

Progressive Education Society's
Modern College of Arts, Science and Commerce,
Shivajinagar, Pune 5
(An Autonomous College Affiliated to Savitribai Phule Pune University)

Detailed Syllabus
For M.Sc. (Computer Application)
(2019-20 Course)
(with effect from 2019-20)

Progressive Education Society's
Modern College of Arts, Science and Commerce (Autonomous)
Shivajinagar, Pune - 5
First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScCMAP101 (Core)
Course Name : Design and Analysis of Algorithms

Teaching Scheme: TH:4Hours/Week
Examination Scheme: CIA : 50 Marks

Credits :04
End-Sem : 50 Marks

Prerequisites:

- Basic knowledge of algorithms and programming concepts
- Data Structures and Advanced Data Structures
- Basic Knowledge of Graphs and Algorithms

Course Objectives:

- To design the algorithms
- To select the appropriate algorithm by doing necessary analysis of algorithms
- To learn basic Algorithm Analysis techniques and understand the use of asymptotic notation ,Understand different design strategies

Course Outcomes:

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

- Analyze the problem and develop the algorithm
- Classify the problem and apply the appropriate design strategy to develop algorithm
- Design algorithm in context of space and time complexity and apply asymptotic notation

Course Contents

Chapter	Title	Number of Lectures
Chapter 1	Basics of Algorithms	8
	1.1.Algorithm definition and characteristics 1.2.Spacecomplexity 1.3.Time complexity, worst case-best case-average case complexity, asymptotic notation 1.4.Recursive and non-recursive algorithms 1.5.Sorting algorithms (insertion sort, heap sort, Bubble sort) 1.6.Sorting in linear time: counting sort, concept of bucket and radix sort 1.7 Searching algorithms: Linear, Binary	
Chapter 2	Divide and conquer strategy	4

	<ul style="list-style-type: none"> 2.1.General method, control abstraction 2.2.Binarysearch 2.3.Merge sort, Quicksort 2.4.Comparison between Traditional method of Matrix Multiplication vs. Strassen's Matrix Multiplication 	
Chapter 3	Greedy Method	10
	<ul style="list-style-type: none"> 3.1.Control Abstraction 3.2. Knapsack problem 3.3.Job sequencing with deadlines, 3.4.Minimum-cost spanning trees: Kruskal and Prim's algorithm 3.5. Optimal storage on tapes 3.6.Optimal merge patterns 3.7.Huffman coding 3.8. Shortest Path: Dijkstra's algorithm 	
Chapter 4	Dynamic Programming	7
	<ul style="list-style-type: none"> 4.1.Principle of optimality 4.2.Matrix chain multiplication 4.3.0/1 Knapsack Problem <ul style="list-style-type: none"> 4.3.1.Merge & Purge 4.3.2.Functional Method 4.4. Concept of Shortest Path <ul style="list-style-type: none"> 4.4.1.Single Source shortest path 4.4.2.Dijkstra's Algorithm 4.4.3.Bellman Ford Algorithm 4.4.4. All pairs Shortest Path 4.4.5. Floyd- Warshall Algorithm 4.4.6.Longest common subsequence 4.4.7. String editing 4.4.8. Travelling Salesperson Problem 	
Chapter 5	Decrease and Conquer:	5
	<ul style="list-style-type: none"> 5.1. Definition of Graph 5.2 Representation of Graph By - DFS and BFS 5.2. Topological sorting 5.3. Connected components and spanning trees 5.4. By Variable Size decrease Euclid's algorithm 5.5. Flow in graph 5.6. Articulation Point and Bridge edge 	
Chapter 6	Backtracking	5
	<ul style="list-style-type: none"> 6.1. General method 6.2. Fixed Tuple vs. Variable Tuple Formulation 6.3. n- Queen's problem 6.4. Graph coloring problem 6.5. Hamiltonian cycle 6.6. Sum of subsets 	
Chapter 7	Branch and Bound	5
	<ul style="list-style-type: none"> 7.1. Introduction 7.2. Definitions of LCBB Search 7.3. Bounding Function, Ranking Function 7.4. FIFO BB Search 	

	7.5. Traveling Salesman problem Using Variable tuple 7.6. Formulation using LCBB 7.7. 0/1 knapsack problem using LCBB	
Chapter 8	Problem Classification	3
	7.3 Nondeterministic algorithm 7.4 The class of P, NP, NP-hard and NP – Complete problems 7.5 Cook’s theorem	
Chapter 9	Experiential Learning	1
	9.1 Search n number of cities on Google map and find shortest route, 9.2 Consider any stable algorithms which are in currently use and find out space Complexity, sTime Complexity and control abstraction.	

Reference Books:

1. Ellis Horowitz, Sartaj Sahni & Sanguthevar Rajasekaran, Computer Algorithms, Galgotia
2. T. Cormen, C. Leiserson, & R. Rivest, Algorithms, MIT Press, 1990
3. A. Aho, J. Hopcroft & J. Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley, 1974
4. Donald Knuth, The Art of Computer Programming (3 vols., various editions, 1973-81), Addison Wesley
5. Steven Skiena, The Algorithm Manual, Springer, ISBN:9788184898651
6. Jungnickel, Graphs, Networks and Algorithms, Springer, ISBN:3540219056

Progressive Education Society's
Modern College of Arts, Science and Commerce (Autonomous)
Shivajinagar, Pune - 5
First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScCMAP102 (Elective)
Course Name : .NET

Teaching Scheme: TH: 4 Hours/Week
Examination Scheme: CIA : 50 Marks

Credits : 04
End-Sem : 50 Marks

Prerequisites :

- Knowledge of object-oriented programming concepts such as data abstraction, encapsulation, inheritance, and polymorphism
- Familiarity with programming language such as C++ and/or Java
- Knowledge of web development

Objectives:

- To understand the DOTNET framework,
- C# language features
- Web development using ASP.NET

Course Outcome:

- Students able to learn c# fundamentals
- Students develop web-sites using .NET framework

Course Contents

Chapter	Title	Number of Lectures
Chapter 1	DOTNET Framework	2
	1.1 Introduction to DOTNET 1.2 DOT NET class framework 1.3 Common Language Runtime 1.3.1 Overview 1.3.2 Elements of .NET application 1.3.3 Memory Management 1.3.4 Garbage Collector : Faster Memory allocation, Optimizations 1.4 Common Language Integration 1.4.1 Common type system 1.4.2 Reflection API 1.5 User and Program Interface	
Chapter 2	Introduction to C#	6
	2.1 Language features 2.1.1 Variables and Expressions, type conversion	

	<ul style="list-style-type: none"> 2.1.2 Flow Control 2.1.3 Functions, Delegates 2.1.4 Debugging and error handling, exception handling (System Defined and User Defined) 2.2 Object Oriented Concepts <ul style="list-style-type: none"> 2.2.1 Defining classes, class members, Interfaces, properties 2.2.2 Access modifiers, Implementation of class, interface and properties 2.2.3 Concept of hiding base class methods, Overriding 2.2.4 Event Handling 2.3 Collections, Comparisons and Conversions <ul style="list-style-type: none"> 2.3.1 Defining and using collections, 2.3.2 Indexers, iterators 2.3.3 Type comparison, Value Comparison 2.3.4 Overloading Conversion operators, as operator 2.4 Generics <ul style="list-style-type: none"> 2.4.1 Using generics 2.4.2 Defining Generics, generic Interfaces, Generic methods, Generic Delegate 	
Chapter 3	Window Programming	5
	<ul style="list-style-type: none"> 3.1 Window Controls <ul style="list-style-type: none"> 3.1.1 Common Controls 3.1.2 Container Controls 3.1.3 Menus and Toolbars 3.1.4 Printing 3.1.5 Dialogs 3.2 Deploying Window Application <ul style="list-style-type: none"> 3.2.1 Deployment Overview 3.2.2 Visual studio setup and Deployment project types 3.2.3 Microsoft windows installer architecture 3.2.4 Building the project : Installation 	
Chapter 4	Data Access	2
	<ul style="list-style-type: none"> 4.1 File System Data 4.2.XML 4.3 Databases and ADO.NET 4.4 Data Binding 	
Chapter 5	Web Programming	2
	<ul style="list-style-type: none"> 5.1 Basic Web programming 5.2 Advanced Web programming 5.3 Web Services 5.4 Deployment Web applications 	
Chapter 6	.NET Assemblies	4

	<ul style="list-style-type: none"> 6.1 Components 6.2 .NET Assembly features 6.3 Structure of Assemble 6.4 Calling assemblies, private and shared assemblies 	
Chapter 7	Networking	3
	<ul style="list-style-type: none"> 7.1 Networking overview 7.2 Networking programming options <ul style="list-style-type: none"> 7.2.1 WebClient 7.2.2 WebRequest and WebResponse 7.2.3 TcpListener &TcpClient 	
Chapter 8	Introduction to GDI+	3
	<ul style="list-style-type: none"> 8.1 Overview of Graphical Drawing 8.2 Pen Class, Brush Class, Font Class 8.3 Using Images 8.4 Clipping, Drawing2D, Imaging 	
Chapter 9	Introduction to ASP.NET	2
Chapter 10	Server Controls and Variables, control Structures & Functions	2
	<ul style="list-style-type: none"> 10.1 Forms, webpages, HTML forms, Webforms 10.2 Request & Response in Non-ASP.NET pages 10.3 Using ASP.NET Server Controls 10.4 Datatypes : Numeric, text, arrays, Data collections 10.5 Overview of Control structures 10.6 Functions : web controls as parameters 	
Chapter 11	Even Driven Programming andPostBack	2
	<ul style="list-style-type: none"> 11.1HTML events 11.2 ASP.NET page events 11.3 ASP.NET Web control events 11.4 Event driven programming and postback 	
Chapter 12	Reading from Databases	5
	<ul style="list-style-type: none"> 12.1 Data pages 12.2 ADO.NET 	
Chapter 13	ASP.NET Server Controls	5
	<ul style="list-style-type: none"> 13.1 ASP.NET Web Controls 13.2 HTML Server Controls 13.3 Web Controls 	
Chapter 14	DOTNET assemblies and Custom Controls	2
	<ul style="list-style-type: none"> 14.1 Introduction to Cookies, Sessions 14.2 Session events 14.3 State management Recommendations 	
Chapter 15	Web Services	2
	<ul style="list-style-type: none"> 15.1 HTTP, XML & Web services 15.2 SOAP 15.3 Building ASP.NET web service 15.4 Consuming a web service 	
Chapter 16	Experiential learning	1
	16.1 Review performance statistics of websites	

Reference Books :

1. **Beginning Visual C#**, Wrox Publication
2. **Professional Visual C#**, Wrox Publication
 - i. **Inside C#**, by Tom Archer ISBN: 0735612889 Microsoft Press © 2001, 403 pages
3. **Beginning ASP.NET 3.5**, Wrox Publication
4. **Programming ASP.NET 3.5** by Jesse Liberty, Dan Maharry, Dan Hurwitz, O'Reilly

Progressive Education Society's
Modern College of Arts, Science and Commerce (Autonomous)
Shivajinagar, Pune - 5
First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScBCAU103
Course Name : Web Programming-I
Teaching Scheme: 4 Lectures/Week
Examination Scheme: CIA : 50 Marks

Credits: 4
End-Sem : 50 Marks

Desirable Prerequisites:

- Basic knowledge in HTML
- Tags & skill of creating web pages should be known
- Knowledge of basic Computer hardware & software is also necessary

Course Objectives:

- Define the basics in web design
- Visualize the basic concept of HTML, XML
- Introduce concept of CSS

Course Outcomes:

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

- Implement interactive web page(s) using HTML, CSS, XML
- Design a responsive web site using HTML5 and above, CSS3 and above and XML

Course Contents

Chapter	Title	Number of Lectures
1	Introduction to Web Technologies	6
	1.1 Introduction to Web Technologies 1.2 How the Website Works? 1.3 Software to create your website 1.4 What makes good website? 1.5 Client-Server and its Communication 1.6 Client and Server Scripting Languages 1.7 Internet-Basic, Internet Protocols(HTTP,FTP,IP) 1.8 World Wide Web (WWW). 1.9. HTTP request message, HTTP response message 1.10 Types of Websites(Static and Dynamic Websites)	
2	Introduction to HTML	10
	2. 1.Introduction to HTML	

	<p>2.2 HTML tags and attributes 2.3 Working with Elements. 2.4.Inserting Image 2.5Client Server image mapping 2. 6 List 2.7 Tables 2.8 Text and Image links 2.9 Frames 2.10 Forms and controls 2.11 Introduction with text box, text area, buttons, List box, radio, checkbox etc</p>	
3	CSS	6
	<p>3.1 Introduction to Style Sheet 3.2 Introduction to Responsive Website 3.3 Types of CSS 3.4 CSS Border, margin, Positioning, color, text, link, background, list, table, padding, image, display properties 3.5 Use of Id & classes in CSS 3.6 Use of <div> & 3.7 Introduction of CSS3 : Gradients, Transitions, Animations, multiple columns 3.8 Introduction of Bootstrap</p>	
4	JAVASCRIPT	9
	<p>4. 1 Concept of script, Types of Scripts, Introduction to Java Script 4.2 Variables, identifier & operator, control structure 4.3 Examples on Java Script operators 4.4 Functions 4.5 Event Handling in Java Scripts 4.6 Concept of array, how to use it in Java Script, types of an array, examples 4.7 Event handling in Java Script with examples 4.8 Math and date object and examples on it. 4.9 String object and examples on it, and some predefined functions 4.10 DOM concept in Java Script, DOM objects 4. 11Validations in Java Script with examples</p>	
5	VBScript	5
	<p>5. 1 Intro. To VBScript 5.2 Variables, Data types, Control Structures & Loops 5.3 Functions in VBScript 5.4 Client side web scripting 5.5 Validating forms, DOM, Handling errors</p>	
6	XML	10
	<p>6. 1 Introduction to XML 6.2 Uses of XML 6.3 Simple XML, 6.4 XML key components 6.5 DTD and Schemas, 6.6 Using XML with web applications.</p>	

	6.7 Introduction to XSL, XSL elements, transforming with XSLT	
7	EXPERIENTIAL LEARNING	1

Reference Books :

1. Steven Holzner, "HTML Black Book", Dremtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Complete HTML- Thomas Powell, fifth edition, McGrawHill publication, ISBN:9780070701946
4. HTML and JavaScript–Ivan Bayross, fourth edition, BPB publication, ISBN:978818330084
5. Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
6. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson
7. Thinking in HTML eBook by Aravind Shenoy

Reference Links:

1. <https://www.tutorialspoint.com/>
2. <https://www.w3schools.com/>

Progressive Education Society's
Modern College of Arts, Science and Commerce (Autonomous)
Shivajinagar, Pune - 5
First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScBCAU104
Course Name : Lab on .NET and Web Programming-I

Teaching Scheme: 4 Lectures/Week

Credits: 4

Examination Scheme: CIA : 50 Marks

End-Sem : 50 Marks

Assignments on Web Programming-I

Practical Assignment (HTML,CSS, JavaScript, VBScript, XML)	
Sub:- Web Programming I	
Sr. No.	Title of the Assignment
1.	HTML tags
2.	Frames, Elements of Forms
3.	CSS Border, margin, Positioning, color, text, link, background, list, table, padding, image, display properties
4.	CSS3 Gradients, Transitions, Animations, multiple columns
5.	Simple function in JavaScript
6.	Array in JavaScript
7.	Validations in JavaScript
8.	Simple function in VBScript
9.	Validations in VBScript
10.	Simple XML
11.	Using DTD and Schemas in XML
12.	Using XML with web applications.

Assignments on .NET

Sr.No	Topic
1.	Array(one dimension, Two dimension, Jagged Array)
2.	Function
3.	OOP's concepts
4.	Properties
5.	Indexers
6.	Parameter Modifiers
7.	Exception Handling
8.	Collection classes
9.	Generic
10.	Window Application(ADO.NET)
11.	Web Application(ADO.NET)

12.	Web Services
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First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScCMAP105 (Elective)
Course Name : Software Development Engineering in Testing

Teaching Scheme: TH:4Hours/Week
Examination Scheme: CIA : 50 Marks

Credits : 04
End-Sem : 50 Marks

Prerequisites : Knowledge of Software Engineering

Objectives :

- Understanding software development life cycle
- Understanding Security testing

Course outcome

On completion of the course, students will be able to

- Learn the different types of testing tools
- Apply the tools to write test cases and use different testing tools

Course Contents

Chapter	Title	Number of Lectures
Chapter 1	SDLC	4
	1.1 What is Software development life cycle? 1.2 Phases of SDLC 1.3 Models of SDLC-Waterfall, Agile and Agile Scrum 1.4 What is the difference between Waterfall and Agile? 1.5 Advantages of using Agile Over Waterfall 1.6 Agile Scrum and Lean Model 1.7 User story, Story Points, Product backlog, Sprint backlog, Roles and responsibility of a scrum master and Product owner 1.8 Meetings conducted in Agile Scrum	
Chapter 2	Types of Testing	10
	2.1 Static Testing/ Dynamic Testing 2.2 Regression/ Retesting 2.3 Usability/ accessibility 2.4 Smoke / Sanity testing 2.5 Chapter Testing/ Integration Testing/ System Testing 2.6 UAT – Alpha Testing /Beta Testing 2.7 White Box/Black box testing 2.8 Functional/Non-functional Testing 2.9 Performance Testing	

	2.10 Load Testing 2.11 Stress Testing 2.12 Penetration Testing 2.13 Cross platform / Cross device testing	
Chapter 3	STLC (Software Testing Life Cycle)	5
	3.1 Test Planning 3.2 Test Plan 3.3 What is a test Plan 3.4 Who creates a Test Plan 3.5 When is the Test Plan created 3.6 Purpose of creating a Test Plan 3.7 Components of a Test plan. 3.8 Test design 3.9 Test implementation and Execution 3.10 Defect Reporting and tracking 3.11 Defect life cycle 3.12 Test closures 3.13 Test metrics	
Chapter 4	Automation Testing – Basics	6
	4.1 Introduction to Automation Testing 4.2 What is Automation testing 4.3 Benefits of Automation Testing 4.4 Tool selection criteria	
Chapter 5	Security Testing	6
	5.1 The Basis of Security Testing 5.2 Security Risks 5.3 Information Security Policies and Procedures 5.4 Security Auditing and Its Role in Security Testing	
Chapter 6	Automation Testing with Testing Tools - Advanced	10
	6.1 Fundamentals of Selenium, overview, presentation, export features, installation, Selenium IDE and web driver 6.2 Test application with Selenium IDE, RC VS web driver, how to create test drive with web drive 6.3 Install Selenium IDE and Firebug 6.4 Selenium IDE Script, Locators in Selenium IDE 6.5 Source Control, Debugging Techniques, HTML, CSS 6.6 Installation of Selenium Web Driver, Scripts in Web Driver 6.7 Accessing Forms in Web Driver, Links & Tables	
Chapter 7	Web Services Testing	6
	7.1 Service Oriented Architecture (SOA), who uses SOA 7.2 Web Services, Why Web Services are Being Used? What is WSDL? , Web Service Standards, tools to test 7.3 Web services, how to test web services, why to test web services 7.4 Understanding WSDL, how is it used, specifications, document, and file, Retrieving and Viewing/ Inspecting WSDL file. 7.5 SOAP, SoapUI tool, download and installation RESTFul Service	

Chapter 8	Experiential learning	1
	8.1 Compare performance characteristics of different testing tools	

Reference Books:

- 1) Lessons Learned in Software Testing: By Cem Kaner , James Bach, Bret Pettichord, ISBN 9781283294928
- 2) Software Testing by Ron Patton, Lisa Crispin, Janet Gregory: Agile Testing : A Practical Guide for Testers and Agile Teams

Progressive Education Society's
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Shivajinagar, Pune - 5
First Year of B.C. A. (Science) (2019 Course)
Course Code : 19ScCMAP106
Course Name : Advanced Database Concepts

Teaching Scheme: 4 Lectures/Week
Examination Scheme: CIA :50 Marks

Credits: 4
End-Sem : 50 Marks

Prerequisite:

- Basic knowledge of database concepts is desirable

Course Objectives:

- Understand the role of a database management system in an organization.
- Understand basic database concepts, including the structure and operation of the relational data model.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- Describe and discuss selected advanced database topics, such as Parallel database and distributed database.
- Understand the role of the database administrator.

Course Outcomes:

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

- Have a broad understanding of database concepts and database management system software
- Have a high-level understanding of major DBMS components and their function
- Be able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model
- Be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS
- Be able to program a data-intensive application using DBMS APIs

Course Contents

Chapter No.	Title	No. of Lectures
Chapter 1	Introduction to Database Systems	8
	1.1 Data 1.2 Information 1.3 Database 1.4 DBMS 1.5 Data Dictionary 1.6 File system Vs. DBMS 1.7 Advantages & Disadvantages of DBMS 1.8 View of Data 1.9 Database Languages 1.10 Data Models 1.11 Levels of Abstraction	

	1.12 Data Independence 1.13 Database Architecture	
Chapter 2	Relational Algebra Operation	3
	2.1 Select 2.2. Project 2.3. Union 2.4. Difference 2.5. Intersection 2.6. Cartesian Product 2.7. Natural Join	
Chapter 3	OODBMS & ORDBMS	5
	3.1 Overview of Object-Oriented concepts & characteristics 3.2 Objects, OIDs and reference types 3.3 Database design for ORDBMS 3.4 Comparing RDBMS, OODBMS & ORDBMS	
Chapter 4	Advanced Database Management System – Concepts & Architecture	8
	4.1 Spatial data management 4.2 Web based systems 4.2.1 Overview of client server architecture, 4.2.2 Databases and web architecture, N-tier Architecture, Business logic – SOAP 4.3 Multimedia databases 4.4 Mobile database	
Chapter 5	Query Processing	6
	5.1 Steps for processing a query 5.2 Sorting 5.3 Join Operation 5.3.1 Nested Loop Join 5.3.2 Block Nested Loop Join	
Chapter 6	Parallel databases	7
	6.1 Introduction 6.2 Parallel database architecture 6.3 I/O parallelism Inter-query and Intra-query parallelism, Intra-operational parallelism 6.4 Design of parallel systems	
Chapter 7	Distributed Databases	10
	7.1 Introduction, 7.2 DDBMS architectures 7.3 Homogeneous and Heterogeneous Databases 7.4 Distributed data storage, 7.5 Distributed transactions 7.6 Commit protocols 7.7 Concurrency control & recovery in distributed databases	

	7.8 Directory systems	
	EXPERIENTIAL LEARNING	1

Reference books:

1. Database System Concepts :-Silberschatz , Korth , Tata McGraw-Hill Publication, ISBN-13: 978-9332901384, ISBN-10: 9332901384
2. Database Management System :-Raghu Ramkrishnan, Tata McGraw-Hill Publication, ISBN: 978-81-317-0885-9
3. SQL, PL/SQL The Programming Language Oracle :- Ivan Bayross, BPB Publication.
4. Database Systems Concepts , Designs and Application by Shio Kumar Singh , Pearson
5. Introduction to SQL by Reck F. van der Lans by Pearson
6. Modern Database Management by Jeffery A Hoffer ,V.Ramesh, HeikkiTopi , Pearson
7. Database Management Systems by DebabrataSahoo ,Tata Mac Graw Hill

Progressive Education Society's
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First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScCMAP201
Course Name : Advanced Operating Systems

Teaching Scheme: 4 Lectures/Week
Examination Scheme: CIA : 50 Marks

Credits: 4
End-Sem : 50 Marks

Prerequisites:

- Knowledge of Basic Operating System Concepts
- General knowledge of operating systems
- Basic Computer Architecture concepts

Course Objectives:

- To understand design issues related to process management
- To understand design issues related to memory management
- To understand design issues related to File management
- To study, learn, and understand the main concepts of advanced operating systems
- To study threads management.
- Focuses on Operating system structuring
- Study of Synchronization, communication and scheduling in parallel systems

Course Outcomes:

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

- Describe the concept of process and memory management
- Get the knowledge of process synchronization
- Identify use and evaluate the storage management policies with respect to different storage management technologies.
- Study and to control the behavior of OS by writing Shell scripts.

Course Contents

Chapter No.	Title	Number of Lectures
Chapter 1	Introduction	6
	1.1 Definition	
	1.2 Types of Operating systems	
	1.3 System Boot	
	1.4 Services provided by OS	
	1.5 Introduction to UNIX OS	
	1.6 Architecture of UNIX	
	1.7 Basics of navigating UNIX environment	

	1.8 Introduction to UNIX file system 1.9 File system layout 1.10 Files and directory management 1.11 Processes and process management	
Chapter 2	Process Management	4
	2.1 Process Concept – The process, Process states, Process control block 2.2 Process Scheduling – Scheduling queues, Schedulers, context switch System Calls: definition, implementation 2.3 Operations on Process – Process creation with program using fork(), Process termination	
Chapter 3	CPU scheduling	6
	3.1 Basic Concept – CPU-I/O burst cycle, CPU scheduler, Preemptive scheduling, Dispatcher 3.2 Scheduling Criteria 3.3 Scheduling Algorithms – FCFS, SJF, Priority scheduling, Round-robin scheduling, Multiple queue scheduling, Multilevel feedback queue scheduling	
Chapter 4	Memory Management	8
	4.1 Background – Basic hardware, Address binding, Logical versus physical address space, Dynamic loading, Dynamic linking and shared libraries 4.2 Swapping 4.3 Contiguous Memory Allocation – Memory mapping and protection, Memory allocation, Fragmentation 4.4 Paging – Basic Method, Hardware support, Protection, Shared Pages 4.5 Segmentation – Basic concept, 4.6 Virtual Memory Management – Background, Demand paging, Performance of demand paging, Page replacement – FIFO, OPT, LRU, Second chance page replacement	
Chapter 5	Deadlock	6
	5.1 System model 5.2 Deadlock Characterization – Necessary conditions, Resource allocation graph 5.3 Deadlock Prevention 5.4 Deadlock Avoidance - Safe state, Resource allocation graph algorithm, Banker's Algorithm 5.5 Deadlock Detection 5.6 Recovery from Deadlock – Process termination, Resource preemption	
Chapter 6	File System	4
	6.1 File concept	

	6.2 Access Methods – Sequential, Direct, Other access methods 6.3 Directory and Disk Structure – Storage structure, Directory overview, Single level directory, Two level directory, Tree structure directory, Acyclic graph directory, General graph directory 6.4 Allocation Methods – Contiguous allocation, Linked allocation, Indexed allocation 6.5 Free Space Management – Bit vector, Linked list, Grouping, Counting, Space maps	
Chapter 7	Introduction to Shell	10
	7.1 Types of shell 7.2 working of Shell 7.3 Shell Commands 7.4 Permissions, users and groups 7.5 Using variables 7.6 Basic operators 7.7 Conditional statements 7.8 Loops 7.9 Command line arguments & IO redirection 7.10 Functions and file manipulations 7.11 Regular expressions and filters	
Chapter 8	Interprocess Communication	3
	8.1 Inter process Communication – Shared memory system, Message passing systems 8.2 Critical Section Problem 8.3 Semaphores: Usage, 8.4 Classic Problems of Synchronization – The bounded buffer problem, The reader writer problem, The dining philosopher problem	
	EXPERIENTIAL LEARNING	1

Reference Books:

1. Operating System Concepts – Silberschatz, Galvin, Gagne, 9th edition, ISBN-13: 978-0470128725
2. The Design of the UNIX Operating System, PHI, by Maurice J. Bach
3. Advanced Programming in the UNIX Environment, Addison-Wesley, by Richard Stevens
4. Modern Operating Systems, Tanenbaum, IIIrd Edition, PHI
Linux Command Line & Shell Scripting, Richard Blum and Christine Bresnahan, 2nd edition, Wiley

Progressive Education Society's
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Shivajinagar, Pune - 5
First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScCMAP202
Course Name : Information System Security

Teaching Scheme: 4 Lectures/Week
Examination Scheme: CIA : 50 Marks

Credits: 4
End-Sem : 50 Marks

Prerequisites

- Knowledge of Information Systems

Course Objectives

- To enable students to get sound understanding of Information system security and cryptography

Course Outcomes

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

- Equip Knowledge and skills for career in Information Security

Course Contents

Chapter No.	Title	Number of Lectures
Chapter 1	Conceptual Foundation of Information Systems Security	3
	1.1 Concepts and Terminology: Threats, Attacks, Vulnerabilities, Risks, Risk Assessment and Mitigation 1.2 Security – Confidentiality, Integrity, availability, Identification, Authentication, Authorization, Accountability, Privacy	
Chapter 2	Cryptography	2
	2.1 Techniques 2.2 Mathematical Foundation 2.3 Steam Ciphers 2.4 Block Ciphers 2.5 Crytanalysis	
Chapter 3	Symmetric/Secret Key Encryption	6
	3.1 Algorithm Types and Modes 3.2 DES (Data Encryption Standard) 3.3 Double DES 3.4 Triple DES	

	3.5 AES (Advanced Encryption Standard) 3.6 IDEA 3.7 Blowfish 3.8 RC5	
Chapter 4	Public Key Encryption	8
	4.1 Principles of public key crypto-systems 4.2 Mathematical Foundation 4.3 RSA Algorithm 4.4 Key Management 4.5 Diffie-Hellman Key Exchange 4.6 Elliptic curve cryptography 4.7 Digital Signatures using DSA (Digital Signature Algorithm) 4.8 DSS (Digital Signature Standard) and RSA	
Chapter 5	Message Integrity Techniques	2
	5.1 MD5 5.2 SHA	
Chapter 6	Public Key Infrastructure	4
	6.1 Trust Hierarchy 6.2 Digital Certificates 6.3 Transaction Certificates	
Chapter 7	Authentication Techniques	4
	7.1 Passwords 7.2 Pass-code 7.3 Pass-phrase 7.4 Challenge-response 7.5 Biometrics based registration and Authentication 7.6 Kerbores	
Chapter 8	Internet Security Protocols	11
	8.1 SSL/TLS 8.2 TSP 8.3 SET 8.4 3-D Secure Protocol 8.5 Electronic Money 8.6 Email Security(PGP, PEM, S/MIME) 8.7 IP Security: IPSec, VPN	
Chapter 9	Server Security	4
	9.1 Concepts 9.2 Design and Implementation of Firewalls, 9.3 Intrusion Detection Systems (IDS) 9.4 Intrusion Prevention Systems (IPS) etc	
Chapter 10	Virus Threats	2
	10.1 Network Viruses 10.2 Worms	
Chapter 11	Data Hiding	1
	11.1 Steganography	
	EXPERIENTIAL LEARNING	1

Reference Books:

1. Atul Kahate," Cryptography And Network Security" TMH, ISBN-10: 9781259029882

Course Code : 19ScBCAU203

Course Name : Web Programming(PHP)-II

Teaching Scheme: 4 Lectures/Week

Credits: 4

Examination Scheme: CIA : 50 Marks

End-Sem : 50 Marks

Prerequisites:

- Basic knowledge in HTML tags & skill of creating web pages should be known
- Knowledge of basic Computer hardware & software is also necessary.

Course Objectives:

- Learn Core-PHP, Server Side Scripting Language
- Learn PHP-Database handling

Course Outcomes:

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

- To Design dynamic and interactive Web pages.

Course Contents

Chapter	Title	Number of Lectures
1	Introduction to Web Technologies	6
	1.1 HTTP basics, Introduction to Web server and Web browser 1.2 Introduction to PHP 1.3 What does PHP do? 1.4 Lexical structure 1.5 Language basics	
2	Function and String	4
	2.1 Defining and calling a function 2.2 Default parameters 2.3 Variable parameters, Missing parameters 2.4 Variable function, Anonymous function 2.5 Types of strings in PHP 2.6 Printing functions 2.7 Encoding and escaping 2.8 Comparing strings 2.9 Manipulating and searching strings 2.10 Regular expressions buttons, List box, radio, checkbox etc	
3	Arrays	8

	3.1 Indexed Vs Associative arrays 3.2 Identifying elements of an array 3.3 Storing data in arrays 3.4 Multidimensional arrays, Extracting multiple values 3.5 Conversion between arrays and variables 3.6 Traversing arrays 3.7 Sorting 3.8 Action on entire arrays 3.9 Using arrays	
4	Databases (PHP-PostgreSQL)	8
	4.1 Using PHP to access a database 4.2 Relational databases and SQL 4.3 PEAR DB basics 4.4 Advanced database techniques	
5	Handling email with PHP	8
	5.1 Email background 5.2 Internet mail protocol 5.3 Structure of an email message 5.4 Sending email with php 5.5 Email attachments. 5.6 Email id validation and verification 5.7 PHP error handling	
6	PHP framework	5
	6.1 Introduction to PHP framework. 6.2 Features, Applications. 6.3 One example like JOOMLA, DRUPAL	
7	AJAX	8
	7.1 Introduction of AJAX 7.2 AJAX web application model 7.3 AJAX –PHP framework 7.4 Performing AJAX validation 7.5 Handling XML data using php and AJAX 7.6 Connecting database using php and AJAX	
8	EXPERIENTIAL LEARNING	1

References Books:

1. Programming PHP By Rasmus Lerdorf and Kevin Tatroe O'Reilly publication, ISBN-13: 978-1449392772
2. Beginning PHP 5, Wrox publication, ISBN-13: 978-1565926103
3. PHP web services , Wrox publication, ISBN-10: 9780470413968
4. AJAX Black Book Kogent solution
5. Mastering PHP BPB Publication
6. PHP cookbook O'Reilly publication
7. Learning PHP and MYSQL, O'Reilly publication
8. PHP and MYSQL, O'Reilly publication
9. PHP for Beginners, SPD publication
10. Programming the World Wide Web , Robert W Sebesta(3rd Edition)
11. Check out Joomla!presss Pearson (Addison-Wesley Professional)

Reference Links:

1. www.php.net.in
2. www.W3schools.com
3. www.wrox.com
4. www.api.drupal.org

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First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScBCAU204

Course Name : Lab on Advanced Operating System and Web Programming(PHP)-II

Teaching Scheme: 4 Lectures/Week

Credits: 4

Examination Scheme: CIA : 50 Marks

End-Sem : 50 Marks

Practical Assignment (PHP)	
Sub:- Web Programming II	
Sr. No.	Topic of Assignment
1.	String manipulation
2.	Arrays
3.	Function
4.	Using object oriented concept
5.	File Handling
6.	Form designing
7.	Error handling in PHP
8.	Database Connectivity in PHP
9.	Sessions and cookies
10.	Simple AJAX
11.	AJAX validation
12.	Handling XML data using PHP and AJAX

Assignments on Advanced Operating system

Sr. No.	Topic of Assignment
1.	Introduction to Linux (Using basic commands like cat with options, ls with options, cal, pwd, wc, grep with options, i/o redirection using >, >>, <, etc)
2.	Creating a directory structure in Linux (Using commands mkdir, cd, rmdir, cp, mv etc.)

3.	An interactive program that accepts month name and checks with current date if the person is late
4.	A command line program that accepts only two arguments and outputs sum and product of the two
5.	Write a shell script to accept a file name, check if it is regular & show it's contents. (use cat command)
6.	Write a shell script to display “ Good Morning”, “ Good afternoon” , and “Good evening” depending on the hour (use date command)
7.	Write a shell script to accept argument string , and display present working directory if argument string is “current” ,display parent directory if argument string is “parent” and display the contents of root directory if argument string is “root” (use pwd, cd and ls command)
8.	Write a shell script which checks if any of the strings in the output of date command are present in the dirfile
9.	Write a shell script to print the information as to how many files and how many directories are present in current directory.
10.	Write a shell script that accepts name from the user and creates a directory by that name,then creates a text file in that directory and stores in it, the data accepted from user(till ^z), and displays the number of characters stored in the file. The program stops if directory name given is null.
11.	Write a program to implement CPU scheduling algorithm.
12.	Write a program to implement memory management algorithm.
13.	Write a program to implement Banker's algorithm.

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First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScBCAU205
Course Name : Project

Teaching Scheme: 4 Lectures/Week
Examination Scheme: CIA : 50 Marks

Credits: 4
End-Sem : 50 Marks

Guidelines for Project:

- Students should prepare Project design using SE/UML techniques

- **Contents of the Project Report:**
 - College certificate
 - Acknowledgement
 - Problem Definition
 - Existing System and need for the new system
 - Scope of the work
 - Feasibility study (Including H/W & S/W setup requirements)
 - Requirement Analysis (including fact finding methods used)
 - E-R diagrams
 - Decision trees/Decision tables
 - Normalized Database Design & Data Dictionary.
 - Data flow Diagrams (if applicable)
 - Use-case Diagrams
 - Class Diagrams
 - Object Diagrams
 - Sequence Diagrams
 - Collaboration Diagram
 - Activity Diagram
 - State Chart (if applicable)
 - Component Diagram
 - Deployment Diagram (if applicable)
 - Use interface design
 - Testing & Implementation plan (Should contain testing strategies, techniques used & implementation approach used)
 - User manual
 - Drawbacks, Limitations & Proposed enhancement
 - Abbreviations used (if any)
 - Bibliography/Reference (Including book titles, authors name, editions, publications, etc)

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First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScCMAP206 (Elective)

Course Name : Soft Computing

Teaching Scheme: TH:4Hours/Week

Credits: 4

Examination Scheme: CIA : 50 Marks

End-Sem : 50 Marks

Prerequisites:

Knowledge of the following:

- Probability
- First Order Predicate Logic
- Classical Logic

Objective:

- To understand the concepts of how an intelligent system work and its brief development process

Course outcome:

This course exposes learners to Neural Network, Fuzzy Logic and Genetic Algorithms, which are the major building blocks of Intelligent Systems

Chapter No.	Title	Number of Lectures
1	Origins and issues	3
	1.1 Modern neuroscience 1.2 Artificial Intelligence 1.3 Classical AI and Neural Network 1.4 Hybrid Intelligent Systems 1.5 The human brain 1.6 Biological neurons	
2	Artificial neurons, neural network and architecture	5
	2.1 Neuron abstraction 2.2 Neuron signal functions 2.3 Architectures: feed forward and feedback 2.4 Salient properties and application domains of neural networks	

3	Geometry of binary threshold neurons and their networks	5
	3.1 Pattern recognition and data classification 3.2 Convex sets, convex hulls and linear separability 3.3 Space of Boolean functions 3.4 Pattern Dichotomizers 3.5 Capacity of a simple threshold logic neuron 3.6 XOR problem 3.7 Multiplayer networks	
4	Perceptrons and LMS	5
	4.1 Learning and memory 4.2 From synapses to behaviour : The case of Aplysia 4.3 Learning algorithms 4.4 Error correction and gradient descent rules 4.5 The learning objectives for TLNs 4.6 Pattern space and weight space 4.7 Perceptron learning algorithm 4.8 MSE Error Surface and its Geometry	
5	Backpropagation	5
	5.1 Multilayered Network Architecture 5.2 Backpropagation Learning Algorithm 5.3 Practical Considerations in implementing BP algorithm 5.4 Applications of Feedforward Neural Networks	
6	Foundations of Fuzzy Systems	5
	6.1 From Crisp to Fuzzy Sets 6.2 Representing Fuzzy Elements 6.3 Basic Terms and Operations 6.4 Properties of Fuzzy sets 6.5 Fuzzy Measures 6.6 Fuzzification 6.7 The Extension Principle 6.8 Alpha-cuts and the Resolution Principle	
7	Fuzzy Relations	4
	7.1 Composition of Fuzzy Relations 7.2 Arithmetic Operations of Fuzzy Numbers 7.3 The alpha-cut method	
8	Linguistic Descriptions	4
	8.1 Fuzzy linguistic descriptions 8.2 Fuzzy Relation Inferences	

	8.3 Fuzzy Implication and Fuzzy Algorithms	
9	Defuzzification Methods	3
	9.1 Centre of Area Defuzzification 9.2 Centre of Sums Defuzzification 9.3 Mean of Maxima (MOM) Defuzzification	
10	Introduction to Genetic Algorithms	4
	10.1 Robustness of traditional Optimization and search methods 10.2 How are genetic algorithms different from Traditional methods 10.3 Genetic Algorithm(GA) – A Simulation by hand 10.4 Similarity Templates	
11	Computer Implementation of a Genetic Algorithm	5
	11.1 Data Structures 11.2 Reproduction, Crossover and Mutation 11.3 A Time to Cross 11.4 Mapping Objective Functions to Fitness Form 11.5 Fitness Scaling 11.6 Coding 11.7 Constraints	

Reference Books:

1. [Neural Networks, A Classroom Approach by Satish Kumar](#)
Tata McGraw-Hill Publishing Company Limited
ISBN : 0-07-048292-6
2. [Fuzzy Logic with Engineering Applications](#)
Timothy J Ross, Wiley Publication, ISBN-10: 047074376X
3. [Genetic Algorithms, in Search, Optimization & Machine Learning by David E. Goldberg](#), Pearson Education, ISBN : 81-7758-829-X

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First Year of B.C. A. (Science) (2019 Course)

Course Code : 19ScCMAP207 (Elective)
Course Name : Grid and Cloud Computing

Teaching Scheme: TH: 4Hours/Week
Examination Scheme: CIA : 50 Marks

Credit : 04
End-Sem : 50 Marks

Prerequisites:

Objective:

- Understand how Grid computing helps in solving large scale scientific problems
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing
- Learn how to program the grid and the cloud
- Understand the security issues in the grid and the cloud environment

Course outcome:

At the end of the course, the student should be able to:

- Apply Grid Computing techniques to solve large scale scientific problems
- Apply the concept of virtualization
- Use the Grid and Cloud tool kits
- Apply the security models in the Grid and Cloud Environment

Chapter No.	Title	Number of Lectures
1	Introduction	10
	1.1 Scalable computing over the Internet 1.2 Technologies for network based systems 1.3 Clusters of cooperative computers 1.4 Grid computing Infrastructures 1.5 Cloud computing 1.6 Evolution of Distributed computing 1.7 Scalable computing over the Internet 1.8 Technologies for network based systems 1.9 Clusters of cooperative computers 1.10 Grid computing Infrastructures 1.11 Introduction to Grid Architecture and standards 1.12 Elements of Grid 1.13 Overview of Grid Architecture	
2	Grid services	8

	<p>2.1 Introduction to Open Grid Services Architecture (OGSA)</p> <p>2.2 Functionality Requirements Practical and Detailed view of OGSA/OGSI</p> <p>2.3 Data intensive grid service models</p> <p>2.4 OGSA services</p>	
3	Virtualization	10
	<p>3.1 Cloud deployment models: public, private, hybrid, community</p> <p>3.2 Categories of cloud computing: Everything as a service: Infrastructure, platform, software – Pros and Cons of cloud computing</p> <p>3.3 Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters</p> <p>3.4 Resource Management – Virtualization for data center automation</p>	
4	Programming Model	10
	<p>4.1 Open source grid middleware packages – Globus Toolkit (GT4) Architecture , Configuration – Usage of Globus – Main components and Programming model</p> <p>4.2 Introduction to Hadoop Framework – Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system</p> <p>4.3 HDFS concepts, command line and java interface, dataflow of File read & File write</p>	
5	Security	10
	<p>5.1 Trust models for Grid security environment – Authentication and Authorization methods</p> <p>5.2 Grid security infrastructure – Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture</p> <p>5.3 IAM practices in the cloud</p> <p>5.4 SaaS, PaaS, IaaS availability in the cloud</p> <p>5.5 Key privacy issues in the cloud</p>	

Reference Books:

- 1.Cloud Computing Bible, Barrie Sosinsky, Willey India Edition, ISBN: 9788126529803
2. Cloud Computing Principles and Paradigms, Rajkumar Buya, James Broberg, Andrzej, Wiley, 2011, ISBN: 0470887990
3. Grid Computing, Joshy Joseph, Craig Fellenstein, Person Education, Person Eductaion, ISBN: 978-81-

