

**Savitribai Phule Pune University**

**Two Year M.Sc. Degree Course  
in Computer Applications**

**M.Sc. ( Computer Applications )**

**(Choice based Credit and Semester based Syllabus for affiliated  
colleges to be implemented from Academic Year 2019-20)**

### 1) Title of the Course:

M.Sc. (Computer Applications)

### 2) Preamble of the syllabus

The M.Sc. (Computer Applications) program is a combination of computer programming, applications and information technology courses. The courses introduce techniques of programming, databases, web designing, system analysis, design tools and different computing environments.

#### Objectives:

The main objective of the Program is to produce trained software professionals with hands-on experience on state-of-the art technologies who will be able to handle software challenges in industry as well as academia. In the context with information Technology industry, the objectives of M.Sc. (Computer Applications) course are:-

- To produce knowledgeable and skilled human resources that is employable in IT and ITES.
- To impart knowledge required for planning, designing and building Complex Application Software Systems as well as to provide support for automated systems or applications.
- To produce entrepreneurs

M.Sc. (Computer Applications) Program is of Two Years duration with four semesters. It is a Full Time post graduate Degree Program. The program will be based on Choice-based credit system comprising of total 80 credit points.

It is believed that the proposed syllabus as part of the credit based system will bring a qualitative change in the way M.Sc. (Computer Applications) is taught, which will offer a more enriched learning experience. It aims to provide technology-oriented students with the knowledge and ability to develop creative solutions, and better understand the effects of future developments of computer systems and technology on people and society.

The syllabus is about developing skills to learn new technology, grasping the concepts and issues behind its use and the use of computers.

### 3) Eligibility:

A Bachelor Degree in Science/Technology/Engineering with minimum 50% marks or equivalent for student belonging to Unreserved Category and minimum 45% or equivalent for students belonging to the Reserved Category.

**Admission:** Admissions will be offered as per the selection procedure / policies adopted by the respective colleges, in accordance with conditions laid down by the Savitribai Phule Pune University. Reservation and relaxation will be as per the government rules.

### 4) External Students: There shall be no external students.

## 5) Course structure

Savitribai Phule University of Pune M.Sc (Computer Applications) (with effect from June 2020-21)									
Semester 1									
Course Code	Course	Teaching Scheme / Week			Examination Scheme and Marks			Credit	
		Theory	Tutorial	Practical	IE	UE	Total	TH	PR
CA- CCTP-1	Web Technology	04	--	--	30	70	100	04	--
CA- CCTP-2	Advance Databases	04	--	--	30	70	100	04	--
CA- CCTP-3	Design and Analysis of Algorithm	04	--	--	30	70	100	04	--
CA- CBOTP- 1 A	Object Oriented Programming with C++	02	--	--	15	35	50	02	--
CA- CBOPP-1 A	Object Oriented Programming with C++ Laboratory	--	--	04	15	35	50	--	2
<b>OR</b>									
CA- CBOTP-1B	ASP.NET	02	--	--	15	35	50	02	--
CA- CBOPP-1B	ASP.NET Laboratory	--	--	04	15	35	50	--	2
<b>OR</b>									
CA- CBOTP-1C	Software Testing (Manual)	02	--	--	15	35	50	02	--
CA- CBOPP-1 C	Software Testing (Manual) Laboratory	--	--	04	15	35	50	--	2
CA- CCPP-1	Web Technology Laboratory	--	--	08	30	70	100	--	4
<b>Total Credits</b>								<b>14</b>	<b>06</b>
<b>Total</b>		<b>14</b>	<b>--</b>	<b>12</b>	<b>150</b>	<b>350</b>	<b>500</b>	<b>20</b>	

**IE:** Internal Evaluation **UE:** External Evaluation **TH:** Theory **PR:** Practical **CA:** M. Sc. (Computer Applications)

**Savitribai Phule University of Pune**  
**M.Sc (Computer Applications)**  
 (with effect from June 2020-21)

**Semester 2**

Course Code	Course	Teaching Scheme / Week			Examination Scheme and Marks			Credit	
		Theory	Tutorial	Practical	IE	UE	Total	TH	PR
CA- CCTP-4	Data Mining and Ware Housing	04	--	--	30	70	100	04	--
CA- CCTP-5	Operating Systems	04	--	--	30	70	100	04	--
CA- CCTP-6	Computer Networks	04	--	--	30	70	100	04	--
CA- CBOTP-2 A	Java Programming	02	--	--	15	35	50	02	--
CA- CBOPP-2A	Java Programming Laboratory	--	--	04	15	35	50	--	2
<b>OR</b>									
CA- CBOTP-2 B	Web Services	02	--	--	15	35	50	02	--
CA- CBOPP-2B	Web Services Laboratory	--	--	04	15	35	50	--	2
<b>OR</b>									
CA- CBOTP-2 C	Software Testing (Automated)	02	--	--	15	35	50	02	--
CA- CBOPP-2C	Software Testing (Automated) Laboratory	--	--	04	15	35	50	--	2
CA- CCPP-2	Data Mining and Ware Housing Laboratory	--	--	08	30	70	100	--	4
<b>Total Credits</b>								<b>14</b>	<b>06</b>
<b>Total</b>		<b>14</b>	<b>--</b>	<b>12</b>	<b>150</b>	<b>350</b>	<b>500</b>	<b>20</b>	

**IE:** Internal Evaluation **UE:** External Evaluation **TH:** Theory **PR:** Practical **CA:** M. Sc. (Computer Applications)

**Savitribai Phule University of Pune**  
**M.Sc (Computer Applications)**  
 (with effect from June 2020-21)

**Semester 3**

Course Code	Course	Teaching Scheme / Week			Examination Scheme and Marks			Credit	
		Theory	Tutorial	Practical	IE	UE	Total	TH	PR
CA- CCTP -7	Mobile Application Development Using Android	04	--	--	30	70	100	04	--
CA- CCTP-8	Internet of Things	04	--	--	30	70	100	04	--
CA- CCTP-9	Artificial Intelligence	04	--	--	30	70	100	04	--
CA- CBOTP-3 A	Python Programming	02	--	--	15	35	50	02	--
CA- CBOPP-3A	Python Programming Laboratory	--	--	04	15	35	50	--	02
<b>OR</b>									
CA- CBOTP-3 B	Big Data	02	--	--	15	35	50	02	--
CA- CBOPP-3B	Big Data Laboratory	--	--	04	15	35	50	--	02
<b>OR</b>									
CA- CBOTP-3 C	DJango	02	--	--	15	35	50	02	--
CA- CBOPP-3C	DJango Laboratory	--	--	04	15	35	50	--	02
CA- CCPP-3	Android Programming Laboratory	--	--	08	30	70	100	--	4
<b>Total Credits</b>								<b>14</b>	<b>06</b>
<b>Total</b>		<b>14</b>	<b>--</b>	<b>12</b>	<b>150</b>	<b>350</b>	<b>500</b>	<b>20</b>	

**IE:** Internal Evaluation **UE:** External Evaluation **TH:** Theory **PR:** Practical **CA:** M. Sc. (Computer Applications)

**Savitribai Phule Pune University**  
**M.Sc (Computer Applications)**  
**(with effect from June 2020-21)**

**Semester 4**

Course Code	Course	Examination Scheme and Marks		
		IE (Credits)	UE (credits)	Total
CA-CCUP	Industrial Training/On-Campus Project	04 150(marks)	16 350(marks)	20 500(marks)
<b>Total Credits</b>				<b>20</b>

**IE:** Internal Evaluation    **UE:** External Evaluation    **CA:** M. Sc. (Computer Applications)

**Note:**

- I. Each credit will be equivalent to 15 clock hours of teaching
- II. 75% of the credits (60) is compulsory from the core subject and 25% i.e. 20 credits from any other department than the one where he/she is registered. In case student wishes to take all courses from the department he/ she can also do so.
- III. Credits: It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/field work per week.
- IV. Refer detailed rules and regulations for credit and semester system in postgraduate department/centers of the university with effect from academic year 2018-19 which is displayed on the website of the university.
- V. CA-CCUP-Core Compulsory University Project: Students must undergo full time industrial training/Institute-level project.
- VI. According to university guidelines any Science, Technology, and Engineering graduates is eligible to take admission for M.Sc. (Computer Application). However, by considering the eligibility of the M.Sc. (Computer Application) course it is necessary to complete the bridge course to become familiar with technology concepts more clearly. Specifically, Non-IT graduates who are not familiar with programming languages, Database Technology need to undergo the bridge course to learn the various courses of M.Sc. (Computer Application).
- VII. Each student will have attend lectures/laboratory sessions and appear for examinations for mandatory courses in Human rights, Cyber Security/Information security and skill development courses arranged by the Institution and earn required credits in each such courses. The grades obtained by the students will be communicated by the respective Institute to the University. However, these grades will not be considered for CGPA calculations. A degree will be only awarded to the students by the University only after completion of all such courses in addition to the courses mentioned for all the semesters.
- VIII. For Industrial training in semester IV, One faculty member will be assigned maximum 05 students

## 6)Details of Bridge Course

**Savitribai Phule Pune University**  
**M.Sc(Computer Applications)-I (2019 Course)**  
**Course Type : Bridge Course**

### Course Contents

<b>Unit I</b>	<b>Fundamentals of Databases</b>	<b>08</b>
---------------	----------------------------------	-----------

1.1 E-R Model 1.2 Converting ER diagram to database 1.3 SQL DDL 1.4 DML Commands  
1.5 SQL queries using PostgreSQL

<b>Unit II</b>	<b>Introduction to HTML</b>	<b>07</b>
----------------	-----------------------------	-----------

#### Introduction to HTML

2.1 Introduction to HTML 2.2 Basic HTML Structure 2.3 Common HTML Tags 2.4 Types of Images, client side and server-side Image mapping, Hyperlinks 2.5 List, Table, Frames 2.6 HTML form and form

<b>Unit III</b>	<b>JAVA Script</b>	<b>07</b>
-----------------	--------------------	-----------

#### JAVA Script

3.1 Introduction to Java Script 3.2 Identifier & operator, control structure, functions 3.3 Predefined functions, math & string functions 3.4 Array in Java scripts 3.5 Event handling in Java script

<b>Unit IV</b>	<b>CSS</b>	<b>08</b>
----------------	------------	-----------

#### CSS

4.1 Introduction to Cascading Style Sheets, 4.2 Concept of CSS 5.2 4.3 Creating Style Sheet  
CSS Properties 4.4 CSS Styling (Background, Text Format, Controlling Fonts) 4.5 Working with block elements and objects 4.6 Working with Lists and Tables, 4.7 CSS Id and Class Box Model (Introduction, Border properties, Padding Properties, Margin properties)  
4.8 CSS Advanced features (Grouping, Dimension, Display, Positioning, Floating, Align, Pseudoclass, Navigation Bar, Image Sprites, Attribute selector), 4.9 CSS Color 4.10 Creating page Layout and Site Designs.

#### Books:

#### Text:

1. Database System Concepts – Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 6<sup>th</sup> edition- McGraw-Hill
2. Practical PostgreSQL- Joshua D. Drake, John C Worsley, O'Reilly Publications
3. HTML and JavaScript – IvanBayross
4. Cascading Style Sheets: The Definitive Guide, 2nd Edition - By EricMeyer

## 6) Detail Syllabus with Recommended Books:

<b>Savitribai Phule Pune University</b> <b>M.Sc. (Computer Applications)</b>		
<b>Title of the Course: - WEB TECHNOLOGY</b> <b>Paper Code: CA - CCTP-1</b>		
Teaching Scheme Theory: 4 hrs / week	No. of Credits 04	Examination Scheme IE : 30 marks UE: 70 marks
<b>Course Contents</b>		
<b>Chapter 1</b>	<b>Introduction to Web Technologies</b>	<b>4 lectures</b>
1. Introduction to Web Technologies 2. How the Website Works? 3. Software to create your website 4. What makes good website? 5. Client-Server and its Communication 6. Client and Server Scripting Languages 7. Internet-Basic, Internet Protocols(HTTP,FTP,IP) 8. World Wide Web (WWW). 9. HTTP request message, HTTP response message 10. Types of Websites(Static and Dynamic Websites)		
<b>Chapter 2</b>	<b>HTML / HTML5</b>	<b>8 lectures</b>
1. Introduction to HTML 2. HTML tags and attributes 3. Working with Elements. 4. Inserting Image 5. Client Server image mapping 6. List 7. Tables 8. Text and Image links 9. Frames 10. Forms and controls 11. Introduction with text box, text area, buttons, List box, radio, checkbox etc.		
<b>Chapter 3</b>	<b>CSS</b>	<b>6 lectures</b>
1. Introduction to Style Sheet 2. Introduction to Responsive Website 3. Types of CSS 4. CSS Border, margin, Positioning, color, text, link, background, list, table, padding, image, display properties 5. Use of Id & classes in CSS 6. Use of <div>&<span> 7. Introduction of CSS3 : Gradients, Transitions, Animations, multiple columns 8. Introduction of Bootstrap.		
M.Sc.(CA) syllabus for affiliated colleges		Page 8 of 38



<b>Chapter 4</b>	<b>JAVASCRIPT</b>	<b>10 lectures</b>
<ol style="list-style-type: none"> <li>1. Concept of script, Types of Scripts, Introduction to javascript</li> <li>2. Variables, identifier &amp; operator, control structure.</li> <li>3. Examples on javascript operators</li> <li>4. Functions</li> <li>5. Event Handling in Java Scripts</li> <li>6. Concept of array, how to use it in javascript , types of an array, examples</li> <li>7. Event handling in javascript with examples</li> <li>8. Math and date object and examples on it.</li> <li>9. String object and examples on it, and some predefined functions</li> <li>10. DOM concept in javascript, DOM objects</li> <li>11. Validations in javascript , examples on it.</li> </ol>		
<b>Chapter 5</b>	<b>XML</b>	<b>4 lectures</b>
<ol style="list-style-type: none"> <li>1. Introduction to XML</li> <li>2. Uses of XML</li> <li>3. Simple XML,</li> <li>4. XML key components</li> <li>5. DTD and Schemas,</li> <li>6. Using XML with web applications.</li> <li>7. Introduction to XSL, XSL elements, transforming with XSLT</li> </ol>		
<b>Chapter 6</b>	<b>Introduction to PHP</b>	<b>5 lectures</b>
<ol style="list-style-type: none"> <li>1. Introduction to php</li> <li>2. How to install PHP Server on LINUX,WINDOWS.</li> <li>3. Syntax</li> <li>4. Echo, print</li> <li>5. Variables, Data Types</li> <li>6. Strings</li> <li>7. Operators</li> <li>8. Loops.</li> </ol>		
<b>Chapter 7</b>	<b>PHP Functions</b>	<b>4 lectures</b>
<ol style="list-style-type: none"> <li>1. Introduction to Functions</li> <li>2. Types of PHP Functions</li> <li>3. Defining and Calling Functions</li> <li>4. Default parameters, Variable parameters, Missing parameters</li> <li>5. Variable Function</li> <li>6. Anonymous Function</li> </ol>		
<b>Chapter 8</b>	<b>PHP Arrays</b>	<b>8 lectures</b>
<ol style="list-style-type: none"> <li>1. Indexed Vs Associative arrays</li> <li>2. Identifying elements of an array</li> <li>3. Storing data in arrays</li> <li>4. Multidimensional arrays</li> <li>5. Extracting multiple values</li> <li>6. Converting between arrays and variables</li> <li>7. Traversing arrays</li> <li>8. Sorting</li> <li>9. Action on entire arrays</li> </ol>		
M.Sc.(CA) syllabus for affiliated colleges		Page 9 of 38

<b>Chapter 9</b>	<b>Introduction To Frameworks</b>	<b>4 lectures</b>
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Steven Holzner, "HTML Black Book", Dremtech press.</li> <li>2. Web Technologies, Black Book, Dreamtech Press</li> <li>3. Web Applications : Concepts and Real World Design, Knuckles, Wiley-India</li> <li>4. Internet and World Wide Web How to program, P.J. Deitel &amp; H.M. Deitel Pearson</li> <li>5. Programming PHP By Rasmus Lerdorf and Kevin Tatroe, O'Reilly publication</li> <li>6. Beginning PHP 5 , Wrox publication</li> <li>7. PHP web seVICES, Wrox publication</li> <li>8. AJAX Black Book, Kogent solution</li> <li>9. Mastering PHP , BPB Publication</li> <li>10. PHP cookbook, O'Reilly publication</li> <li>11. PHP for Beginners, SPD publication 8. Programming the World Wide Web , Robert W Sebesta(3rd Edition)</li> <li>12. <a href="https://www.w3schools.com">https://www.w3schools.com</a></li> <li>13. <a href="https://www.tutorialspoint.com">https://www.tutorialspoint.com</a></li> <li>14. <a href="https://www.php.net">https://www.php.net</a></li> <li>15. <a href="#">Thinking in HTML eBook</a> by Aravind Shenoy</li> <li>16. <a href="#">Learn HTML and CSS faster</a> by Mark Myers</li> </ol>		

**Savitribai Phule Pune University  
M.Sc. (Computer Applications)**

**Course Title: Advanced Databases  
Paper Code: CA - CCTP-2**

Teaching Scheme Theory: 4 hrs / week	No. of Credits 04	Examination Scheme IE : 30 marks UE: 70 marks
---	----------------------	---

**Course Contents**

<b>Chapter 1</b>	<b>Functional Dependency:</b>	<b>6 lectures</b>
Introduction, Definition, Trivial / nontrivial dependencies, Closure of a dependency set, closure of an attribute set, irreducible set of dependencies, normalization (1,2, 3 , BCNF), Multi-valued dependencies, 4 <sup>th</sup> NF, join dependencies, 5 <sup>th</sup> NF		
<b>Chapter 2</b>	<b>Procedural programming PL/PgSQL</b>	<b>6 lectures</b>
Adding PL/PGSQL to database, language structure, using variables, controlling program flow, stored functions, views, Exception handling, concept and creation of cursor and triggers, using transaction control statements, Locks.		
<b>Chapter 3</b>	<b>Query processing and optimization</b>	<b>6 lectures</b>
Overview of Query processing, measures of query cost, selection, join, projection, evaluation of expression. transformation of relational expressions, estimating statistics of expression results, , choice of evaluation plans,		
<b>Chapter 4</b>	<b>Introduction to Transaction processing concepts &amp; theory</b>	<b>5 lectures</b>
Introduction, transaction and system concepts, desirable properties of transactions, characterizing schedules based on recoverability, characterizing schedules based on serializability, transaction support in SQL		
<b>Chapter 5</b>	<b>Concurrency control techniques</b>	<b>6 lectures</b>
Concept of Locking and lock manager component, binary locking mechanism, 2-phase locking techniques for concurrency control, C.C based on timestamp ordering, Multi-version concurrency control, Validation (optimistic) technique, Granularity of data items, Multiple granularity locking for C.C., using locks for concurrency control in indexes.		
<b>Chapter 6</b>	<b>Database recovery techniques</b>	<b>4 lectures</b>
Failure classification, recovery concepts, recovery techniques based on deferred updates & immediate updates, shadow paging, the Aries recovery algorithm, Database backup & recovery		
<b>Chapter 7</b>	<b>Database security</b>	<b>3 lectures</b>
Introduction, Discretionary access control based on Grant & Revoke, Mandatory access control & role based access control for multilevel security, introduction to statistical database security, introduction to flow control, challenges in database security.		
<b>Chapter 8</b>	<b>Parallel and Distributed Databases</b>	<b>12 lectures</b>
Architecture for parallel databases, Parallel query optimization, Parallelizing individual operations, Introduction to distributed databases, Distributed database architectures, Storing data in a Distributed database system,		

Distributed catalog Management, Distributed query processing, Updating distributed data, Introduction to distributed transactions, Distributed concurrency control, Distributed recovery.		
<b>Chapter 9</b>	<b>Internet Databases</b>	<b>6 lectures</b>
The worldwide web, Databases and web, Architecture (application servers and server side scripting), Introduction to XML, XML DTDs, Domain specific DTDs, XML-QL : Querying XML data, Semi-structured data model, Implementation issues for Semi-Structured data, Indexing for text search (inverted files, Signature files), Rank keyword searches on web. (An algorithm for ranking web pages.		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S. Sudarshan, Tata McGraw- Hill, 6<sup>th</sup> Edition.</li> <li>2. Database Systems, Shamkant B. Navathe, RamezElmasri, Pearson, 5<sup>th</sup> Edition.</li> <li>3. Database management systems, Raghu Ramakrishnan &amp; Johannes Gehrke, 2<sup>nd</sup> Edition.</li> <li>4. Database Management system, Bipin Desai,</li> <li>5. An introduction to database systems, C. J. Date,</li> <li>6. Principles of Distributed Database Systems, M. Tamer Ozsu and Patrick Valduriez, Pearson, 2<sup>nd</sup> Edition.</li> <li>7. Practical Postgresql, JoshuaD. Drake, John C Worsley, O'reilly Publication</li> </ol>		

**Savitribai Phule Pune University  
M.Sc. (Computer Applications)**

**Title of the Course: Design and Analysis of Algorithms  
Paper Code: CA - CCTP-3**

Teaching Scheme Theory: 4 hrs / week	No. of Credits 04	Examination Scheme IE : 30 marks UE: 70 marks
---	----------------------	---

**Course Contents**

<b>Chapter 1</b>	<b>Fundamentals of Algorithms and mathematics</b>	<b>4 lectures</b>
	<ol style="list-style-type: none"> <li>1. Problem, algorithm definitions</li> <li>2. Mathematics for algorithmic</li> <li>3. Sets</li> <li>4. Functions and relations</li> <li>5. Combinations</li> <li>6. Vectors and matrices</li> <li>7. Linear inequalities and linear equations</li> </ol>	
<b>Chapter 2</b>	<b>Analysis of Algorithm</b>	<b>8 lectures</b>
	<ol style="list-style-type: none"> <li>1. Algorithm</li> <li>2. Performance Analysis - space complexity, time complexity, worst case – best case –average case complexity,</li> <li>3. Asymptotic notations</li> <li>4. Sorting algorithms (Bubble sort , insertion sort, heap sort)</li> <li>5. Sorting in linear time (Counting , radix and Bucket Sort)</li> <li>6. Searching algorithms</li> <li>7. Recursive algorithms ( Tower of Hanoi , Permutations)</li> </ol>	
<b>Chapter 3</b>	<b>Divide and conquer design strategy</b>	<b>8 lectures</b>
	<ol style="list-style-type: none"> <li>1. Control abstraction</li> <li>2. Recurrence and different methods to solve recurrence</li> <li>3. Binary search</li> <li>4. Max-Min problem</li> <li>5. Merge sort</li> <li>6. Quick sort</li> <li>7. Strassen's matrix multiplication</li> </ol>	
<b>Chapter 4</b>	<b>Greedy Method</b>	<b>6 lectures</b>
	<ol style="list-style-type: none"> <li>1. General strategy</li> <li>2. Knapsack problem</li> <li>3. Job sequencing with deadlines,</li> <li>4. Minimum-cost spanning trees, Kruskal and Prim's algorithm</li> <li>5. Optimal storage on tapes</li> <li>6. Optimal merge patterns</li> <li>7. Huffman coding</li> </ol>	

<b>Chapter 5</b>	<b>Dynamic programming</b>	<b>8 lectures</b>
1.	General Strategy	
2.	The Principle of Optimality	
3.	Matrix chain multiplication	
4.	Longest common subsequence	
5.	String editing	
6.	0/1 knapsack problem,	
7.	Traveling salesperson problem	
<b>Chapter 6</b>	<b>Graph Algorithms</b>	<b>8 lectures</b>
1.	Introduction – Basic definitions of graph	
2.	Graph Traversals- BFS, DFs, classification of edges	
3.	Topological sort	
4.	Strongly connected components	
5.	Single source shortest paths- Dijkstra’s algorithm	
6.	Bellman- Ford algorithm	
7.	All pairs shortest paths, Floyd-Marshall algorithm	
8.	Flow networks, Ford-Fulkerson method	
<b>Chapter 7</b>	<b>Backtracking</b>	<b>5 lectures</b>
1.	General method	
2.	8 Queen’s problem	
3.	Sum of subsets problem	
4.	graph coloring problem	
5.	Hamiltonian cycle	
<b>Chapter 8</b>	<b>Branch and Bound</b>	<b>5 lectures</b>
1.	General method	
2.	FIFO, LIFO, LCBB,	
3.	TSP problem,	
4.	0/1 knapsack problem	
<b>Chapter 9</b>	<b>Problem classification</b>	<b>2 lectures</b>
1.	Nondeterministic algorithm	
2.	The class of P, NP, NP-hard and NP- Complete problems	
3.	significance of Cook’s theorem	
<b>Reference Books:</b>		
1.	Computer Algorithms, Ellis Horowitz, Sartaj Sahni & Sanguthevar Rajasekaran, Galgotia	
2.	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.	
3.	The Design and Analysis of Computer Algorithms, A. Aho, J. Hopcroft, & J. Ullman, Addison Wesley, 1974	
4.	The Art of Computer Programming (3 vols., various editions, 1973-81) Donald Knuth, Addison Wesley	
5.	Fundamental of Algorithms, Gills Brassard, Paul Bratley, PHI.	
6.	Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.	
7.	Foundations of Algorithms, Shailesh R Sathe, Penram	
8.	Design and Analysis of Algorithms, S. Sridhar, Oxford University press, 2014.	
9.	<a href="http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html">http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html</a>	
10.	<a href="https://nptel.ac.in/courses/106106131/">https://nptel.ac.in/courses/106106131/</a>	
11.	<a href="http://openclassroom.stanford.edu">http://openclassroom.stanford.edu</a>	

**Savitribai Phule Pune University**  
**M.Sc. (Computer Applications)**

**Title of the Course: Object Oriented Programming with C++**  
**Paper Code: CA - CBOP-1 A**

Teaching Scheme  
Theory: 2 hrs / week

No. of Credits  
02

Examination Scheme  
IE : 15 marks  
UE: 35 marks

**Course Contents**

<b>Chapter 1</b>	<b>Introduction to C++</b>	<b>4 lectures</b>
	<ol style="list-style-type: none"> <li>1. Basics of C++,</li> <li>2. Structure of C++ Program, keywords in C++,</li> <li>3. Data types hierarchy in C++,</li> <li>4. Operators in C++: Scope resolution operator, Insertion and Extraction operator New and Delete operators.</li> <li>5. Reference variable.</li> <li>6. Manipulators function: endl, setw, set fill, set precision.</li> </ol>	
<b>Chapter 2</b>	<b>Classes and Objects</b>	<b>6 lectures</b>
	<ol style="list-style-type: none"> <li>1. Object oriented Concepts</li> <li>2. Structure sand class, Class, Object, Access specifies,</li> <li>3. Class members,</li> <li>4. Defining member functions :Inside and outside the class definition,</li> <li>5. Creating objects. String class, operation on string, Array of objects.</li> <li>6. 'this' pointer.</li> </ol>	
<b>Chapter 3</b>	<b>Function in C++</b>	<b>4 lectures</b>
	<ol style="list-style-type: none"> <li>1. Call by reference, Return by reference,</li> <li>2. Function overloading and default arguments</li> <li>3. Inline function</li> <li>4. Passing and returning objects from functions, Static class members</li> <li>5. Friend Concept – Function, Class</li> </ol>	
<b>Chapter 4</b>	<b>Constructors and Destructors</b>	<b>2 lectures</b>
	<ol style="list-style-type: none"> <li>1. Constructor</li> <li>2. Types of constructors: Default, parameterized ,copy</li> <li>3. Destructors</li> </ol>	
<b>Chapter 5</b>	<b>Operator overloading</b>	<b>3 lectures</b>
	<ol style="list-style-type: none"> <li>1. Introduction, rules of operator overloading</li> <li>2. Operator overloading:</li> <li>3. Unary and binary operators,</li> <li>4. Comparison, arithmetic assignment operator</li> </ol>	
<b>Chapter 6</b>	<b>Inheritance</b>	<b>4 lectures</b>
	<ol style="list-style-type: none"> <li>1. Introduction</li> <li>2. Types of Inheritance: Single inheritance, Multiple inheritance, Multilevel inheritance Hierarchical inheritance Hybrid inheritance.</li> <li>3. Derived Class Constructor sand Destructors</li> <li>4. Ambiguity in multiple Inheritances, virtual base classes, Abstract base class.</li> </ol>	

<b>Chapter 7</b>	<b>Virtual Function &amp; Polymorphism</b>	<b>3 lectures</b>
<ol style="list-style-type: none"> <li>1. Introduction, Pointer to object, Pointer to derived</li> <li>2. class, Overriding member functions, Virtual function, Rules for virtual functions, pure virtual function</li> </ol>		
<b>Chapter 8</b>	<b>Working with files</b>	<b>3 lectures</b>
<ol style="list-style-type: none"> <li>1. File operations – Text files, Binary files</li> <li>2. File stream class and methods</li> <li>3. File Updation with random access</li> </ol>		
<b>Chapter 9</b>	<b>Exception handling</b>	<b>1 lectures</b>
Introduction to Exception Handling		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Programming In Ansi C -by E. Balagurusamy</li> <li>2. Let us C – by Yashavant P. Kanetkar</li> <li>3. A First Course in Programming with C- by T Jeyapoovan</li> <li>4. Object- Oriented Programming with C++ by E. Balaguruswamy</li> <li>5. C/C++ Programmer's Reference by Herbert Schildt 1997</li> </ol>		



**Savitribai Phule Pune University  
M.Sc. (Computer Applications)**

**Title of the Course: Object Oriented Programming with C++ Laboratory  
Paper Code: CA - CBOP-1 A (LABORATORY)**

Teaching Scheme Practical: 4 hrs / week	No. of Credits 02	Examination Scheme IE : 15 marks UE: 35 marks
--	----------------------	---

Sr. No.	Assignment
1.	Write a C++ program to prompt the user to input her/his name and print this name on the screen, as shown below. The text from keyboard can be read by using cin>> and to display the text on the screen you can use cout<<.
2.	Write a program in C++ to display various type or arithmetic operation using mixed data type
3.	Write a C++ program to prompt the user to input 3 integer values and print these values in forward and reversed order, as shown below.
4.	Write a program to find greatest from three numbers.
5.	Write a program of student mark sheet where Physics, Chemistry and Maths are the subject as input
6.	Define a class "Bank" with following data members Acc-no, Name of Depositor, A/C Balance, Write member function to perform following task. Accept Details Display Details
7.	Write a program in C++ to swap two numbers.
8.	Write a program in C++ to swap two numbers using reference variable.
9.	Write a program in C++ to test the Type Casting
10.	Write a C++ program to read an integer n and prints the factorial of n.
11.	Write a C++ program to compute the sum of the specified number of Prime numbers.
12.	Write a program in C++ to demonstrate the manipulators.
13.	Write a C++ program to demonstrate the use of Friend function in class.
14.	Write a C++ program to sort an Array in Ascending order.
15.	Write a C++ program to create a class Person which contains data members as P_Name, P_City, P_Contact_Number. Write member functions to accept and display five Persons information.
16.	Write a C++ program to create a class Student which contains data members as Roll_Number, Stud_Name, Marks in five subjects. Write member functions to accept Student information. Display all details of student along with a percentage and class obtained depending on percentage. (Use array of objects)
17.	Create a C++ class for a student object with the following attributes—roll no, name, number of subjects, marks of subjects. Write member function for accepting marks and display all information of student along with total and Percentage. Display marklist with Use of manipulators.
18.	Write a menu driven C++ program using class to perform all arithmetic operation (+, -, *, /) (use inline function).
19.	Write a C++ program to find volume of cube, cylinder and rectangle using function

	overloading
20.	Write a C++ program to find area of triangle, circle, and rectangle using function overloading.
21.	Create a class student containing data members: a. Roll_no b. name c. marks1, marks2, marks3 Write necessary member functions: a. to accept details of all students b. to display details of one student c. to display details of all students (Use Function overloading).
22.	Write a C++ program using class to check maximum of two integer numbers using Inline function and conditional operator
23.	Create two classes' dist1 (meters, centimeters) and dist2 (feet, inches). Accept two distances from the user, one in meters and centimeters and the other in feet and inches. Find the sum and difference of the two distances. Display the result in both (meters and centimeters) as well as feet and inches (use friend function).
24.	Write a C++ program using class which contains two data members of type integer. Create and initialize the object using default constructor, parameterized constructor and parameterized constructor with default value. Write a member function to display maximum from given two numbers for all objects
25.	Create a class time that contains hours, minute and seconds as data members. Write the member function to overload operator '+' to add two object of type time,(Use Parameterized constructor to accept values for time).
26.	Write a program in C++ to overload the binary operator "+".Overload an operator binary "+".Overload operator binary "+" (addition).
27.	Create class "multi" with 2 data members x and y. Class has multiple constructor and i.e. one default constructor and another parameterized, which receives value of x and y. show() display the value accordingly.
28.	WAP to print user-defined in formations using formatting functions. Input or assign strings and numbers and define field width for them. Fill the empty spaces with character and also define size of numerical float values
29.	Create base class called shape. Use this class to store two double type values that could be used to compute the area of figures. Derive two specific classes called cylinder and rectangle from the base shape. Add to the base class, a member function get_data(), print_data() to initialize base class data members and display_area(), display_perimeter() to compute and display area and perimeter of shape
30.	Implement multiple and hierarchical inheritance. The class Allrounder derives information from both Bowler and Batsman classes which in turn derive information from the class Cricketer. Define all four classes and write a program to create, update and display information contained in Allrounder objects display the object having the highest number of runs.
31.	Create a base class Conversion. Derive three different classes Weight (Gram, Kilogram), Volume (Milliliter, Liter), Currency (Rupees, Paise) from Conversion class. Write a C++ program to perform read, convert and display operations. (Use Pure virtual function) Create a base class Media. Derive two different classes Book (Book_id, Book_name, Publication, Author, Book_price) and CD (CD_title, CD_price, CD_capacity) from Media. Write a C++ program to accept and display information of both Book and CD.

	(Use pure virtual function)
<b>32.</b>	Create a base class Media. Derive two different classes Book (Book_id, Book_name, Publication, Author, Book_price) and CD (CD_title, CD_price, CD_capacity) from Media. Write a C++ program to accept and display information of both Book and CD. (Use pure virtual function)
<b>33.</b>	Write a C++ program to read the contents of a text file. Count and display number of characters, words and lines from a file. Find the number of occurrences of a given word present in a file.
<b>34.</b>	Write a C++ program to read the contents of a "Sample.txt" file. Store all the uppercase characters in "Upper.txt", lowercase characters in "Lower.txt" and digits in "Digit.txt" files. Change the case of each character from "Sample.txt" and store it in "Convert.txt" file.
<b>35.</b>	Write a C++ program to divide two numbers using Exception Handling

**Savitribai Phule Pune University**  
**M.Sc.(Computer Applications – 2019 COURSE )**  
**SEMESTER - I**

**Paper Code: CA-CBOTP-1 B Course Title : ASP .NET**

<b>Teaching Scheme:</b> TH: 02 Hours/Week	<b>Credit 02</b>	<b>Examination Scheme:</b> In-Sem : 15 Marks End-Sem : 35 Marks
---	------------------	---

**Prerequisite Courses:**

- C++, HTML and CSS

**Course Objectives:**

- To study the web based applications

**Course Outcomes:**

- To become Software Designer

**Course Contents**

<b>Unit I</b>	<b>Introduction to .NET Framework</b>	<b>05</b>
	<ul style="list-style-type: none"> <li>• The .NET Framework – an Overview</li> <li>• Framework Components</li> <li>• 1.3FrameworkVersions</li> <li>• Types of Applications which can be developed usingMicrosoft.NET</li> <li>• MS.NET Base Class Library</li> <li>• MS.NET Namespaces</li> <li>• MSIL</li> <li>• Dot Net Compilation Process</li> <li>• The Common Language Runtime(CLR)</li> <li>• Managed Code</li> <li>• MS.NET Memory Management / Garbage Collection</li> <li>• Common Type System(CTS)</li> <li>• Common Language Specification(CLS)</li> <li>• JIT Compilers</li> <li>• VisualStudio.NET</li> </ul>	
<b>Unit II</b>	<b>Introduction to C#</b>	<b>05</b>
	<ul style="list-style-type: none"> <li>• Introduction to C#</li> <li>• Building Blocks of C#</li> <li>• Type Conversion</li> <li>• Functions</li> </ul>	

	<ul style="list-style-type: none"> <li>• Exception Handling</li> <li>• Classes in C#</li> <li>• Access Modifiers</li> <li>• Interfaces</li> <li>• Properties</li> <li>• Inheritance</li> </ul>	
<b>Unit III</b>	<b>Introduction to ASP.NET</b>	<b>06</b>
	<ul style="list-style-type: none"> <li>• What is ASP.NET?</li> <li>• ASP.NET Page Life Cycle</li> </ul>	
	<ul style="list-style-type: none"> <li>• Architecture of ASP.NET</li> <li>• Forms, WebPages, HTML forms,</li> <li>• Request &amp; Response in Non-ASP.NET pages</li> <li>• Using ASP.NET Server Controls</li> <li>• Overview of Control structures</li> <li>• Functions</li> </ul>	
<b>Unit IV</b>	<b>Event Driven Programming</b>	<b>03</b>
	<ul style="list-style-type: none"> <li>• HTML events</li> <li>• ASP.NET Web control events</li> <li>• Event driven programming and postback</li> </ul>	
<b>Unit V</b>	<b>Database Connectivity using ADO .NET</b>	<b>07</b>
	<ul style="list-style-type: none"> <li>• Databases and ADO.NET</li> <li>• Architecture ,Components of ADO.NET</li> <li>• Data Provider in DotNet</li> <li>• Connection in ADO.Net</li> <li>• Command in ADO.Net</li> <li>• Data Reader in ADO.Net</li> <li>• Data Adapter in ADO.Net</li> <li>• Data Set</li> <li>• Data Binding</li> </ul>	
<b>Unit VI</b>	<b>ASP.NET Server Controls</b>	<b>04</b>
	<ul style="list-style-type: none"> <li>• Introduction to ASP.NET Controls</li> <li>• HTML Server Controls</li> <li>• Web Server Controls</li> <li>• Validation Controls</li> <li>• Session and Cookies</li> </ul>	
<b>Total Lectures</b>		<b>30</b>

**Books:**

**Text:**

- C# 6.0 and the .NET 4.6 Framework by Andrew Troelsen and Philip Japikse
- Programming Entity Framework by Julia Lerman
- Pro ASP.Net MVC 5 (Expert's Voice in ASP.Net) by Adam Freeman

**Savitribai Phule Pune University**  
**M.Sc.(Computer Applications - 2019 Course)**  
**SEMESTER - I**  
**Course Code: CA –CBOPP-1 B**  
**Course Title : ASP.NET Laboratory**

**Teaching Scheme:**  
**TH: 04**  
**Hours/Week**

**Credit 02**

**Examination Scheme:**  
**In-Sem : 15 Marks**  
**End-Sem : 35 Marks**

**DOT NET Assignments**

1. Write C# program to swap two numbers
2. Write C# program to create following output  
1  
2 3  
4 5 6  
7 8 9 10
- 3 Create windows c# application program for open file, save file, folder browser dialogue box
4. Create c# dialogue boxes for font dialogue, color dialogue & print dialogue box
5. Create windows c# application program for split container control and review controls
6. Write a web application in Asp.net using c# to select date from calendar control and display name of the day, name of the month from the selected date.
- 7 .Create ASP.Net c# web application for registration and login form with database connectivity.

Login

Username

Password

8. Write a web application in asp.net using c# to design following web page and use Required Field validator (For Name, Address and E-mail Id) and Regular Expression

Name	<input type="text"/>
Address	<input type="text"/>
E-mail Id	<input type="text"/>
<input type="button" value="Submit"/>	

9. Write a web application in asp.net using c# to design a master page with two content pages, one content page will display the student's personal information and another will show the student's academic information

10. Write a web application in asp.net using c# to design following web page, accept fruit name from the user and add it to the list box on clicking of add button, user can select multiple fruit names from list box, click on submit button all selected fruit names should get displayed on label control

Enter Fruit Name	<input type="text" value="Pineapple"/>
<input type="button" value="Add"/>	
<input type="listbox" value="Apple, Mango, Orange, Pineapple"/>	
<input type="button" value="Submit"/>	
You Selected from the Listbox: Orange Pineapple	



11. Write a webapplication in asp.net using c# to accept the user's information and on click on submit button entered information should get displayed into next page(session).
12. Write a web application in asp.net using c# to create a table book (bid, title, author\_name, publication, edition, price). Insert records into table and display appropriate message using label server control.
13. Write a web application in asp.net using c# to search the number of player plays in "Cricket" and display result in GridView. Game (gid, gname, no\_of\_players, duration)
14. Write a web application in asp.net using c# to insert records into table hospital (hno, hname, no\_of\_dept, doctor\_name, date\_of\_registration). Display hospital details in GridView.
15. Write a web application in asp.net using c# to update number of movies of actor "XYZ". Display updated records in GridView. Actor (aid, aname, no\_of\_movies)
16. Write a web application in asp.net to create Emp (Eno, EName, Sal) table. Insert at least 5 records into the table And display the details of given employee.
17. Write web application for Calculator.
18. Write web application in asp.net to scroll the text continuously from left to right and vice versa.
19. Write web application in asp.net to display the data from database on to the report.
20. Write web application in asp.net to validate Email of user.

**Savitribai Phule Pune University**  
**M.Sc.(Computer Applications - 2019 Course)**  
**SEMESTER - I**  
**Course Code: CA -CBOTP-1 C**  
**Course Title : Software Testing (Manual Testing)**

<b>Teaching Scheme:</b> TH: 02 Hours/Week	<b>Credit 02</b>	<b>Examination Scheme:</b> In-Sem : 15 Marks End-Sem : 35 Marks
---	------------------	---

**Prerequisite Courses:**

- Software Concepts

**Course Objectives:**

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
- To learn how to planning a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
- To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.
- To gain software testing experience by applying software testing knowledge and methods to practice-oriented software testing projects.

**Course Outcomes:** Student will

- Have an ability to apply software testing knowledge and engineering methods.
- Have an ability to design and conduct a software test process for a software testing project.
- Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation.
- Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.

**Course Contents**

<b>Unit I</b>	<b>Introduction to Testing and Software Model</b>	<b>03</b>
<ul style="list-style-type: none"> <li>• Introduction to Software Testing</li> <li>• Objectives of Software Testing</li> <li>• Types of Software Testing</li> <li>• SDLC Model</li> <li>• Waterfall Model</li> </ul>		

	<ul style="list-style-type: none"> <li>• V-Model</li> <li>• Prototype Model</li> <li>• Agile Model</li> <li>• How to choose which model is best suited for your project</li> </ul>	
<b>Unit II</b>	<b>Types of Testing</b>	<b>10</b>
	<ul style="list-style-type: none"> <li>• Unit Testing</li> <li>• Integration Testing</li> <li>• System Testing</li> <li>• UAT Testing</li> <li>• Software Testing Methods Used in Industry</li> <li>• White Box Testing</li> <li>• Black Box Testing</li> <li>• An introduction or familiarization of various popular testing types</li> <li>• Regression Testing</li> <li>• Ad-hoc Testing</li> <li>• Smoke Testing</li> <li>• Sanity Testing</li> <li>• Usability Testing</li> <li>• Exploratory Testing</li> <li>• Compatibility Testing</li> <li>• Installation Testing</li> <li>• Non-Functional Testing <ul style="list-style-type: none"> <li>○ Load Testing</li> <li>○ Stress Testing</li> <li>○ Volume Testing</li> </ul> </li> <li>• Database Testing</li> <li>• Functional testing vs. non-functional testing...etc.</li> </ul>	
<b>Unit III</b>	<b>Software Testing Life Cycle</b>	<b>06</b>
	<ul style="list-style-type: none"> <li>• Overview of the stages of STLC:</li> <li>• Test planning</li> <li>• Test design</li> <li>• Test execution</li> <li>• Test Plan walkthrough - Live Project document</li> <li>• Practical tips on how to identify the following items for the Test plan: <ul style="list-style-type: none"> <li>○ Scope</li> <li>○ Test strategy</li> <li>○ Effort Estimation</li> <li>○ Entry criteria</li> <li>○ Exit Criteria</li> <li>○ Defect Management process</li> </ul> </li> </ul>	

<b>Unit IV</b>	<b>Test Templates creation and use</b>	<b>07</b>
<ul style="list-style-type: none"> <li>• Test scenario template</li> <li>• Test case template</li> <li>• Test plan</li> <li>• Defect report</li> <li>• Status report...etc</li> <li>• Test scenario creation – what are they, how to write them, why, when etc.</li> <li>• Test documentation review- How to perform Peer reviews</li> <li>• Test cases creation</li> <li>• Test case design techniques <ul style="list-style-type: none"> <li>○ Boundary Value analysis</li> <li>○ Equivalence partitioning</li> <li>○ Error guessing</li> <li>○ Types of parameters</li> </ul> </li> </ul>		
<b>Unit V</b>	<b>Traceability Matrix</b>	<b>04</b>
<ul style="list-style-type: none"> <li>• 5.1 Test execution</li> <li>• 5.2 Defect management</li> <li>• Finding defects</li> <li>• Logging defects</li> <li>• Tracking and managing defects</li> <li>• Defect lifecycle</li> <li>• 5.3 Test reporting</li> <li>• Daily status reports</li> <li>• Test metrics</li> <li>• 5.4 User Acceptance Testing(UAT)</li> <li>• QA team's role</li> <li>• UAT plan</li> <li>• UAT execution , Go/no-go decisions Classes</li> </ul>		
<b>Total Lectures</b>		<b>30</b>
<b>Books:</b>		
<ul style="list-style-type: none"> <li>• Srinivasan Desikan and Gopaldaswami Ramesh- Software Testing Principles and practices- Pearson Education India</li> <li>• Amol Prakash Ujagare-Practical Approach of Software Testing- Adhyyan Books</li> <li>• Ron Patton-Software Testing Second Edition SAMS Pearson Publication</li> </ul>		

**Savitribai Phule Pune University**  
**M.Sc.(Computer Applications 2019 Course)**  
**SEMESTER - I**

**Course Code: CA -CBOPP-1 C**

**Course Title : Software Testing (Manual Testing)Laboratory**

**Teaching Scheme:**

**TH: 04**

**Hours/Week**

**Credit 02**

**Examination Scheme:**

**In-Sem : 15 Marks**

**End-Sem : 35 Marks**

## **Assignments**

**Testers Qualities:** Instructor to frame suitable activities to address following questions

1. What qualities testers should have?
2. As a tester, what qualities do you have? Provide with examples to justify your qualities?
3. Describe what you would like to do in a new job as a Software Tester?
4. Why A Tester needs to interact with various IT departments?

### **Why Testing Is Important?**

1. Why is Testing Important? Justify with few good examples?
2. What happen if you not test software properly? Provide few examples and problems occurred due to not testing enough?
3. How rigorous testing helps IT companies?
4. Why Testing is important in Software Industry?
5. What are the advantages of starting early testing in SDLC?
6. Can testing be 100%? if not then why?
7. Provide various justifications for separating software testing from software development job? Why not software developers should conduct complete testing rather than companies pay separately to software testers?

### **Different Types Of Testing**

1. What are the different types of Testing?
2. Explain each in not more than 5sentences:
  - Unit Testing
  - Integration Testing
  - Alpha Testing
  - System Testing

- Usability Testing
  - Cross Browser Testing
  - Multi-Platform Testing
  - Performance Testing
  - Security Testing
  - User Acceptance Testing(UAT)
  - Beta Testing
    - a) What is Functional Testing? List various testing which come under this category?
    - b) What is Non Functional Testing? List various testing which come under this category?
    - c) How Acceptance testing is importance? Who does acceptance Testing? What we do in this testing?
3. List five key differences Smoke Testing Vs Sanity Testing?
  4. Define Manual Vs Automated testing?
  5. List as many differences as you can between white box testing and black box testing?

### **Test Cases**

What is a Test Case?

List out level of Test Cases? What are fields of a Test case Template?

Write test cases for Gmail Login? Give at least 5 examples?

Design 3 positive Test cases and 3 negative test cases regarding: <http://newtours.demoaut.com>

What problems you face in writing test cases?

What is called a good Test Case? What is a bad Test Case?

What are guidelines for writing Test Cases?

What is Test Data? Why is it important?

Develop Test cases for Flight Reservation Application?

(Use standard guidelines to write your test cases. Cover all sections provided in SRS).

### **Test Plan**

What is Test plan ? What are the Contents of a Test Plan? Describe each.

Write an example of a Test Plan?

Develop Test Plan for Flight Reservation System Application? Make sure you cover all the sections and it should look like professional document?

### **Traceability matrices**

What is a Traceability matrix? How to use it?

Traceability matrix is useful? How? Describe with Example with any application?

Develop Traceability Matrix for Flight Reservation Application?

### **Requirement**

1. What's full form of SRS?
2. Why SRS is important in Manual Testing?
3. What is Use Cases?
4. Design 5 different Use Cases?
5. What are Non-functional Requirement in SRS?
6. Design a Use Case Diagram? Describe briefly.

### **Test Strategies**

1. What is Test Strategies? Importance.
2. Discuss a Test Strategies on object-oriented software?
3. What are the different Test environments, infrastructure and tools?

### **Test Methodologies**

1. What is Agile Methodology?
2. How Scrum Works? Describe each components.
3. What is Product Backlog? Design a Sample.
4. What are advantage and disadvantage Agile Scrum?
5. How Waterfall model work? Define each Phase.
6. Why Waterfall model is harmful?

### **Defect Management**

1. What is software defect or bug?
2. List 10 different defects with example which you encountered in your previous projects?
3. What are the different causes of Defects i.e why defect occur?
4. Define Defect Life Cycle?
5. What is defect or bug report?
6. Have you developed bug report? If yes, then explain what are various sections did you include in your bug report?
7. How was defect management process implemented by a software development company?
8. Once QA persons found defects, what s/he does with that defect?

### **Test Effort Estimation**

1. What is Test Effort Estimation?
2. Design a Test Effort Estimation?

## Practical Based Scenario :

### Exercise #1: Finding Defects

As a software tester, what do you do? Of course, testing the software, you would say.....Okay, can you find out defects on the page shown below?

The screenshot shows a web form titled "New Registratio" with the following fields and content:

- Choose User Id:** Input field containing "T\$1Dw\_5&" with the placeholder text "Enter User ID".
- Password:** Input field containing "\*\*\*\*\*" with the placeholder text "Enter Password".
- Confirm Password:** Input field containing "hello123".
- Name:** Input field containing "Tester1.1 and Tester 1.2".
- Email:** Empty input field with the text "(Requires verification. Will not be published.)" to its right.
- Country:** Dropdown menu showing "India".
- Verification:** A small image showing a verification number "4" and a text prompt "Please enter the verification number exactly as shown in left." followed by an empty input field.
- Register:** A button located at the bottom right of the form.

### Here is how you can judge yourself:

If you find:

- 0 – 4 defects => Poor
- 5 – 6 defects => Average
- 7 – 8 defects => Good
- 9 – 10 defects => Excellent
- 10+ defects => Best tester!

(you are the judge and you need to count on valid defects)

### Here is one example of a defect as a hint:

– Confirm password field does not show content in encrypted mode.

List all the other in the comments below.

### Exercise #2: Writing Test Scenarios

We do not only test, but we also develop test scenarios too. There is a real-life scenario and you need to write test ideas for the same.

**Write test ideas for this Scenario:** You are at the grocery store's checkout counter. You have bought five items (x, y, z, a, and b). You make payment and move to the EXIT door..



**Example Test ideas as a hint:**

1. If the checkout counter is not operated by any human, scan all the five items, scan your card and make payment.
2. The scanners should scan proper relevant information.

**Exercise #3: Defect Reporting**

As a tester, the best part of the job is to report defects. We would like to know how you would report the following defect (you can decide upon the fields you want to include while reporting the defect in the best way).

**Write a detailed defect report for this sample defect:** After logging into Gmail, it navigates to Google.com

No hint here. :) Just write a good and complete defect report

**Exercise #4: Providing Suggestions**

Providing suggestions to improve quality or user experience is the extension of a Software Testing job. So why not try that? Can you tell us how user experience can be improved for the following sign-in page?



The image shows a sign-in form with the following elements:

- Sign In** (Section Header)
- What is your e-mail address?** (Label)
- My e-mail address is** [Text Input Field]
- Do you have password?** (Label)
- No, I am a new customer.**
- Yes, I have a password:** [Text Input Field]
- [Forgotten your password?](#) (Link)
- Sign in using our secure server** [Submit Button]

**Here is an example suggestion as a hint:**

*– Rather than asking the customer to select whether he is a new customer, the system should check the status of the customer based on the e-mail address or User ID he had provided.*

### **-Exercises:1 Finding defects**

- 1) In header part of form Colors should be proper( Blue background and Blue font color is not seems good)
- 2) Spell mistake should not be there in word 'Registration' in header part.
- 3) Label 'Choose User Id should not be there(As there is no drop-down list)
- 4) If User ID is mandatory then "Enter User ID"(validation message) label should be in Red font and it should be display once focus comes to next textbox.
- 5) Same for Password field.
- 6) Conform password field values should be encrypted (With required field validation message)
- 7) For name there should be validation message for Alphabets values only.
- 8) Captcha image quality (Style) should be good.
- 9) There should be option for Refresh captcha.
- 10) Help message for Captcha input should be proper.
- 11)"Register" Button should be on proper place.
- 12) Label message for button should be visible properly.

### **-Exercises:2 Test scenarios**

- 1) Verify that checkout counter is operated by a human.
- 2) Verify that each product has barcode label.
- 3) Verify that Barcode reader reads valid values of produce.
- 4) Verify that software calculates valid total of all selected product values.
- 5) Verify that user has Valid bank Debit card.
- 6) Verify that user should have minimum balance equal to total amount of all chosen products.
- 7) Verify that user has entered valid password otherwise there should be valid warning message.
- 8) Verify that Payment system not publish any confidential information about user.
- 9) Verify that Payment system should collect only requested amount (equal to total amount of all 5 products).

### **-Exercises:3 Bug Reporting**

Bug Id: 01

Objectives: After logged in to Gmail user should be redirected to the Inbox page of Gmail.

Version: 1.0

Severity : Critical

Priority : High

Steps to reproduce:

1. Open URL <http://www.gmail.com>
2. Click on 'Sign in' link
3. Enter your email and password.
4. Click on the 'Sign in' button
5. It is redirected to Google.com (instead of gmail)

Attachment: Bug\_Screen1.png

Status : OPEN

Date Reported : 02/27/2020

Reported By : GSJ

Assigned To : AGP

-

Exercises:4 : Suggestions

- 1) Instead of "My e-mail address is" label it should be like simply "Email"
- 2) Instead of two different radio button for two different types of users (with password and With no password)
- 3) There should be one email address field
- 4) There should be one password field.
- 5) There should be one link for new members which will redirect on new registration page
- 6) After logged in to Gmail user should be redirected to Inbox page of Gmail.  
Button text should be "Signin"
- 7) There should be another button to cancel action ("CANCLE" button)
- 8) No Label is required like "What is your email address?".

**Savitribai Phule Pune University  
M.Sc. (Computer Applications)**

**Title of the Course: Web Technology Laboratory  
Paper Code: CA - CCPP-1**

Teaching Scheme Practical: 8 hrs / week	No. of Credits 04	Examination Scheme IE : 30 marks UE: 70 marks
--	----------------------	---

**Practical Assignment (CSS, JavaScript, Ajax, PHP)**

**Practical Assignment Set-I JavaScript**

<b>Sr. No.</b>	<b>Assignments</b>
1.	Write a JavaScript to create an image slider.(Use array to store images)
2.	Write a JavaScript Program to read a number from user, store its factors into the array and display that array. (Handle onClick Event)
3.	Write a java script function to display Clock in the textbox.
4.	Write a JavaScript program to read a character string from user and perform the following functions: Accept a character from user and count the number of occurrences of that character in the string.Accept a Position from user and print the character at specified position.
5.	Write a JavaScript program to design student registration form and perform following validation:- Check all fields should not contain a null value- Check name field contains only alphabets- Mobile No. field should be of 10 digits.s-Pin code field should be of 06 digits.
6.	Write a Java Script program to design Customer Account Details Form and perform validation on pan number field. (pan number is of only 10 characters long, out of which first 5 characters are alphabets, next 4 characters are digits and last character is alphabet )
7.	Write a JavaScript program to compare the values of password and confirmed password field and display message accordingly. Also perform the validation to check any of the field should not be empty.
8.	Write a PHP script to set selected image from ComboBox (DropDownList) to the background of Page.
9.	Design HTML form, accept student Name, Age, and Mobile No. from user. Using java Script validate for following a) Student Name should not be empty. b) Student Age must be between 1 to 20.
10.	Write a java Script that Accept a string from user. Pass this string as parameter to a function name 'check_vowel' on button click event and return the count of the number vowels within the string.
11.	Write a java script function to Accept First Name and Last Name from user. Display users entered information. [ Hint: use alert and prompt dialogbox]
12.	Write a Java Script to accept email address from user and count no. of @occurrences and number of DOT(.) occurrences.

**Practical Assignment Set-II (Database(Postgresql) & Ajax)**

Sr. No.	Assignment
1.	Consider the following entities and their relationship. Doctor ( doc_no, dname, address, city, area) Hospital (hosp_no, hname, hcity) Doctor-Hospital related with many-one relationship. Create a RDB in 3NF for above and solve the following. Using above database write a script in PHP to print the Doctor visiting to the hospital in tabular format. Accept hospital name from user[ Use PostgreSQL]
2.	Write a AJAX program to read contact. Dat file and print the contain of a file in a Tabular form when the user clicks on print button. Contact.dat file contain srno, name, residence number, mobile number, context/ relation. [ Enter at least 3 record in contact.dat file] [Note: Examinar may change the contact. dat, dept.dat and provide proper structure of the file]
3.	Write AJAX program to print movie by selecting an actor's name. create table Movie and Actor with 1:M cardinality as follows: Movie ( mno, mname, release_year) Actor( ano, aname) [USE PostgreSQL]
4.	Write a AJAX program to search Student name according to the character typed and display list using array
5.	Write a AJAX program to print Teacher information from postgresQL table Teacher. Teacher (Tno, Name, Subject, Research area). [Note: Examiner can change postgresql table]

**Practical Assignment Set-III (XML)**

Sr. No.	Assignment
1.	Write a script to create XML file as 'Employee.xml'. The element of this xml file are as follows: <Empdetails> <Employee EMPno= Empname=> <Salary>-----</Salary> <Designation>-----</Designation> </Employee> </Empdetails>
2.	Write a PHP script to generate an XML in the following format in php. <? Xml version='1.0'encoding=""ISO-8859-1'?> <Book Store> <Books> <PHP> <Title> Programming in PHP </ Title> <Publication>O'RELLY<Publication> </PHP> <PHP> <Title> Beginners PHP</ Title>

	<pre>&lt;Publication&gt; WORX&lt;/Publication&gt; &lt;/PHP&gt;&lt;/Books&gt; &lt;/Book Store&gt;</pre>
3.	<p>Write a script to create XML file 'University.xml'. The element details of 'University.xml' Are as follows:</p> <pre>&lt;Univ&gt; &lt;Uname&gt;-----&lt;/Uname&gt; &lt;CITY&gt;-----&lt;/CITY&gt; &lt;Rank&gt;-----&lt;/Rank&gt; &lt;/Univ&gt;</pre> <p>a) Store the details of at least 3 universities.  b) Link the 'University.xml' file to CSS and get well formatted output as given below.</p> <p>i) Uname :  Color : black;  Font-family: copperplate G0thic Light;  Font size: 16pt;  Font:Bold;</p> <p>ii) City and Rank  Color: Yellow;  Font-family: Arial;  Font-size : 12pt;  Font: Bold;</p>
4.	<p>Write a PHP Script to read 'BOOK.xml' file and print specific content of a file using DOMDocument parser. 'Book.xml' file should contain following information with at least 5 records with values.</p> <p>BookInfo  Book NO, Book Name, Author Name, Price, Year.  [Note: Examiners can change the Book info file to Student info, Teacher info]</p>
<b>Practical Assignment Set-IV (PHP)</b>	
<b>Sr. No.</b>	<b>Assignment</b>
1.	<p>Write a PHP script for the following.</p> <p>a) Design a form to accept the details of 5 different items such as Item code, Item Name, unit, sold and Rate.  b) Display the bill in tabular format. Use only 4 textboxes. [ Use explode]</p>
2.	<p>Design a HTML form to accept a string. Write a PHP script for the following.</p> <p>a) Write a function to count the total number of Vowels from the script.  b) Show the occurrences of each Vowel from the script.</p>
3.	<p>Write a PHP script, which will return the following component of the URL 'http:// www.example.com/php-example/index.php'</p> <p>List of component: Scheme, Host, Path</p> <p><b>Excepted o/p</b>  Scheme: http  Host: www.example.com  Path:/php-example/index.php</p>
4.	<p>Write a PHP script to display following information using super global variable.</p>

	<p>a) Client IP Address.  b) Browser detection/information.  C) To check whether the page is called from 'https' or 'http'.</p>
5.	<p>Write a menu driven program to perform various file operations. Accept filename from user.  a) Display type of file.  b) Delete a file.</p>
6.	<p>Write a menu driven program the following operation on an associative array  a) Reverse the order of each element's key-value pair.  b) Traverse the element in an array in random order.</p>
7.	<p>Create a HTML form that accept user email. Write a PHP program to check whether user email address contain @ symbol or not. Display proper message.</p>
8.	<p>Write a PHP script to design a form to accept email from user and validate email address using regular expression.</p>
9.	<p>Write a PHP script to keep track of number of times the web page has been access.  [Use Session]</p>
10.	<p>Write a PHP script to check how many times the web page access.[ Use cookies]</p>
11.	<p>Write a PHP script for the following.  Define an array. Find the element from the array that matches the given values using appropriate search function.</p>
12.	<p>Write a PHP script for the following.  Design a form to accept a string and check whether the given string is Palindrome or not.  [ Use built-in function.]</p>
13.	<p>Write a menu driven program to perform the following operation on an associative array.  a) Display the elements of an array along with key.  b) Display the size of an array.</p>
14.	<p>Write a PHP Script to accept customer Name from user and do the following  a) Transform Customer Name all Upper case latter.  b) Make First character to Upper Case.</p>
15.	<p>Write a PHP script to accept the number from user and write a function to calculate the factorial of a given number ( non-negative integer). The function accept the number as argument.  Write a PHP Program to read two file names from user and append content of first file into second file.</p>
16.	<p>Write a PHP program to declare a multidimensional array. Display specific element from a multidimensional array. Also delete given element from the multidimensional array.  ( after each operation display array contents).</p>
17.	<p>Write a PHP program to read a directory name and extension form user. Display the files with specified extension from that directory.</p>
18.	<p>Write a PHP program to create a Class calculator which will accept two value from user and pass as an argument through parameterized constructor and do</p>

	<p>the following task.</p> <p>a) Add Them</p> <p>b) Subtract Them</p> <p>c) Multiply them together or divide them on request.</p>
19.	Write a PHP script to accept username and password. If in the first three chances, username and password entered is correct then display second form with 'welcome message' otherwise display error message. [ Use Session]
20.	Write a PHP script to create a Class shape and its subclass triangle, square and circle and display area of the selected shape.( use the concept of Inheritance) Display menu( use radio button) a) Triangle b) Square c) Circle
21.	Write a menu driven program to perform the following stack related operations. i) Insert an element in stack. ii) Delete an element from stack.[Hint: Use array_push(), array_pop()]
22.	Write a PHP program to define Interface shape which has two method as area() and volume (). Define a constant PI Create a class Cylinder implement this interface and calculate area and Volume.
23.	Write a PHP program to read Flat file 'Student.dat' that has student details as roll no, name, m1,m2,m3 as mark of three subjects. Display the data from the file in tabular format. Also display total and percentage of each student. <b>Dat file : student.dat</b> 1 Ajay 50 20 80 2 Vijay 30 80 60
24.	Write a PHP script to accept Employee details ( Eno, Ename, address) on first page. On second page accept earning( Basic, Da, HRA). On third page print Employee information( ENO,Ename, Address, BASIC, DA, HRA, TOTAL) [Hint: Use Session]
25.	Write a PHP script for the following: a) Design a form to accept two numbers from the users. b) Give option to choose an arithmetic operation ( use Radio Button). c) Display the result on next form. d) Use concept of default parameter.
26.	Write a PHP script to change the preference of your web page like font style, font, size, font color, background color using cookie. Display selected settings on next page and actual implementation ( with new settings) on third page.
27.	Write a PHP script to design a form to accept two strings( one smaller than other) from the user. Find whether the smallest string appear at the start of the larger string. Provide textbox to accept the string that will replace all occurrences of smaller string present in larger string.



**28.**

Write a PHP script to design a form to compose/write an email with following details.

TO

Subject

Message

Send Mail

# **SEMESTER-II**

**Savitribai Phule Pune University  
M.Sc. (Computer Applications)**

**Course Title: Data Mining & Data Warehousing  
Paper Code: CA - CCTP-4**

Teaching Scheme Theory: 4 hrs / week	No. of Credits 04	Examination Scheme IE : 30 marks UE: 70 marks
---	----------------------	---

**Course Contents**

<b>Chapter 1</b>	<b>Introduction to Data Mining.</b>	<b>4 lectures</b>
	<ol style="list-style-type: none"> <li>1. Basic Data Mining Tasks.</li> <li>2. DM versus Knowledge Discovery in Databases.</li> <li>3. Data Mining Issues.</li> <li>4. Data Mining Metrics.</li> <li>5. Social Implications of Data Mining.</li> <li>6. Overview of Applications of Data Mining.</li> </ol>	
<b>Chapter 2</b>	<b>Introduction to Data Warehousing.</b>	<b>8 lectures</b>
	<ol style="list-style-type: none"> <li>1. Architecture of DW</li> <li>2. OLAP and Data Cubes</li> <li>3. Dimensional Data Modeling-star, snowflake schemas</li> <li>4. Data Preprocessing – Need, Data Cleaning, Data Integration &amp;</li> <li>5. Transformation, Data Reduction</li> <li>6. Machine Learning, Pattern Matching</li> </ol>	
<b>Chapter 3</b>	<b>Data Mining Tasks</b>	<b>8 lectures</b>
	<ol style="list-style-type: none"> <li>1. Frequent item-sets and Association rule mining: Apriori algorithm,</li> <li>2. Use of sampling for frequent item-set, FP tree algorithm</li> <li>3. Graph Mining: Frequent sub-graph mining, Tree mining, Sequence Mining.</li> </ol>	
<b>Chapter 4</b>	<b>Classification And Prediction.</b>	<b>10 lectures</b>
	<ol style="list-style-type: none"> <li>1. Decision tree learning <ul style="list-style-type: none"> <li>• Construction, performance, attribute selection</li> <li>• Issues: Over-fitting, tree pruning methods, missing values,</li> <li>• continuous classes</li> <li>• Classification and Regression Trees (CART)</li> </ul> </li> <li>2. Bayesian Classification: <ul style="list-style-type: none"> <li>• Bayes Theorem, Naïve Bayes classifier,</li> <li>• Bayesian Networks</li> <li>• Inference</li> <li>• Parameter and structure learning <ul style="list-style-type: none"> <li>• Linear classifiers.</li> <li>• Least squares, logistic, perceptron and SVM classifiers</li> </ul> </li> </ul> </li> <li>3. Prediction <ul style="list-style-type: none"> <li>• Linear regression</li> <li>• Non-linear regression</li> </ul> </li> </ol>	
<b>Chapter 5</b>	<b>Accuracy Measures.</b>	<b>6 lectures</b>
	Precision, recall, F-measure, confusion matrix, cross-validation, bootstrap	

<b>Chapter 6</b>	<b>Clustering</b>	<b>10 lectures</b>
<ol style="list-style-type: none"> <li>1. k-means</li> <li>2. Expectation Maximization (EM) algorithm</li> <li>3. Hierarchical clustering, Correlation clustering</li> </ol>		
<b>Chapter 7</b>	<b>Software for data mining and applications of data mining</b>	<b>6 lectures</b>
R and Weka tool.		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Data Mining: Concepts and Techniques, Han, Elsevier ISBN:9789380931913/ 9788131205358</li> <li>2. Margaret H. Dunham, S. Sridhar, Data Mining – Introductory and Advanced Topics, Pearson Education</li> <li>4. Tom Mitchell, —Machine Learningll, McGraw-Hill, 1997</li> <li>5. Christopher M. Bishop, —Pattern Recognition and Machine Learningll, Springer 2006</li> <li>6. Raghu Ramkrishnan, Johannes Gehrke, Database Management Systems, Second Edition,</li> <li>7. McGraw Hill International Ian H.Witten, Eibe Frank Data Mining: Practical Machine Learning Tools and Techniques,</li> </ol>		

**Savitribai Phule Pune University  
M.Sc. (Computer Applications)**

**Title of the Course: Operating Systems  
Paper Code: CA - CCTP-5**

Teaching Scheme  
Theory: 4 hrs / week

No. of Credits  
**04**

Examination Scheme  
IE : 30 marks  
UE: 70 marks

**Course Contents**

**Chapter 1 | Introduction to Operating System Concepts. | 3 lectures**

1. Introduction to Operating System Concept.
2. Different services provided by Operating System to User.
3. Introduce the concept of Process, Process States , Process Control Block, User Interface, System Calls.

**Chapter 2 | Introduction to UNIX concepts. | 5 lectures**

1. Introduction to Unix Operating System.
2. Features of Unix.
3. Architecture of the Unix Operating System.
4. Introduction to File System and Process Environment.
5. Working with Unix
  - The login prompt.
  - General features of Unix commands/ command structure.
  - Command arguments and options.
  - Understanding of some basic commands such as echo, printf, ls, who, date, passwd, cal, Combining commands.

**Chapter 3 | Using Unix Commands. | 6 lectures**

1. What is Command.
2. Meaning of Internal and external commands.
3. The type command: knowing the type of a command and locating it.
4. The man command knowing more about Unix commands and using Unix online manual pages. The man with keyword option and whatis.
5. Knowing the user terminal, displaying its characteristics and setting characteristics.
6. The root login. Becoming the super user: su command. The /etc/passwd and /etc/shadow files.
7. Commands to add, modify and delete users.

**Chapter 4 | Handling Files under Unix. | 10 lectures**

1. Unix files.
2. Naming files. Basic file types.
3. Organization of files. Standard directories.
4. Parent child relationship.
5. The home directory and the HOME variable.

	<ol style="list-style-type: none"> <li>6. Reaching required files- the PATH variable, manipulating the PATH, Relative and absolute pathnames.</li> <li>7. Directory commands – pwd, cd, mkdir, rmdir commands.</li> <li>8. The dot (.) and double dots (..) notations to represent present and parent directories and their usage in relative path names.</li> <li>9. File related commands – cat, mv, rm, cp, wc and od commands.</li> <li>10. File attributes and permissions and knowing them.</li> <li>11. The ls command with options.</li> <li>12. Changing file permissions: the relative and absolute permissions changing methods.</li> </ol>	
<b>Chapter 5</b>	<b>Managing Processes in Unix.</b>	<b>5 lectures</b>
	<ol style="list-style-type: none"> <li>1. Process Concept.</li> <li>2. Mechanism of process creation.</li> <li>3. Parent and child process.</li> <li>4. The ps command with its options.</li> <li>5. Executing a command at a specified point of time: at command.</li> <li>6. The nice command.</li> <li>7. Background processes. The bg and fg command. The kill command.</li> <li>8. The find command with illustrative example.</li> </ol>	
<b>Chapter 6</b>	<b>Using Shells</b>	<b>5 lectures</b>
	<ol style="list-style-type: none"> <li>1. What is Shell Under Unix?</li> <li>2. Different types of shells in Unix.</li> <li>3. The shells interpretive cycle.</li> <li>4. Wild cards and file name generation.</li> <li>5. Removing the special meanings of wild cards.</li> <li>6. Three standard files and redirection.</li> <li>7. Connecting commands: Pipe.</li> <li>8. The grep, egrep commands. .</li> </ol>	
<b>Chapter 7</b>	<b>Using Vi Editor</b>	<b>4 lectures</b>
	<ol style="list-style-type: none"> <li>1. Introduction to the Vi editor.</li> <li>2. Different ways of invoking and quitting vi.</li> <li>3. Different modes of vi. Input mode commands.</li> <li>4. Command mode commands.</li> <li>5. The ex mode commands.</li> <li>6. Illustrative examples Navigation commands.</li> </ol>	
<b>Chapter 8</b>	<b>Shell Programming</b>	<b>12 lectures</b>
	<ol style="list-style-type: none"> <li>1. Shell programming.</li> <li>2. Ordinary and environment variables.</li> <li>3. The .profile. Read and read-only commands.</li> <li>4. Command line arguments.</li> <li>5. exit and exit status of a command.</li> <li>6. Logical operators for conditional execution.</li> </ol>	

7. The test command and its shortcut.
8. The if, while, for and case control statements.
9. The set and shift commands and handling positional parameters.
10. The here ( << ) document and trap command.
11. Simple shell program examples.
12. File inodes and the inode structure.
13. File links – hard and soft links. Filters.
14. Head and tail commands.
15. Cut and paste commands.
16. The sort command and its usage with different options.

**Reference Books:-**

1. Operating System Concepts - Siberchatz, Galvin, Gagne (8th Edition)
2. Unix Concepts and Applications., Sumitabha Das., 4th Edition., Tata McGraw Hill
3. UNIX and Shell Programming, Behrouz A. Forouzan, Richard F. Gilberg : Cengage Learning – India Edition. 2009.
4. UNIX & Shell Programming, M.G. Venkatesh Murthy, Pearson Education.
5. Linux Command Line and Shell Scripting Bible, Richard Blum , Christine Bresnahan , 2nd Edition , Wiley, 2014

**Savitribai Phule Pune University  
M.Sc. (Computer Applications)**

**Title of the Course: Computer Networks  
Paper Code: CA - CCTP-6**

Teaching Scheme  
Theory: 4 hrs / week

No. of Credits  
**04**

Examination Scheme  
IE : 30 marks  
UE: 70 marks

**Course Contents**

<b>Chapter 1</b>	<b>Introduction to Computer Networks</b>	<b>6 lectures</b>
------------------	--	-------------------

**Data Communication**

Characteristics of data communication, components, data representation, data flow. **Computer Networks**

Distributed processing, Physical structure-Point to Point, Broadcast, Categories of topology (mesh, star, ring, bus etc.)

**Categories of network**

LAN,WAN,MAN,INTERNET etc.

**Protocols and Standards**

Definition of protocol, key elements , Defacto & Dejure standard, Standards organizations.

**Network Software**

Protocol Hierarchies layers, protocols, peers, interfaces, network architecture, protocol stack design issues of the layers – addressing, error control, flow control, multiplexing and demultiplexing, routing Connection-oriented and connectionless service

**Service Primitives** – listen, connect, receive, send, disconnect The relationships of services to protocol

<b>Chapter 2</b>	<b>Network Models</b>	<b>4 lectures</b>
------------------	-----------------------	-------------------

**OSI Reference model**

Functionality of each layer

**TCP/IP model**

Introduction to IP,TCP & UDP TCP/IP Protocol Suite

**Addressing**

Physical, Logical & Port addresses

<b>Chapter 3</b>	<b>The Physical Layer</b>	<b>9 lectures</b>
------------------	---------------------------	-------------------

**The Basic Concepts of analog & digital signals**

Bit rate, bit length, base band transmission Transmission Impairments – attenuation, distortion and noise Data Rate Limits – Nyquist's bit rate formula for noiseless channel and Shannon's law Problems on above concepts

**Performance of the Network**

Bandwidth, Throughput, Latency(Delay), Bandwidth –Delay Product, Jitter Problems on above concepts

**Line Coding digital to digital conversion**



<p>Characteristics, Line Coding Schemes Unipolar, NRZ, RZ, Manchester and Differential Manchester</p> <p><b>Transmission Modes</b> Parallel Transmission Serial Transmission – Asynchronous and Synchronous</p> <p><b>Multiplexing</b> FDM, TDM, WDM.</p> <p><b>Switching</b> Circuit Switching, Message Switching and Packet Switching</p>		
<b>Chapter 4</b>	<b>The Data Link Layer</b>	<b>5 lectures</b>
<p><b>Framing</b> Character Count, Byte Stuffing, Bit Stuffing and Physical Layer Coding Violations</p> <p><b>Error Control</b> Hamming Code and CRC</p> <p><b>Elementary data link protocols</b> Simplex stop &amp; wait protocol, Simplex protocol for noisy channel.</p> <p><b>Sliding Window Protocols</b> 1-bit sliding window protocols, Pipelining – Go-Back N and Selective Repeat</p>		
<b>Chapter 5</b>	<b>The Medium Access Sub layer</b>	<b>4 lectures</b>
<p><b>Random Access Protocols</b> ALOHA – pure and slotted, CSMA – 1-persistent, p-persistent and Non-persistent CSMA/CD, CSMA/CA</p> <p><b>Controlled Access</b> Reservation, Polling and Token Passing</p> <p><b>Channelization</b> FDMA, TDMA and CDMA</p>		
<b>Chapter 6</b>	<b>The Network layer</b>	<b>10 lectures</b>
<p><b>Design Issues</b> Store-and-forward packet switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection Oriented Service, Comparison of Virtual Circuit and Datagram</p> <p><b>Logical Addressing</b> IPV4 Addresses – Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation(NAT) IPV6 Addresses – Addressing Structure, Address Space</p> <p><b>IPV4 Protocol</b> Datagram Format, Fragmentation, Checksum, Options</p> <p><b>IPV6 Protocol</b> Advantages, Packet Format, Extension Headers</p> <p><b>Transition From IPV4 to IPV6</b> Dual Stack, Tunneling, Header Translation</p> <p><b>Routing Concepts</b> Properties of routing algorithm, Comparison of Adaptive and Non-Adaptive Routing Algorithms</p>		

<b>Chapter 7</b>	<b>The Transport layer</b>	<b>6 lectures</b>
<p><b>Process-to-Process Delivery</b>  Client Server Paradigm, Multiplexing and De-multiplexing, Connectionless Vs Connection-Oriented Service, Reliable Vs Unreliable</p> <p><b>User Datagram Protocol UDP</b>  Datagram Format, Checksum, UDP operations, Use of UDP</p> <p><b>Transmission Control Protocol (TCP)</b>  TCP Services, TCP Features, TCP Segment, TCP Connection, Flow Control, Error Control TCP Congestion Control Slow Start Mechanism</p> <p><b>Introduction to SCTP</b></p>		
<b>Chapter 8</b>	<b>The Application layer</b>	<b>8 lectures</b>
<p><b>Domain Name System (DNS)</b>  Name Space, Domain Name Space, Distribution of Name Space, DNS in the Internet, Name – Address Resolution</p> <p><b>TELNET</b>  Timesharing Environment, Logging, NVT, Embedding, Options, Mode of Operations</p> <p><b>E-MAIL</b>  Architecture, User Agent, Message Transfer Agent-SMTP, Message Access Agent-POP, IMAP, Web Based Mail</p> <p><b>File Transfer Protocol (FTP)</b>  Communication over control connection, Communication over Data Connection, Anonymous FTP</p> <p><b>WWW</b>  Architecture, WEB Documents</p> <p><b>HTTP</b>  HTTP Transaction, Persistent and Non-persistent Connection, Proxy Server</p>		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Computer Networks, Tanenbaum, ISBN:788177581652, Pearson</li> <li>2. Data Communication and Networking by Behrouz Forouzan, TATA McGraw Hill.Fourth editions</li> </ol>		

**Savitribai Phule Pune University  
M.Sc. (Computer Applications)**

**Title of the Course: Java Programming  
Paper Code: CA - CBOP-2**

Teaching Scheme  
Theory: 2 hrs / week

No. of Credits  
**02**

Examination Scheme  
IE : 15 marks  
UE: 35 marks

**Course Contents**

<b>Chapter 1</b>	<b>Introduction to Java</b>	<b>2 lectures</b>
History and Features of Java JDK,JRE,JIT , Bytecode and JVM Simple java program Data Types Variable: final, static, abstract Array, Function.		
<b>Chapter 2</b>	<b>Objects and Classes</b>	<b>4 lectures</b>
Definition of Class Access Specifiers, Constructors Use of “this” keyword String , String Buffer and Wrapper class Inner classes, Nested classes, local classes, Anonymous classes(Anonymous object) Introduction to Packages Garbage Collection (finalize() Method)		
<b>Chapter 3</b>	<b>Inheritance and Collection</b>	<b>5 lectures</b>
Inheritance Basics , Types of Inheritance Use of 'super' and 'Final' Keyword Usage of abstract class and abstract methods Interface Introduction to Collection		
<b>Chapter 4</b>	<b>Exception Handling and I/O</b>	<b>4 lectures</b>
Introduction to Exception handling Exception types , Exception class User defined exception Introduction to Java.io package Byte streams , Character streams File IO basics Object serialization – Reader and Writer		
<b>Chapter 5</b>	<b>Swing , Applet programming</b>	<b>4 lectures</b>
MVC(Model View Controller) Architecture Swing Applet fundamentals, Applet lifecycle, Creating and running applets Applets: Event Handling using applets.		
<b>Chapter 6</b>	<b>Database Programming</b>	<b>4 lectures</b>
Introduction to JDBC: Architecture JDBC Drivers , Connectivity .		

JDBC statement, JDBC ResultSet and types JDBC Metadata		
<b>Chapter 7</b>	<b>Servlets</b>	<b>4 lectures</b>
Introduction to Servlet and Hierarchy of Servlet Life cycle of servlet Handling HTTPRequest and HTTPResponse HttpServlet: → Reading form data from servlet → Servlet - Database communication Session tracking –User Authorization, URL Rewriting, Hidden Form fields, Cookies and HttpSession		
<b>Chapter 8</b>	<b>JSP</b>	<b>4 lectures</b>
Simple first JSP program Life cycle of JSP Implicit Objects Scripting elements –Declarations, Expressions, Scriplets, Comments JSP Directives –Page Directive, include directive Mixing Scriplets and HTML Example of forwarding contents from database to servlet servlet to JSP and displaying it using JSP scriplet tag		
<b>Reference Books:</b>		
<ol style="list-style-type: none"> <li>1. Complete reference Java by Herbert Schildt(5th edition)</li> <li>2. Java 2 programming black books, Steven Horlzner</li> <li>3. Java EE Project using EJB 3, JPA and struts 2 for beginners, Shah, SPD</li> <li>4. Core Java Volume-II Advanced Features, Eighth Edition, Cay S.Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press</li> <li>5. Commercial web development using java 2.0, Ivan Byaross, BPB</li> <li>6. Java Programming A practical Approach, C Xavier, McGraw Hill</li> </ol>		

**Savitribai Phule Pune University  
M.Sc. (Computer Applications)**

**Java Programming Laboratory  
Paper Code: CA - CBOP-2**

Teaching Scheme Practical: 4 hrs / week	No. of Credits <b>02</b>	Examination Scheme IE : 15 marks UE: 35 marks
--	-----------------------------	---

Sr. No.	Assignments
1.	To find the sum of 10 number of integers entered by user.
2.	To find the factorial of a given number (Use command line argument)
3.	To learn use of single dimensional array.
4.	To learn use of a two dimensional array
5.	To convert a decimal to binary number and vice-versa.
6.	To check if a number is prime or not, by taking the number as input from the keyboard
7.	To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument
8.	Write a program that show working of different functions of String and StringBufferclasss like setCharAt(), setLength(), append(), insert(), concat()and equals().
9.	Write a program to create a "Time" class with methods where Time is computed in terms of hrs and minutes, how to create objects of a class and to see the use of this pointer
10.	Modify the "Time" class by creating constructor for assigning values (hours and minutes) to the time object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
11.	Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions(from lower to higher data type)
12.	Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
13.	Write a program to show the use of static functions and to pass variable length arguments in a function.
14.	Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
15.	Write a program "DivideByZero" that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.

16.	Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
17.	Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
18.	Write a program to create URL object, create a URL Connection using the openConnection() method and then use it examine the different components of the URLand content.
19.	Write a program to implement a simple datagram client and server in which a message that is typed into the server window is sent to the client side where it is displayed.
20.	Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
21.	Write a program to demonstrate different keyboard handling events.
22.	Write a program to generate a window without an applet window using main() function.
23.	Write a program to demonstrate the use of Traffic Signals.
24.	Java Program to Display Characters from A to Z using loop
25.	Java Program to Count Number of Digits in an Integer
26.	Java Program to Reverse a Number
27.	Java Program to Calculate the Power of a Number
28.	Java Program to Check Whether a Number is Palindrome or Not
29.	Java Program to Check Whether a Number is Prime or Not
30.	Java Program to Display Prime Numbers Between Two Intervals
31.	Java Program to Check Armstrong Number
32.	Java Program to Display Armstrong Number Between Two Intervals
33.	Java Program to Display Prime Numbers Between Intervals Using Function
34.	Java Program to Display Armstrong Numbers Between Intervals Using Function
35.	Java Program to Display Factors of a Number
36.	Java Program to Make a Simple Calculator Using switch...case
37.	Creating a web page using JSP Tags
38.	Understanding the behavior of cookies and session management using JSP
39.	Create MVC application: using Servlet, JSP, Understanding

**Savitribai Phule Pune University**  
**M.Sc.(Computer Applications )-I (2019 Course)**  
**Semester- II**  
**Course Code: CA CBOTP- 2 B**  
**Course Title : Web Services**

<b>Teaching Scheme:</b> TH: 02 Hours/Week	<b>Credit 02</b>	<b>Examination Scheme:</b> In-Sem : 30 Marks End-Sem : 70 Marks
---	------------------	---

**Prerequisite Courses:** Knowledge about ASP.Net programming.  
 Good Understanding of Object Oriented Programming concepts.  
 familiarity with XML.

**Course Objectives:**

- To understand the details of web services technologies like WSDL, UDDI, SOAP
- To learn how to implement and deploy web services.
- To understand the concept of RESTful system.

**Course Outcomes:**

On completion of the course, student will be able to–

- Create and use Web Services.
- Creating RESTful Services.

**Course Contents**

<b>Unit I</b>	<b>Web Service</b>	<b>07</b>
---------------	--------------------	-----------

**Introduction to Web Services**

The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

**Web Services Architecture**

Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication models, basic steps of implementing web services.

<b>Unit II</b>	<b>SOAP</b>	<b>08</b>
----------------	-------------	-----------

**SOAP**

Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP communication model, Building SOAP Web Services, developing SOAP Web Services using ASP.Net, Error handling in SOAP, Advantages and disadvantages of SOAP.

<b>Unit III</b>	<b>WSDL and UDDI</b>	<b>09</b>
<p><b>WSDL And UDDI</b>  WSDL in the world of Web Services, Web Services life cycle, WSDL Document Structure, WSDL bindings, WSDL Elements, limitations of WSDL.</p> <p>UDDI – UDDI Registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, support for categorization in UDDI Registries, Publishing API, Publishing information to a UDDI Registry, searching information in a UDDI Registry, deleting information in a UDDI Registry, limitations of UDDI.</p>		
<b>Unit IV</b>	<b>REST</b>	<b>06</b>
<p><b>The REST Architectural</b>  Introducing HTTP, The core architectural elements of a RESTful system, Description and discovery of RESTful web services, ASP.Net Core and Entity Framework for building RESTful web services, JSON message format and tools and frameworks around JSON, Build RESTful web services with Web APIs, The Description and Discovery of RESTful Web Services, Design guidelines for building RESTful web services, Secure RESTful web services.</p>		
<b>Total Lectures</b>		<b>30</b>
<b>Books:</b>		
<b>Title of the Book Author/s Publication:</b>		
14. C# Web Services: Building .NET Web Services by Zach Greenvoss-ChristianNagel WROX Press Ltd. 15. Building RESTful Web Services with .NET Core by Gaurav Arora, Tadit Dash Packt Publishing Limited 16. XML, Web Services, and the Data Revolution F. P. Coyle Pearson Education.		



**Savitribai Phule Pune University**  
**M.Sc.(Computer Applications (2019 Course))**  
**SEM-II**

**Course Code: CA -CBOPP-2 B**  
**Course Title : Web Services Laboratory**

<b>Teaching Scheme:</b> TH: 04 Hours/Week	<b>No. of Credits: 02</b>	<b>Examination Scheme:</b> In-Sem : 15 Marks End-Sem : 35 Marks
<b>Assignment 1</b>	Create 'Dynamic Web Project', which will host your web service functionality to greet the user according to server time and create 'Dynamic Web Project', which will host the client application that will send user name and test the web service.	
<b>Assignment 2</b>	Create 'Dynamic Web Project', which will host your web service functionality to convert Celsius to Fahrenheit and create 'Dynamic Web Project', which will host the client application that will send Celsius and test the web service.	
<b>Assignment 3</b>	Create 'Dynamic Web Project', which will host your web service functionality to find the factorial of given number and create 'Dynamic Web Project', which will host the client application that will send positive integer number and test the web service.	
<b>Assignment 4</b>	Create 'Dynamic Web Project', which will host your web service functionality to validate email id (use regular expression) and create 'Dynamic Web Project', which will host the client application that will send email id and test the web service.	
<b>Assignment 5</b>	Create 'Dynamic Web Project', which will host your web service functionality to validate user name and password (use database for storing username and password) and create 'Dynamic Web Project', which will host the client application that will send user name and password and test the web service.	
<b>Assignment 6</b>	Create 'Dynamic Web Project', which will host your web service functionality to select employee details (use database for storing emp details (eno, ename, designation, salary)) and create 'Dynamic Web Project', which will host the client application that will send employee name and display the details.	

<b>Assignment 7</b>	Create 'Dynamic Web Project', which will host your web service functionality to select Movie details (Movie(mno, mname,release_year) and Actor(ano,aname), 1 : M cardinality ) and create 'Dynamic Web Project', which will host the client application that will send actor name and display the details.
<b>Assignment 8</b>	Create 'Dynamic Web Project', which will host your web service functionality to validate mobile no (use regular expression: should contain only 10 numeric no) and create 'Dynamic Web Project', which will host the client application that will send mobile no and test the web service.
<b>Assignment 9</b>	Create 'Dynamic Web Project', which will host your web service functionality to convert Rupees to Dollar, Pound, Euro,..... and create 'Dynamic Web Project', which will host the client application that will send amount in Rupees & type of conversion and tests the web service.
<b>Assignment 10</b>	Create 'Dynamic Web Project', which will host your web service functionality to give the suggestion for given key word and create 'Dynamic Web Project', which will host the client application that tests the web service.
<b>Assignment 11</b>	Create 'Dynamic Web Project', which will host your web service functionality to find area and volume of the circle and create 'Dynamic Web Project', which will host the client application that tests the web service.
<b>Assignment 12</b>	Create 'Dynamic Web Project', which will host your web service functionality to find number of vowels in the given string and create 'Dynamic Web Project', which will host the client application that tests the web service.
<b>Assignment 13</b>	Create 'Dynamic Web Project', which will host your web service functionality to convert decimal number to Binary, Octal, Hexa Decimal and create 'Dynamic Web Project', which will host the client application that will send decimal number & type of conversion and test the web service.
<b>Assignment 14</b>	Create 'Dynamic Web Project', which will host your web service functionality to validate user name and password (use database for storing username and password) and create 'Dynamic Web Project', which will host the client application that will send user name and password and test the web service.
<b>Assignment 15</b>	Create 'Dynamic Web Project', which will host your web service functionality for returning book price and create 'Dynamic Web Project', which will host the client application that will send Book Name.

<b>Assignment 16</b>	Create 'Dynamic Web Project', which will host your web service functionality to find Weather report of the current date and create 'Dynamic Web Project', which will host the client application that tests the web service.
<b>Assignment 17</b>	Create 'Dynamic Web Project', which will host your web service functionality to update the date and time for flight booking for any airways(JET) (use database for storingFlight details) and create 'Dynamic Web Project', which will host the client application that will send request(eg: MakeMyTrip) to test the web service.

**Savitribai Phule Pune University**  
**M.Sc.(Computer Applications )-I (2019 Course)**  
**SEM-II**  
**Course Code: CA-CBOTP-2 C**  
**Course Title : Software Testing(Automation)**

<b>Teaching Scheme:</b> TH: 02 Hours/Week	<b>Credit 02</b>	<b>Examination Scheme:</b> In-Sem : 15 Marks End-Sem : 35 Marks
---	------------------	---

**Prerequisite Courses:**

- Basic understanding in any preferred programming language and webservices..

**Course Objectives:**

- Finding defects which may get created by the programmer while developing the software.
- Gaining confidence in and providing information about the level of quality.
- To prevent defects.
- To make sure that the end result meets the business and user requirements.

**Course Contents**

<b>Unit I</b>	<b>Introduction to Automation Testing and Selenium</b>	<b>02 Hours</b>
	<ul style="list-style-type: none"> <li>• What is Automation testing</li> <li>• Advantages of Automation testing</li> <li>• Disadvantages of Automation testing</li> <li>• History of Selenium</li> <li>• Why Selenium tool</li> <li>• Differences between Selenium and other Tools like QTP</li> <li>• Different components in Selenium</li> <li>• major components in selenium like Selenium IDE, Selenium RC, Selenium WebDriver and SeleniumGrid</li> </ul>	
<b>Unit II</b>	<b>Introduction to Selenium IDE</b>	<b>04 Hours</b>
	<ul style="list-style-type: none"> <li>• Installation and Introduction to IDE</li> <li>• Creating first script using record and playback</li> <li>• Installation of Inspector Tools and its Uses.</li> <li>• Generating Scripts using different Web Elements</li> <li>• Handling Wait Commands</li> <li>• Handling Validations Commands</li> <li>• Handling Store Commands</li> <li>• Limitations of IDE</li> </ul>	

<b>Unit III Introduction to Selenium WebDriver</b>	<b>07 Hours</b>
<ul style="list-style-type: none"> <li>• First Program on selenium</li> <li>• Basic features of webdriver like get and navigation functions, different types of Waits, taking screenshot etc.</li> </ul>	
<ul style="list-style-type: none"> <li>• Verify Page title in Selenium Webdriver</li> <li>• Navigation in Selenium</li> <li>• Radio button and Checkbox in Selenium Webdriver</li> <li>• Handling Auto Suggestion</li> <li>• Handling Drop-down List</li> <li>• Handling File upload using Sikuli/AutoIT</li> <li>• Handling Drag and Drop in Selenium</li> <li>• Handling Mouse Hover, Keyword Events using Action class</li> <li>• Synchronization using webdriver(Waits)</li> <li>• How to take screenshot using Selenium</li> <li>• How to Take Multiple Screenshots</li> <li>• How to capture Error message using webdriver</li> <li>• Handling Multiple windows</li> <li>• Handling Alert Messages.</li> <li>• Handling Frames.</li> <li>• Cross Browsing using Selenium</li> <li>• Complete details of Dynamic XPath in Selenium</li> <li>• Complete details on CSS in Selenium</li> <li>• How to download files in Selenium Webdriver.</li> <li>• Handling Web Table</li> <li>• Handling Web Calendar</li> <li>• How to use Logs File in Selenium</li> <li>• How to use Properties File in Selenium</li> </ul>	
<b>Unit IV TestNG Framework</b>	<b>06 Hours</b>
<ul style="list-style-type: none"> <li>• Configure Eclipse with Selenium and TestNG</li> <li>• New- Installation of TestNG</li> <li>• Create First TestNG Program and Execute.</li> <li>• Check reports generated by TestNG</li> <li>• How to execute only failed test cases in Selenium Webdriver</li> <li>• What is TestNG Listeners and How to implement TestNG Listener in Selenium Webdriver</li> </ul>	

- How to run group Test cases in Selenium using TestNG
- How to run Multiple Programs using TestNG.
- Execute Selenium Webdriver Test cases parallel using TestNG
- XSLT report generation using TestNg and Ant
- Building a BAT file to run tests using ANT
- Putting Data providers for multiple tests in a single file
- Parameterizing /Sharing single dataprovider for multiple test cases
- TestNg Maven Configuration
- Maven-surefire-report-plug-in with testng
- Executing testng from maven on Command Prompt
- Generating Maven Surefire Reports
- Generating XSLT Reports with Maven
- Managing Multiple testSuites

## **Unit V Selenium Grid**

**08 Hours**

- Introduction to Grid
- Reading Nodes and Hubs
- Deciding number of browsers on a Node
- Deciding type of browsers on Node
- Limiting number of concurrent browsers on node
- Difference between maxSession and maxInstance
- Configuring chrome driver and IE driver exe files on grid
- Testng configurations
- Remote WebDriver and Desired Capabilities
- Configuring JSON file format to initialize/configure hub and nodes
- Running single test on single node - serially in multiple browsers
- Running single test on single node – parallely on multiple browsers
- Running single test on multiple nodes – each node having different browser
- Can we decide node to run test?
- Running multiple tests spread across 3 nodes – one for ie, one for firefox and one for chrome
- Node Timeout
- Prioritizing the test cases
- Prioritizer Interface and Custom Prioritizer
- Sharing same web driver instance among multiple tests after prioritizing them
- Grid Coding in eclipse
- Creating a Grid sample test case

- End to end scenario building and execution on Grid -demonstration on one node
- End to end scenario building and execution on Grid -demonstration on multiple nodes on virtual machine
- End to end scenario building and execution on Grid -demonstration on multiple nodes on virtual machine and on multiple browsers.

<b>Unit VI</b>	<b>Page Object Model</b>	<b>03 Hours</b>
----------------	--------------------------	-----------------

- What is Page ObjectModel
- When to use POM
- Examples to POM
- POM using PageFactory
- Sample Examples for POM. Web Variables

**Books:**

**Text:**

- Parveen -Learning Selenium IDE Automation Testing Tool Kindle Edition
- Unmesh Gundecha , Satya Avasarala - Selenium WebDriver 3 Practical Guide: End-to- end automation testing for web and mobile browsers with Selenium WebDriver, 2nd Kindle Edition
- David Burns - Selenium 2 Testing Tools: Beginner's Guide Kindle Edition
- Krishna Rungta -Learn Selenium in 1 Day: Definitive Guide to Learn Selenium for Beginners Kindle Edition
- Alex Siminiuc-Improve Selenium Code with Automation Patterns: PageObject Model Page Factory Page Elements Base Page Loadable Component - Kindle Edition

- End to end scenario building and execution on Grid -demonstration on onenode
- End to end scenario building and execution on Grid -demonstration on multiple nodes on virtualmachine
- End to end scenario building and execution on Grid -demonstration on multiple nodes on virtual machine and on multiplebrowsers.

<b>Unit VI</b>	<b>Page Object Model</b>	<b>03 Hours</b>
----------------	--------------------------	-----------------

- What is Page ObjectModel
- When to usePOM
- Examples toPOM
- POM using PageFactory
- Sample Examples for POM. WebVariables

**Books:**

**Text:**

- Parveen -Learning Selenium IDE Automation Testing Tool KindleEdition
- Unmesh Gundecha , Satya Avasarala - Selenium WebDriver 3 Practical Guide: End-to- end automation testing for web and mobile browsers with Selenium WebDriver, 2nd KindleEdition
- David Burns - Selenium 2 Testing Tools: Beginner's Guide KindleEdition
- Krishna Rungta -Learn Selenium in 1 Day: Definitive Guide to Learn Seleniumfor Beginners KindleEdition
- Alex Siminiuc-Improve Selenium Code with Automation Patterns: PageObject Model Page Factory Page Elements Base Page Loadable Component Kindle Edition



**Savitribai Phule Pune University**  
**M.Sc.(Computer Applications )-I (2019 Course)**  
**SEM-II**

**Course Code: CA-CBOPP-2 C**  
**Course Title : Software Testing (Automated)**

**Teaching Scheme:**  
**TH: 04**  
**Hours/Week**

**Credit 02**

**Examination Scheme:**  
**In-Sem : 15 Marks**  
**End-Sem : 35 Marks**

**Assignments:**

Automation Testing Using Selenium

- 1) Download & Install Selenium WebDriver
- 2) Write different components in Selenium
- 3) Write First program in Selenium
- 4) Generate a Script using different web elements
- 5) Select CheckBox and Radio Button in Selenium WebDriver
- 6) Work on Drop down list, Drag & Drop, Error message capturing using webdriver
- 7) Work on Images, Web Tables, Web Calender, Log files, Property files in Selenium
- 8) Work on Selenium Form WebElement: TextBox, Submit Button, sendkeys(),click()
- 9) How to Verify Tooltip using Selenium WebDriver
- 10) How to Find All/Broken links using Selenium Webdriver
- 11) Testing browser, their types & configurations
- 12) Configure chromedriver, IEdriver exe files on grid
- 13) Configure JSON file format
- 14) Testing nodes using browser
- 15) Create Grid sample test case
- 16) Solve examples related to POM

TestNG Assignments

- 17) Download & Install TestNG and configure Eclipse
- 18) Create Program in TestNG and Execute
- 19) Check reports & execute failed test cases in Selenium Webdriver
- 20) Run & Execute Test cases in Selenium using TestNG
- 21) Generate report using TestNG
- 22) Work on Maven - Configure, Generate report



**Savitribai Phule Pune University  
M.Sc. (Computer Applications)**

**Data Mining and Ware Housing Laboratory  
Paper Code: CA - CCPP-2**

Teaching Scheme Practical: 8 hrs / week	No. of Credits <b>04</b>	Examination Scheme IE : 30 marks UE: 70 marks
--	-----------------------------	---

Sr. No.	Assignments
1.	<p><b>Using the WEKA Workbench</b></p> <p>A. Become familiar with the use of the WEKA workbench to invoke several different machine learning schemes. Use latest stable version. Use both the graphical interface (Explorer) and command line interface (CLI). See Weka home page for Weka documentation.</p> <p>B. Use the following learning schemes, with the default settings to analyze the weather data (in weather.arff). For test options, first choose "Use training set", then choose "Percentage Split" using default 66% percentage split. Report model percent error rate.</p> <ul style="list-style-type: none"> <li>• ZeroR (majority class)</li> <li>• OneR</li> <li>• Naive Bayes Simple</li> <li>• J4.8</li> </ul> <p>C. Which of these classifiers are you more likely to trust when determining whether to play? Why?</p> <p>D. What can you say about accuracy when using training set data and when using a separate percentage to train?</p>
2.	<p><b>Basic classification and usage of weka (Acknowledgement: Assignments 1 and 2 are from <a href="http://www.kdnuggets.com/data_mining_course/assignments/index.html">http://www.kdnuggets.com/data_mining_course/assignments/index.html</a>)</b></p> <ul style="list-style-type: none"> <li>• Become familiar with the use of the WEKA workbench to invoke several different machine learning schemes. Use latest stable version. Use both the graphical interface (Explorer) and command line interface (CLI). See Weka home page for Weka documentation.</li> <li>• Use the following learning schemes, with the default settings to analyze the weather data (in weather.arff). For test options, first choose "Use training set", then choose "Percentage Split" using default 66% percentage split. Report model percent error rate. <ul style="list-style-type: none"> <li>- ZeroR (majority class)</li> <li>- OneR</li> <li>- Naive Bayes Simple</li> <li>- J4.8</li> </ul> </li> <li>• Which of these classifiers are you more likely to trust when determining whether to play? Why?</li> <li>• What can you say about accuracy when using training set data and when using a separate percentage to train?</li> </ul>

3.	<p><b>Classification – I</b>  <b>Build different classification models using different classification algorithms (such as decision tree, naive bayes, bayesian networks) for the IRIS dataset that comes with weka / R.</b>  <b>(UCI ML link: <a href="http://archive.ics.uci.edu/ml/datasets/Iris">http://archive.ics.uci.edu/ml/datasets/Iris</a>).</b></p> <p>Compare the accuracy (precision, recall, F1 measure) of these different classification algorithms.</p>
4.	<p><b>Classification – II</b></p> <p>For this assignment, you will use the "Iris" data-set from UCI Machine Learning Repository.  You can access this data-set from <a href="http://archive.ics.uci.edu/ml/datasets/Iris">http://archive.ics.uci.edu/ml/datasets/Iris</a>.  This data-set considers three classes of flowers : Iris Setosa, Iris Versicolour, Iris Virginica and has 50 samples from each flower (so a total of 150 samples).  For each sample, it records 4 features: sepal length in cm; sepal width in cm; petal length in cm; petal width in cm</p> <p>Task:</p> <ol style="list-style-type: none"> <li>1. Divide the data into 2 parts : part I containing a random set of 30 samples, and the rest into part II.</li> <li>2. Use part I to get prior probabilities of each class.</li> <li>3. First you will use only the first feature to classify the flowers into these 3 classes. Assume that  The class conditional distribution of "sepal length" is Gaussian for each of the 3 classes. Estimate the parameters of the three distributions using maximum likelihood estimation. Use data in part II.</li> <li>4. Using the parameters obtained above, classify the data in part II. Report on the number of errors.</li> <li>5. Now use all four features in Step 3 above : assume that the class conditional distribution is a 4-dimensional Gaussian. Repeat Step 4.</li> </ol> <p>(Acknowledgement: Assignment from IITDelhi course(<a href="http://www.cse.iitd.ac.in/~pkalra/siv895/assignment.html">http://www.cse.iitd.ac.in/~pkalra/siv895/assignment.html</a>))</p>
5.	<p><b>Regression</b></p> <p>Build a linear regression model for the housing dataset from UCI Machine learning repository  (Dataset: <a href="http://archive.ics.uci.edu/ml/datasets/Housing">http://archive.ics.uci.edu/ml/datasets/Housing</a>). Use feature selection algorithm (say PCA) to reduce the dimensionality of data. Which are the features selected in this reduced dataset? Build a linear regression with the reduced dataset? Compare the two models built.</p>

- 7) Equivalence of Previous Syllabus:**                    **Not Applicable (This is the first course)**
- 8) University Terms:** As declared by university in every academic year.
- 9) Qualification of Teacher:** As per norms