

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 Science)

(2019-20 Course)

(with effect from 2019-20)

CIA:Continuous Internal Evaluation

Semester 1 (Part I)

Course Type	Course Code	Course / Paper Title	Hours / Week	Credit	CIA	End Sem Exam	Total
CCT-1	19CsCmpP101	Programming Languages (Python)	4	4	50	50	100
CCT-2	19CsCmpP102	Design Analysis and of Algorithms	4	4	50	50	100
CCT-3	19CsCmpP103	Advanced Database Concepts (NoSQL: MongoDB)	4	4	50	50	100
CCP-1	19CsCmpP104	Lab on Programming Languages and Advanced Database Concepts	4	4	50	50	100
DSET-1	19CsCmpP105	Software Development Engineering Testing	4	4	50	50	100
	19CsCmpP106	Artificial Intelligence					
Total			20	20	250	250	100
AECCT-1	19CpCysP101	Cyber Security-I	1	1	50	50	100
AECCT-2	19CpHrtP102	Human Rights-I	1	1	50	50	100
Total			22	22	280	420	700
Extra Credentials		Activity Based Learning-I (MOOC or IIT Bombay Spoken Tutorial, Microsoft Virtual Academy courses)Advanced C, Advanced CPP,Python					

Semester 2 (Part I)

Course Type	Course Code	Course / Paper Title	Hours / Week	Credit	CIA	End Sem Exam	Total
CCT-4	19CsCmpP201	Advanced Operating Systems (Unix Internals)	4	4	50	50	100
CCT-5	19CsCmpP202	Mobile Technologies (Android)	4	4	50	50	100
CCT-6	19CsCmpP203	Data Mining and Data Warehousing	4	4	50	50	100
CCP-2	19CsCmpP204	Project on Emerging Trends	4	4	50	50	100
CCP-3	19CsCmpP205	Lab on Advanced Operating Systems and Mobile Technologies	4	4	50	50	100
DSET-2	19CsCmpP206	DOT NET	4	4	50	50	100
	19CsCmpP207	Research Methodology					
Total			24	24	300	300	600
AECCT-3	19CpCysP201	Cyber Security-I	1	1	50	50	100
AECCT-4	19CpHrtP202	Human Rights-I	1	1	50	50	100
Total			26	26	320	480	800
Extra Credentials		Activity Based Learning-II (MOOC or IIT Bombay Spoken Tutorial, Microsoft Virtual Academy courses) Linux, C# Fundamentals					

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

Course Code : 19CsCmpP101
Course Name : Programming Languages(Python)

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

Credit : 04
End-Sem : 50 Marks

Prerequisites:

- An understanding of programming in an imperative language (e.g., C/C++, Java)
- Knowledge of basic algorithms and data structures (e.g., sorting, searching, lists, stacks, and trees)
- Knowledge of basic discrete mathematics (e.g., sets, relations, functions, induction, and simple algebraic concepts)

Course Objectives:

- An understanding of programming language paradigm.
- Understanding of Lambda Calculus.
- Learning functional programming language Python.

Course Outcomes:

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

- Students can solve problems by using Python language.
- Students can implement projects by using Python Framework.

Course Contents

Chapter 1	Introduction to programming languages	2 lectures
	1.1 The Art of Language Design 1.2 The Programming Language Spectrum 1.3 Why Study Programming Languages? 1.4 Programming Environments 1.5 Declarative style of programming,	
Chapter 2	Introduction to FP & Mathematical Functions	5 lectures
	2.1 Principles of FP 2.2 History Of FP 2.3 Why functional programming 2.4 Mathematical functions : definition, lambda expression 2.5 Functional Forms or a higher-order function :- Function Composition, Construction 2.6 Disadvantages of FP	
Chapter 3	Introduction to Lambda calculus	5 lectures
	3.1 Introduction, 3.2 The benefits of lambda notation,	

	3.3 Lambda calculus as a formal system - Lambda terms (Variables, Constants, Combinations, Abstractions), 3.4 Free and bound variables, 3.5 Substitution 3.6 Conversions: Definition Only (Alpha conversion, Beta 3.7 conversion, Eta conversion) 3.8 Lambda reduction	
Chapter 4	Introduction To Python	2 lectures
	4.1 Installation and 4.2 Working with Python 4.3 Understanding Python variables 4.4 Python basic Operators 4.5 Understanding python blocks	
Chapter 5	Python Data Types	2 lectures
	5.1 Declaring and using Numeric data types: int, float, complex 5.2 Using string data type and string operations 5.3 Defining list and list slicing 5.4 Use of Tuple data type	
Chapter 6	Python Program Flow Control	4 lectures
	6.1 Conditional blocks using if, else and elif 6.2 Simple for loops in python 6.3 For loop using ranges, string, list and dictionaries 6.4 Use of while loops in python Loop manipulation using pass, continue, break and else 6.5 Programming using Python conditional and loops block	
Chapter 7	Python Functions	3 lectures
	7.1 Modules And Packages 7.3 Organizing python codes using functions 7.3 Organizing python projects into modules Importing own module as well as external modules 7.4 Understanding Packages	
Chapter 8	Python String, List And Dictionary Manipulations	3 lectures
	8.1 Building blocks of python programs 8.2 Understanding string in build methods 8.3 List manipulation using in build methods 8.4 Dictionary manipulation Programming using string, list and dictionary in build functions	
Chapter 9	Python File Operation	2 lectures
	9.1 Reading config files in python 9.2 Writing log files in python 9.3 Read functions, read(), readline() and readlines() 9.4 Write functions, write() and writelines() 9.5 Manipulating file pointer using seek Programming using file operations	
Chapter 10	Python Object Oriented Programming	2 lectures
	10.1 OOps Concept of class	

	10.2 Object and instances Constructor 10.3 Class attributes and destructors 10.4 Real time use of class in live projects 10.5 Inheritance 10.6 Overlapping and overloading operators 10.7 Adding and retrieving dynamic attributes of classes 10.8 Programming using OOps support	
Chpater 11	Python Regular Expression	2 Lectures
	11.1 Powerful pattern matching and searching Power of 11.2 Pattern searching using regex in python 11.3 Real time parsing of networking or system data using regex Password, email, url validation using regular expression 11.4 Pattern finding programs using regular expression	
Chapter 12	Python Database Interaction	2 Lectures
	12.1 SQL Database connection using python 12.2 Creating and searching tables Reading and storing config information on database	
Chapter 13	Python Libraries	11 Lectures
	13.1 Numpy 13.2 Pandas 13.3 Matplotlib 13.4 Scipy Only Introduction	
Chapter 14	Python Framework	2 Lectures
	14.1 Introduction to Django	
Chapter 15	Experiential Learning	1 Lecture
	15.1 Analysis of all Functional programming with respect to Python 15.2 Analysis and study of Libraries provided by Python to support AI	

References:

1. Functional Programming: Practice and Theory by Bruce J. Maclennan • ISBN-10: 0201137445 • ISBN-13: 978-0201137446 2.
2. An Introduction to Functional Programming Through Lambda Calculus (Dover Books on Mathematics) Paperback by Greg Michaelson • ISBN-10: 0486478831 • ISBN-13: 978-0486478838
3. Computational Semantics with Functional Programming by Jan van Eijck (Author), Christina Unger (Author) • ISBN-10: 0521757606 • ISBN-13: 978-0521757607
4. Introduction to Computer Science Using Python: A Computational Problem-Solving Focus by Charles Dierbach
5. Programming Languages: Principles and Practice By Kenneth C. Loudon • ISBN-10: 1575864967 • ISBN-13: 978-1575864969
6. LEARNING TO PROGRAM WITH PYTHON by Richard L. Halterman
7. Python 3 Object-oriented Programming Second Edition by Dusty Phillips
8. The Definitive Guide to Web Development Done Right by Adrian Holovaty and Jacob Kaplan-Moss
9. Djangogirl.com

Progressive Education Society's
Modern College of Arts, Science and Commerce (Autonomous)
Shivajinagar, Pune - 5
First Year of M.Sc. (Computer Science)
(2019 Course)
Course Code : 19CsCmpP102
Course Name : Design and Analysis of Algorithms

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

Credit :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

Chapter1	Basics of Algorithms	8 lectures
	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 lectures

	<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. 2.5 Strassen's Matrix Multiplication 	
Chapter 3	Greedy Method	10 lectures
	<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 3.8Shortest Path: Dijkstra's algorithm 	
Chapter 4	Dynamic Programming	7 lectures
	<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 lectures
	<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 lectures
	<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 lectures

	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 lectures
	7.4 Nondeterministic algorithm 7.5 The class of P, NP, NP-hard and NP – Complete problems 7.6 Cook’s theorem	
Chapter 9	Experiential Learning	1 Lecture
	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.	

References:

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 M.Sc. (Computer Science)
(2019 Course)

Course Code :19CsCmpP103 (Core)
Course Name : Advanced Database Techniques

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

Credit : 04
End-Sem : 50 Marks

Prerequisites

- Knowledge of RDBMS
- Knowledge of SQL and PLSQL
- Networking basics

Course Objectives

- To reinforce and strengthen the database concepts
- To equip students with knowledge to implement and integrate databases in actual applications.
- To introduce advanced concepts of transaction management and recovery techniques.
- To create awareness of how enterprise can organize and analyze large amounts of data

Course Outcomes:

On completion of the course, student will be able to

- Design and implement full-fledged real life applications integrated with database systems.
- Apply security controls to avoid any type of security incidents on vital database systems.
- Design advanced data systems using Object based systems or Distributing databases for better resource management.

Course Contents

Chapter 1	Introduction to Advanced Databases	3 lectures
	1.1 Database System Architectures: 1.2 Centralized and Client-Server Architectures 1.3 Server System Architecture 1.4 Parallel Systems 1.5 Distributed Systems	
Chapter 2	Parallel Databases	5 lectures
	2.1 Introduction	

	<ul style="list-style-type: none"> 2.2 Goals of Parallel Databases 2.3 Different Types of DBMS Parallelism 2.4 Performance Parameters 2.5 Parallel Data Architecture 2.6 <u>Evaluation of Parallel Query</u> <ul style="list-style-type: none"> 2.6.1 Inter and Intra Query Parallelism 2.6.2 Inter and Intra operation Parallelism 2.7 Optimization of Parallel query 2.8 <u>Virtualization</u> 	
Chapter 3	Distributed Databases	8 lectures
	<ul style="list-style-type: none"> 3.1 Introduction 3.2 Goals of Distributed Databases 3.3 Types of Distributed Databases (Horizontal, Vertical, Hybrid) 3.4 Data replication 3.5 Replication Schemas 3.6 Query Processing and Optimization 3.7 Recovery <ul style="list-style-type: none"> 3.7.1 Two-phase commit protocol 3.7.2 Concurrency problems 3.7.3 Concurrency Controls 	
Chapter 4	Object Based Databases	8 lectures
	<ul style="list-style-type: none"> 4.1 Concepts of Object Databases 4.2 Features of OODBMS 4.3 Challenges in ODBMS Implementation 4.4 Object Identity – Object structure 4.5 Objects and Attributes <ul style="list-style-type: none"> 4.5.1 Type Constructors 4.5.2 Encapsulation of Operations 4.5.3 Methods 4.5.4 Persistence 4.5.5 Type and Class Hierarchy 4.6 Structures and Unstructured data 4.7 Case Studies 	
Chapter 5	XML Databases	9 lectures
	<ul style="list-style-type: none"> 5.1 XML Data Model 5.2 DTD 5.3 XML Schema 5.4 XML Querying 5.4 Web Databases 5.6 JDBC 5.7 Information Retrieval 	
Chapter 6	Big Databases	3 lectures
	<ul style="list-style-type: none"> 6.1 Introduction 6.2 Four V's of Big data 6.3 <u>NoSQL Databases</u> 6.4 Examples of NoSQL DB 6.5 Advantages 6.7 NoSQL Vs SQL 	

Chapter 7	NoSQL (Any one fromMongoDB/CASSANDRA)	12 lectures
	7.1 Overview 7.2 Architecture 7.3 Features 7.4 Advantages 7.5 Basics 7.6 Servers 7.7 Databases 7.8 Collections 7.9 Documents / Objects 7.8 CRUD 7.9 Indexes	
Chapter 8	Experiential Learning	1 lecture
	8.1 Create same database using RDBMS and NoSQL 8.2 Do operations on these databases 8.3 Do comparative study of it.	

References:

1. Database System Concepts, By Silberschatz A., Korth H., Sudarshan S., 6th Edition, McGraw Hill Education
2. Fundamentals of Database Systems, By: Elmasri and Navathe, 4th Edition
3. An Introduction to Database Systems”, C J Date, Addison-Wesley
4. MongoDB: The Definitive Guide” by Kristina Chodorow
5. MongoDB in Action” by Kyle Banker
6. Parallel and Distributed Computing (English, Paperback, Basu S. K.)

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

Course Code : 19CsCmpP104 (Lab)
Course Name : Lab on Programming Languages and Advanced Database Concepts

Teaching Scheme: Practical: 2+2 = 4Hours/Week
Examination Scheme: CIA : 50 Marks

Credit : 04
End-Sem : 50 Marks

Lab assignments of Programming Languages(Python)

Assignment 1	Introduction To Python
	Installation of Python on different OS Working with Python as a calculator
Assignment 2	Programs on Flow Control
	Basic programs for understanding of different control flow in Python
Assignment 3	Functions
	Writing Programs using functions Use of Modules Use of packages
Assignment 4	Python programs for String, List
	Building blocks of python programs Understanding string in build methods List manipulation using in build methods
Assignment 5	Dictionary Manipulations
	Dictionary manipulation Programming using string, list and dictionary in build functions
Assignment 6	Python File Operation
	Reading config files in python Writing log files in python read functions, read(), readline() and readlines() write functions, write() and writelines()
Assignment 7	Python Object Oriented Programming
	Simple OO programs
Assignment 8	Python Regular Expression
	pattern matching and searching pattern searching using regex in python
Assignment 9	Python Database Interaction
	Demo for SQL/ SQLite connectivity
Assignment 10	Python Libraries
	Numpy Pandas

Assignment 11	Python Libraries
	Matplotlib Scipy
Assignment 11	Python Framework
	Tutorial on Django

Lab assignments of Advanced Database Concepts

Assignment Number	Name
1	Create User and add Role
2	Creation of database and collection
3	Insert data in collection, inserting multiple documents in collection
4	CRUD operations on collections
5	Aggregate commands
6	Query and Write operation commands
7	Finding documents with expressions and comparison queries
8	Sort and limit queries with examples
9	Usage of functions
10	Functional Loops - forEach and map
11	Interacting with cursors
12	Regular expressions with examples

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

Course Code : 19CsCmpP105
Course Name : Software Development Engineering Testing

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

Credit : 04
End-Sem : 50 Marks

Prerequisites : 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 1	SDLC	4 Lectures
	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	4
Chapter 2	Types of Testing	10 Lectures
	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	

	<ul style="list-style-type: none"> 2.11 Stress Testing 2.12 Penetration Testing 2.13 Cross platform / Cross device testing 	
Chapter 3	STLC (Software Testing Life Cycle)	5 Lectures
	<ul style="list-style-type: none"> 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 Lectures
	<ul style="list-style-type: none"> 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 Lectures
	<ul style="list-style-type: none"> 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 Lectures
	<ul style="list-style-type: none"> 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 Lectures

	<p>7.1 Service Oriented Architecture (SOA), who uses SOA</p> <p>7.2 Web Services, Why Web Services are Being Used? What is WSDL? , Web Service Standards, tools to test</p> <p>7.3 Web services, how to test web services, why to test web services.</p> <p>7.4 Understanding WSDL, how is it used, specifications, document, and file, Retrieving and Viewing/ Inspecting WSDL file.</p> <p>7.5 SOAP, SoapUI tool, download and installation</p> <p>RESTFul Service</p>	
Chapter 8	Experiential learning	1 Lecture
	8.1 Compare performance characteristics of different testing tools	

References:

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

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

Course Code : 19CsCmpP106
Course Name : Artificial Intelligence

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

Credit : 04
End-Sem : 50 Marks

Prerequisites: -

- Basic Knowledge of Data Structure.
- Basic knowledge of Algorithm.

Course Objectives:

- The course will cover basic ideas and techniques underlying the design of intelligent computer systems.
- To understand implementation of basic AI algorithms.

Course Outcomes:

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

- Identify problems that are amenable to solution by AI methods.
- Identify appropriate AI methods to solve a given problem.
- Formalize a given problem in the language/framework of different AI methods.

Course Contents

Chapter 1	Introduction to AI	2 lectures
	1.1 Introduction to AI 1.2 History of AI 1.3 Course logistics	
Chapter 2	Problem Solving :	6 lectures
	2.1 Problem space 2.2 Solving Problems by Searching 2.3 Heuristic search techniques 2.4 Constraint satisfaction problems 2.5 Stochastic search methods.	
Chapter 3	Heuristic Search Techniques	10 lectures
	3.1 Generate-and-test 3.2 Hill Climbing 3.3 Best First Search 3.4 Problem Reduction 3.5 Constraint Satisfaction 3.6 Mean-Ends Analysis,	
Chapter 4	Knowledge and Reasoning :	12 lectures

	4.1 Building a Knowledge Base : Propositional logic, first order logic, situation calculus. 4.2 Theorem Proving in First Order Logic. Planning, partial order planning. 4.3 Uncertain Knowledge and Reasoning	
Chapter 5	Knowledge Inference	11 lectures
	5.1 Knowledge representation -Production based system, Frame based system. 5.2 Inference – Backward chaining, Forward chaining, Rule value approach 5.3 Fuzzy reasoning – Certainty factors, Bayesian Theory-Bayesian Network-	
Chapter 6	Gaming Planning And Learning	4 lectures
	6.1 minimax, alpha-beta pruning. 6.2 Overview of different forms of learning 6.3 Learning Decision Tree	
Chapter 7	Experiential Learning	3 lectures
	Find Out different features of NLP Find out problem definition of Vision	

Reference books –

1. Computational Intelligence, Eberhart, Elsevier, ISBN 9788131217832
2. Artificial Intelligence: A New Synthesis, Nilsson, Elsevier, ISBN 9788181471901
3. Artificial Intelligence, Tata McGraw Hill, 2nd Edition, by Elaine Rich and Kevin Knight
4. Introduction to Artificial Intelligence and Expert System, Prentice Hall of India Pvt. Ltd.,
5. New Delhi, 1997, 2nd Printing, by Dan Patterson.
6. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 3rd edition.
7. Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013.
8. <http://nptel.ac.in>

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

Course Code : 19ScCmpP201
Course Name : Advanced Operating Systems (UNIX/Linux Internals)

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

Credit : 04
End-Sem : 50 Marks

Prerequisites

- General knowledge of operating systems
- Working knowledge of C programming.
- Basic algorithms and data structure concepts.

Course Objectives

- To study, learn, and understand the main concepts of advanced operating systems
- It is intended for anyone writing C programs that run under Unix/Linux.
- To study threads management.
- Study of Synchronization, communication and scheduling in parallel systems

Course Outcomes

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

- Describe the important computer system resources and the role of operating system in their management policies and algorithms
- Study and to control the behavior of OS by writing Shell scripts.
- understand and analyze theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files

Course Contents

Chapter 1	Introduction to UNIX/LINUX Kernel	3 lectures
	1.1 Overview of operating system 1.2 Introduction to UNIX OS 1.3 Architecture of UNIX 1.4 Basics of navigating UNIX environment	
Chapter 2	File system	7 lectures
	2.1 Introduction to UNIX file system 2.2 File system layout 2.3 Files and directory management 2.4 Processes and process management	
Chapter 3	Usage of command line-shell	4 lectures
	3.1 Types of shell	

	<ul style="list-style-type: none"> 3.2 Shell functionality 3.3 Environment 3.4 Shell Commands 3.5 Permissions, users and groups 	
Chapter 4	Shell Scripting	9 lectures
	<ul style="list-style-type: none"> 4.1 Writing, executing and debugging basic script 4.2 Making interactive scripts 4.3 Conditional statements 4.4 Loops 4.5 Command line arguments 4.6 Functions and file manipulations 4.7 Regular expressions and filters 	
Chapter 5	Different Types of System Calls	7 lectures
	<ul style="list-style-type: none"> 5.1 Process Control 5.2 File management 5.3 Device management 5.4 Information maintenance 5.5 Programming using system calls 	
Chapter 6	Interprocess Communication(IPC)	8 lectures
	<ul style="list-style-type: none"> 6.1 Introduction to IPC 6.2 IPC between processes on a single computer system 6.3 IPC between processes on different systems 6.4 Pipes-creation IPC between related processes using FIFOs(Named pipes) 6.5 Differences between unnamed and named pipes 6.6 popen and pclose library functions. 6.6 Message Queues 6.7 Semaphores 	
Chapter 7	Signals	5 lectures
	<ul style="list-style-type: none"> 7.1 Introduction to signals 7.2 Interrupts Concept 7.3 Difference between signals and Interrupts 7.4 Signal function 7.5 Signal names 7.6 Signal generation 7.7 Signal handling 7.8 Kernel support for signals 	
Chapter 8	Virtualization and Containers	4 lectures
	<ul style="list-style-type: none"> 8.1 Introduction to visualization 8.2 Virtual machine 8.3 Introduction to containers 8.4 Importance of containers 8.5 Virtual Box 8.6 Difference between containers and 8.7 virtualization 	

Chapter 9	Experiential Learning	1 lecture
	9.1 Comparison of different operating systems 9.2 Study of open source OS characteristics 9.3 Changing parameters of configuration files and study behavior of it	

References:

1. Linux System Programming, O'Reilly, by Robert Love.
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
5. Linux Command Line & Shell Scripting, Richard Blum and Christine Bresnahan, 2nd edition, Wiley
6. UNIX for Programmers and Users, 3rd Edition Graham Glass, King Ables

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

Course Code : 19ScCmpP202
Course Name : Mobile Computing (Android)

s

Teaching Scheme: TH: 4 Hours/Week

Credit : 04

Examination Scheme: CIA : 50 Marks

End-Sem : 50 Marks

Prerequisites:

- Student must be aware of Wired and Wireless Networks
- Student must be aware of TCP/IP protocol suit
- Java Programming Knowledge is essential

Course Objectives

- To make the students well aware of software development framework and network architecture for Mobile Computing in order to fulfill the requirements of skill sets expected by IT Industry.

Course Outcome:

- To study Mobile Computing and Mobile Technology.
- To learn the changes/modifications required in Standard Protocols like Mobile IP and Mobile TCP for Mobile Wireless Network.
- To learn new protocols that will be implemented in MANET.
- To learn Software Architecture and changes in Application Environment for the Mobile Computing.
- To get introduced to various platforms and Android Programming Environment.

Course Contents

Chapter 1	Introduction to Mobile Computing	2 lectures
	1.1 Mobility and Portability 1.2 Location Dependent Services 1.3 Simplified Reference Model 1.4 Cellular Systems	
Chapter 2	Telecommunication Systems	5 lectures
	2.1 GSM (System Architecture, Localization and Calling, Handover, Security) 2.2 GPRS Architecture 2.3 DECT – System Architecture	

	2.4 UMTS – System Architecture, Handover 2.5 UTRAN - System Architecture	
Chapter 3	Mobile Network Layer	12 lectures
	3.1 Mobile IP (Goals, Entities and Terminologies, Packet Delivery, Agent Discovery, Registration, Tunneling & Encapsulation, Optimizations, IPV6, Micro-mobility Support) 3.2 Dynamic Host Configuration Protocol 3.3 Mobile Ad-hoc Networks (Routing, Destination Sequence Distance Vector, Dynamic Source Routing, Alternate Metrics)	
Chapter 4	Mobile Transport Layer	4 lectures
	4.1 Tradition TCP Issues 4.2 TCP Improvements (Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast Recovery, Transmission/Time-out Freezing, Selective Retransmission, Transaction – Oriented TCP) 4.3 TCP over 2.5G/3G/4G 4.4 Performance Enhanced Proxies	
Chapter 5	Introduction to Mobile Development Frameworks and Tools	5 lectures
	5.1 N-Tier Client-Server Framework and Tools 5.2 JAVA (J2ME, CLDC, CDC, Java Card, JINI, JXTA Peer-to-Peer Protocol) 5.3 BREW 5.4 WINDOWS CE 5.5 WAP (Architecture, WAP UI, Proxies and Gateways, MMS, WAP Push, Security, Dimensions of Mobility) 5.6 Symbian EPOC	
Chapter 6	XML and Mobile Applications	5 lectures
	6.1 DOM Parsing 6.2 SAX Parsing 6.3 XML Web Services 6.4 SOAP 6.5 WSDL 6.6 Key XML Technologies for Mobile Computing	
Chapter 7	UI Development	4 lectures
	7.1 Building Generic User Interfaces 7.2 UML for Modeling GUI Components 7.3 XForms 7.4 Platforms for Mobile GUIs (WAP, J2ME,	

	BREW, Microsoft) 7.5 Multimodal User Interfaces (Software and System Architecture) 7.6 Mobile Agents for Mobile Computing and Application of Mobile Agents 7.7 Peer-to-Peer Application Development for Mobile Computing	
Chapter 8	Introduction to Android Operating System & Programming	10 lectures
	8.1 Android Architecture 8.2 Components of Android Application 8.3 UI Designing and Event Handling 8.4 Exploring 2D Graphics 8.5 Multimedia 8.6 Storing Local Data 8.7 Locating and Sensing 8.8 SQLite	
Chapter 9	Experiential Learning	1 lecture
	9.1 Comparisons of various mobile 9.2 applications that are used by students and submission of report.	

Reference Books

1. Mobile Communications, Jochen Schiller, Pearson Education
2. Mobile Computing Principles, Reza B'Far, CAMBRIDGE
3. Beginning Android Application Development by Wei-Meng Lee Wiley India
4. Mobile Computing: Technology, Applications, and Service Creation by Asoke K. Talukder
5. The Android Developers Guide [<http://developer.android.com/guide/index.htm>]

Progressive Education Society's
Modern College of Arts, Science and Commerce (Autonomous)
 Shivajinagar, Pune - 5

First Year of M.Sc. (Computer Science) (2019 Course)

Course Code : 19ScCmpP203
Course Name :Data Mining and Data Warehousing

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

Credit : 04
End-Sem : 50 Marks

Prerequisites:

- Basic programming skills
- Basic skills in statistics and linear algebra

Course Objectives :

- This course will introduce the concepts, techniques, design and applications of data warehousing and data mining.
- Some systems for data warehousing and/or data mining will also be introduced.
- The course is expected to enable students to understand and implement classical algorithms in data mining and data warehousing

Course outcome:

- On completion of the course students will get knowledge of:
- Data preprocessing and data quality.
 - Modeling and design of data warehouses.
 - Algorithms for data mining.

Course Contents

Chapter 1	Introduction to Data Mining	5 lectures
	1.1. Basic Data Mining Tasks 1.2. DM versus Knowledge Discovery in Databases 1.3. Data Mining Issues 1.4. Data Mining Metrics 1.5. Social Implications of Data Mining 1.6. Overview of Applications of Data Mining	
Chapter 2	Introduction to Data Warehousing	5 lectures
	2.1. Architecture of Data Warehouse 2.2. OLAP and Data Cubes 2.3. Dimensional Data Modeling-Star, Snowflake Schemas 2.4. Data Processing 2.4.1. Need 2.4.2. Data Cleaning	

	<ul style="list-style-type: none"> 2.4.3. Data Integration 2.4.4. Transformation 2.4.5. Data Reduction 2.5. Machine Learning 2.6. Pattern Matching 	
Chapter 3	Data Mining Techniques	6 lectures
	<ul style="list-style-type: none"> 3.1. Frequent Item-Sets 3.2. Association Rule Mining 3.3. Rule Basic Measures – Support and Confidence 3.4. Apriori Algorithm 3.5. Use of Sampling for Frequent Item Set 3.6. FP tree algorithm 3.7. Graph Mining 3.8. Tree mining 3.9. Sequence Mining 	
Chapter 4	Classification & Prediction	17 lectures
	<ul style="list-style-type: none"> 4.1. Decision Tree 4.2. Construction, Performance, Attribute Selection 4.3. Issues: Over-Fitting, Tree Pruning Methods, Missing Values 4.4. Continuous Classes 4.5. Classification and Regression Trees (CART) 4.6. Bayesian Classification 4.7. Bayes Theorem, Naïve Bayes classifier 4.8. Bayesian Networks 4.9. Linear Classifier & Types of Linear Classifiers 4.10. Least Squares 4.11. Prediction 4.12. Linear Regression 4.13. Non-linear Regression 	
Chapter 5	Accuracy Measures	4 lectures
	<ul style="list-style-type: none"> 5.1. Precision, Recall, F-measure, Confusion Matrix 5.2. Cross-validation, Bootstrap 	
Chapter 6	Data Mining Tools	3 lectures
	<ul style="list-style-type: none"> 6.1. Usage of DM Tools 6.2. Sample applications of Data Mining 	
Chapter 7	Clustering	4 lectures
	<ul style="list-style-type: none"> 7.1. Distance Based Clustering 7.2. K-Means Clustering 7.3. Expectation Maximization (EM) Algorithm 7.4. Hierarchical Clustering <ul style="list-style-type: none"> 7.4.1. Agglomerative Clustering 7.4.2. Divisive Clustering 7.5. Computing Inter-Cluster Distance 	

Chapter 8	Overview of Advanced Techniques	3 lectures
	8.1. Active Learning 8.2. Reinforcement Learning 8.3. Text Mining 8.4. Graphical Models 8.5. Web Mining 8.6. Spatial Mining	
Chapter 9	Experiential Learning	1 lecture
	9.1. Usage of DM Tool	

References :s

1. Data Mining: Concepts and Techniques, Han, Elsevier ISBN:9789380931913/ 9788131205358
2. Margaret H. Dunham, S. Sridhar, Data Mining – Introductory and Advanced Topics, Pearson Education
3. Tom Mitchell, —Machine Learning, McGraw-Hill, 1997
4. R.O. Duda, P.E. Hart, D.G. Stork. Pattern Classification. Second edition. John Wiley and Sons, 2000.
5. Christopher M. Bishop, —Pattern Recognition and Machine Learning, Springer 2006
6. Raghu Ramkrishnan, Johannes Gehrke, Database Management Systems, Second Edition, McGraw Hill International
7. Ian H. Witten, Eibe Frank Data Mining: Practical Machine Learning Tools and Techniques, Elsevier/(Morgan Kaufman), ISBN:9789380501864
8. [Research-Papers]: Some of the relevant research papers that contain recent results and developments in data mining field

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

Course Code : 19ScCmpP204 (Lab)
Course Name : Project on Emerging Trends

Teaching Scheme: Practical :4Hours/Week

Credit : 04

Examination Scheme: CIA : 50 Marks

End-Sem : 50 Marks

The Project can be platform, Language and technology independent. Project will be evaluated by project guide. Assessment will be done weekly in the respective batch. Evaluation will be on the basis of weekly progress of project work, progress report, oral, results and documentation and demonstration. You should fill your status of the project work on the progress report and get the Signature of project guide regularly. Progress report should sharply focus how much time you have spent on specific task.

Project Progress Report

Roll No & Name of the student	
Title of the Project	
Project guide Name	

SN	From Date	To Date	Details of Project work	Projectguidesign (with date)

Head,
 Dept. of Computer Science

- Students should prepare design document using SE/UML techniques depends on your project

- Project Report Contents should be as follows :
 1. College certificate
 2. Acknowledgement
 3. Problem Definition
 4. Existing System and need for the new system
 5. Scope of the work
 6. Feasibility study (Including H/W & S/W setup requirements)
 7. Requirement Analysis (including fact finding methods used)
 8. E-R diagrams
 9. Decision trees/Decision tables
 10. Normalized Database Design & Data Dictionary.
 11. Data flow Diagrams (if applicable)
 12. Use-case Diagrams
 13. Class Diagrams
 14. Object Diagrams
 15. Sequence Diagrams
 16. Collaboration Diagram
 17. Activity Diagram
 18. State Chart (if applicable)
 19. Component Diagram
 20. Deployment Diagram (if applicable)
 21. User interface design Menus
Input Screens using sample data Reports, Graphs using sample data
 22. Testing & Implementation plan (Should contain testing strategies, techniques used & implementation approach used.)
 23. User manual
 24. Drawbacks, Limitations & Proposed enhancement
 25. Abbreviations used (if any)
 26. Bibliography/Reference (Including book titles, authors name, editions, publications, etc)

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

Course Code : 19ScCmpP205 (Lab)
Course Name : Advanced Operating Systems and Mobile Technologies (Android)

Teaching Scheme: TH: 2 + 2 = 4 Hours/Week
Examination Scheme: CIA : 25 Marks

Credit : 04s
End-Sem : 25 Marks

Lab Assignments on Advanced Operating Systems

1	Usage of shell and execute different shell commands
2	Creations of different Users and Groups and setting permissions
3	Write Shell Scripts using Conditional statements
4	Write Shell Scripts using Loops
5	Write Shell Scripts using Command line arguments
6	Write Shell Scripts using Functions and file manipulations
7	Write Shell Scripts using Regular expressions and filters
8	Usage of file related system calls
9	Usage dup and dup2 system calls
10	Create unnamed and named pipes and communicate between different processes using it
11	Usage of signals using three types of signal handlers
12	Basic assignments using virtual machine

Lab Assignments on Mobile Technologies (Android)

1	Setup Java Development Kit
2	Configure Android SDK
3	Setup Eclipse IDE
4	Setup Android Development Tools Plugin
5	Create Android Virtual Device
6	Problem Definition and Scope
7	Database Design or File Structure Design
8	UML Diagrams
9	GUI Development
10	Testing Android Application
11	Deploying Android Application on Device
12	Testing and Bug Fixing

NOTE: Students are expected to submit Final Document with Presentation.

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

Course Code : 19ScCmpP206
Course Name : DOT NET

Teaching Scheme: TH: 4 Hours/Week
Examination Scheme: CIA : 25 Marks

Credit : 04s
End-Sem : 25 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 1	DOTNET Framework	2 lectures
	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 lectures
	2.1 Language features 2.1.1 Variables and Expressions, type conversion 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	

	<p>2.2.1 Defining classes, class members, Interfaces, properties</p> <p>2.2.2 Access modifiers, Implementation of class, interface and properties</p> <p>2.2.3 Concept of hiding base class methods, Overriding</p> <p>2.2.4 Event Handling</p> <p>2.3 Collections, Comparisons and Conversions</p> <p>2.3.1 Defining and using collections,</p> <p>2.3.2 Indexers, iterators</p> <p>2.3.3 Type comparison, Value Comparison</p> <p>2.3.4 Overloading Conversion operators, as operator</p> <p>2.4 Generics</p> <p>2.4.1 Using generics</p> <p>2.4.2 Defining Generics, generic Interfaces, Generic methods, Generic Delegate</p>	
Chapter 3	Window Programming	5 Lectures
	<p>3.1 Window Controls</p> <p>3.1.1 Common Controls</p> <p>3.1.2 Container Controls</p> <p>3.1.3 Menus and Toolbars</p> <p>3.1.4 Printing</p> <p>3.1.5 Dialogs</p> <p>3.2 Deploying Window Application</p> <p>3.2.1 Deployment Overview</p> <p>3.2.2 Visual studio setup and Deployment project types</p> <p>3.2.3 Microsoft windows installer architecture</p> <p>3.2.4 Building the project : Installation</p>	
Chapter 4	Data Access	2 lectures
	<p>4.1 File System Data</p> <p>4.2.XML</p> <p>4.3 Databases and ADO.NET</p> <p>4.4 Data Binding</p>	
Chapter 5	Web Programming	2 lectures
	<p>5.1 Basic Web programming</p> <p>5.2 Advanced Web programming</p> <p>5.3 Web Services</p> <p>5.4 Deployment Web applications</p>	
Chapter 6	.NET Assemblies	4 lectures
	<p>6.1 Components</p> <p>6.2 .NET Assembly features</p> <p>6.3 Structure of Assemble</p> <p>6.4 Calling assemblies, private and shared assemblies</p>	
Chapter 7	Networking	3 lectures
	<p>7.1 Networking overview</p> <p>7.2 Networking programming options</p> <p>7.2.1 WebClient</p> <p>7.2.2 WebRequest and WebResponse</p> <p>7.2.3 TcpListener &TcpClient</p>	
Chapter 8	Introduction to GDI+	3 lectures

	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 lectures
Chapter 10	Server Controls and Variables, control Structures & Functions	2 lectures
	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, datacollections 10.5 Overview of Control structures 10.6 Functions : web controls as parameters	
Chapter 11	Even Driven Programming andPostBack	2 lectures
	11.1 HTML 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 lectures
	12.1 Data pages 12.2 ADO.NET	
Chapter 13	ASP.NET Server Controls	7 lectures
	13.1 ASP.NET Web Controls 13.2 HTML Server Controls 13.3 Web Controls	
Chapter 14	DOTNET assemblies and Custom Controls	2 lectures
	14.1 Introduction to Cookies, Sessions 14.2 Session events 14.3 State management Recommendations	
Chapter 15	Web Services	2 lectures
	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 lecture
	16.1 Review performance statistics of websites developed in .net	

References :

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 M.Sc. (Computer Science) (2019 Course)

Course Code : 19CsCmpP207
Course Name : Research Methodology

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

Credit : 04
End-Sem : 50 Marks

Desirable Prerequisites: No prerequisites for PG students

Course Objectives:

- Read, interpret, and critically evaluate social research
- Identify, explain, and apply the basic concepts of research, such as variable sampling, reliability and validity
- Recognize the ethical issues involved in research and practice ethical research standards
- Use a variety of research methods through hands-on experience

Course Outcomes:

Upon completing this course, each student will be able to:

- demonstrate knowledge of research processes (reading, evaluating and developing)
- Prepare intellectual framework necessary to explore wide spectrum of research areas
- perform literature reviews
- identify, explain, compare, and prepare the key elements of a research proposal/report
- The qualitative as well as quantitative methods of research will help bridge the gap between theory and practice

Course contents

Chapter 1	Purpose and Products of Research	6 lectures
	1.1 Information Systems and Computing disciplines 1.2 Possible products and outcomes of research 1.3 Finding and choosing research topics 1.4 Evaluating the purpose and products of research	
Chapter 2	Research Process	2 Lectures
	2.1 Model of research process 2.2 Evaluating the research process	
Chapter 3	The Internet Research, Participants and Research Ethics	8 Lectures
	3.1 Internet research topics 3.2 Literature review on the Internet 3.3 The Internet and research strategies and methods 3.4 Internet research, the law and ethics 3.5 Rights of people directly involved 3.6 Responsibilities of an ethical Researcher 3.7 Design and creation projects and ethics 3.8 Evaluating research ethics	
Chapter 4	Literature Review	5 Lectures
	4.1 Purpose of literature review 4.2 Literature resources 4.3 The Internet and literature reviews 4.4 Conducting and evaluating literature review	
Chapter 5	Types of Research	6 Lectures
	5.1 Surveys 5.2 Design and Creation 5.3 Experiments 5.4 Case Studies 5.5 Action Research 5.6 Ethnography 5.7 Interviews 5.8 Observations 5.9 Questionnaires 5.10 Documents	
Chapter 6	Quantitative Data Analysis	8 Lectures
	6.1 Types of quantitative data 6.2 Data coding 6.3 Visual aids for quantitative data analysis 6.4 Using statistics for quantitative data analysis 6.5 Interpretation of data analysis results 6.6 Evaluating quantitative data analysis	35
Chapter 7	Qualitative Data Analysis	8 Lectures

	7.1 Analyzing textual data 7.2 Analyzing non-textual qualitative data 7.3 Grounded theory 7.4 Computer aided qualitative analysis 7.5 Evaluating qualitative data analysis	
Chapter 8	Experiential Learning	5 Lectures
	8.1 Writing of research proposal and research report 8.2 Poster presentation and Conference paper presentation	

References:

1. **Researching Information Systems and Computing** by Briony J. Oastes Sage Publications India Pvt. Ltd., New delhi ISBN 1-4129-0224-X (pbk)
2. **Your research Project, A Step by step Guide for the first-time researcher** by Nicholas Walliman, Vistaar Publications (A division of Sage Publications), New Delhi ISBN 81-7829-540-7
3. **Research Methods** by William M K Trochim Cornel University, biztantra, An imprint of Dreamtech Press. WILEY-dreamtech India Pvt. Ltd.