
b. What are steam pipes? Explain passing of file descriptors. (06 Marks)
c. Briefly explain client-server functions. (06 Marks)

* * * * *

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.



STORAGE AREA NETWORKS

1. Syllabus:

Semester: VII	Year: 2018-19
Subject Title: Storage Area Networks	Subject Code: 15CS754
Total Contact Hours: 40	Duration of Exam : 03
SEE Marks:60	CIE Marks: 40
Staff : Prof. Sujata S. Desai ,Prof. Suvarna L. Kattimani	

Module – 1

Storage System: Introduction to evolution of storage architecture, key data center elements, virtualization, and cloud computing. Key data center elements – Host (or compute), connectivity, storage, and application in both classic and virtual environments. RAID implementations, techniques, and levels along with the impact of RAID on application performance. Components of intelligent storage systems and virtual storage provisioning and intelligent storage system implementations.

8 Hours

Module – 2

Storage Networking Technologies and Virtualization :Fibre Channel SAN components, connectivity options, and topologies including access protection mechanism ‘zoning”, FC protocol stack, addressing and operations, SAN-based virtualization and VSAN technology, iSCSI and FCIP protocols for storage access over IP network, Converged protocol FCoE and its components, Network Attached Storage (NAS) - components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.

8 Hours

Module – 3

Backup, Archive, and Replication: This unit focuses on information availability and business continuity solutions in both virtualized and non-virtualized environments. Business continuity terminologies, planning and solutions, Clustering and multipathing architecture to avoid single points of failure, Backup and recovery - methods, targets and topologies, Data deduplication and backup in virtualized environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection

8 Hours

Module – 4

Cloud Computing Characteristics and benefits: This unit focuses on the business drivers, definition, essential characteristics, and phases of journey to the Cloud. ,Business drivers for Cloud computing, Definition of Cloud computing, Characteristics of Cloud computing, Steps involved in transitioning from Classic data center to Cloud computing environment Services and deployment models, Cloud infrastructure components, Cloud migration considerations.

8 Hours



Module – 5

Securing and Managing Storage Infrastructure This chapter focuses on framework and domains of storage security along with covering security, Implementation at storage networking, Security threats, and countermeasures in various domains Security solutions for FC-SAN, IP-SAN and NAS environments, Security in virtualized and cloud environments, Monitoring and managing various information infrastructure components in classic and virtual environments, Information lifecycle management (ILM) and storage tiring, Cloud service management activities **8 Hours**

Text Books:

T1. Information Storage and Management, Author :EMC Education Services, Publisher: Wiley

ISBN: 9781118094839

T2. Storage Virtualization, Author: Clark Tom, Publisher: Addison Wesley Publishing Company

ISBN : 9780321262516

Reference Books:

-Nil-

2. Prerequisites:

- Knowledge of storage systems, such as storage arrays, and define the specific technologies associated with arrays
- Knowledge of different types of networks, storage configurations and the types of logical storage configurations
- Knowledge of data services and their application to storage
- Knowledge of storage management software and its application to storage

3. Course Overview and its Relevance to Program:

The storage area network (SAN) infrastructure facilitates storage consolidation, data sharing, server clustering, LAN-free and server-less backup across heterogeneous host server platforms. This course focuses on the planning and implementation considerations associated with establishing that SAN infrastructure. Functions provided by SAN fabric components, such as Fiber Channel host bus adapters (HBAs), Fiber Channel switches and directors, and SCSI to Fiber Channel protocol converters are discussed, and the interdependencies of these components are examined.

Mechanisms to implement resource access control for data access integrity among heterogeneous hosts in a storage networking environment are also examined. Examine products and strategies associated with managing the explosive growth of business data across the enterprise in today's networking economy. Learn the basic concepts and terminology associated with Storage Area Networks (SAN), Network Attached Storage (NAS), Internet Small Computer System Interface (iSCSI), and map the promise of SANs to the complications of managing islands of information among heterogeneous environments with disparate operating systems, data formats, user interfaces, and limited integration of products from assorted vendors.



4. Course Outcomes:

The students will be able to:

- C475.1 Define Virtualization; cloud computing, Backup Recovery and Replication of different Storage Systems
- C475.2 Explain various storage infrastructures, planning and solutions
- C475.3 Identify Business Continuity Terminologies, planning and solutions
- C475.4 Apply clustering and multipath architectures for Information storage systems
- C475.5 Evaluate Different phases of cloud migration considerations in storage systems
- C475.6 Formulate security in virtualized and cloud environments

5. Applications:

- Centralized management
- Support for sharing removable-media libraries
- LAN-less and server-less backup
- Heterogeneous platform support
- Remote vaulting and mirroring
- Real-time backup
- Resource and Data Sharing

6. Module Wise Plan:

MODULE-1

Module-I	No of Hours: 8
Title: Storage System	

Learning Objectives: The main objectives of this module are to

1	Acquire knowledge of different types of logical and physical components of a storage infrastructure
2	Identify and describe the functions to build data center networking for switch network
3	Learn different types of RAID implementations and their benefits.
4	Understand the benefits of the different storage network for different
5	Knowledge of different components of intelligent storage systems

Lecture No.	Topics Covered	Teaching method	POs attained	PSOs attained	COs attained	Text Book/ Chapter No.
L1	Introduction to Information Storage, Evolution of Storage Architecture	PPT, Chalk and Board	1	1	C475.1	T1/1
L2	Data Center Infrastructure, Virtualization and Cloud Computing		1	1	C475.1	T1/1
L3	Data Center Application, key data center elements		1	1	C475.1	T1/1
L4	Data Protection: RAID		1	1	C475.1	T1/1
L5	RAID Impact on Disk Performance		1	1,2	C475.1	T1/1



L6	Intelligent Storage Systems		1	1,2	C475.2	T1/1
L7	Components of an Intelligent Storage System		1	1,2	C475.1	T1/1
L8	Storage Provisioning		1	1,2	C475.2	T1/1

Textbook 1: Ch 1, 2, 5.1 to 5.10

Assignment Questions:

Assignment Questions		COs attained
Q1. Explain information Storage with examples.		C475.1
Q2. What are the core elements of a data center?		C475.2
Q3. Explain different types of file system.		C475.2
Q4. Differentiate between memories and compute virtualization.		C475.2
Q5. Write difference disk drive components.		C475.2
Q6. What are the requirements for storage based application		C475.2

MODULE-2

Module-II	No of Hours: 8
Title: Storage Networking Technologies and Virtualization	

Learning Objectives: The main objectives of this module are to:

1	Identify and describe the functions to build data center networking for switch network.
2	Discuss different types of logical and physical components of a storage infrastructure.
3	Describe the different types of RAID implementations and their benefits.
4	Understand the importance of Fiber Channel protocols and how to communicate with each other.
5	Describe the benefits of the different network storage options for different application environments
6	Identify single points of failure in a storage infrastructure and list solutions.
7	Describe the different role in providing disaster recovery and business continuity capabilities.
8	Identify and analyzes the common threats in each domain

Lecture No.	Topics Covered	Teaching method	POs attained	PSOs attained	COs attained	Text Book/ Chapter No.
L9	Introduction to Storage Networking Technologies	PPT, Chalk and Board	1	1	C475.1	T1/6
L10	Fibre Channel Storage Area Networks		1,2	2	C475.1	T1/6
L11	Components of FC SAN FC Connectivity		1,2	2	C45.1	T1/6
L12	Virtualization in SAN		1,2	1,2	C475.1	T1/6
L13	IP SAN and FCoE		1,2	1,2	C475.2	T1/6
L14	FCIP, FCoE		1,2	1,2	C475.3	T1/6
L15	Network-Attached Storage,		1,2	1,2	C475.3	T1/6
L16	Object-Based and Unified Storage		1,2	2	C475.3	T1/6

Textbook 1: Ch 4,5,6

Assignment Questions	Cos attained
-----------------------------	---------------------



What are the single points of failure in a storage infrastructure?	C475.1
Define different backup/recovery topologies	C475.1
What is the role in providing disaster recovery?	C475.2
What are the key areas to monitor in a data center?	C475.2
Define the list and analyzes the common threats in each domain.	C475.3
What are the file-level virtualization technologies and processes.	C475.3

MODULE-3

Module-III	No of Hours: 10
Title: Backup, Archive, and Replication	

Learning Objectives: The main objectives of this module are to:

1	Identify key areas to monitor in a data center for different components
2	Understand the different networked storage options for different application environments.
3	Differentiate between business continuity (BC) and disaster recovery (DR)
4	Define planned and unplanned outages in SAN.
5	Understand the different networked storage options for different application environments.
6	Understand the different backup and recovery topologies and their role.

Lecture No.	Topics Covered	Teaching method	POs attained	PSOs attained	COs attained	Text Book/ Chapter No.
L17	Introduction to Backup and Archive	PPT, Chalk and Board	4,5	1,2	C475.3	T1/4
L18	Backup in Virtualized Environments		4,5	1,2	C475.3	T1/5
L19	Backup in Virtualized Environments		2,4,5	1,2	C475.3	T1/5
L20	Local Replication		5	1,2	C475.3	T1/5
L21	Local Replication in a Virtualized Environment		3,4,5	1,2	C475.3	T1/5
L22	Remote Replication Technologies		3,4	1,2	C475.4	T1/6
L23	Three-Site Replication,		2,3,4	1,2	C475.4	T1/6
L24	Remote Replication and Migration in a Virtualized Environment		2,3,4	1,2	C475.4	T1/6

Assignment Questions:

Assignment Questions	COs attained
Define different backup and recovery topologies.	C475.3
Define remote replication technologies and their role.	C475.3
Explain Local Replication in virtualized environment	C475.3
Understand different type process and file-level virtualization technologies	C475.3
Understand block-level and file-level storage.	C475.4
Understand Remote Replication and Migration in a Virtualized Environment	C475.4
Explain backup process in virtualized environment	C475.4

MODULE-4

Module-IV	No of Hours: 8
Title: Cloud Computing Characteristics and benefits	



Learning Objectives: The main objectives of this module are to:

1	Advantages of Cloud Computing
2	Characteristics of Cloud Computing
3	Business drivers for Cloud Computing
4	cloud computing environment services and deployment models
5	Cloud migration considerations

Lecture No.	Topics Covered	Teaching method	POs attained	PSO's attained	COs attained	Text Book/ Chapter No.
L25	Introduction : Cloud Computing characteristics and benefits	PPT Chalk and Board	6,7	1,2,3	C475.3	T1/7
L26	Phases of journey to the cloud		6,7	1,2,3	C475.3	T1/1
L27	Benefits of Cloud Computing		6,7	1,2,3	C475.3	T1/2
L28	Business drivers for cloud computing		6,7	1,2,3	C475.3	T1/3
L29	Characteristics of cloud computing		6,7	1,2,3	C475.3	T1/4
L30	Transition from classic data center to cloud computing environment services and deployment models		6,7	1,2,3	C475.5	T1/5
L31	Cloud infrastructure components		6,7	1,2,3	C475.5	T1/2
L32	Cloud migration considerations		6,7	1,2,3	C475.5	T1/T2

Textbook 1: Ch 7, 8, Textbook 1: Ch 8



Assignment Questions:

Assignment Questions		COs attained
1.	Understand the concept of cloud computing and benefits	C475.1
2.	Understand the journey of cloud mass storage system	C475.5
3.	Understand the Business drivers behind the cloud strategy	C475.5
4.	Explain cloud in fracture components	C475.5
5.	Explain cloud migration procedure in cloud computing	C475.5

MODULE-5

Module-V	No of Hours: 8
Title: Securing and Managing Storage Infrastructure	

Learning Objectives: The main objectives of this module are to:

1	Understand the frameworks and domains of storage era
2	Discuss the implementation levels of networking in SAN
3	Discuss security threats in FC-SAN,IP-SAN

Lecture No.	Topics Covered	Teaching Method	POs attained	PSOs attained	COs attained	Text Book/ Chapter No.
L33	Framework and domains of storage security	Chalk and Board	9,10,11	1,2,3	C475.5	T1/9
L34	Implementation at storage networking		9,10,11	1,2,3	C475.5	T1/9
L35	Security threats in various domains		9,10,11	1,2,3	C475.5	T1/9
L36	Security solutions for FC-SAN, IP-SAN		9,10,11	1,2,3	C475.5	T1/9
L37	NAS environments		9,10,11	1,2,3	C475.6	T1/9
L38	Security in virtualized and cloud environments		9,10,11	1,2,3	C475.6	T1/10
L39	Information life cycle management and storage tiering		9,10,11	1,2,3	C475.6	T1/11
L40	Cloud service management activities		10,11	1,2,3	C475.6	T1/11

Textbook 1: Ch 9, 10, Textbook 2: Ch 11



Assignment Questions:

Assignment Questions	COs attained
Compare modern security concepts as they are applied to cloud computing	C475.6
Assess the security of virtual systems.	C475.6
Evaluate the security issues related to multi-tenancy.	C475.6
Appraise compliance issues that arise from cloud computing.	C475.6
Design and develop elegant and flexible cloud software solutions.	C475.6
Evaluate the security issues related to the development of cloud applications.	C475.6
Manage and deploy a cloud based application.	C475.6
Research and critique a topic related to Software development in the cloud.	C475.6

SAN I.A. PORTION

I. A. Test	Units
I I.A. Test	Module I, Module II (14 Hours)
II I.A. Test	Module II (2 Hours), Module III(8 Hours), Module IV (4 Hours)
III I.A. Test	Module IV (5 Hours), Module V (8 Hours)



MACHINE LEARNING LABORATORY

[As per Choice Based Credit System (CBCS) scheme]

(Effective from the academic year 2017 - 2018)

SEMESTER – VII

Subject Code	17CSL76	IA Marks	40
Number of Lecture Hours/Week	01I + 02P	Exam Marks	60
Total Number of Lecture Hours	40	Exam Hours	03
Credits-2			

Description (If any):

1. The programs can be implemented in either JAVA or Python.
2. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
3. Data sets can be taken from standard repositories (<https://archive.ics.uci.edu/ml/datasets.html>) or constructed by the students.

Lab Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Course outcomes: The students should be able to:

1. Understand the implementation procedures for the machine learning algorithms.
2. Design Java/Python programs for various Learning algorithms.
3. Apply appropriate data sets to the Machine Learning algorithms.
4. Identify and apply Machine Learning algorithms to solve real world problems.

Conduction of Practical Examination:

- All laboratory experiments are to be included for practical examination.
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script
- Marks distribution: Procedure + Conduction + Viva: 15 + 70 + 15 (100)

Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.



WEB TECHNOLOGY LABORATORY WITH MINI PROJECT

[As per Choice Based Credit System (CBCS) scheme]

(Effective from the academic year 2017 - 2018)

SEMESTER – VII

Subject Code	17CSL77	IA Marks	40
Number of Lecture Hours/Week	01I + 02P	Exam Marks	60
Total Number of Lecture Hours	40	Exam Hours	03
Credits-2			
Lab Experiments:			
PART-A			
1. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.			
2. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.			
3. Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXT-SHRINKING” in BLUE color. Then the font size decreases to 5pt.			
4. Develop and demonstrate a HTML5 file that includes JavaScript script that uses functions for the following problems: a. Parameter: A string b. Output: The position in the string of the left-most vowel c. Parameter: A number d. Output: The number with its digits in the reverse order			
5. Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.			
6. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.			
7. Write a PHP program to display a digital clock which displays the current time of the server.			
8. Write the PHP programs to do the following: a. Implement simple calculator operations. b. Find the transpose of a matrix. c. Multiplication of two matrices. d. Addition of two matrices.			
9. Write a PHP program named states.py that declares a variable states with value "Mississippi Alabama Texas Massachusetts Kansas". write a PHP program that does the following:			
a. Search for a word in variable states that ends in xas. Store this word in element 0 of a list named statesList.			
b. Search for a word in states that begins with k and ends in s. Perform a caseinsensitive comparison.			
[Note: Passing re.Ias a second parameter to method compile performs a case-insensitive comparison.] Store this word in element1 of statesList.			
c. Search for a word in states that begins with M and ends in s. Store this word in element 2 of the list.			
d. Search for a word in states that ends in a. Store this word in element 3 of the list.			



10. Write a PHP program to sort the student records which are stored in the database using selection sort.

Study Experiment / Project:

Develop a web application project using the languages and concepts learnt in the theory and exercises listed in part A with a good look and feel effects. You can use any web technologies and frameworks and databases.

Note:

1. In the examination each student picks one question from part A.
2. A team of two or three students must develop the mini project. However during the examination, each student must demonstrate the project individually.
3. The team must submit a brief project report (15-20 pages) that must include the following
 - a. Introduction
 - b. Requirement Analysis
 - c. Software Requirement Specification
 - d. Analysis and Design
 - e. Implementation
 - f. Testing

Course outcomes: The students should be able to:

- Design and develop dynamic web pages with good aesthetic sense of designing and latest technical know-how's.
- Understand the concepts of Web Application Terminologies, Internet Tools other web services.
- Recall how to link and publish web sites

Conduction of Practical Examination:

1. All laboratory experiments from part A are to be included for practical examination.
2. Mini project has to be evaluated for 40 Marks.
3. Report should be prepared in a standard format prescribed for project work.
4. Students are allowed to pick one experiment from the lot.
5. Strictly follow the instructions as printed on the cover page of answer script.

Marks distribution:

Part A: Procedure + Conduction + Viva: 09 + 42 +09 =60 Marks b)

Part B: Demonstration + Report + Viva voce 20+14+06 = 40 Marks Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.