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Progressive Education Society's

Modern of College of
Arts, Science & Commerce (Autonomous)
Ganeshkhind Pune 16

Msc

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Two Years M.Sc. Degree Course in Computer Applications

M.Sc. (Computer Applications)

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(Choice based Credit and Semester based Syllabus to be implemented from
Academic Year 2022-23)

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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's 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.

**Modern of College of Arts, Science & Commerce (Autonomous)
Ganeshkhind Pune 16
M.Sc. (Computer Applications) Year I Semester 1**

Course Code	Course	Teaching Scheme / Week			Examination Scheme and Marks			Credit	
		Theory	Tutorial	Practical	IE	CE	Total	Th	Pr
22-CA-CCTP-1	Web Technology	04	-	-	30	70	100	04	-
22-CA-CCTP-2	Advance Databases	04	-	-	30	70	100	04	-
22-CA-CCTP-3	Design and Analysis of Algorithm	04	-	-	30	70	100	04	-
22-CA-CBOTP-1 A	Object Oriented Programming with C++	02			15	35	50	02	-
22-CA-CBOPP-1 A	Object Oriented Programming with C++ Laboratory			04	15	35	15	-	02
OR									
22-CA-CBOTP-1B	ASP.NET	02	-	-	15	35	50	02	-
22-CA-CBOPP-1B	ASP.NET Laboratory	-	-	04	15	35	50	-	02
OR									
22-CA-CBOTP-1C	Software Testing (Manual)	02	-	-	15	35	50	02	-
22-CA-CBOPP-1 C	Software Testing (Manual) Laboratory	-	-	04	15	35	50	-	02
22-CA-CCPP-1	Web Technology Laboratory	-	-	08	30	70	100	-	04
Total Credits								14	06
Total		14	-	12	150	350	500	20	

IE: Internal Evaluation CE: College Evaluation TH: Theory PR: Practical

Extra Credit (Mandatory)

Course Type	Course Code	Course Name	Credit
Extra Credit Theory Paper	22-191	Human Rights	1
	22-192	Introduction to Cyber Security/ Information security	1

Modern of College of Arts, Science & Commerce (Autonomous)
Ganeshkhind Pune 16
M.Sc. (Computer Applications) Year I Semester II

Course Code	Course	Teaching Scheme / Week (hrs)			Examination Scheme and Marks			Credit	
		Theory	Tutorial	Practical	IE	CE	Total	Th	Pr
22-CA-CCTP-4	Data Mining and Ware Housing	04	-	-	30	70	100	04	-
22-CA-CCTP-5	Operating Systems	04	-	-	30	70	100	04	-
22-CA-CCTP-6	Computer Networks	04	-	-	30	70	100	04	-
22-CA-CBOTP- 1A	Java Programming	02			15	35	50	02	-
22-CA-CBOPP-1A	Java Programming Laboratory			04	15	35	15	-	02
OR									
22-CACBOTP-2 B	Web Services	02	-	-	15	35	50	02	-
22-CACBOPP-2B	Web Services Laboratory	-	-	04	15	35	50	-	02
OR									
22-CA-CBOTP-1C	Software Testing (Automated)	02	-	-	15	35	50	02	-
22-CACBOPP-2C	Software Testing (Automated) Laboratory	-	-	04	15	35	50	-	02
22-CA-CCPP-2	Data Mining and Ware Housing Laboratory	-	-	08	30	70	100	-	04
Total Credits								14	06
Total		14	-	12	150	350	500	20	

IE: Internal Evaluation CE: College Evaluation TH: Theory PR: Practical

Extra Credit (Mandatory)

Course Type	Course Code	Course Name	Credit
Extra Credit Theory Paper	22-291	Human Rights	1
	22-292	Introduction to Cyber Security/ Information security	1

Modern of College of Arts, Science & Commerce (Autonomous)

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M.Sc. (Computer Applications) Year I Semester III

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

IE: Internal Evaluation CE: College Evaluation TH: Theory PR: Practical

Extra Credit (Mandatory)

Course Type	Course Code	Course Name	Credit
Extra Credit Theory Paper	23-392	Introduction to Cyber Security/ Information security-III	1
	23-394	Skill Development-I	2

	23-395	Introduction to Constitution	2
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Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16 M.Sc. (Computer Applications) Year I Semester IV				
Course Code	Course	Examination Scheme and Marks		
		IE	UE	Total
23-CA-CCUP	Industrial Training/On Campus Project	04 150(marks)	16 350(marks)	20 500(marks)
Total Credits				20

Extra Credit (Mandatory)			
Course Type	Course Code	Course Name	Credit
Extra Credit Theory Paper	23-492	Introduction to Cyber Security/ Information security-IV	1
	23-494	Skill Development-II	2

IE: Internal Evaluation CE: College 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/centres 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.

Detail Syllabus:

Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16			
M.Sc. (Computer Applications)			
Title of the Course: - WEB TECHNOLOGY Paper Code: 22-CA - CCTP-1			
Teaching Scheme Theory: 4 hrs. / week	No. of credits: 04	Examination Scheme IE: 30 marks CE: 70 marks	
Prerequisites HTML basics for form designing.			
Course Objectives <ul style="list-style-type: none">● To Design dynamic and interactive Web pages.● To Learn Core-PHP, Server-Side Scripting Language● To Learn PHP-Database handling			
Course Outcomes On completion of the course, student will be able to– <ul style="list-style-type: none">● Implement interactive web page(s) using HTML, CSS, and JavaScript.● Design a responsive web site using HTML5 and CSS3.			
Course Content			
Chapter 1	Introduction to Web Technologies	4 lectures	6 marks
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)			
Chapter 2	HTML / HTML5	8 lectures	10 marks
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.			
Chapter 3	CSS	6 lectures	8 marks

<ol style="list-style-type: none"> 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>& 7. Introduction of CSS3 : Gradients, Transitions, Animations, multiple columns 			
Chapter 4	JAVASCRIPT	10 lectures	13 marks
<ol style="list-style-type: none"> 1. Concept of script, Types of Scripts, Introduction to JavaScript 2. Variables, identifier & operator, control structure. 3. Examples on JavaScript operators 4. Functions 5. Event Handling in Java Scripts 6. Concept of array, how to use it in JavaScript, types of an array, examples 7. Event handling in JavaScript with examples 8. Math and date object and examples on it. 9. String object and examples on it, and some predefined functions 10. DOM concept in JavaScript, DOM objects 11. Validations in JavaScript, examples on it. 			
Chapter 5	XML	4 lectures	6 marks
<ol style="list-style-type: none"> 1. Introduction to XML 2. Uses of XML 3. Simple XML, 4. XML key components 5. DTD and Schemas, 6. Using XML with web applications. 7. Introduction to XSL, XSL elements, transforming with XSLT 			
Chapter 6	Introduction to PHP	5 lectures	7 marks
<ol style="list-style-type: none"> 1. Introduction to pup 2. How to install PHP Server on LINUX, WINDOWS. 3. Syntax 4. Echo, print 5. Variables, Data Types 6. Strings 7. Operators 8. Loops. 			
Chapter 7	PHP Functions	3 lectures	4 marks
<ol style="list-style-type: none"> 1. Introduction to Functions 2. Types of PHP Functions 3. Defining and Calling Functions 4. Default parameters, Variable parameters, Missing parameters 5. Variable Function 6. Anonymous Function 			

Chapter 8	PHP Arrays	8 lectures	10 marks
<ol style="list-style-type: none"> 1. Indexed Vs Associative arrays 2. Identifying elements of an array 3. Storing data in arrays 4. Multidimensional arrays 5. Extracting multiple values 6. Converting between arrays and variables 7. Traversing arrays 8. Sorting 9. Action on entire arrays 			
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Steven Holzer, "HTML Black Book", Kromtech press. 2. Web Technologies, Black Book, Dreamtech Press 3. Web Applications: Concepts and Real-World Design, Knuckles, Wiley-India 4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson 5. Programming PHP By Rasmus Lerdorf and Kevin Tatroe, O'Reilly publication 6. Beginning PHP 5, Wrox publication 7. PHP web services, Wrox publication 8. AJAX Black Book, Kogent solution 9. Mastering PHP, BPB Publication 10. PHP cookbook, O'Reilly publication 11. PHP for Beginners, SPD publication 8. Programming the World Wide Web, Robert W Sebesta (3rd Edition) 12. https://www.w3schools.com 13. https://www.tutorialspoint.com 14. https://www.php.net 15. <u>Thinking in HTML eBook</u> by Aravind Shenoy 16. <u>Learn HTML and CSS faster</u> by Mark Myers 			

Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16 M.Sc. (Computer Applications) Course Title: Advanced Databases Paper Code: 22-CA - CCTP-2		
Teaching Scheme Theory: 4 hrs / week	No. of Credits 04	Examination Scheme IE: 30 marks CE: 70 marks
Prerequisites <ul style="list-style-type: none"> Basic Knowledge of file system, storing data in file system and Operations on sets 		
Course Objectives <ul style="list-style-type: none"> To understand the fundamental concepts of database. To understand user requirements and frame it in data model. To understand creations, manipulation and querying of data in databases. 		
Course Outcomes On completion of the course, students will be able to– <ul style="list-style-type: none"> Solve real world problems using appropriate set, function, and relational models. Design E-R Model for given requirements and convert the same into database tables. Use SQL 		
Course Contents		
Chapter 1	Functional Dependency:	6 lectures
1. Introduction 2. Definition 3. Trivial / nontrivial dependencies, 4. Closure of a dependency set 5. closure of an attribute set 6. irreducible set of dependencies 7. normalization (1,2, 3, BCNF) 8. Multi-valued dependencies 9. 4 th NF, join dependencies, 5 th NF		
Chapter 2	Procedural programming PL/PgSQL	6 lectures
1. Adding PL/PgSQL to database, 2. Language structure 3. Using variables 4. Controlling program flow 5. Stored functions, 6. Views,		

	<ul style="list-style-type: none"> 7. Exception handling 8. Concept and creation of cursor and triggers, 9. Using transaction control statements, Locks. 	
Chapter 3	Query processing and optimization	6 lectures
	<ul style="list-style-type: none"> 1. Overview of Query processing, 2. Measures of query cost, selection, join, projection, evaluation of expression. 3. Transformation of relational expressions, 4. Estimating statistics of expression results, 5. Choice of evaluation plans, 	
Chapter 4	Introduction to Transaction processing concepts & theory	5 lectures
	<ul style="list-style-type: none"> 1. Introduction, 2. Transaction and system concepts, 3. Desirable properties of transactions, characterizing schedules based on recoverability, 4. Characterizing schedules based on serializability, 5. Transaction support in SQL 	
Chapter 5	Concurrency control techniques	6 lectures
	<ul style="list-style-type: none"> 1. Concept of Locking and lock manager component, 2. Binary locking mechanism, 3. 2- phase locking techniques for concurrency control, 4. C.C based on timestamp ordering, 5. Multi-version concurrency control, 6. Validation (optimistic) technique, 7. Granularity of data items, Multiple granularity locking for C.C., 8. Using locks for concurrency control in indexes. 	
Chapter 6	Database recovery techniques	4 lectures
	<ul style="list-style-type: none"> 1. Failure classification, 2. Recovery concepts, 3. Recovery techniques based on deferred updates & immediate updates, 4. Shadow paging, 5. The Aries recovery algorithm, 6. Database backup & recovery 	
Chapter 7	Database security	3 lectures
	<ul style="list-style-type: none"> 1. Introduction, 2. Discretionary access control based on Grant & Revoke, 3. Mandatory access control & role-based access control for multilevel security, 4. Introduction to statistical database security, 5. Introduction to flow control, 6. Challenges in database security. 	
Chapter 8	Parallel and Distributed Databases	12 lectures
	<ul style="list-style-type: none"> 1. Architecture for parallel databases, 2. Parallel query optimization, 3. parallelizing individual operations, 4. Introduction to distributed databases, 5. Distributed database architectures, 6. storing data in a Distributed database system, 7. Distributed catalog Management, 	

8. Distributed query processing, Updating distributed data,
9. Introduction to distributed transactions,
10. Distributed concurrency control
11. Distributed recovery.

Chapter 9	Internet Databases	6 lectures
<ol style="list-style-type: none"> 1. The worldwide web, 2. Databases and web, 3. Architecture (application servers and server-side scripting), 4. Introduction to XML, XML DTDs, Domain specific DTDs, XML-QL: Querying XML data, 5. Semi-structured data model, 6. Implementation issues for Semi-Structured data, 7. Indexing for text search (inverted files, Signature files), 8. Rank keyword searches on web. (An algorithm for ranking web pages. 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S. Sudarshan, Tata McGraw- Hill, 6th Edition. 2. Database Systems, Shamkant B. Navathe, Ramez Elmasri, Pearson, 5th Edition. 3. Database management systems, Raghu Ramakrishnan & Johannes Gehrke, 2nd Edition. 4. Database Management system, Bipin Desai, 5. An introduction to database systems, C. J. Date, 6. Principles of Distributed Database Systems, M. Tamer Ozsu and Patrick Valduriez, Pearson, 2nd Edition. <p>Practical Postgresql, Joshua D. Drake, John C Worsley, O'reilly Publication</p>		

<p align="center">Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16 M.Sc. (Computer Applications) Title of the Course: Design and Analysis of Algorithms Paper Code: 22-CA - CCTP-3</p>		
Teaching Scheme Theory: 4 hrs / week	No. of Credits: 04	Examination Scheme IE: 30 marks CE: 70 marks
<p>Prerequisites</p> <ul style="list-style-type: none"> • Basic knowledge of algorithms and programming concepts • Data Structures and Advanced Data Structures • Basic Knowledge of Graphs and Algorithms 		
<p>Course Objectives</p> <ul style="list-style-type: none"> • To learn basic Algorithm Analysis techniques and understand the use of asymptotic notation • To understand different design strategies • Understand the use of data structures in improving algorithm performance • Understand classical problem and solutions 		
<p>Course Outcomes</p> <p>After successful completion of course students will be able to:</p> <ul style="list-style-type: none"> • Learn fundamental concepts of asymptotic notations of an algorithm, Space & Time Complexity, Searching & Sorting Algorithms, Divide and Conquer techniques, greedy algorithms, dynamic programming. • Understand the techniques used for designing different graph algorithms. • Learn how to apply backtracking, branch, and bound techniques for real time problems. 		
Course Contents		
Chapter 1	Fundamentals of Algorithms and mathematics	3 lectures
<ol style="list-style-type: none"> 1. Problem, algorithm definitions 2. Mathematics for algorithmic 3. Sets 4. Functions and relations 		

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

3. Sum of subsets problem 4. graph coloring problem 5. Hamiltonian cycle		
Chapter 8	Branch and Bound	6 lectures
1. General method 2. FIFO, LIFO, LCBB, 3. TSP problem, 4. 0/1 knapsack problem Deleted Problem classification 1. Nondeterministic algorithm 2. The class of P, NP, NP-hard and NP- Complete problems 3. significance of Cook's theorem		
Reference Books:		
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. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html 10. https://nptel.ac.in/courses/106106131/ http://openclassroom.stanford.edu		

Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16 M.Sc. (Computer Applications) Title of the Course: Object Oriented Programming with C++ Paper Code: 22- CA - CBOP-1A		
Teaching Scheme	No. of Credits: 02	Examination Scheme
Theory: 2 hrs / week		IE: 15 marks CE: 35 marks
Prerequisites Basic Knowledge of C Programming.		
Course Objectives <ul style="list-style-type: none"> • Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved. • Identify classes, objects, members of a class and the relationships among them needed for finding the solution to specific problems 		
Course Outcome		

<p>On completion of the course, students will be able to–</p> <ul style="list-style-type: none"> • Implement Object Oriented programming concept using basic syntaxes of control Structures, strings, and function for developing skills of logic building activity. 		
Course Contents		
Chapter 1	Introduction to C++	4 lectures
<ol style="list-style-type: none"> 1. Basics of C++, 2. Structure of C++ Program, keywords in C++, 3. Data types hierarchy in C++, 4. Operators in C++: Scope resolution operator, Insertion and Extraction operator New and Delete operators. 5. Reference variable. 6. Manipulator's function: endl, setw, set fill, set precision. 		
Chapter 2	Classes and Objects	6 lectures
<ol style="list-style-type: none"> 1. Object oriented Concepts 2. Structure and class, Class, Object, Access specifiers, 3. Class members, 4. Defining member functions: Inside and outside the class definition 5. Accessor and Mutator Functions 6. Creating objects. String class, operation on string, Array of objects. 7. 'this' pointer. 		
Chapter 3	Function in C++	4 lectures
<ol style="list-style-type: none"> 1. Call by reference, Return by reference, 2. Function overloading and default arguments 3. Inline function 4. Passing and returning objects from functions, Static class members 5. Friend function, Friend Class 		
Chapter 4	Constructors and Destructors	2 lectures
<ol style="list-style-type: none"> 1. Constructor 2. Types of constructors: Default, parameterized, copy 3. Destructors 		
Chapter 5	Operator overloading	3 lectures
<ol style="list-style-type: none"> 1. Introduction, rules of operator overloading 2. Operator overloading: 3. Unary and binary operators, 4. Comparison, arithmetic assignment operator 		
Chapter 6	Inheritance	4 lectures
<ol style="list-style-type: none"> 1. Introduction 2. Types of Inheritance: Single inheritance, Multiple inheritance, Multilevel inheritance Hierarchical inheritance Hybrid inheritance. 3. Derived Class Constructor and Destructors 4. Ambiguity in multiple Inheritances, virtual base classes, Abstract base class. 		
Chapter 7	Virtual Function & Polymorphism	3 lectures

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

<p align="center">Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16 M.Sc. (Computer Applications) Title of the Course: Object Oriented Programming with C++ Laboratory Paper Code: 22- CA - CBOP-1A (LABORATORY)</p>		
Teaching Scheme Practical: 2 hrs / week	No. of Credits: 02	Examination Scheme IE: 15 marks CE: 35 marks
<p>Prerequisites Basic Knowledge of object-oriented concepts and C++.</p>		
<p>Course Objectives</p> <ul style="list-style-type: none"> • Understand the difference between the top-down and bottom-up approach. • Describe the object-oriented programming approach in connection with C++. 		
<p>Course Outcome On completion of the course, student will be able to–</p> <ul style="list-style-type: none"> • Create simple programs using classes and objects in C++. • Implement Object Oriented Programming Concepts in C++. • Develop applications using stream I/O and file I/O. • Implement simple graphical user interfaces. • Implement Object Oriented Programs using templates and exceptional handling concepts. 		
Assignments		Total No. of Sessions-10
Sr. No.	Assignment	

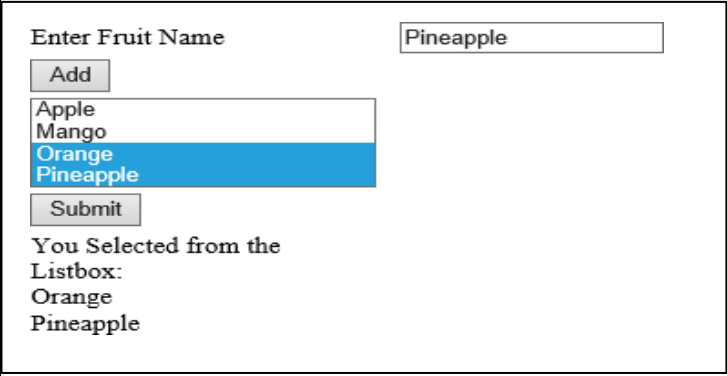
1	Write a C++ program to read information of Book(id,name, author, copies), create 5 objects and read and display values of those objects. Virtual Labs Function overloading Constructors Inheritance
2	Write a program in C++ to display various type, size or arithmetic operation using mixed data type
3	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 the 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 using reference variable.
8	Write a program in C++ to test the Type Casting
9	Write a program in C++ to demonstrate the manipulators.
10	Write a C++ program to demonstrate the use of Friend function in class

Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16 M.Sc. (Computer Applications) Course Title: ASP .NET Paper Code: 22- CA-CBOTP-1B		
Teaching Scheme: TH: 02 Hours/Week	Credit 02	Examination Scheme: IE: 15 Marks CE: 35 Marks
Prerequisite Courses: C++, HTML and CSS		
Course Objectives: <ul style="list-style-type: none"> • To study the web-based applications. • Understand the ASP.NET web application execution model. • Understand the difference between desktop and dynamic web applications. 		
Course Outcomes: <ul style="list-style-type: none"> • Create and modify simple web services. • Create desktop and web applications that consume simple web services. 		
Course Contents		
Unit I	Introduction to .NET Framework	05
1. The .NET Framework – an Overview		

<ol style="list-style-type: none"> 2. Framework Components 3. 1.3FrameworkVersions 4. Types of Applications which can be developed usingMicrosoft.NET 5. MS.NET Base Class Library 6. MS.NET Namespaces 7. MSIL 8. Dot Net Compilation Process 9. The Common Language Runtime (CLR) 10. Managed Code 11. MS.NET Memory Management / Garbage Collection 12. Common Type System (CTS) 13. Common Language Specification (CLS) 14. JIT Compilers 15. VisualStudio.NET 		
Unit II	Introduction to C#	05
<ol style="list-style-type: none"> 1. Introduction to C# 2. Building Blocks of C# 3. Type Conversion 4. Functions 5. Exception Handling 6. Classes in C# 7. Access Modifiers 8. Interfaces 9. Properties 10. Inheritance 		
Unit III	Introduction to ASP.NET	06
<ol style="list-style-type: none"> 1. What isASP.NET? 2. ASP.NET Page Life Cycle 3. Architecture ofASP.NET 4. Forms, Web Pages, HTML forms, 5. Request & Response in Non-ASP.NET pages 6. Using ASP.NET Server Controls 7. Overview of Control structures 8. Functions 		
Unit IV	Event Driven Programming	03
<ol style="list-style-type: none"> 1. HTML events 2. ASP.NET Web control events 3. Event driven programming and post back 		
Unit V	Database Connectivity using ADO .NET	07
<ol style="list-style-type: none"> 1. Databases andADO.NET 2. Architecture, Components of ADO.NET 		

<ol style="list-style-type: none"> 3. Data Provider in DotNet 4. Connection inADO.Net 5. Command inADO.Net 6. Data Reader inADO.Net 7. Data Adapter inADO.Net 8. Data Set 9. Data Binding 		
Unit VI	ASP.NET Server Controls	04
<ol style="list-style-type: none"> 1. Introduction to ASP.NET Controls 2. HTML Server Controls 3. Web Server Controls 4. Validation Controls 5. Session and Cookies 		
Reference Books:		
<ol style="list-style-type: none"> 1. C# 6.0 and the .NET 4.6 Framework by Andrew Troelsen and PhilipJapikse 2. Programming Entity Framework by JuliaLerman 3. Pro ASP.Net MVC 5 (Expert's Voice in ASP.Net) by AdamFreeman 		

Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16 M.Sc. (Computer Applications)		
Course Code:22- CA –CBOPP-1 B Course Title: ASP.NET Laboratory		
Teaching Scheme: TH: 02 Hours/Week	Credit 02	Examination Scheme: IE: 15 Marks CE: 35 Marks
Prerequisite: Knowledge of C and C++.		
Course Objectives: <ul style="list-style-type: none"> ● Introduction to .Net IDE Component Framework. ● Programming concepts in .Net Framework. ● Creating a website using ASP.Net Controls. 		
Course Outcomes: At the end of this Lab course students will be able to: <ul style="list-style-type: none"> ● Create user interactive web pages using ASP.Net. ● Create simple data binding applications using ADO.Net connectivity. ● Performing Database operations for Windows Form and web applications. 		
Assignments		Total No. of Sessions-10
1.	1. Write C# program to swap two numbers	
2	Create windows c# application program for open file, save file, folder browser dialogue box	
3	Create windows c# application program for split container control and review controls	

4	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
5	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 
6	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.
7	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)
8	Write web application in asp.net to display the data from database on to the report.
9	Write web application in asp.net to validate Email of user.
10	Create c# dialogue boxes for font dialogue, color dialogue & print dialogue box

Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16		
M.Sc. (Computer Applications)		
Course Title: Software Testing (Manual Testing) Course Code: 22-CA -CBOTP-1 C		
Teaching Scheme: TH: 02 Hours/Week	Credit 02	Examination Scheme: IE: 15 Marks CE: 35 Marks
Prerequisite Courses: Object oriented Software Concepts		
Course Objectives: 1. To study fundamental concepts in software testing, including software testing objectives,		

process, criteria, strategies, and methods.

2. To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.
3. To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.
4. To expose the advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions.
5. To gain software testing experience by applying software testing knowledge and methods to practice-oriented software testing projects.

Course Outcomes: Student will be able to:

- 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

Unit I

Introduction to Testing and Software Model

03

1. Introduction to Software Testing
2. Objectives of Software Testing
3. Types of Software Testing
4. SDLC Model
5. Waterfall Model
6. V-Model
7. Prototype Model
8. Agile Model
9. How to choose which model is best suited for your project

Unit II

Types of Testing

10

1. Unit Testing
2. Integration Testing
3. System Testing
4. UAT Testing
5. Software Testing Methods Used in Industry
6. White Box Testing
7. Black Box Testing
8. An introduction or familiarization of various popular testing types
9. Regression Testing
10. Ad-hoc Testing
11. Smoke Testing
12. Sanity Testing
13. Usability Testing
14. Exploratory Testing
15. Compatibility Testing
16. Installation Testing
17. Non-Functional Testing
 - a. Load Testing

<ul style="list-style-type: none"> b. Stress Testing c. Volume Testing <p>18. Database Testing</p> <p>19. Functional testing vs. non-functional testing...etc.</p>		
Unit III	Software Testing Life Cycle	06
<ul style="list-style-type: none"> 1. Overview of the stages of STLC: 2. Test planning 3. Test design 4. Test execution 5. Test Plan walkthrough - Live Project document 6. Practical tips on how to identify the following items for the Test plan: <ul style="list-style-type: none"> a. Scope b. Test strategy c. Effort Estimation d. Entry criteria e. Exit Criteria 7. Defect Management process 		
Unit IV	Test Templates creation and use	07
<ul style="list-style-type: none"> 1. Test scenario template 2. Test case template 3. Test plan 4. Defect report 5. Status report...etc 6. Test scenario creation – what are they, how to write them, why, when etc. 7. Test documentation review- How to perform Peer reviews 8. Test cases creation 9. Test case design techniques <ul style="list-style-type: none"> a. Boundary Value analysis b. Equivalence partitioning c. Error guessing 10. Types of parameters 		
Unit V	Traceability Matrix	04
<ul style="list-style-type: none"> 1. 5.1 Test execution 2. 5.2 Defect management 3. Finding defects 4. Logging defects 5. Tracking and managing defects 6. Defect lifecycle 7. 5.3 Test reporting 8. Daily status reports 9. Test metrics 10. 5.4 User Acceptance Testing (UAT) 		

11. QA team's role
12. UAT plan
13. UAT execution, Go/no-go decisions Classes

Reference Books:

1. Srinivasan Desikan and Gopalaswami Ramesh- Software Testing Principles and practices- Pearson Education India
2. Amol Prakash Ujagare-Practical Approach of Software Testing- Adhyyan Books
3. Ron Patton-Software Testing Second Edition SAMS Pearson Publication

**Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16
M.Sc. (Computer Applications)**

Course Title: Software Testing (Manual Testing)

Laboratory Course Code: 22-CA -CBOPP-1 C

Teaching Scheme:

TH: 02 Hours/Week

Credit 02

Examination Scheme:

IE: 15 Marks

CE: 35 Marks

Prerequisites

Object oriented software concepts

Basic concepts of software engineering

Course Objectives:

- Identify the need of software testing in current industry scenario, techniques, and tools in area of software testing.
- Demonstrate the ability to apply multiple methods to check reliability of a software system and to identify and apply redundancy and fault tolerance for a medium-sized application.
- Identify the Fault in program logic that fails to validate data and values properly before they are used
- Discuss the distinctions between validation and defect testing.
- Understand types of testing and essential characteristics of tool used for test automation.

Course Outcomes:

The students will be able to:

- Understand the concept and need of software testing.
- Understand the need and usage of software tools required for manual and automated testing.

Assignments

Total No. of Sessions-10

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?

5. Why is Testing Important? Justify with few good examples?
6. What happen if you not test software properly? Provide few examples and problems occurred due to not testing enough?
7. How rigorous testing helps IT companies?

Different Types of Testing

8. What are the different types of Testing?
9. Explain each in not more than 5sentences:
 - a. Unit Testing
 - b. Integration Testing
 - c. Alpha Testing
 - d. System Testing

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 registration form titled "New Registratio". The fields and their contents are as follows:

- Choose User Id: T\$1Dw_5& (Label: Enter User ID)
- Password: ***** (Label: Enter Password)
- Confirm Password: hello123
- Name: Tester1.1 and Tester 1.2
- Email: (empty field) (Label: Requires verification, Will not be published.)
- Country: India (dropdown menu)
- Verification: 4 (Label: Please enter the verification number exactly as shown in left.)
- Input field for verification: r
- Register button

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!

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

<p>have bought five items (x, y, z, a, and b). You make payment and move to the EXIT door..</p> <p>Example Test ideas as a <u>hint</u>:</p> <ol style="list-style-type: none"> 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.
<p>Exercise #3: Defect Reporting</p> <p>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).</p> <p>Write a detailed defect report for this sample defect: After logging into Gmail, it navigates to Google.com</p> <p>No hint here. :) Just write a good and complete defect report</p>

<p align="center">Modern of College of Arts, Science & Commerce (Autonomous) Ganeshkhind Pune 16 M.Sc. (Computer Applications) Title of the Course: Web Technology Laboratory Paper Code: 22-CA - CCPP-1</p>		
Teaching Scheme Practical: 2 hrs / week	No. of Credits : 04	Examination Scheme IE: 30 marks CE: 70 marks
<p>Prerequisites:</p> <ul style="list-style-type: none"> • Basic knowledge of HTML Concepts. 		
<p>Course Objectives:</p> <ul style="list-style-type: none"> • To develop an ability to design and implement static and dynamic website 		
<p>Course Outcomes: The students will be able to:</p> <ul style="list-style-type: none"> • Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's. • Have a Good grounding of Web Application Terminologies, Internet Tools, E – Commerce and other web services. 		
Assignments		Total No. of Sessions-10
Practical Assignment (CSS, JavaScript, PHP)		
Sr. No.	Assignments	
1	Write a JavaScript Program to read a number from user, store its factors into the array and display that array. (Handle onClick Event)	
2	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	
3	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)	

4	Write a PHP script to set selected image from ComboBox (DropDownList) to the background of Page.
5	Design HTML form, accept student Name, Age, and Mobile No. from user. Using java Script validate for following Student Name should not be empty. Student Age must be between 1 to 20.
6	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.
7	Write a Java Script to accept email address from user and count no. of @occurrences and number of DOT(.) occurrences.
8	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]
9	Write a java script function to Accept First Name and Last Name from user. Display users entered information. [Hint: use alert and prompt dialogbox]
10	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>
11	Write a PHP script for the following. a) Design a form to accept the details of 5 different items such as Item code, Item Name, unit, sold and Rate. Display the bill in tabular format. Use only 4 textboxes. [Use explode]
12	Design a HTML form to accept a string. Write a PHP script for the following. a) Write a function to count the total number of Vowels from the script. Show the occurrences of each Vowel from the script.
13	Write a PHP script, which will return the following component of the URL 'http:// www.example.com/php-example/index.php' List of component: Scheme, Host, Path Excepted o/p Scheme: http Host: www.example.com Path:/php-example/index.php
14	Write a menu driven program to perform various file operations. Accept filename from user. a) Display type of file. Delete a file.
15	PHP Assignments using Virtual Labs 1. switch case 2. do while loop 3. associative array 4. functions and recursions 5. session handling http://vlabs.iitb.ac.in/vlabs-dev/labs/phplab/index.php

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016

**M.Sc. (Computer Science) Year -I Semester- I
Extra Credit Syllabus**

Course Code: 22-191	Course Name: Human Rights-I	Total Lectures (14 Hours)
Teaching Scheme: 2 hrs./week	Examination Scheme: IE: 10 Marks CE: 15 Marks	No. of Credits 1
Course Objectives:	To acquaint students with the concept of Human Rights that develops the knowledge, skills, and values of human rights	
Course Outcomes:	<ul style="list-style-type: none"> • Identify and understand Human values • Analyse the concept of Human Rights • Compare Rights and Duties • Enumerate legal instruments related to Human Rights • Differentiate between different types of rights 	
Chapter	Course Contents	No. of Lectures
Module 1: Introduction to Human Rights and Duties		
1	Basic Concept a) Human Values- Dignity, Liberty, Equality, Justice, Unity in Diversity, Ethics and Morals b) Meaning and significance of Human Rights Education	3
2	Perspectives of Rights and Duties a) Rights: Inherent-Inalienable-Universal- Individual and Groups b) Nature and concept of Duties c) Interrelationship of Rights and Duties	2
3	Introduction to Terminology of Various Legal Instruments a) Meaning of Legal Instrument- Binding Nature b) Types of Instruments: Covenant-Charter-Declaration-Treaty-Convention-Protocol Executive Orders and Statutes	4
4	United Nations And Human Rights a) Brief History of Human Rights- International and National Perspectives b) Provision of the charters of United Nations c) Universal Declaration of Human Rights- Significance-Preamble d) Civil and Political Rights-(Art. 1-21) e) Economic, Social and Cultural Rights-(Art.22-28) f) Duties and Limitations-(Art. 29) g) Final Provision (Art. 30)	5

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016

M.Sc. (Computer Science) Year -I Semester- I

Course Code: 22-192	Course Name: Introduction to Cyber Security / Information Security- I	Total Lectures (14 Hours)
Teaching Scheme: 2 hrs./week	Examination Scheme: IA: 10 Marks CE: 15 Marks	No. of Credits: 1
Course Prerequisites:	<ul style="list-style-type: none"> ● Basic Knowledge of Computer Science Subjects ● Basic knowledge of computer networks 	
Course Objectives:	<ul style="list-style-type: none"> ● To understand networking concepts ● To learn cryptography, security concepts in networking 	
Course Outcomes:	<ul style="list-style-type: none"> ● After successful completion of course students will be able to: ● Learn various computer networking concepts ● Understand need and applications of information security ● Learn different security threats and vulnerabilities ● Learn different cryptographic techniques in computer networks 	
Chapter	Course Contents	No. of Lectures
Module 1: Pre-requisites in Information and Network Security		
1	Overview of Networking Concepts <ol style="list-style-type: none"> 1. Basics of Communication Systems 2. Transmission Media 3. Topology and Types of Networks 4. TCP/IP Protocol Stacks 5. Wireless Networks 6. The Internet 	3
2	Information Security Concepts <ol style="list-style-type: none"> 1. Information Security Overview: Background and Current Scenario 2. Types of Attacks 3. Goals for Security 4. E-commerce Security 5. Computer Forensics 6. Steganography 	3
3	Security Threats and Vulnerabilities <ol style="list-style-type: none"> 1. Overview of Security threats 2. Weak / Strong Passwords and Password Cracking 3. Insecure Network connections 4. Malicious Code 5. Programming Bugs 6. Cybercrime and Cyber terrorism 7. Information Warfare and Surveillance 	5
4	Cryptography / Encryption <ol style="list-style-type: none"> 1. Introduction to Cryptography / Encryption 2. Digital Signatures 3. Public Key infrastructure 4. Applications of Cryptography 5. Tools and techniques of Cryptography 	3

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016 M.Sc. (Computer Applications) Course Title: Data Mining & Data Warehousing Paper Code: 22-CA - CCTP-4		
Teaching Scheme Theory: 4 hrs / week	No. of Credits : 04	Examination Scheme IE: 30 marks CE: 70 marks
Prerequisite Courses: <ul style="list-style-type: none"> ● Database knowledge (relational and non-relational) ● Statistical/Programming language (Java, Python, Matlab, R, C++, SQL) ● Machine/deep learning Algorithms 		
Course Objectives: <ul style="list-style-type: none"> ● To extract knowledge from data repository for data analysis, frequent pattern, classification and prediction. 		
Course Outcome: Students will be able to <ul style="list-style-type: none"> ● Store voluminous data for online processing ● Pre-process the data for mining applications ● Apply the association rules for mining the data 		
Course Contents		
Chapter 1	Introduction to Data Mining.	4 lectures
1. Basic Data Mining Tasks. 2. DM versus Knowledge Discovery in Databases. 3. Data Mining Issues. 4. Data Mining Metrics. Social Implications of Data Mining. 5. Overview of Applications of Data Mining.		
Chapter 2	Introduction to Data Warehousing.	4 lectures
1. Architecture of DW 2. OLAP and Data Cubes 3. Dimensional Data Modeling-star, snowflake schemas 4. Data Preprocessing – Need, Data Cleaning, Data Integration & 5. Transformation, Data Reduction 6. Machine Learning, Pattern Matching		
Chapter 3	Data Mining Tasks	8 lectures
1. Frequent item-sets and Association rule mining: Apriori algorithm, 2. Use of sampling for frequent item-set, FP tree algorithm 3. Graph Mining: Frequent sub-graph mining, Tree mining, Sequence Mining.		
Chapter 4	Classification And Prediction.	15 lectures

<ol style="list-style-type: none"> 1. Decision tree learning <ol style="list-style-type: none"> a. Construction, performance, attribute selection b. Issues: Over-fitting, tree pruning methods, missing values, c. continuous classes d. Classification and Regression Trees (CART) 2. Bayesian Classification: <ol style="list-style-type: none"> a. Bayes Theorem, Naïve Bayes classifier, b. Bayesian Networks c. Inference d. Parameter and structure learning <ol style="list-style-type: none"> i. Linear classifiers. ii. Least squares, logistic, perceptron and SVM classifiers 3. Prediction 4. Linear regression 5. Non-linear regression 		
Chapter 5	Accuracy Measures.	6 lectures
<ol style="list-style-type: none"> 1. Precision, 2. recall, 3. F-measure, 4. confusion matrix, 5. cross-validation, 6. bootstrap 		
Chapter 6	Clustering	10 lectures
<ol style="list-style-type: none"> 1. Introduction 2. Types of Clustering 3. hierarchical clustering- k-means algorithm 4. Expectation Maximization (EM) algorithm 5. Hierarchical clustering, Correlation clustering 		
Chapter 7	Software for data mining and applications of data mining	1 lectures
R and Weka tool.		
Reference Books:		
<ol style="list-style-type: none"> 1. Data Mining: Concepts and Techniques, Han, Elsevier ISBN:9789380931913/ 2. 9788131205358 Margaret H. Dunham, S. Sridhar, Data Mining – Introductory and Advanced Topics, Pearson Education 3. Tom Mitchell, —Machine Learning, McGraw-Hill, 1997 4. Christopher M. Bishop, —Pattern Recognition and Machine Learning, Springer 2006 5. Raghu Ramkrishnan, Johannes Gehrke, Database Management Systems, Second Edition, 6. McGraw Hill International Ian H. Witten, Eibe Frank Data Mining: Practical Machine Learning Tools and Techniques, 7. Pallawi Bulakh, Dipali Meher, Data mining and Data warehousing , Nirali Prakshan, Pune 		

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016 M.Sc. (Computer Applications) Title of the Course: Operating Systems Paper Code: 22-CA - CCTP-5		
Teaching Scheme Theory: 4 hrs / week	No. of Credits 04	Examination Scheme IE: 30 marks CE: 70 marks
Prerequisite Course : Students need to know C, have reasonable understanding of programming concepts in general		
Course Objectives: To understand the services provided by and the design of an operating system		
Course Outcomes: <ul style="list-style-type: none"> ● Identify basic components of the operating system. ● Conceptualize synchronization amongst various components of a typical operating system. ● Understand and simulate activities of various operating system components. 		
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 <ul style="list-style-type: none"> a. The login prompts. b. General features of Unix commands/ command structure. c. Command arguments and options. d. 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 what is. 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.
6. Reaching required files- the PATH variable, manipulating the PATH, Relative and absolute pathnames.
7. Directory commands – pwd, cd, mkdir, rmdir commands.
8. The dot (.) and double dots (..) notations to represent present and parent directories and their usage in relative path names.
9. File related commands – cat, mv, rm, cp, wc and od commands.
10. File attributes and permissions and knowing them.
11. The ls command with options.
12. Changing file permissions: the relative and absolute permissions changing methods

Chapter 5	Managing Processes in Unix.	5 lectures
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1. Process Concept.
2. Mechanism of process creation.
3. Parent and child process.
4. The ps command with its options.
5. Executing a command at a specified point of time: at command.
6. The nice command.
7. Background processes. The bg and fg command.
8. The kill commands.
9. The find command with illustrative example.

Chapter 6	Using Shells	5 lectures
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1. What is Shell Under Unix?
2. Different types of shells in Unix.
3. The shells interpretive cycle.
4. Wild cards and file name generation.
5. Removing the special meanings of wild cards.
6. Three standard files and redirection.
7. Connecting commands: Pipe.The grep, egrep commands. .

Chapter 7	Using Vi Editor	4 lectures
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1. Introduction to the Vi editor.
2. Different ways of invoking and quitting vi.
3. Different modes of vi. Input mode commands.
4. Command mode commands.
5. The ex mode commands.
6. Illustrative examples Navigation commands.

Chapter 8	Shell Programming	12 lectures
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1. Shell programming.
2. Ordinary and environment variables.
3. The .profile. Read and read-only commands.
4. Command line arguments.
5. exit and exit status of a command.
6. Logical operators for conditional execution.
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 - Silberchatz, 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.
Linux Command Line and Shell Scripting Bible, Richard Blum , Christine Bresnahan , 2nd Edition , Wiley, 2014

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016 M.Sc. (Computer Applications) Title of the Course: Computer Networks Paper Code:22-CA - CCTP-6		
Teaching Scheme Theory: 4 hrs / week	No. of Credits 04	Examination Scheme IE: 30 marks CE: 70 marks
Prerequisite: <ul style="list-style-type: none"> ● An understanding of the TCP/IP protocol and the its layer model is recommended. ● Basic knowledge of python (such as through Intro to Computer Science) is required. 		
Course Objectives: <ul style="list-style-type: none"> ● Learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems. 		
Course Outcome: Students will be able to <ul style="list-style-type: none"> ● Understand the concepts of Data Communication. ● Study the functions of OSI Layers. ● Familiarise with the Transmission Media, Flow Control and Error Detection & Correction. 		
Course Contents		
Chapter 1	Introduction to Computer Networks	6 lectures
<ol style="list-style-type: none"> 1. Characteristics of data communication, components, data representation, data flow. 2. Distributed processing, Physical Structure-Point to Point, Broadcast, Categories of topology (mesh, star, ring, bus etc.) 3. LAN, WAN, MAN, INTERNET etc. 4. Definition of protocol, key elements, Defacto & Dejure standard organizations. 5. Protocols, peers, interfaces, network architecture, protocol stack. 6. design issues of the layers – addressing, error control, flow control, multiplexing and demultiplexing, routing Connection-oriented and connectionless service. 7. Service Primitives – listen, connect, receive, send, disconnect The relationships of services to protocol 		
Chapter 2	Network Models	4 lectures
<ol style="list-style-type: none"> 1. OSI Reference model functionality of each layer TCP/IP model 		

2. Introduction to IP,TCP & UDP TCP/IP Protocol Suite		
3. Addressing- Physical, Logical & Port addresses		
Chapter 3	The Physical Layer	9 lectures
1. The Basic Concepts of analog & digital signals 2. 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 3. Bandwidth, Throughput, Latency (Delay), Bandwidth –Delay Product, Jitter Problems on above concepts 4. Line Coding digital to digital conversion Characteristics, Line Coding Schemes Unipolar, NRZ, RZ, Manchester and Differential Manchester 5. Transmission Modes -Parallel Transmission Serial Transmission – Asynchronous and Synchronous 6. Multiplexing- FDM, TDM, WDM. 7. Switching -Circuit Switching, Message Switching and Packet Switching		
Chapter 4	The Data Link Layer	5 lectures
1. Framing -Character Count, Byte Stuffing, Bit Stuffing and Physical Layer Coding Violations 2. Error Control - Hamming Code and CRC 3. Elementary data link protocols - Simplex stop & wait protocol, Simplex protocol for noisy channel. 4. Sliding Window Protocols - 1-bit sliding window protocols, Pipelining – Go-Back N and Selective Repeat		
Chapter 5	The Medium Access Sub layer	4 lectures
1. Random Access Protocols -ALOHA – pure and slotted, CSMA – 1-persistent, p-persistent and Non-persistent CSMA/CD, CSMA/CA 2. Controlled Access - Reservation, Polling and Token Passing 3. Channelization - FDMA, TDMA and CDMA		
Chapter 6	The Network layer	10 lectures
1. Design Issues 2. 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 3. Logical Addressing 4. IPV4 Addresses – Address Space, Notations, Classful Addressing, Classless Addressing, Network Address Translation (NAT) IPV6 Addresses – Addressing Structure, Address Space 5. IPV4 Protocol - Datagram Format, Fragmentation, Checksum, Options 6. IPV6 Protocol -Advantages, Packet Format, Extension Headers 7. Transition From IPV4 to IPV6 - Dual Stack, Tunneling, Header Translation 8. Routing Concepts - Properties of routing algorithm, Comparison of Adaptive and Non-Adaptive Routing Algorithms		
Chapter 7	The Transport layer	6 lectures
1. Process-to-Process Delivery 2. Client Server Paradigm, Multiplexing and De-multiplexing, Connectionless Vs Connection-Oriented Service, Reliable Vs Unreliable 3. User Datagram Protocol UDP 4. Datagram Format, Checksum, UDP operations, Use of UDP		

5. Transmission Control Protocol (TCP)		
6. TCP Services, TCP Features, TCP Segment, TCP Connection, Flow Control, Error Control TCP Congestion Control Slow Start Mechanism		
7. Introduction to SCTP		
Chapter 8	The Application layer	8 lectures
1. Domain Name System (DNS) - Name Space, Domain Name Space, Distribution of Name Space, DNS in the Internet, Name – Address Resolution		
2. TELNET - Timesharing Environment, Logging, NVT, Embedding, Options, Mode of Operations		
3. E-MAIL - Architecture, User Agent, Message Transfer Agent-SMTP, Message Access Agent-POP, IMAP, Web Based Mail		
4. File Transfer Protocol (FTP) - Communication over control connection, Communication over Data Connection, Anonymous FTP		
5. WWW -Architecture, WEB Documents		
6. HTTP - HTTP Transaction, Persistent and Non-persistent Connection, Proxy Server		
Reference Books:		
1. Computer Networks, Tanenbaum, ISBN:788177581652, Pearson		
2. Data Communication and Networking by Behrouz Forouzan, TATA McGraw Hill.Fourth editions		

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016		
M.Sc. (Computer Applications)		
Title of the Course: Java Programming Paper Code: 22-CA - CBOP-2		
Teaching Scheme Theory: 2 hrs / week	No. of Credits 02	Examination Scheme IE: 15 marks CE: 35 marks
Prerequisite :		
<ul style="list-style-type: none"> You must know at least the basics of how to use a computer, and should be able to start a command line shell 		
Course Objectives:		
<ul style="list-style-type: none"> To identify Java language components and how they work together in applications. To design and program stand-alone Java applications To learn how to design a graphical user interface (GUI) with Java Swing. To understand how to use Java APIs for program development. 		
Course Outcome:		
<ul style="list-style-type: none"> Understand the knowledge of java programming and object-oriented concepts the use of Java in a variety of technologies and on different platforms. 		
Course Contents		
Chapter 1	Introduction to Java	2 lectures
1. History and Features of Java		
2. JDK,JRE,JIT , Bytecode and JVM Simple java program		
3. Data Types Variable: final, static, abstract		
4. Array, Function.		
Chapter 2	Objects and Classes	4 lectures
1. Definition of Class		

<ol style="list-style-type: none"> 2. Access Specifiers, Constructors Use of “this” keyword 3. String, String Buffer, and Wrapper class 4. Inner classes, Nested classes, local classes, Anonymous classes (Anonymous object) Introduction to Packages 5. Garbage Collection (finalize () Method) 		
Chapter 3	Inheritance and Collection	5 lectures
<ol style="list-style-type: none"> 1. Inheritance Basics, Types of Inheritance, Use of 'super' and 'Final' Keyword 2. Usage of abstract class and abstract methods Interface. 3. Introduction to Collection. 		
Chapter 4	Exception Handling and I/O	4 lectures
<ol style="list-style-type: none"> 1. Introduction to Exception handling Exception types , Exception class User defined exception 2. Introduction to Java.io package Byte streams, Character streams File IO basics 3. Object serialization – Reader and Writer 		
Chapter 5	Swing, Applet programming	4 lectures
<ol style="list-style-type: none"> 1. MVC(Model View Controller) Architecture Swing 2. Applet fundamentals, Applet lifecycle, Creating and running applets 3. Applets: Event Handling using applets 		
Chapter 6	Database Programming	4 lectures
<ol style="list-style-type: none"> 1. Introduction to JDBC: Architecture 2. JDBC Drivers , Connectivity . JDBC statement, JDBC Result Set and types 3. JDBC Metadata 		
Chapter 7	Servlets	4 lectures
<ol style="list-style-type: none"> 1. Introduction to Servlet and Hierarchy of Servlet Life cycle of servlet 2. Handling HTTP Request and HTTP Response 3. Http Servlet: Reading form data from servlet 4. Servlet – Database communication 5. Session tracking –User Authorization, URL Rewriting, Hidden Form fields, Cookies and Http Session 		
Chapter 8	JSP	4 lectures
<ol style="list-style-type: none"> 1. Simple first JSP program Life cycle of JSP 2. Implicit Objects 3. Scripting elements –Declarations, Expressions, Scriptlets, Comments JSP Directives –Page Directive, include directive 4. Mixing Scriptlets and HTML 5. Example of forwarding contents from database to servlet , servlet to JSP and displaying it using JSP scriptlet tag 		
Reference Books:		
<ol style="list-style-type: none"> 1. Complete reference Java by Herbert Schildt(5th edition) 2. Java 2 programming black books, Steven Horlzner 3. Java EE Project using EJB 3, JPA and struts 2 for beginners, Shah, SPD 4. Core Java Volume-II Advanced Features, Eighth Edition, Cay S.Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press 5. Commercial web development using java 2.0, Ivan Byaross, BPB 6. Java Programming A practical Approach, C Xavier, McGraw Hill 		

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016 M.Sc. (Computer Applications) Title of the Course Java Programming Laboratory Paper Code: 22-CA - CBOP-2		
Teaching Scheme Practical: 2 hrs / week	No. of Credits 02	Examination Scheme IE: 15 marks CE: 35 marks
Prerequisite Courses: <ul style="list-style-type: none"> You must know at least the basics of how to use a computer and should be able to start a command line shell. If you are new to programming then Introduction to Programming is strongly recommended. If you already know C++ or any other Object-Oriented language, Java should be easy to pick up. 		
Course Objectives : <ul style="list-style-type: none"> Develop Java program using packages, inheritance and interface. Create Multithreaded programs. exception handling and develop programs using class and inputs from keyboard. Develop graphical User Interface using AWT. 		
Course Outcome : Students will be able to: <ul style="list-style-type: none"> knowledge of the structure and model of the Java programming language, (knowledge) develop software in the Java programming language, (application) 		
Assignments		Total No. of Sessions-10
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	Write a program that show working of different functions of String and StringBufferclasss like setCharAt (), setLength(), append(), insert(), concat()and equals().	
4	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
5	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.
6	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)
7	Write a program that creates illustrates different levels of protection in classes/subclasses belonging to same package or different packages
8	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.
9	Write a program to demonstrate the use of Traffic Signals.
10	Java Program to Display Characters from A to Z using loop

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016 M.Sc. (Computer Applications) Course Title: Web Services Course Code: 22- CA CABOT- 2 B		
Teaching Scheme: TH: 02 Hours/Week	Credit 02	Examination Scheme: IE: 30 Marks CE: 70 Marks
Prerequisite Courses: <ul style="list-style-type: none"> ● Strong knowledge about Java programming. ● Good Understanding of Object-Oriented Programming concepts. ● Must be familiar with XML. 		
Course Objectives: <ul style="list-style-type: none"> ● 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: <ul style="list-style-type: none"> ● On completion of the course, student will be able to– Create and use Web Services. ● Creating RESTful Services. 		
Course Contents		
UNIT I	Web services	Lectures 07
1. 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.		
2. 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.		
UNIT II	SOAP	08
1. SOAP - Simple Object Access Protocol, 2. Inter-application communication and wire protocols, 3. SOAP as a messaging protocol, 4. Structure of a SOAP message, 5. SOAP communication model, 6. Building SOAP Web Services, developing SOAP Web Services using ASP.Net, 7. Error handling in SOAP, Advantages and disadvantages of SOAP.		
UNIT III	WSDL AND UDDI	09
1. WSDL - WSDL in the world of Web Services, Web Services life cycle, WSDL Document Structure, WSDL bindings, WSDL Elements, limitations of WSDL. 2. 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		
UNIT IV	REST	06
The REST Architecture 1. Introducing HTTP, 2. The core architectural elements of a RESTful system, 3. Description and discovery of RESTful web services, 4. ASP.Net Core and Entity Framework for building RESTful web services, 5. JSON message format and tools and frameworks around JSON, 6. Build RESTful web services with Web APIs, 7. The Description and Discovery of RESTful Web Services, 8. Design guidelines for building RESTful web services, 9. Secure RESTful web services.		
Books:		
1. Title of the Book Author/s Publication: 2. C# Web Services: Building .NET Web Services by Zach Greenvoss- Christian Nage WROX Press Ltd. 3. Building RESTful Web Services with .NET Core by Gaurav Arora, Tadit Dash Packt Publishing Limited 4. XML, Web Services, and the Data Revolution F. P. Coyle Pearson Education		

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016		
M.Sc. (Computer Applications)		
Course Code: CA -CBOPP-2 B Course Title : Web Services Laboratory		
Teaching Scheme: TH: 02 Hours/Week	No. of Credits: 02	Examination Scheme: IE: 15 Marks CE: 35 Marks

Prerequisite:	
<ul style="list-style-type: none"> ● Strong knowledge about Java programming / PHP / .Net Framework ● Good Understanding of Object-Oriented Programming concepts. ● Basic knowledge of XML. 	
Course Objectives:	
<ul style="list-style-type: none"> ● To understand how to develop web services using Java/PHP/.Net 	
Course Outcome:	
<ul style="list-style-type: none"> ● Create dynamic web projects. ● Create client-based web applications 	
Assignments	Total No. of Sessions-10
Assignment 1	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 username and test the web service.
Assignment 2	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.
Assignment 3	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.
Assignment 4	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.
Assignment 5	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.
Assignment 6	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.
Assignment 7	Create 'Dynamic Web Project', which will host your web service functionality to select Movie details (Movie(mno, name, 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.
	Create 'Dynamic Web Project', which will host your web service

Assignment 8	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.
Assignment 9	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.
Assignment 10	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.

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016 M.Sc. (Computer Applications) Course Title: Software Testing(Automation) Course Code: 22-CA-CBOTP-2 C Course		
Teaching Scheme:	Credit 02	Examination Scheme:
TH: 02 Hours/Week		IE: 15 Marks CE :35 Marks
Prerequisite Courses:		
Basic understanding in any preferred programming language and web services.		
Course Objectives:		
<ul style="list-style-type: none"> ● 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 Outcome :		
<ul style="list-style-type: none"> ● Various test processes and continuous quality improvement ● Types of errors and fault models ● Methods of test generation from requirements ● Behavior modeling using UML: Finite state machines (FSM) ● Test generation from FSM models 		
Course Contents		
Unit I	Introduction to Automation Testing and Selenium	02 Hours
<ol style="list-style-type: none"> 1. What is Automation testing 2. Advantages of Automation testing 3. Disadvantages of Automation testing 4. History of Selenium 5. Why Selenium tool 6. Differences between Selenium and other Tools like QTP 		

<ul style="list-style-type: none"> 7. Different components in Selenium 8. major components in selenium like Selenium IDE, Selenium RC, Selenium Web driver and Selenium Grid 		
Unit II	Introduction to Selenium IDE	04 Hours
<ul style="list-style-type: none"> 1. Installation and Introduction to IDE 2. Creating first script using record and playback 3. Installation of Inspector Tools and its Uses. 4. Generating Scripts using different Web Elements 5. Handling Wait Commands 6. Handling Validations Commands 7. Handling Store Commands 8. Limitations of IDE 		
Unit III	Introduction to Selenium WebDriver	07 Hours
<ul style="list-style-type: none"> 1. Verify Page title in Selenium Webdriver 2. Navigation in Selenium 3. Radio button and Checkbox in Selenium Webdriver 4. Handling Auto Suggestion 5. Handling Drop-down List 6. Handling File upload using Sikuli/AutoIT 7. Handling Drag and Drop in Selenium 8. Handling Mouse Hover, Keyword Events using Action class 9. Synchronization using webdriver(Waits) 10. How to take screenshot using Selenium 11. How to Take Multiple Screenshots 12. How to capture Error message using webdriver 13. Handling Multiple windows 14. Handling Alert Messages. 15. Handling Frames. 16. Cross Browsing using Selenium 17. Complete details of Dynamic XPath in Selenium 18. Complete details on CSS in Selenium 19. How to download files in Selenium Webdriver. 20. Handling Web Table 21. Handling Web Calendar 22. How to use Logs File in Selenium 23. How to use Properties File in Selenium 		
Unit IV	TestNG Framework	06 Hours
<ul style="list-style-type: none"> 1. Configure Eclipse with Selenium and TestNG 2. New- Installation of TestNG 3. Create First TestNG Program and Execute. 4. Check reports generated by TestNG 5. How to execute only failed test cases in Selenium Web driver 		

<ol style="list-style-type: none"> 6. What is TestNG Listeners and How to implement TestNG Listener in Selenium Web driver 7. How to run group Test cases in Selenium using TestNG 8. How to run Multiple Programs using TestNG. 9. Execute Selenium Web driver Test cases parallel using TestNG 10. XSLT report generation using TestNg and Ant 11. Building a BAT file to run tests using ANT 12. Putting Data providers for multiple tests in a single file 13. Parameterizing /Sharing single dataprovider for multiple test cases 14. TestNg Maven Configuration 15. Maven-surefire-report-plug-in with testng 16. Executing testng from maven on Command Prompt 17. Generating Maven Surefire Reports 18. Generating XSLT Reports with Maven 19. Managing Multiple testSuites 		
Unit V	Selenium Grid	08 Hours
<ol style="list-style-type: none"> 1. Introduction to Grid 2. Reading Nodes and Hubs 3. Deciding number of browsers on a Node 4. Deciding type of browsers on Node 5. Limiting number of concurrent browsers on node 6. Difference between maxSession and maxInstance 7. Configuring chrome driver and IE driver exe files on grid 8. Testng configurations 9. Remote WebDriver and Desired Capabilities 10. Configuring JSON file format to initialize/configure hub and nodes 11. Running single test on single node - serially in multiple browsers 12. Running single test on single node – parallely on multiple browsers 13. Running single test on multiple nodes – each node having different browser 14. Can we decide node to run test? 15. Running multiple tests spread across 3 nodes – one for ie, one for firefox and one for chrome 16. Node Timeout 17. Prioritizing the test cases 18. Prioritizer Interface and Custom Prioritizer 19. Sharing same web driver instance among multiple tests after prioritizing them 20. Grid Coding in eclipse 21. Creating a Grid sample test case. 22. End to end scenario building and execution on Grid -demonstration on one node 23. End to end scenario building and execution on Grid -demonstration on multiple nodes on virtual machine 24. End to end scenario building and execution on Grid -demonstration on multiple nodes on virtual machine and on multiple browsers. 		
Unit VI	Page Object Model	03 Hours
<ol style="list-style-type: none"> 1. What is Page Object Model 2. When to use POM 		

<ol style="list-style-type: none"> 3. Examples to POM 4. POM using PageFactory 5. Sample Examples for POM. Web Variables
Books:
<ol style="list-style-type: none"> 1. Parveen -Learning Selenium IDE Automation Testing Tool Kindle Edition 2. 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 3. David Burns - Selenium 2 Testing Tools: Beginner’s Guide Kindle Edition 4. Krishna Rungta -Learn Selenium in 1 Day: Definitive Guide to Learn Selenium for Beginners Kindle Edition 5. Alex Siminiuc-Improve Selenium Code with Automation Patterns: PageObject 6. Model Page Factory Page Elements Base Page Loadable Component - Kindle Edition

<p>Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016 M.Sc. (Computer Applications) Course Title: Software Testing (Automated) Laboratory Course Code:CA-CBOPP-2 C</p>		
<p>Teaching Scheme: PR: 02 Hours/Week</p>	<p>Credit 02</p>	<p>Examination Scheme: IE: 15 Marks CE :35 Marks</p>
<p>Prerequisite Courses:</p> <ul style="list-style-type: none"> • Basic knowledge of OOSE concepts. 		
<p>Course Objectives:</p> <ul style="list-style-type: none"> ● Identify the need of software testing in current industry scenario, techniques and tools in area of software testing. ● Demonstrate the ability to apply multiple methods to check reliability of a software system and to identify and apply redundancy and fault tolerance for a medium-sized application,. ● Identify the Fault in program logic that fails to validate data and values properly before they are used. ● Discuss the distinctions between validation and defect testing. ● Understand types of testing and essential characteristics of tool used for test automation 		
<p>Course Outcome: Students will be able to</p> <ul style="list-style-type: none"> ● Understand the concept and need of software testing ● Understand the need and usage of software tools required for manual and automated testing 		
<p>Assignments:</p>		

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

TestNG Assignments

1. Download & Install TestNG and configure Eclipse
2. Create Program in TestNG and Execute
3. Check reports & execute failed test cases in Selenium WebDriver
4. Run & Execute Test cases in Selenium using TestNG
5. Generate report using TestNG
6. Work on Maven - Configure, Generate report

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016 M.Sc. (Computer Applications) Course Title: Data Mining and Ware Housing Laboratory Paper Code: 22-CA - CCPP-2		
Teaching Scheme Practical: 2 hrs / week	No. of Credits 04	Examination Scheme IE: 30 marks CE: 70 marks
Prerequisite Courses: <ul style="list-style-type: none">● Statistics for Data Analytics or equivalent working knowledge is required.● Linear Algebra for Machine Learning is also recommended, but not required.		
Course Objectives: <ul style="list-style-type: none">● To introduce students to basic applications, concepts, and techniques of data mining.● To develop skills for using recent data mining software (eg. R) to solve practical problems in a variety of disciplines.		
Course Outcome: Students will be able to <ul style="list-style-type: none">● get familiar with WEKA and R software for data mining and warehousing.		
Sr. No.	Assignments	Total No. of Sessions- 10

1.	<p>Using the WEKA Workbench</p> <ol style="list-style-type: none"> 1. 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. 2. 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. 3. ZeroR (majority class) OneR Naive Bayes Simple 4. Which of these classifiers are you more likely to trust when determining whether to play? Why? 5. What can you say about accuracy when using training set data and when using a separate percentage to train?
2.	<p>Basic classification and usage of weka (Acknowledgement: Assignments 1 and 2 are from http://www.kdnuggets.com/data_mining_course/assignments/index.html)</p> <ol style="list-style-type: none"> 1. Become familiar with the use of the WEKA workbench to invoke several different machine learning schemes. 2. Use latest stable version. Use both the graphical interface (Explorer) and command line 3. interface (CLI). See Weka home page for Weka documentation. 4. 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. <ol style="list-style-type: none"> a. ZeroR (majority class) b. OneR c. Naive Bayes Simple d. J4.8 5. Which of these classifiers are you more likely to trust when determining whether to play? Why? <ul style="list-style-type: none"> • What can you say about accuracy when using training set data and when using a separate percentage to train?

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016		
M.Sc. (Computer Science) Year -I Semester- II		
Course Code: 22-291	Course Name: Human Rights-II	Total Lectures (14 Hours)
Teaching Scheme: 2 hrs/week	Examination Scheme: IA: 10 Marks CE: 15 Marks	No. of Credits 1
Course Prerequisites:	To familiarise students with the concept of vulnerable and disadvantaged communities, to enable them to understand challenges faced by these marginalised sections of society	

Course Objectives:	After successful completion students will be able to <ul style="list-style-type: none"> • Enumerate vulnerable and disadvantaged communities • Illustrate standards of status of women and children • Analyse role of United Nations in addressing Human Rights of vulnerable and disadvantaged communities • Evaluate policies and measures that address socio-economic disadvantaged communities 	
Chapter	Course Contents	No. of Lectures
Module 2: Human rights of vulnerable and disadvantaged groups		
1	General Introduction <ul style="list-style-type: none"> a) Meaning and Concept of Vulnerable and Disadvantaged b) Groups, Customary, Socio-Economic and Cultural Problems of c) Vulnerable and Disadvantaged Groups 	2
2	Social status of women and children in International and national perspective <ul style="list-style-type: none"> a) Human Rights and Women's Rights – International and National Standards b) Human Rights of Children-International and National Standards 	4
3	Status of Social and Economically Disadvantaged people <ul style="list-style-type: none"> a) Status of Indigenous People and the Role of the UN b) Status of SC/ST and Other Indigenous People in the Indian Scenario c) Human Rights of Aged and Disabled d) The Minorities and Human Rights 	5
4	Human rights of vulnerable groups <ul style="list-style-type: none"> a) Stateless Persons b) Sex Workers c) Migrant Workers d) HIV/AIDS Victims 	3

Modern College of Arts, Science and Commerce (Autonomous), Ganeshkhind, Pune 411016

M.Sc. (Computer Science) Year -I Semester- II

Course Code: 22-292	Course Name: Introduction to Cyber Security / Information Security-II	Total Lectures (13 Hours)
Teaching Scheme: 2 hrs/week	Examination Scheme: IA: 10 Marks CE: 15 Marks	No. of Credits 1
Course Prerequisites:	<ul style="list-style-type: none"> ● Basic Computer Science Concepts 	
Course Objectives:	<ul style="list-style-type: none"> ● To understand security laws ● To understand IPR concepts 	
Course Outcomes:	After successful completion of course students will be able to: <ul style="list-style-type: none"> ● Understand security management practices ● Cyber security laws and standards ● IPR concepts 	
Chapter	Course Contents	No. of Lectures
Module 2: Security Management		
1	Security Management Practices <ol style="list-style-type: none"> 1. Overview of Security Management 2. Information Classification Process 3. Security Policy 4. Risk Management 5. Security Procedures and Guidelines 6. Business Continuity and Disaster Recovery 7. Ethics and Best Practices 	7

2	Security Laws and Standards <ol style="list-style-type: none">1. Security Assurance2. Security Laws3. IPR4. International Standards5. Security Audit6. SSE-CMM / COBIT etc	6
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