DR. D. Y. PATIL SCHOOL OF SCIENCE & TECHNOLOGY
DR. D. Y. PATIL VIDYAPEETH, PUNE
(Deemed to be University)
(Accredited (3rd cycle) by NAAC with a CGPA of 3.64 on four-point scale at 'A++' Grade)
(Declared as Category - I University by UGC Under Graded Autonomy Regulations, 2018)
(An ISO 9001: 2015 and 14001:2015 Certified University and Green Education Campus)

BSC detailed Syllabus Semester III to VIII

Dr. D. Y. Patil Vidyapeeth, Dr. D. Y. Patil School of science & Technology
Second Year BSC (2023 Course)
(With effect from Academic Year 2023-24)

SEMESTER III

Course Code	Course Type	Course Name	Teaching Scheme			Examination Assessment Scheme				Credit scheme			
			Lecture	Tutorial	Practical	CA	End Sem	Practical	Total	L	T	P	C
BSC-BCS-301	Major	Data structures	3	0	4	40	60	100	200	3	0	4	5
BSC-BCS-302	Major	Computer Networks	4	0	0	40	60	100	200	4	0	0	4
BSC-BCS-303	Major	Theory of Optimization & Graph Theory	4	0	0	40	60	-	100	4	0	0	4
PCC-BCS-301	VA	Project Management	1	0	2	20	30	-	50	1	0	2	2
PEC-BCS-301	DSE	A: Cloud AWS/AZURE B: Regression Analysis C: Firewall & Internet Security	2	0	4	40	60	100	200	2	0	4	4
HSMC-BCS-301	AEC	Ability/Skill Enhancement	2	0	2	50	-	-	50	2	0	2	3
			16	**0**	**12**	**230**	**270**	**300**	**800**	**16**	**0**	**12**	**22**

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

Second Year BSc (2024-25 Course)

BSC-BCS-301 : Data Structures

Teaching Scheme:	Credit	Examination Scheme:
TH: 3Hours/Week	**5**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Problem Solving and Programming In C

Course Objectives:

- To understand the basic concepts in data structure.
- To discuss various algorithmic strategies to solve real life problems.
- To acquaint the learner various data searching and sorting techniques.
- To identify and use the appropriate data structure for various real life problems using computer languages.
- To understand the concepts of linear, non-linear data structures with its complexities.
- To understand and efficiently apply various data structures

Course Outcomes:

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

CO1: To understand the need of data structures.
CO2: To learn to apply the algorithm complexity techniques for various estimations.
CO3: To use organized data structure to solve various problem statements.
CO4: To develop the solutions to social issues using NP Complete theory.
CO5: To distinguish the use of various structures in solving problems.
CO6: To understand the usage of appropriate data structures to implement algorithms.

Course Contents

Unit I	Introduction to Data Structures	(06 Hours)

Introduction, Need of Data Structure, Fundamental Concepts: Data and information, Data type, Abstract Data Type, Types of Data Structures, Algorithms: Problem Solving, Introduction to algorithm, Characteristics of algorithm, Algorithm design tools: Pseudo-code and flowchart Complexity of algorithm: Space complexity, Time complexity, Asymptotic notation- Big-O, Theta and Omega, Finding complexity using step count method.

#Exemplar/Case Studies	Problems on time complexity calculation.	
Mapping of Course Outcomes for Unit I	CO1, CO2, CO6	
Unit II	**Array**	**(07 Hours)**
Overview of Array, Array as an Abstract Data Type, Operations on Array, Multidimensional Arrays: Two-dimensional arrays, n-dimensional arrays, Storage Representation and their Address Calculation: Row major and Column Major Array applications – Searching: Sequential search, Sentinel search, Binary Search, Fibonacci Search Sorting: Internal, External, Stable, In-place Sorting, Sorting Methods- Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Bucket Sort.		
#Exemplar/Case Studies	Comparison of searching & sorting methods in terms of complexity.	
Mapping of Course Outcomes for Unit II	CO1, CO3, CO5	
Unit III	**Linked Lists**	**(07 Hours)**
Linked List as an ADT, Dynamic implementation of Linked List, Types of Linked List – Singly, Doubly, Circular, Operations on Linked List - create, traverse, insert, delete, search, sort, reverse, concatenate, merge, time complexity of operations. Applications of Linked List – Polynomial representation, Addition of two polynomials Generalized linked list – concept, representation, multiple-variable polynomial representation using generalized list.		
#Exemplar/Case Studies	Study and analyze use of linked lists in Operating Systems.	
Mapping of Course Outcomes for Unit III	CO1, CO3, CO5	
Unit IV	**Stacks & Queues**	**(08 Hours)**

Stack: Concept of Stack, Stack as an ADT, Stack Implementation using sequential and linked organization, Stack Operations Applications of Stack: Recursion, converting expressions from infix to postfix or prefix form, evaluating postfix or prefix form. Queue: Concept of Queues, Queues as an ADT, Implementation of queue using array and linked organization, Queue Operations, Types of Queue- circular queue, double ended queue, priority queue Applications of Queue– CPU Scheduling in multiprogramming environment, Round robin algorithm		
#Exemplar/Case Studies	Study and analyze use of Priority queue in bandwidth management	
Mapping of Course Outcomes for Unit IV	CO1, CO3, CO5	
Unit V	**Trees**	**(07 Hours)**
Tree : Trees and binary trees-concept and terminology, Expression tree, Binary tree as an ADT Binary search tree: Binary search tree as an ADT(Insert Search Delete, level wise Display), Recursive and Non recursive algorithms for binary search tree traversals Threaded binary tree: Concept of threaded binary tree. Preorder and In-order traversals of in-order threaded binary tree Applications of trees.		
#Exemplar/Case Studies	Use of binary tree in expression tree-evaluation and Huffman's coding	
Mapping of Course Outcomes for Unit V	CO1, CO3, CO4, CO6	
Unit VI	**Graphs**	**(06 Hours)**
Graph -Concept and terminologies, Graph as an ADT, Representation of graphs using adjacency matrix and adjacency list, Breadth First Search traversal, Depth First Search traversal, Prim's and Kruskal's algorithms for minimum spanning tree, Shortest path using Dijkstra's algorithm, All pairs shortest paths- Flyod-Warshall Algorithm, topological sorting.		
#Exemplar/Case Studies	Study and analyze working of Google map	
Mapping of Course Outcomes for Unit VI	CO1, CO3, CO4, CO6	
Learning Resources		

Text Books:

1. Horowitz, Sahani, Dinesh Mehata, —Fundamentals of Data Structures in C++‖, Galgotia Publisher, ISBN: 8175152788, 9788175152786.
2. Y. Langsam, M. Augenstin, A. Tannenbaum, "Data Structures using C and C++", 2nd Edition, Prentice Hall of India, 2002, ISBN-81-203-1177-9.

Reference Books:

1. Classic Data Structures-D. Samanta, Prentice Hall India Pvt. Ltd.
2. Data Structures using C and C++- Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum, Pearson Education
3. Data Structures: A Pseudo code approach with C, Richard Gilberg ,Behrouz A. Forouzan, Cengage Learning.
4. Introduction to Data Structures in C- Ashok Kamthane, Pearson Education
5. Algorithms and Data Structures, Niklaus Wirth, Pearson Education

@The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	-	-	-	1	-	-	-
CO2	3	2	2	3	-	-	-	-	1	-	-	-
CO3	3	2	3	2	-	-	-	-	1	-	-	-
CO4	3	2	2	2	-	-	-	-	1	-	-	-
CO5	2	1	1	1	-	-	-	-	1	-	-	-
CO6	3	2	3	2	-	-	-	-	1	-	-	-

BSC-BCS-301 Data Structures Lab

Teaching Scheme **Practical: 04 Hours/Week**		**Examination Scheme and Marks** **Internal: 40 Marks** **External: 60 Marks**

Companion Course: Data Structures

Course Objectives:

- To understand the standard and abstract data representation methods.
- To acquaint with the structural constraints and advantages in usage of the data.
- To understand the memory requirement for various data structures.
- To operate on the various structured data.

Course Outcomes:

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

CO1: To demonstrate the usage of various structures in approaching the problem solution.
CO2: Apply the algorithms to solve the programming problems.
CO3: Apply and analyze effective and efficient data structures in solving various Computer domain problems.
CO4: Analyze the problems to apply suitable algorithm and data structure.

Guidelines for Instructor's Manual

The instructor's manual should be created as a comprehensive guide and practical tool. It should encompass an introduction (detailing information about the University, program, institute, department, foreword, and preface), the course curriculum, guidelines for conducting classes and assessments, topics covered, concepts, objectives, outcomes, a selection of typical applications/assignments/guidelines, and reference materials..

Guidelines for Student's Laboratory Journal

Students are required to submit their laboratory assignments in the form of a journal. This journal should include a certificate, a table of contents, and a handwritten write-up for each assignment. The write-up should cover the assignment title, completion date, objectives, problem statement, software and hardware requirements, assessment grades/marks with the assessor's signature, a brief overview of the theory/concepts, algorithm, flowchart, test cases, test data set (if applicable), mathematical models (if applicable), and conclusion/analysis. Additionally, softcopies of program codes along with sample outputs for all assignments must be submitted. In an effort to promote environmental consciousness and contribute to Green IT, please refrain from attaching printed papers to the journal. Instead, it is encouraged to utilize a DVD containing students' programs, which will be maintained by the Laboratory In-charge. For reference purposes, one or two journals with program prints may be retained in the Laboratory.

Guidelines for Laboratory /Internal Assessment

The Continuous Assessment of laboratory work should consider a student's overall performance on laboratory assignments. Each assessment of laboratory assignments will allocate grades/marks based on various criteria, including adherence to deadlines, performance, creativity, effective coding, and punctuality.

Guidelines for Practical Examination

The formulation of problem statements should be a collaborative effort between the internal and external examiners. In practical assessments, utmost importance should be placed on successfully executing the problem statement. Evaluation may include relevant questions to gauge students' grasp of fundamental concepts and their ability to implement solutions effectively and efficiently. This approach promotes transparent evaluation and fairness, thereby alleviating any uncertainty or doubt

among students. Adhering to these principles will solidify our collective efforts for a promising beginning to students' academic journey.

Guidelines for Laboratory Conduction

The instructor should craft assignments by considering the topic's prerequisites, technological dimensions, practical applications, and current trends. The assignment policy should cater to the needs of average students while also incorporating elements to engage and challenge the more advanced learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended :- Windows / Linux

Programming tools recommended: - Turbo C++, Open Source C++ Programming tool like G++/GCC

Virtual Laboratory:

- https://cse01-iiith.vlabs.ac.in/
- https://ds1-iiith.vlabs.ac.in/Introduction.html

Part I : Name of the Lab

Suggested List of Laboratory Experiments/Assignments

(6 assignments are compulsory)

Sr. No.	Group A
1.	Write C++ program for storing matrix and perform a) Matrix Addition b) Matrix Subtraction c) Matrix Multiplication
2.	Write C++ program to store student roll no of a class enrolled for training program in array in random order. Write function for- a) Searching whether particular student enrolled for training program or not using linear search. b) Searching whether particular student enrolled for training program or not using binary search.
3.	Write C++ program to store percentage of students in array. Write function for sorting array of floating point numbers in ascending order using a) Selection Sort b) Bubble sort and display top five scores.
4.	Write C++ program to implement Singly Linked List & perform the listed operations on it: a) Insertion b) Deletion c) Display d) Update e) Search
5.	Write C++ program for conversion of infix form of expression to postfix form.

6.	Write C++ program for implementation of Linear Queue using linked list.
7.	Write C++ program to perform the following: a) Create a binary search tree. b) Traverse the above binary search tree recursively in pre-order, post-order and in-order.
8.	Write C++ programs to implement the following graph traversal algorithms: a) Depth first search. b) Breadth first search
	Group B (Mini Project) **Select any one problem statement**
1.	Implement tic-tac-toe.
2.	Implement Snake game.
3.	Build Cash Flow Analyzer
4.	Implement Sudoku
5.	Build Map Navigator
6.	Implement File Zipper

@The CO-PO Mapping Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	2	3	2	2	-	-	-	-	-	-	-	

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Dr. D. Y. Patil School of Science & Technology

Second Year BSc (SEM 3) (2024-25 Course)

BSC- BCS- 302 : Computer Networks

Teaching Scheme:	Credit	Examination Scheme:
TH: 04 Hours/Week	04	Internal (TH): 40 Marks External (TH): 60 Marks

Prerequisite Courses, if any:

- Student should have a fundamental understanding of programming and digital electronics, computer organizations.

Companion Course, if any: Data Communication

Course Objectives:

- To get a basic understanding of networking standards, protocols, and technology.
- To learn various framing, error control, flow management, and routing techniques.
- To understand the role of protocols at different layers of the protocol stack. To get knowledge in network programming.
- To analyze the contents in the layers using simulation tools.
- To design and implement routing algorithms.
- Using Modern Tools, demonstrate LAN and WAN protocol behavior.
- Using Application, Transport, and Network Layer Protocols, examine data flow between peers in an IP network.
- Demonstrate basic switch and router configuration.

Course Outcomes:

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

CO1: To analyze the needs of a certain organizational structure to determine the best networking architecture, topologies, transmission channels, and technologies.

CO2: To demonstrate concerns with design, flow, and error control.

CO3: Analyze data flow utilizing the Application, Transport, and Network Layer Protocols in the TCP/IP paradigm.

CO4: To demonstrate how computer network capabilities, selection, and usage can be applied to various sectors of the user community. Using appropriate standards and technology, illustrate Client-Server architectures and prototypes.

CO5: To showcase various routing and switching strategies.

Course Contents

Unit I	Introduction	(06 Hours)
Basics of Networks: - Definition, Need, Applications, Network Topologies, BUS, STAR, MESH, Hybrid: Definition, Advantages & Disadvantages, Applications OSI Reference Model: Diagram, Working & Significance of Each Layer. Protocol Basics: Definition, Types of Protocols, Usage of Various Protocols, Networking Components (Hardware): Cables & Connectors (Coaxial, UTP/STP, Fiber Optics, Cat(x)Cables), Switches (Unmanaged, Smart Web Managed, Full Managed), Hardware/Software Firewall, Study of UTM, Wireless Routers DSL/ADSL – Latest Examples and Usage.		
#Exemplar/Case Studies	To demonstrate different types of cables and networking devices	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Physical Layer**	**(07 Hours)**
Introduction to LAN, MAN, WAN, PAN, Ad-hoc Network, Network Architectures: Client-Server, Peer-to-Peer, Distributed, and SDN, OSI Model, TCP/IP Model, OSI Model, TCP/IP Model, Star and hierarchical topologies; Layers, Transmission Mediums: CAT5, 5e, 6, OFC, and Radio Spectrum, Network Devices: Bridge, Switch, Router, and Access Point, Manchester and Differential Manchester Encodings; IEEE802.11: Frequency Hopping (FHSS) and Direct Sequence; Direct sequences		
#Exemplar/Case Studies	To demonstrate different topologies, different network architectures	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Data Link Layer**	**(08 Hours)**

Services to the Network Layer, Framing, Error Control, and Flow Control are all design issues. Parity Bits, Hamming Codes (11/12-bits), and Unrestricted Simplex, Stop and Wait, and Sliding Window Protocol are examples of flow control protocols. Pure and Slotted ALOHA, CSMA, WDMA, IEEE 802.3 Standards and Frame Formats, CSMA/CD, Binary Exponential Back -off algorithm, Fast Ethernet, Gigabit Ethernet, IEEE 802.11a/b/g/n and IEEE 802.15 and IEEE 802.16 Standards, Frame formats, CSMA/CA.		
#Exemplar/Case Studies	Use of Parity bit & Humming codes	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Network Layer**	**(08 Hours)**
Switching techniques, IP Protocol, IPv4 and IPv6 addressing schemes, Subnetting, NAT, CIDR, ICMP, Routing Protocols: Distance Vector, Link State, Path Vector, Routing in Internet using Graphical Network System 3, Wireshark: RIP, OSPF, BGP, Congestion control and QoS, , MPLS, Mobile IP, Routing in MANET : AODV, DSR		
#Exemplar/Case Studies	Use of IP addresses, Simulation on NS3, Wireshark etc.	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Transport Layer**	**(08 Hours)**
Services, Berkley Sockets, Addressing, Connection establishment and Port Numbers, Connection release, Flow control and buffering, Multiplexing, TCP, TCP Timer management, TCP Congestion Control, Real Time Transport protocol (RTP), Stream Control Transmission Protocol (SCTP), Quality of Service (QoS), Differentiated services, TCP and UDP for Wireless.		
#Exemplar/Case Studies	Connection oriented and connection less networks with port numbers, TCP packet tracer	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Application Layer**	**(08 Hours)**
Domain Name System (DNS), Hyper Text Transfer Protocol (HTTP), Email: SMTP, MIME, POP3, Webmail, FTP, TELNET, Dynamic Host Control Protocol (DHCP), Simple Network Management Protocol (SNMP).		
#Exemplar/Case Studies	Case study on: How DNS, HTTP works?	
Mapping of Course Outcomes for Unit VI	CO4	
Learning Resources		

Text Books:

1. Andrew S. Tenenbaum, “Computer Networks”, PHI, ISBN 81-203-2175-8.
2. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw- Hill, Publications, ISBN: 0 – 07 – 058408

Reference Books:

1. Kurose, Ross “Computer Networking a Top-Down Approach Featuring the Internet”, Pearson, ISBN-10: 0132856204 2.
2. Matthew S. G, “802.11 Wireless Networks”, O’Reilly publications, ISBN: 81-7656-992-5
3. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols” Prentice Hall, ISBN-10: 8131706885; ISBN-13: 978-8131706886
4. Holger Karl and Andreas Willing, “Protocols and Architectures for Wireless Sensor Networks”, Wiley India, ISBN: 9788126533695 5. Eldad Perahia, Robert Stacey, “Next Generation Wireless LANs”, Cambridge, ISBN-10: 1107016762; ISBN-13: 978-1107016767

@The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	1	-	-	-	-	-	-	-	-
CO2	1	2	-	2	-	-	-	-	-	-	-	-
CO3	2	1	2	1	-	-	-	-	-	-	-	-
CO4	1	2	-	2	1	-	-	-	-	-	-	-
CO5	-	-	2	-	1	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-

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Dr. D. Y. Patil School of Science & Technology

Second Year of BSC (2024-25 Course)

BSC-BCS-303 : Theory of Optimization & Graph Theory

Teaching Scheme:	Credit	Examination Scheme:
TH: 4 Hours/Week	**4**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Data Structures
- Discrete Mathematics

Course Objectives:

- To Study Graphs, Types of graphs.
- To Study Operations on graphs (Union, Intersection, Ring sum and Product).
- Understand connected graphs and its properties.
- Study Trees and its properties.

Course Outcomes:

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

CO1 Convert real life problems into graph theoretical models.
CO2 Check whether two graphs are isomorphic or not.
CO3 Apply basic operations on graphs and connected graphs.
CO4 Identify Eulerian and Hamiltonian graphs. Credit:
CO5 Find shortest spanning tree for a given graph.
CO6 Apply set theory to solve problems.

Course Contents

Unit I	**Introduction**	**(07 Hours)**
What is a Graph, Application of Graphs, Finite and Infinite Graphs, Incidence and Degree, Isolated Vertex, Pendant Vertex and Null Graph, Isomorphism, Subgraphs, Walks, Paths, and Circuits, Connected Graphs, Disconnected Graphs, and Components, Euler Graphs, Operations on Graphs, Hamiltonian Paths and Circuits		
#Exemplar/Case Studies	The Traveling Salesman Problem	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Trees**	**(07 Hours)**
Trees, Some Properties of Trees, pendant Vertices in a Tree, Distance and Centers in a Tree, Rooted and Binary Trees, On Counting Trees, Spanning Trees, Fundamental Circuits, Spanning Trees in a Weighted Graph		
#Exemplar/Case Studies	Study and analyze Spanning tree algorithms.	
Mapping of Course Outcomes for Unit II	CO2,	
Unit III	**Planar and Directed graphs**	**(07 Hours)**
Basic concepts, Eulers formula, polyhedrons and planar graphs, charactrizations, planarity testing, 5-color-theorem Out-degree, in-degree, connectivity, orientation, Eulerian directed graphs, Hamilton directed graphs, tournaments		
#Exemplar/Case Studies	Compare Planar and directed graphs.	
Mapping of Course Outcomes for Unit III	CO3	

Unit IV	Sets	(07 Hours)
Bipartite graphs, line graphs, chordal graphs, Basic equations, matchings in bipartite graphs, perfect matchings, greedy and approximation algorithms. Cut-Sets, Some Properties of a Cut-Set, All Cut-Sets in a Graph, Fundamental Circuits and Cut-Sets, Connectivity and Separability.		
#Exemplar/Case Studies	Study and analyze approximation algorithm.	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**System of Linear Equations**	**(06 Hours)**
System of linear equations- Introduction, matrix form of linear system, definition of row equivalent matrices. Consistency of homogeneous and non-homogeneous system of linear equations using rank, condition for consistency, Solution of System of Equations: Gauss elimination and Gauss-Jordan elimination method, examples.		
#Exemplar/Case Studies	Compare Gauss elimination & Gauss-Jordan elimination method	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Linear Transformations**	**(06 Hours)**
Definition and Examples, Properties, Equality, Kernel and range of a linear Transformation, Rank-Nullity theorem, Composite and Inverse Transformation, Matrices and Linear Transformation, Basic Matrix Transformations in R2 and R3		
#Exemplar/Case Studies	Study and implement Inverse Transformation.	
Mapping of Course Outcomes for Unit VI	CO6	

Learning Resources

Text Books:

1. J.A. Bondy and U.S.R.Murty: Graph Theory and Applications (Freely downloadable from Bondy's website; Google-Bondy)
2. D.B.West: Introduction to Graph Theory, Prentice-Hall of India/Pearson, 2009 (latest impression)

Reference Books:

1. J.A.Bondy and U.S.R.Murty: Graph Theory, Springer, 2008.
2. R.Diestel: Graph Theory, Springer(low price edition) 2000.

@The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	-	-	-	-	1	-	-	-
CO2	3	2	3	1	-	-	-	-	1	-	-	-
CO3	2	2	3	1	-	-	-	-	1	-	-	-
CO4	3	2	3	1	-	-	-	-	1	-	-	-
CO5	1	2	2	1	1	-	-	-	1	-	-	1
CO6	3	2	3	1	1	-	-	-	1	-	-	1

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Second Year of Engineering (2024-25 Course)

PCC-BCS-301: Project Management

Teaching Scheme:	Credit	Examination Scheme:
TH: 01 Hours/Week	02	**Internal (TH): 20 Marks** **External (TH): 30 Marks**

Prerequisite Courses, if any:

- Students must have a knowledge of fundamentals of software Engineering

Companion Course, if any:

Course Objectives:

Course Objective:

- To learn and understand the principles of Project Management.
- To be acquainted with methods of Project Life cycle
- To apply Design and Testing principles to project development.
- To understand project management through life cycle of the project.

Course Outcomes:

CO1: Understand the concepts of project management.
CO2: Understand the Project life cycle.
CO3: Create a project schedule using various tools.
CO4: Estimate the project cost.
CO5: Explain the Project Communication Management.
CO6: Explain various human resource planning.

Course Contents

Unit I	Introduction to Project Management	(02Hours)
Knowledge areas as per PMBOK, Project Scope Management, Project Charter and Stakeholder Management		
#Exemplar/Case Studies	**The Sydney Opera House Project**	
Mapping of Course Outcomes for Unit I	CO1	

Unit II	Project Life Cycle & Initiation	(02Hours)
Project Life Cycle & Initiation, Portfolio Approach to Project Management, Project/Portfolio Selection & Organizational Strategy, Project Planning		
#Exemplar/Case Studies	**The Airbus A380 Project**	
Mapping of Course Outcomes for Unit II	CO2	

Unit III	Project Scheduling & Risk Analysis	(02Hours)
Project Scheduling, Project Cost Management, Risk Analysis in Project Management, Exposure to Software applicable in Project Management		
#Exemplar/Case Studies	**The Apple iPhone Development Project**	
Mapping of Course Outcomes for Unit III	CO3	

Unit IV	Project Procurement	(02Hours)
Project Procurement and Supply Chain Management, Project Quality Management, Six Sigma & Project Management, Critical Chain Project Management		
#Exemplar/Case Studies	**The Apple iPhone Development Project**	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Project Communication Management**	**(02Hours)**
Project Communication Management, Software Project Management and Adaptive & Agile Project Management, PM Process Framework and Value Delivery Systems in Project Management, Behavioral & Leadership aspects of Project Management		
#Exemplar/Case Studies	**The Tesla Electric Car Project**	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Human Resource Planning**	**(02Hours)**
Human Resource Planning in Project Management, Business Analytics, AI and Automation in Project Management, Project Commissioning, Closure & Handover		
#Exemplar/Case Studies	**Online Marketplace Platform Project**	
Mapping of Course Outcomes for Unit VI	CO6	

Learning Resources

Text Books:

1. Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 10th ed.

Reference Books:

1. Project Management Absolute Beginner's Guide Series, Greg Horine, illustrated, reprint, Que, 2013, 0789750104, 9780789750105
2. Making Things Happen: Mastering Project Management By Scott Berkun
3. Strategic Project Management Made Simple: Practical Tools for Leaders and Teams
   Strategic Project Management Made Simple: Practical Tools for Leaders and Teams, Terry Schmidt, John Wiley & Sons, 2009, ISBN : 047044293X, 9780470442937

@The CO-PO mapping table

CO\ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	2	-	-	-	-	-	-	1
CO3	2	-	-	-	1	-	-	-	1	-	1	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	1	-	-	-	-	-	-	1
CO6	2	-	-	-	-	-	-	-	-	-	-	-

PCC-BCS-301: Project Management Lab

Teaching Scheme Practical: 02 Hours/Week		Examination Scheme and Marks Internal: 20 Marks External: 30 Marks

Companion Course:

Course Objectives:

- Apply various software engineering concepts for real world applications.
- Apply various project management concepts for real world applications.

Course Outcomes:

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

- **CO1:** Understand real world problem statements.
- **CO2**: Create project schedule.
- **CO3**: Understand and apply the Project testing concepts.

Guidelines for Instructor's Manual

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Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended :- Windows

Programming tools recommended: - Jira,Height

Virtual Laboratory:

Suggested List of Laboratory Experiments/Assignments

(6 assignments are compulsory)

Sr. No.	Group A
1.	Problem Identification and justification
2.	Feasibility study of the project to the organization
3.	Preparation of Statement of Work
4.	Create Work Breakdown structure using Gantt chart
5.	Project budget and cost distribution plan
6.	Communications Management Plan
7.	Quality control plan for the project.
	Group B (Mini Project) **Select any one problem statement**
1	Online hotel booking systems
2.	Stock Market Risk Analysis
3.	Hospital Management System
4.	Shopping Mall Inventory Management
5.	Student Attendance Management System
6.	Restaurant Management system
7.	Railway reservation system

@The CO-PO Mapping Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	3	-	-	-	-	-	-	1
CO2	1	2	2	2	2	-	-	-	-	-	-	1
CO3	1	2	2	2	2	-	-	-	-	-	-	1

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

Second Year of BACHELOR OF SCIENCE (COMPUTER SCIENCE)

(2024-25 Course)

PEC-BCS-301 A: Discipline Specific Elective -3 (Cloud(AWS/Azure))

Teaching Scheme:	Credit	Examination Scheme:
TH: 2 Hours/Week	4	**Internal (TH): 20 Marks** **External (TH): 30 Marks**

Prerequisite Courses, if any:

- Fundamentals of Embedded Systems, IoT
- Basic of Computer Networking, data communication ,

Companion Course, if any: Embedded Systems and IoT

Course Objectives:

1. Describe the AWS Cloud and the AWS global infrastructure
2. Recognize and explain basic AWS Cloud architectural principles
3. Describe key services on the AWS platform and their common use cases
4. Describe the basic security and compliance aspects of the AWS platform and the shared security model
5. Define the billing, account management, and pricing models
6. Describe basic/core characteristics of deploying and operating in the AWS Cloud
7. To understand the azure virtual machines
8. Recognize the services offered by Azure
9. Understand the azure storage
10. Configure the Azure active directory services To understand the azure virtual machines
11. Recognize the services offered by Azure
12. Understand the azure storage
13. Configure the Azure active directory services

Course Outcomes:

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

CO1:Windows Azure Account and IAAS, PAAS, SAAS on Aws Cloud platform (Creation & Apply)

CO2 :Virtual Machine on Server Application (Plan)

CO3: Virtual Machine to cluster and deployment of load balances and Managing Voluminous Information with EBS, Glacier Storage Service (Understand)

CO4: Interpret Architecture and Pharrell Programing of Cloud Computing. (Apply)

CO5: Demonstrate practical implementation of Cloud computing and to understand the azure virtual machines . and Amazon Identity and Access Management ,Internet Gateway in Cloud Platform (Understand)

Course Contents

Unit I	Introduction to Microsoft Azure Virtual machines	(09 Hours)

Introduction to Microsoft Azure Virtual machines: Introduction to Azure VM - Resource planning with Basic and standard vm - VM pricing - Difference between basic and standard vm - Creating virtual machines - Choosing the type of vm - Configuring DNS address - Configuring endpoints - Connecting to virtual machine - Implementing the lifecycle of a virtual machine - Uploading and downloading virtual hard disks - Attaching an empty hard disk to vm - Creating VM from a custom image - Deleting images and disks

#Exemplar/Case Studies	Food Service	
Mapping of Course Outcomes for Unit I	CO1,CO2	
Unit II	**Azure Networking**	**(09 Hours)**
Azure Networking : Creating and configuring a virtual network - Deploying a virtual machine in a virtual network - Deploying a web service in a virtual network - Modifying a network configuration - Configuring access control list - Configuring reserved IP addresses - Configuring public IP addresses - Implementing a point-to-site VPN - Implementing a site-to-site VPN - Implementing a virtual network to virtual network vpn - Configuring internal load balancing		
#Exemplar/Case Studies	Payment Gateway	
Mapping of Course Outcomes for Unit II	CO2, CO3	
Unit III	**Azure Storage**	**(09 Hours)**
Azure Storage : Storage account in azure - Implement blobs and azure files - Types of storage in azure - Blob - Table - Queue - Drives - Managing storage account keys - Implementing SQL databases - Choosing a service tier - Implementing point-in-time recovery - Implementing georeplication - Scalability strategies - Importing and exporting data.		
#Exemplar/Case Studies	Media BroadCasting Service	
Mapping of Course Outcomes for Unit III	CO2,CO3	
Unit IV	**Introduction to Cloud Computing And Amazon Web Services**	**(09 Hours)**
Introduction to Cloud Computing And Amazon Web Services: Introduction to Cloud Computing, Cloud Service Delivery Models (IAAS, PAAS, SAAS), Cloud Deployment Models (Private, Public, Hybrid and Community), Cloud Computing Security, Case Study Introduction to Amazon Web Services, Why Amazon? Use Cases, AWS Storage Options, AWS Compute Options, AWS Database Options, AWS Workflow Automation and Orchestration Options, AWS Systems Management And Monitoring Options, AWS Virtual Private Cloud Introduction, Pricing Concepts.		
#Exemplar/Case Studies	Pricing Model: Usage Reporting, billing andmetering (AWS), Cloud Statistics	
Mapping of Course Outcomes for Unit IV	CO3, CO5	

Unit V	AWS Storage	(09 Hours)
AWS Storage: Amazon Storage, S3 Storage Basics, Buckets and Objects, Creating A Web Server Using S3 Endpoints, Managing Voluminous Information with EBS, Glacier Storage Service , Describe Amazon Dynamo, Understand key aspects of Amazon RDS, Launch an Amazon RDS instance		
#Exemplar/Case Studies	Cryon	
Mapping of Course Outcomes for Unit V	CO3, CO5	
Unit VI	**AWS Networking**	**(09 Hours)**
AWS Networking: Introduction to AWS Networking , Access Control Lists (ACLs), Setting Up a Security Group, Setting Up VPC And Internet Gateway, Setting Up A VPN, Setting Up A Customer Gateway For VPN, Setting Up Dedicated Hardware For VPC, Scenario 1:VPC With A Public Subnet Only (Standalone Web), Scenario 2: VPC with Public And Private Subnets (3 Tier App), Scenario 3:VPC With Public And Private Subnets And Hardware VPN Access (Web On The Cloud, Database and App On Prem) Scenario 4: VPC With A Private Subnet Only And Hardware VPN Access. (Extension Of Your Corporate Network), Route53 for 9 SUB DNS System, Cloud front, Case Study		
#Exemplar/Case Studies	Xebia	
Mapping of Course Outcomes for Unit VI	CO4,CO5	

Learning Resources

Text Books:

3. Microsoft Azure Essentials: Fundamentals of Azure, 2nd Edition, Michael Collier, Robin Shahan ISBN: 978-1-5093-0296-3.
1. AWS Certified Solutions Architect Official Study Guide: Associate Exam (Aws Certified Solutions Architect Official: Associate Exam) by Joe Baron,Hisham Baz , Tim Bixler , Biff Gaut, Kevin E. Kelly ISBN: 978-1119138556

Reference Books:

1. Cloud Computing Bible by Barrie Sosinsky, Wiley India Pvt. Ltd,
2. Microsoft Azure Essentials: Fundamentals of Azure (ISBN 9780735697225), Michael S. Collier and Robin E. Shahan
3. Microsoft Azure Essentials: Fundamentals of Azure (ISBN 9780735697225),
4. Yohan Wadia , "AWS Certified Solutions Architect Official Study Guide: Associate Exam, John Packt Publishing
5. Bernald Golden, "Amazon Web Services for Dummies", John Wiley & Sons.

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CO3	3	2	3	2	3	2	2	-	1	-	-	-
CO4	3	2	3	2	1	2	-	-	1	-	-	-
CO5	3	2	3	1	1	1	1	-	1	-	-	1

PEC-BCS-301A: Cloud AWS, AZURE Lab

Teaching Scheme **Practical: 02 Hours/Week**		**Examination Scheme and Marks** **Internal: 40 Marks** **External: 60 Marks**

Companion Course: ESC-CS 601: Cloud Computing

Course Objectives:

- Describe the AWS Cloud and the AWS global infrastructure
- Recognize and explain basic AWS Cloud architectural principles
- Describe key services on the AWS platform and their common use cases
- Describe the basic security and compliance aspects of the AWS platform and the shared security model
- Define the billing, account management, and pricing models
- Describe basic/core characteristics of deploying and operating in the AWS Cloud
- To understand the azure virtual machines
- Recognize the services offered by Azure
- Understand the azure storage
- Configure the Azure active directory services

Course Outcomes:

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

CO1 : : IAAS, PAAS, SAAS on Aws Cloud platform and Monitoring Azure Services (Apply)
CO2 : EC2 instances from of AMI's and Windows Azure Account (Creation)
CO3 : Managing Voluminous Information with EBS, Glacier Storage Service and Virtual Machine on ServerApplication (Plan)
CO4 : Amazon Identity and Access Management(Understand)
CO5 : VPC And Internet Gatewayin Cloud Plarform and Monitoring Azure Services (Plan)

Guidelines for Instructor's Manual

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The instructor should craft assignments by considering the topic's prerequisites, technological dimensions, practical applications, and current trends. The assignment policy should cater to the needs of average students while also incorporating elements to engage and challenge the more advanced learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended :- Ghost OS,CloudMe

Programming tools recommended: - CloudZero,Amazon Web Services,Google App Engine

Virtual Laboratory:

- https://vlab.noaa.gov/web/osti-modeling/cloud-computing1
- https://www.codio.com/solutions/virtual-labs

Part I : Cloud Computing	
Suggested List of Laboratory Experiments/Assignments **(6 assignments are compulsory)**	
Sr. No.	**Group A**
1.	AWS root user account creation using AWS management console
2.	Understanding AWS Billing Dashboard and Setting up billing alerts using Cloud Watch
3.	Launching an EC2 instance and accessing it through SSH using putty.
4.	Creating web server on EC2, with and without bash script
5.	Create and document the process of creating a windows azure account
6.	Create a virtual machine from available releases of windows server images
7.	Create a virtual machine using the option “quick Create”
8.	Create a custom VM and Capture the image
	Group B (Mini Project) **Select any one problem statement**
9.	Creating and hosting static web site using S3 bucket.
10	**Demonstrating Amazon SNS service.**
11	**Configuration of Database engine using Amazon RDS.**
12	**Creating DNS using Route 53**
13	**Create a SQL server DB , Create tables and add data to the table**
14	**Test basic sql commands on the table created in the previous step.**
15	**Migrate an on premise DB to Azure**
16	Create a storage account in Azure

@The CO-PO Mapping Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	1	1	1	-	1	1	-	-	1

CO2	1	3	1	3	1	-	1	-	1	-	-	-
CO3	2	2	3	1	2	1	2	1	1	-	-	-
CO4	2	3	1	1	1	2	1	-	1	-	-	-
CO5	1	1	1	2	1	2	2	1	1	-	-	1

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Dr. D. Y. Patil School of Science & Technology

Second Year of BSc (2024-25 Course)

PEC-BCS-301B: Regression Analysis

Teaching Scheme:	**Credit**	**Examination Scheme:**
TH: 2 Hours/Week	4	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Basics of statistics

Companion Course, if any:

Course Objectives:

- Understand the motivation of regression analysis.
- Understand the theoretical assumptions behind the linear model and their importance in properly conducting a regression analysis.
- Know how to estimate the parameters in regression models.
- Be able to validate the modeling assumptions with formal tests and visual diagnostic tools.
- Know how to make inferences regarding the linear model.
- Be able to apply the above knowledge and techniques in on your own data or problems.

Course Outcomes:

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

CO1: Formulate the simple linear regression model.
CO2: Understand regression coefficients and its properties.
CO3: Formulate the multiple linear regression model.
CO4: Identify the correct model using model selection and variable selection criteria.
CO5: Use and understand generalizations of the linear model to binary and count data.
CO6: Apply Regression analysis to own data or problems.

Course Contents

Unit I	Simple Linear Regression	(06 Hours)
Introduction to regression analysis: overview and applications of regression modelling, major steps in regression modelling. Simple linear regression.		
#Exemplar/Case Studies	Simple linear regression for sales forecasting	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Regression Coefficient**	**(06 Hours)**
Estimation of regression coefficients using ordinary least squares and maximum likelihood estimation, properties of regression coefficients, significance and confidence intervals of regression coefficients.		
#Exemplar/Case Studies	Maximum Likelihood Estimation in Logistic Regression for Credit Risk Analysis	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Multiple Linear Regression**	**(06 Hours)**
Assumptions, ordinary least square estimation of regression coefficients, properties of the regression coefficients, significance and confidence intervals of regression coefficients with interpretation.		

#Exemplar/Case Studies	Confidence Intervals of Regression Coefficients in Housing Price Prediction	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Model Adequacy**	**(06 Hours)**
Residual analysis; Departures from underlying assumptions: Multicollinearity, Heteroscedasticity, Autocorrelation, Effect of outliers. Diagnostics and remedies.		
#Exemplar/Case Studies	Multicollinearity in Marketing Mix Modeling	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Model Selection Criteria**	**(06 Hours)**
Model selection criteria: R-Square, Adjusted R Square, Mean Square error criteria; Variable selection criteria: Forward, Backward and Stepwise procedures.		
#Exemplar/Case Studies	R-Squared Analysis in Customer Satisfaction Modeling	
Mapping of Course Outcomes for Unit V	CO4	
Unit VI	**Non-Linear Regression**	**(06 Hours)**
Introduction to nonlinear regression, least squares in the nonlinear case and estimation of parameters, Models for binary and count response variable, applications.		
#Exemplar/Case Studies	Nonlinear Regression Modeling for Drug Response Prediction	
Mapping of Course Outcomes for Unit VI	CO5, CO6	
Learning Resources		

Text Books:

1. Montgomery D.C, Peck E.A and Vining G.G, —Introduction to Linear Regression Analysis, John Wiley and Sons Inc., New York, 2012.
2. Chatterjee S and Hadi A, —Regression Analysis by Example, 4th edition, John Wiley and Sons Inc, New York, 2015.

Reference Books:

1. George A.F.S and Lee A.J, —Linear Regression Analysis, John Wiley and Sons, Inc, 2012.
2. Pardoe I, —Applied Regression Modeling, John Wiley and Sons Inc, New York, 2012
3. Iain Pardoe, —Applied Regression Modeling, John Wiley and Sons, Inc, 2012.
4. P. McCullagh, J.A. Nelder, —Generalized Linear Models, Chapman & Hall, 1989.

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CO4	3	2	1	2	-	-	-	-	-	-	-	1
CO5	3	2	2	2	1	-	-	-	-	-	-	1
CO6	3	2	2	2	2	-	-	-	-	-	-	1

PEC-BCS-301B Regression Analysis Lab

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Practical: 04 Hours/Week	04	Internal: 40 Marks External: 60 Marks

Companion Course: DSE 3: Regression Analysis

Course Objectives:

- Demonstrate knowledge in applying R software and tools available in modern operating system.
- To implement regression programming in R.
- Apply various regression analysis algorithms using the software and apply it in modelling.

Course Outcomes:

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

CO1: Demonstrate regression analysis for a given data set.

CO2: Create and edit visualizations of regression models with R.

CO3: Check model accuracy and parameter estimation.

CO4: Implementation of different regression models for real life applications and own data set.

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Operating System recommended: - Windows

Programming tools recommended: - R

Virtual Laboratory:

Part I: Regression Analysis Lab

Suggested List of Laboratory Experiments/Assignments

(6 assignments are compulsory)

Sr. No.	Group A(Two Assignments are compulsory)
1.	Download and install R – R IDE environments, Loading Data Frames – Data analysis with summary statistics and scatter plots.
2.	Simple Linear Regression
3.	Maximum likelihood estimation
4.	Multiple linear regression model
5.	Residual Analysis
6.	Checking for multicollinearity
7.	Model parameter estimation
8.	Binary Response Model

	Group B (Mini Project) Select any one problem statement
1.	Stock Price Prediction
2.	Calories burnt prediction
3.	Restaurant Recommendation system
4.	Inventory stock demand forecasting
5.	Customer Behaviour Analysis
6.	Analyze social media marketing data
7.	Global Temperature and Pollution
8.	Experience and Salary Analysis

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CO3	3	2	3	1	1							1
CO4	3	2	2	3	1							1
CO5												

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Dr. D. Y. Patil School of Science & Technology

Second Year of BSc (SEM 3) (2024-25 Course)

PEC- BCS- 301 : Firewall and Internet Security (DSE-3)

Teaching Scheme:	Credit	Examination Scheme:
TH: 02 Hours/Week **PR: 04 Hours/Week**	**04**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Computer Fundamentals and Networking

Companion Course, if any: Data Communication, Internet security

Course Objectives:

- To get a basic understanding of networking standards, protocols, and technology.
- To understand the role of protocols at different layers of the protocol stack. To get knowledge in network programming.
- To analyze the contents in the layers using simulation tools.
- To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
- To develop students can identify the current Computer security and breaches

Course Outcomes:

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

CO6: To analyze basics of OSI model and TCP/IP protocol suite, the needs of a computer security.
CO7: To demonstrate Application layer and Transport layer user authentication and security.
CO8: Analyze network layer security protocols.
CO9: To understand IP security with its architecture and modes of operations.
CO10: To analyze firewall design principles, Intrusion detection system and VPN.
CO11: To understand firewall and security in mobile and IOT.

Course Contents

Unit I	Network Fundamental and Security	(06 Hours)

Introduction to OSI Model with all layers: TCP/IP Protocol Suite, Introduction Attacks on Computers and Computer Security: 1. Need for Security 2. Security Attacks (Active and Passive attacks) 3. Network Security 4. Network Security Model 5. Internet Standards and RFCs 6. Symmetric Key Cryptography 7. Introduction to Modern Symmetric Key Ciphers- DES, Blowfish, IDEA, AES, RC5, 8. Modes of operation of Modern Symmetric Key Ciphers 9. Asymmetric Key Cryptography – RSA 10. Digital signatures and Digital Certificates 11. Certificate Authority and key management Kerberos 12. X.509 Directory Authentication Service.

#Exemplar/Case Studies	To understand TCP/IP protocol suite.
Mapping of Course Outcomes for Unit I	CO1

Unit II	User Authentication and security at Application and Transport Layer	(06 Hours)

Pretty Good Privacy (PGP) and S/MIME. User Authentication: 1. Remote User-Authentication Principles 2. Remote User-Authentication Using Symmetric Encryption 3. Remote User-Authentication Using Asymmetric Encryption. Application Layer Security: 1. Email privacy: PGP and S/MIME 2. SSL Architecture –Handshake ,Change Cipher Space, Alert And Record Protocols 3. SSL Message Formats – Transport Layer Security. Transport Level Security: Transport Layer Security, HTTPS, Secure Shell (SSH)

#Exemplar/Case Studies	Use of encryption, need of user authentication and security measures.
Mapping of Course Outcomes for Unit II	CO2

Unit III	Network Layer Security	(04 Hours)
Network Layer Security: 1. Modes – Two Security Protocols 2. Security Association 3. Security Policy 4. Internet Key Exchange 5. System Security: Description 6. Buffer Overflow And Malicious Software(Viruses and Related Threats, Virus Counter measures,) 7. Malicious Programs		
#Exemplar/Case Studies	Case study of network layer security protocols.	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**IP Security**	**(04 Hours)**
IP Security: 1. Overview of IP Security (IPSec) 2. IP Security Architecture 3. Modes of Operation 4. Security Associations (SA) 5. Authentication Header (AH) 6. Encapsulating Security Payload (ESP) 7. Internet Key Exchange		
#Exemplar/Case Studies	Use of IP addresses, IPSec protocol.	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Firewall And security**	**(04 Hours)**
Firewalls: 1. The Need for firewalls 2. Firewall Characteristics 3. Types of Firewalls 4. Firewall Design principles 5. Trusted Systems 6. Intruders 7. Intrusion Detection Systems. 8. Firewall Biasing, Firewall location and configuration 9. Virtual Private Networks.		
#Exemplar/Case Studies	Firewall installation and configuration.	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Firewall Security in Mobile and IOT**	**(04 Hours)**
Firewall Security in Mobile and IOT: 1. Security and Threats To SDN 2. Cloud Security 3. Security Issues and Risks 4. Data Protection 5. Security As A Service 6. Addressing Cloud Security 7. IOT 8. Security Framework.		
#Exemplar/Case Studies	Emerging trends in firewall security	
Mapping of Course Outcomes for Unit VI	CO6	
Learning Resources		

Text Books:

1. Behrouz A Forouzan, Cryptography and Network Security , McGraw-Hill Education, 2011.
2. William Stallings, Network Security Essentials: Applications and Standards, Prentice Hall India, 4th Edition.

Reference Books:

1. Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud" William Stallings Publisher: Addison-Wesley 2015.
2. William Stallings, Cryptography and Network Security: Principles and Standards, Prentice Hall India, 3rd Edition, 2003.
3. Computer Security Basics by by Rick Lehtinen ,Publisher : O'Reilly Media; 2nd edition (23 June 2006); CBS PUBLISHERS & DISTRIBUTORS PVT. LTD 01149347068,ISBN-10 : 0596006691, 978- 0596006693.
4. Fundamentals of Computer Security by Josef Pieprzyk ,Thomas Hardjono ,Jennifer Seberry ,Publisher : Springer; Softcover reprint of hardcover 1st ed. 2003 edition (1 December 2010), ISBN : 3642077137,978-3642077135.

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PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	1	-	-	-	-	-	-	-	-
CO2	1	2	-	2	-	-	-	-	-	-	-	-
CO3	2	1	2	1	-	-	-	-	-	-	-	-
CO4	1	2	-	2	1	-	-	-	-	-	-	-
CO5	2	1	2	-	1	-	-	-	-	-	-	-
CO6	1	2	-	-	-	-	-	-	-	-	-	-

PEC- BCS- 301C : Firewall and Internet Security Lab (DSE-3)

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Practical: 04 Hours/Week	04	Internal: 40 Marks External: 60 Marks

Companion Course: Data Communication, Internet security

Course Objectives:

- To get a basic understanding of networking standards, protocols, and technology.
- To understand the role of protocols at different layers of the protocol stack. To get knowledge in network programming.

- To analyze the contents in the layers using simulation tools.
- To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.
- To develop students can identify the current Computer security and breaches.

Course Outcomes:

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

- **CO1:** Understand the internals of firewall security
- **CO2**: Handle simulation tools which provides different security measures
- **CO3**: Use of technical knowledge and skills to protect and defend computer system/ network.

Guidelines for Instructor's Manual

The instructor's manual should be created as a comprehensive guide and practical tool. It should encompass an introduction (detailing information about the University, program, institute, department, foreword, and preface), the course curriculum, guidelines for conducting classes and assessments, topics covered, concepts, objectives, outcomes, a selection of typical applications/assignments/guidelines, and reference materials..

Guidelines for Student's Laboratory Journal

Students are required to submit their laboratory assignments in the form of a journal. This journal should include a certificate, a table of contents, and a handwritten write-up for each assignment. The write-up should cover the assignment title, completion date, objectives, problem statement, software and hardware requirements, assessment grades/marks with the assessor's signature, a brief overview of the theory/concepts, algorithm, flowchart, test cases, test data set (if applicable), mathematical models (if applicable), and conclusion/analysis. Additionally, softcopies of program codes along with sample outputs for all assignments must be submitted. In an effort to promote environmental consciousness and contribute to Green IT, please refrain from attaching printed papers to the journal. Instead, it is encouraged to utilize a DVD containing students' programs, which will be maintained by the Laboratory In-charge. For reference purposes, one or two journals with program prints may be retained in the Laboratory.

Guidelines for Laboratory /Internal Assessment

The Continuous Assessment of laboratory work should consider a student's overall performance on laboratory assignments. Each assessment of laboratory assignments will allocate grades/marks based on various criteria, including adherence to deadlines, performance, creativity, effective coding, and punctuality.

Guidelines for Practical Examination

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among students. Adhering to these principles will solidify our collective efforts for a promising beginning to students' academic journey.

Guidelines for Laboratory Conduction

The instructor should craft assignments by considering the topic's prerequisites, technological dimensions, practical applications, and current trends. The assignment policy should cater to the needs of average students while also incorporating elements to engage and challenge the more advanced learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Virtual Laboratory:

- http://cse18- iiith.vlabs.ac.in/Introduction.html?domain=Computer%20Scie nce
- http://vlabs.iitb.ac.in/vlabs-dev/labs/cglab/index.php

Part I : Firewall and Internet Security Lab

Suggested List of Laboratory Experiments/Assignments

(6 assignments are compulsory)

Sr. No.	Group A
1.	Study of different wireless network components and features of any one of the Mobile Security Apps.
2.	Study of the features of firewall in providing network security and to set Firewall Security in windows.
3.	Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome)
4.	Study of different types of vulnerabilities for hacking a websites / Web Applications.
5.	Analyze the Security Vulnerabilities of E-commerce services.
6.	Analyze the security vulnerabilities of E-Mail Application

	Group B (Mini Project) **Select any one problem statement**
8.	Create a small network of computers as per suitable topology and ensure the firewall security in it.
9.	For the website of your college, check which type of security measure is used? How it works? Make detail report of it.

@The CO-PO Mapping Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	2	3	-	-	-	-	-	-	1
CO2	1	2	2	2	2	-	-	-	-	-	-	1
CO3	1	2	2	2	2	-	-	-	-	-	-	1
CO4												
CO5												

Dr. D. Y. Patil Vidyapeeth, Dr. D. Y. Patil School of science & Technology
Second Year BSC (2023 Course)
(With effect from Academic Year 2023-24)

SEMESTER IV

Course Code	**Course Type**	**Course Name**	**Teaching Scheme**			**Examination Assessment Scheme**				**Credit scheme**			
			Lecture	**Tutorial**	**Practical**	**CA**	**End Sem**	**Practical**	**Total**	**L**	**T**	**P**	**C**
BSC-BCS-401	Major	Design & Analysis of Algorithms	3	0	4	40	60	100	200	3	0	4	5
BSC-BCS-402	Major	Theory of Computation	4	0	0	40	60	-	100	4	0	0	4
BSC-BCS-403	Major	Software Engineering	4	0	0	40	60	-	100	4	0	0	4
PCC-BCS-401	VA	Organizational Behaviour	1	0	2	20	30	-	50	1	0	2	2
PEC-BCS-401	DSE	A: Cloud Developer Tools & Ecossytem B: Data Wrangling with Python C: Applied Cryptography	2	0	4	40	60	100	200	2	0	4	4

HSMC-BCS-401	AEC	Ability/Skill Enhancement	2	0	2	50	-	-	50	2	0	2	3
			16	**0**	**12**	**230**	**270**	**200**	**700**	**16**	**0**	**12**	**22**

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

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Second Year of Bsc (2024-25 Course)

BSC-BCS-401 : Design and Analysis of Algorithms

Teaching Scheme:	**Credit**	**Examination Scheme:**
TH: 3 Hours/Week	**5**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Data Structures & Algorithms
- Discrete Mathematics

Course Objectives:

- To develop problem solving abilities using mathematical theories.
- To apply algorithmic strategies while solving problems.
- To analyze performance of different algorithmic strategies in terms of time and space.
- To develop time and space efficient algorithms.

Course Outcomes:

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

- CO1: Calculate computational complexity using asymptotic notations for various algorithms.
- CO2: Apply Divide & Conquer as well as Greedy approach to design algorithms.
- CO3: Understand and analyze optimization problems using dynamic programming.
- CO4: Illustrate different problems using Backtracking.
- CO5: Compare different methods of Branch and Bound strategy.
- CO6: Classify P, NP, NP-complete, NP-Hard problems.

Course Contents

Unit I	**Introduction**	**(06 Hours)**
Algorithm: The Role of Algorithms in Computing - What are algorithms, Design of Algorithm, Analysis of Algorithm: Efficiency- Analysis framework, asymptotic notations – big O, theta and omega. Analysis of Non-recursive and recursive algorithms: Solving Recurrence Equations using Masters theorem and Substitution method. Brute Force method: Introduction to Brute Force method & Exhaustive search, Brute Force solution to 8 queens' problem.		
#Exemplar/Case Studies	Implement Tower of Hanoi	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Computational Complexity**	**(06 Hours)**
Non Deterministic algorithms, The classes: P, NP, NP Complete, NP Hard, Satisfiability problem, Proofs for NP Complete Problems: Clique, Vertex Cover		
#Exemplar/Case Studies	Analysis of iterative and recursive algorithm	
Mapping of Course Outcomes for Unit II	CO1, CO6	
Unit III	**Divide & Conquer and Greedy Method**	**(07 Hours)**
Divide & Conquer: Overview, Quick Sort, Binary search, Finding Max-Min, Large integer Multiplication. Greedy Method: General method and characteristics, Kruskal's method for MST, Dijkstra's Algorithm, Fractional Knapsack problem, Job Sequencing, Max flow problem.		
#Exemplar/Case Studies	Study and analyze Merge sort implementation by using Divide and Conquer	
Mapping of Course Outcomes for Unit III	CO1, CO2	
Unit IV	**Dynamic Programming**	**(07 Hours)**

Dynamic Programming: Principle, control abstraction, time analysis of control abstraction, binomial coefficients, Travelling Salesman Problem, OBST, 0/1 knapsack, Chain Matrix multiplication.		
#Exemplar/Case Studies	Study and analyze Fibonacci sequence by using Dynamic Programming.	
Mapping of Course Outcomes for Unit IV	CO1,CO3	
Unit V	**Backtracking and Branch-n-Bound**	**(07 Hours)**
Backtracking: Principle, control abstraction, time analysis of control abstraction, 8-queen problem, graph coloring problem, sum of subsets problem. Branch-n-Bound: Principle, control abstraction, time analysis of control abstraction, strategies- FIFO, LIFO and LC approaches, TSP, knapsack problem.		
#Exemplar/Case Studies	Study of Airline Crew Scheduling	
Mapping of Course Outcomes for Unit V	CO1, CO4, CO5	
Unit VI	**Amortized Analysis**	**(07 Hours)**
Amortized Analysis: Aggregate Analysis, Accounting Method, Potential Function method, Amortized analysis-binary counter, stack Time-Space tradeoff, Introduction to Tractable and Non tractable Problems, Introduction to Randomized and Approximate algorithms, Embedded Algorithms: Embedded system scheduling (power optimized scheduling algorithm), sorting algorithm for embedded systems.		
#Exemplar/Case Studies	Study and analyze cutting stock problem	
Mapping of Course Outcomes for Unit VI	CO3, CO5	

Learning Resources

Text Books:

3. Parag Himanshu Dave, Himanshu Bhalchandra Dave, “Design And Analysis of Algorithms”, Pearson Education, ISBN 81-7758-595-9
4. Gilles Brassard, Paul Bratley, “Fundamentals of Algorithmics”, PHI, ISBN 978-81-203-1131-2

Reference Books:

6. Michael T. Goodrich, Roberto Tamassia, “Algorithm Design: Foundations,” Analysis and Internet Examples‖, Wiley, ISBN 978-81-265-0986-7
7. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, MIT Press; ISBN 978-0-262-03384-8
8. Horowitz and Sahani, "Fundamentals of Computer Algorithms", University Press, ISBN: 978 81 7371 6126, 81 7371 61262
9. Rajeev Motwani and Prabhakar Raghavan, “Randomized Algorithms” Cambridge University Press, ISBN: 978-0-521-61390-3
10. Dan Gusfield, “Algorithms on Strings, Trees and Sequences”, Cambridge University Press,ISBN:0- 521-67035-7

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CO1	1	2	-	-	-	-	-	-	1	-	-	-
CO2	2	3	-	-	-	-	-	-	1	-	-	-
CO3	2	3	2	-	-	-	-	-	1	-	-	-
CO4	2	3	3	2	-	-	-	-	1	-	-	-
CO5	2	2	2	2	-	-	-	-	1	-	-	-
CO6	2	2	1	2	1-	-	-	-	1	-	-	-

BSC-BCS-401 Design and Analysis of Algorithms Lab

Teaching Scheme Practical: 04 Hours/Week		Examination Scheme and Marks Internal: 40 Marks External: 60 Marks

Companion Course: Design and Analysis of Algorithms

Course Objectives:

- To develop problem solving abilities using mathematical theories.
- To apply algorithmic strategies while solving problems.
- To analyze performance of different algorithmic strategies in terms of time and space.
- To develop time and space efficient algorithms.

Course Outcomes:

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

CO7: Apply and demonstrate Divide & Conquer as well as Greedy approach to design algorithms.
CO8: Apply and analyze optimization problems using dynamic programming.
CO9: Illustrate different problems using Backtracking.
CO10: Demonstrate problems using Branch and Bound strategy.

Guidelines for Instructor's Manual

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Guidelines for Laboratory Conduction

The instructor should craft assignments by considering the topic's prerequisites, technological dimensions, practical applications, and current trends. The assignment policy should cater to the needs of average students while also incorporating elements to engage and challenge the more advanced

learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended :- Windows / Linux

Programming tools recommended: - Turbo C++, Open Source C++ Programming tool like G++/GCC

Virtual Laboratory:

- https://ds1-iiith.vlabs.ac.in/Introduction.html
- https://ds2-iiith.vlabs.ac.in/List%20of%20experiments.html

Part I : Name of the Lab

Suggested List of Laboratory Experiments/Assignments

(6 assignments are compulsory)

Sr. No.	Group A
1.	Using Divide and Conquer Strategies design a function for Binary Search.
2.	Implement Travelling Salesman problem by using Greedy Strategy.
3.	Write a program to implement Min-Max algorithm.
4.	Implement Dijkstras shortest path algorithm by using Greedy Strategy.
5.	Write a program to implement OBST by using Dynamic Programming.
6.	Write a program to implement graph coloring problem by using Backtracking.
7.	Implement 8 Queens problem by using Backtracking.
8.	Implement 0-1 knapsack problem using branch and bound approach
	Group B (Mini Project) **Select any one problem statement**
1	Implement Tower of Hanoi.
2.	Implement Chessboard Game..
3.	Stochastic Control by using Dynamic Programming.
4.	Crossword Puzzle.

5.	Implement job scheduling.
6.	Implement Sudoku.
7.	Build Maze for shortest path.

@The CO-PO Mapping Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	-	-	-	-	-	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	-	-
CO3	2	3	3	2	-	-	-	-	-	-	-	-
CO4	2	2	2	2	-	-	-	-	-	-	-	-

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BSc Semester IV (2024-25 Course)

BSC-BCS-402: Theory of Computation

Teaching Scheme:	Credit	Examination Scheme:
TH: 4 Hours/Week	**4**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Automata Theory
- Formal/Regular Languages

Companion Course, if any: Automata Theory & Formal Languages

Course Objectives:

* To understand computability, decidability, and complexity through problem solving.
* To analyze and design abstract model of computation & formal languages
* To understand and conduct mathematical proofs for computation and algorithms.

Course Outcomes:

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

CO1. Explain the basic concepts of switching and finite automata theory & languages.
CO2. Relate practical problems to languages, automata, computability and complexity.
CO3. Construct abstract models of computing and check their power to recognize the languages.
CO4. Analyze the grammar, its types, simplification and normal form.
CO5. Interpret rigorously formal mathematical methods to prove properties of languages, grammars and automata.
CO6. Develop an overview of how automata theory, languages and computation are applicable in engineering application.

Course Contents

Unit I	Introduction of Automata Theory	(07 Hours)

Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and mealy machines, composite machine, Conversion from Mealy to Moore and vice versa.

#Exemplar/Case Studies	Case Study: Basics of automata theory in computational models. Example: Exploring deterministic and nondeterministic finite automata (DFA/NFA) for simple pattern matching.	
Mapping of Course Outcomes for Unit I	**CO1**	
Unit II	**Types of Finite Automata**	**(08 Hours)**
Non Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Meaning of union, intersection, concatenation and closure, 2 way DFA.		
#Exemplar/Case Studies	Case Study: Comparing DFA and NFA in system design. Example: Implementing a regular expression engine using DFA for efficient text search.	
Mapping of Course Outcomes for Unit II	**CO2**	
Unit III	**Grammars**	**(07 Hours)**
Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, ambiguity in grammar, simplification of context free grammar, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar, killing null and unit productions. Chomsky normal form and Greibach normal form.		
#Exemplar/Case Studies	Case Study: Role of grammars in programming languages. Example: Using context-free grammars (CFG) to design a simple parser for a new programming language.	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Push down Automata**	**(08 Hours)**
Push down Automata: example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA, Petrinet model.		
#Exemplar/Case Studies	Case Study: Understanding pushdown automata in parsing. Example: Building a syntax analyzer for arithmetic expressions using pushdown automata to handle nested structures.	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Turing Machine**	**(06 Hours)**

Turing Machine: Techniques for construction. Universal Turing machine Multitape, multihead and multidimensional Turing machine, N-P complete problems. Decidability and Recursively Enumerable Languages, decidability, decidable languages, undecidable languages, Halting problem of Turing machine & the post correspondence problem.		
#Exemplar/Case Studies	Case Study: Exploring the concept of Turing completeness. Example: Simulating a basic Turing machine to solve computational problems, such as binary addition.	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**RECURSIVE AND RECURSIVELY ENUMERABLE LANGUAGES (REL)**	**(06 Hours)**
RECURSIVE AND RECURSIVELY ENUMERABLE LANGUAGES (REL): Properties of recursive and recursively enumerable languages, Universal Turing machine, The Halting problem, Undecidable problems about TMs. Context sensitive language and linear bounded automata (LBA), Chomsky hierarchy, Decidability, Post's correspondence problem (PCP), un-decidability of PCP.		
#Exemplar/Case Studies	Case Study: Applying automata theory in OS development. Example: Using finite automata for designing a simple scheduler to manage process states.	
Mapping of Course Outcomes for Unit VI	**D**evelop an overview of how automata theory, languages and computation are applicable in engineering application.	

Learning Resources

Text Books:

5. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman (2007), Introduction to Automata Theory Languages andComputation, 3rdedition, Pearson Education, India.
6. K. L. P Mishra, N. Chandrashekaran (2003), Theory of Computer Science-Automata Languages and Computation, 2nd edition, Prentice Hall of India, India.

Reference Books:

- Introduction to Automata Theory Language & Computation, Hopcroft & Ullman, Narosa Publication. https://www.rgpvonline.com
- Element of the Theory Computation, Lewis & Christors, Pearson.
- Theory of Computation, Chandrasekhar & Mishra, PHI.
- Theory of Computation, Wood, Harper & Row.
- Introduction to Computing Theory, Daniel I-A Cohen, Wiley.

@The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	1	-	-	-	-	1	-	-	1
CO2	3	2	3	1	-	-	-	-	1	-	-	-
CO3	3	2	3	1	-	-	-	-	1	-	-	-
CO4	3	2	3	1	1	-	-	-	1	-	-	-
CO5	3	2	3	1	1	-	-	-	1	-	-	1
CO6	3	2	3	1	1	-	-	-	1	-	-	1

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

Second Year of BSc (2024-25 Course)

BSC-BCS-403: Software Engineering

Teaching Scheme:	Credit	Examination Scheme:
TH: 04 Hours/Week	04	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Students must have a knowledge of fundamentals of software programming

Companion Course, if any:

Course Objectives:

Course Objective:

1. To learn and understand the principles of Software Engineering.
2. To be acquainted with methods of capturing, specifying, visualizing and analyzing software requirements.
3. To apply Design and Testing principles to S/W project development.
4. To understand project management through life cycle of the project.

Course Outcomes:

CO1: Apply software engineering principles to develop software.
CO2: Analyze software requirements and formulate design solution for a software.
CO3: Explain concepts of project estimation.
CO4: Create a project schedule using various tools.
CO4: Explain risk management and software configuration management.
CO5: Explain various types of software testing.

Course Contents

Unit I	Introduction	(08 Hours)
Software Engineering Fundamentals: Introduction to software engineering, The Nature of Software, Defining Software, Software Engineering Practice. Software Process: A Generic Process Model, defining a Framework Activity, Identifying a Task Set, Process Patterns, Process Assessment and Improvement, Prescriptive Process Models, The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models, A Final Word on Evolutionary Processes. Unified Process, Agile software development: Agile methods, plan driven and agile development.		
#Exemplar/Case Studies	Agile Tools- JIRA	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Software Requirements Engineering and Analysis**	**(08 Hours)**
Modelling: Requirements Engineering, Establishing the Groundwork, Identifying Stakeholders, Recognizing Multiple Viewpoints, working toward Collaboration, Asking the First Questions, Eliciting Requirements, Collaborative Requirements Gathering, Usage Scenarios, Elicitation Work Products, Developing Use Cases, Building the Requirements Model, Elements of the Requirements Model, Negotiating Requirements, Validating Requirements. Suggested Free Open Source tools: StarUML, Modelio, SmartDraw.		
#Exemplar/Case Studies	Write SRS in IEEE format for selected Project Statement/ case study Study SRS of Online Voting system (http://dos.iitm.ac.in/OOSD_Material/CaseStudies/CaseStudy2/eVote-srs.pdf), Library management System, Develop use case model for any software applications.	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Project Estimation & Scheduling**	**(08 Hours)**

Estimation for Software Projects:The Project Planning Process, Defining Software Scope and Checking Feasibility, Resources management, Reusable Software Resources, Environmental Resources, Software Project Estimation, Decomposition Techniques, Software Sizing, Problem-Based Estimation, LOC-Based Estimation, FP-Based Estimation, Object Point (OP)-based estimation, Process-Based Estimation, Process-Based Estimation, Estimation with Use Cases, Use-Case–Based Estimation, Reconciling Estimates, Empirical Estimation Models, The Structure of Estimation Models, The COCOMO II Mode, Preparing Requirement Traceability Matrix Project Scheduling: Project Scheduling, Defining a Task for the Software Project, Scheduling. Suggested Free Open Source Tool:GanttProject, Agantty, ProjectLibre.		
#Exemplar/Case Studies	Write SRS in IEEE format for selected Project Statement/ case study Study SRS of Online Voting system (http://dos.iitm.ac.in/OOSD_Material/CaseStudies/CaseStudy2/eVote-srs.pdf), Library management System,	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Design Engineering**	**(08 Hours)**
Design Concepts: Design within the Context of Software Engineering, The Design Process, Software Quality Guidelines and Attributes, Design Concepts - Abstraction, Architecture, design Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Refinement, Aspects, Refactoring, Object-Oriented Design Concept, Design Classes, The Design Model , Data Design Elements, Architectural Design Elements, Interface Design Elements, Component-Level Design Elements, Component Level Design for WebApps, Content Design at the Component Level, Functional Design at the Component Level, Deployment-Level Design Elements, Architectural Design: Software Architecture, What is Architecture, Why is Architecture Important, Architectural Styles, A brief Taxonomy of Architectural Styles. Suggested Free Open Source Tool:SmartDraw.		
#Exemplar/Case Studies	Study design of Biometric Authentication software	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Risks and Configuration Management**	**(08 Hours)**
Risk Management: Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Monitoring, and Management, The RMMM Plan. Software Configuration Management: Software Configuration Management, The SCM Repository The SCM Process, Configuration Management for any suitable software system Suggested Free Open Source Tools: CFEngine Configuration Tool, Puppet Configuration Tool.		
#Exemplar/Case Studies	Risk management in Food delivery software	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Software Testing**	**(08 Hours)**

A Strategic Approach to Software Testing, Verification and Validation, Organizing for Software Testing, Software Testing Strategy—The Big Picture, Criteria for Completion of Testing, Strategic Issues, Test Strategies for Conventional Software, Unit Testing, Integration Testing, Test Strategies for Object-Oriented Software, Unit Testing in the OO Context, Integration Testing in the OO Context, Test Strategies forWebApps, Validation Testing, Validation-Test Criteria, Configuration Review. Suggested Free Open Source Tools:Selenium, JUnit.	
#Exemplar/Case Studies	Selemium Testing with any online application
Mapping of Course Outcomes for Unit VI	CO6

Learning Resources

Text Books:

1. Roger Pressman, —Software Engineering: A Practitioner's Approach‖, McGraw Hill, ISBN 0– 07–337597–7

2. Ian Sommerville, —Software Engineering‖, Addison and Wesley, ISBN 0-13-703515-2

Reference Books:

1. Carlo Ghezzi, —Fundamentals of Software Engineering", Prentice Hall India, ISBN-10: 0133056996

2. Rajib Mall, —Fundamentals of Software Engineering‖, Prentice Hall India, ISBN-13: 978-8120348981

3. Pankaj Jalote, —An Integrated Approach to Software Engineering‖, Springer, ISBN 13: 9788173192715.

4. S K Chang, —Handbook of Software Engineering and Knowledge Engineering‖, World Scientific, Vol I, II, ISBN: 978-981-02-4973-1

5. Tom Halt, —Handbook of Software Engineering‖, Clanye International ISBN10: 1632402939 7

@The CO-PO mapping table

CO\ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	2	-	-	-	-	-	-	1
CO3	2	-	-	-	1	-	-	-	1	-	1	-
CO4	2	-	-	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	1	-	-	-	-	-	-	1
CO6	2	-	-	-	-	-	-	-	-	-	-	-

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

Second Year of Bachelor of Computer Applications (2024-25 Course)

PCC-BCS-401: Organizational Behavior

Teaching Scheme:	Credit	Examination Scheme:
TH: 01 Hours/Week **PR: 02 Hours/Week**	**02**	**Internal (TH): 20 Marks** **External(TH): 30 Marks**

Prerequisite Courses, if any:

- Students must have knowledge communication skills and human values

Companion Course, if any: -

Course Objectives:

- To study the fundamental concepts of Organization Behavior.
- To understand the impact of individual and group behavior on organizational effectiveness.
- To learn on the motivation and leadership influence to Behavior and Performance.
- To learn on Group Dynamics of people management and conflict management.
- To understand the diverse work culture and essence of Quality Work Life in an Organization.

Course Outcomes:

On completion of the course, learner will be able to–
CO1: Analyze Organizational Behavior and Management along with the Basic Behavioral Science that influence Organizational Behavior.
CO2: recognizing and valuing individual Personalities and Behaviors by working on Perceptions from Organizational Perspective
CO3: Develop good Work Culture and Climate in an Organization
CO4: recognize good and bad leadership for the organization
CO5: Analyze the influence of Individual and Group Behavior towards meeting the Organizational Goal.
CO6: resolve conflict at the interest of the common Organizational Goal.

Course Contents

Unit I	**Introduction to Organizational Behaviour**	**(03 Hours)**

Management and Organizational Behavior, Theories of Management, Major Behavioral Science that contribute to Organizational Behavior-Psychology, Sociology, Socio-Psychology, Political Science, Anthropology, Organizational structure, Dynamics of People and Organization, Models of Organizational Behavior, Hawthorne studies, Challenges and opportunities in Organizational Behavior		
#Exemplar/Case Studies	Coca Cola Case Study: An Analysis of Organizational Behavior	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Motivation, Personality & Perception**	**(05 Hours)**
Motivation-Motivation and Behavior, theories of Motivation, Reinforcement theory, Organizational Learning Process, Motivation and performance, Financial and Non-financial incentives, Personality Determinants of personality, Type A and Type B personality, Values, Attitudes & Beliefs, Argyris'sMaturity-Immmaturity Continuum, Perception-Motivation and Perception, Meaning, Need of Perceptual process, Factors influencing Perceptual process, self-concept and self-esteem.		
#Exemplar/Case Studies	Netflix Inc.'s Organizational Structure and its strategic Implications	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Group Dynamics and Stress Management:**	**(04 Hours)**
Group Dynamics-Team & Group difference, Group Effectiveness, Formal & Informal Group, Stages of Group Development, Group Decision Making, Inter group relation and Conflict, Stress Management-Stress and Behavior, Sources of Stress, Consequences of Stress and Performance		
#Exemplar/Case Studies	Bella's: a case study in organizational behavior	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Leadership**	**(03 Hours)**
Leadership-Introduction and characteristics of Leadership, Formal and Informal leadership, Theories of Leadership, Leadership Qualities, Leadership vs. management, Leadership styles.		
#Exemplar/Case Studies	A Case Study on Women leadership in Panchayati Raj Institutions (PRI) at the Gram Panchayat level	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Conflict Management and Power & Politics**	**(05 Hours)**

Conflict Management-Nature of Conflict, Sources of Organizational Conflict, Modes of Conflict Resolution, Conflict Management, Power & Politics-Difference between Influence, Power &Authority, Sources of power, Organizational Politics, Machiavellian ism, Ethics of Power and Politics in Organizations.		
#Exemplar/Case Studies	A case study on Maruti Suzuki Ltd	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Organization Development and Culture**	**(04 Hours)**
Organizational Change, Resistance to change, Steps for planned change, Quality Work Life, Organization Development Objective and Interventions, Organization Climate and Organizational Effectiveness, Managing Organizational Culture		
#Exemplar/Case Studies	Organizational Socialization in Professional Sport: The National Basketball Association's Rookie Transition Program	
Mapping of Course Outcomes for Unit VI	CO6	

Learning Resources

TEXT BOOKS:

1. Uma Sekaran, Organisational Behaviour, Tata McGraw Hill
2. John W Newstrom, Organisational Behaviour, Tata McGraw Hill

Reference Books:

1. Stephen P.Robbins, Timothy A. Judge, Niharika Vohra (18th ed.), Pearson Education, New Delhi4. L. M. Prasad, Organisational Behaviour, Sultan Chand & Sons

@The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	-	-	-	-	-	-	-	-	-
CO2	1	1	-	-	2	-	-	-	1	-	-	1
CO3	2	-	1	-	1	-	-	-	2	-	2	-
CO4	-	-	2	-	-	-	-	-	-	-	2	-
CO5	2	1	-	-	2	-	-	-	-	-	-	1

CO6	2	1	-	-	-	-	-	-	-	-	-	-

PCC-BCS-401: Organizational Behavior		
Teaching Scheme **Practical: 02 Hours/Week**		**Examination Scheme and Marks** **Internal (PR): 20 Marks** **External (PR): 30 Marks**

Companion Course: PEC-CA-401: Software Project Management

Course Objectives:

- Understand the various stages of testing
- Appreciate the use of tools for verification and validation
- Appreciate the benefits of using metrics for verification and validation

Course Outcomes:

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

CO1: Design Architecture of given system.
CO2: Create basic UML diagrams for real world application
CO3: Employ various software architecture design components.
CO4: Design methods for improving software quality from the perspective of software architecture.

Guidelines for Instructor's Manual

The instructor's manual should be created as a comprehensive guide and practical tool. It should encompass an introduction (detailing information about the University, program, institute, department, foreword, and preface), the course curriculum, guidelines for conducting classes and assessments, topics covered, concepts, objectives, outcomes, a selection of typical applications/assignments/guidelines, and reference materials..

Guidelines for Student's Laboratory Journal

Students are required to submit their laboratory assignments in the form of a journal. This journal should include a certificate, a table of contents, and a handwritten write-up for each assignment. The write-up should cover the assignment title, completion date, objectives, problem statement, software and hardware requirements, assessment grades/marks with the assessor's signature, a brief overview of the theory/concepts, algorithm, flowchart, test cases, test data set (if applicable), mathematical models (if applicable), and conclusion/analysis. Additionally, softcopies of program codes along with sample outputs for all assignments must be submitted. In an effort to promote environmental consciousness and contribute to Green IT, please refrain from attaching printed papers to the journal. Instead, it is encouraged to utilize a DVD containing students' programs, which will be maintained by the Laboratory In-charge. For reference purposes, one or two journals with program prints may be retained in the Laboratory.

Guidelines for Laboratory /Internal Assessment

The Continuous Assessment of laboratory work should consider a student's overall performance on laboratory assignments. Each assessment of laboratory assignments will allocate grades/marks based on various criteria, including adherence to deadlines, performance, creativity, effective coding, and punctuality.

Guidelines for Practical Examination

The formulation of problem statements should be a collaborative effort between the internal and external examiners. In practical assessments, utmost importance should be placed on successfully executing the problem statement. Evaluation may include relevant questions to gauge students' grasp of fundamental concepts and their ability to implement solutions effectively and efficiently. This approach promotes transparent evaluation and fairness, thereby alleviating any uncertainty or doubt among students. Adhering to these principles will solidify our collective efforts for a promising beginning to students' academic journey.

Guidelines for Laboratory Conduction

The instructor should craft assignments by considering the topic's prerequisites, technological dimensions, practical applications, and current trends. The assignment policy should cater to the needs of average students while also incorporating elements to engage and challenge the more advanced learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended: - Windows / Linux

Programming tools recommended: - SysML/ StarUML, Selenium

Part I : Software Application Architecture

Suggested List of Laboratory Experiments/Assignments

(6 assignments are compulsory)

Sr. No.	Group A

1.	Let us examine the problem faced by Mr. Nataraj, Regional Manager of Alpha Pvt. Ltd. Alpha makes and distributes products from more than 10international pharmaceutical and health care companies. Mr. Nataraj is responsible for managing existing clients and also to get new clients. He manages a number of sales representatives. Important customers have a dedicated sales representatives, while other sales representatives try to get new clients. One day an important customer (Good Health Hospital) called Mr. Nataraj and complained that Mr. Bhavan (the sales representative) was ineffective and insisted he be removed, or else they would not give any business. Here are Mr. Nataraj's thoughts: • The track record of Mr. Bhavan was good and he was liked within the company. Dismissing him or even transferring him to a new region will affect the morale of the work force. •Good health hospitals is a major customer and gives good business. Loosing the hospital is not an option. Therefore the demands of the hospital have to be met. **Q . If You were Mr. Natraj, how will you solve this issue?**
2.	Krishnamurthy, plant manager of frame manufacturing company, is the chairperson of the ad hoc committee for space utilization. The committee is made up of various departmental heads of the company. The general manager of the company has given MURTHY the responsibility for seeing whether the various office, operations and warehouse facilities of the company are being optimally utilized. The company is beset by rising costs and the need for more space. However, before Okaying an expensive addition to the plant, the general manager wants to be sure that the currently available space is being utilized properly MURTHY opened up the first committee meeting byReiterating the charge of the committee. Then MURTHY asked the members if they had any initial observations to make. The first to speak was the office manager. He stated “well IKnow we are using every possible inch of room that we have available to us. But when I walk out into the plant I see lot of open spaces. We have people piled on top of oneAnother, but out in the plant there seems to be plenty of room.” the production manager quickly replied, “We do not have a lot of space. You office people have the luxury facilities. My supervisors don’t even have room for descend a file cabinet. i have repeatedly told the plant manager we need more space. After all, our operation determines whether this plant succeeds or fails, not like you people inThe front office pushing paper around.’ MURTHY interrupted at this point and said, “Obviously we have different interpretations of the space utilization around here. BeforeFurther discussion I think it would be best if we have some objective facts to work with. I am going to ask the industrial engineer to provide us with some statistics on plant and office layouts before our next meeting. Today’s meeting is adjourned **QUESTIONS: WHAT PERCEPTUAL PRINCIPLES ARE EVIDENT IN THIS CASE ?**

3.	One Monday morning Sanjay Nagpal, a recent recruit from a reputed anagement institute in Chennai walked into the sales office at maniple as a new sales trainee. Raghavan the zonal sales manager for a large computer hardware firm was there to greet him. Raghavan's job consisted of overseeing the work of sales officers, field executives and trainee salesman numbering over 50 of three areas namely manipal, Bangalore. Trivandrum. The sales growth of computers, parts and other office equipments in his area was highly satisfactory, especially in recent years – thanks to the developmental initiatives taken by respective state government in spreading computer education in office, schools, college, banks and other institutions. Raghavan had collected several sales reports, catalogues, and pamphlets describing in detail the types of office equipment sold by the company. After a pleasure chat about their backgrounds, Raghavan gave sanjay the collected material and showed him to his assigned desk. Thereafter Rahavan excused himself and did not return. Sanjay spent the whole day scanning the material and at 5.00 P.m. he picked up his things and went home. **Q: what do you think about Raghavan's approach for training Programme?**
4.	Prepare a case study report on Leadership in Infosys Technologies
5.	Organizational Socialization in Professional Sport: The National Basketball Association's Rookie Transition Program
6.	A case study on Maruti Suzuki Ltd
7.	Any other case studies
	Group B (Mini Project) **Select any one problem statement**
1	A case study of Organizational Behaviour and Resistance to changes in Malaysia's Commercial Banking Industry
2.	Assessing Organizational Behavior: A Case Study in a Colombian Retail Store
3.	Case Study - A Turnaround at Tentex
4.	Case Study - The Key-Man Syndrome
5.	Case Study - Engine Solutions (ES) Acquires JNC
6.	Managing the Emotional Employee in the Work Setting
7.	Any other (choice of student)

@The CO-PO Mapping Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	1	2		2	3	-	-	-	-	-	-	1
CO2	1		2	2	2	-	-	-	-	-	-	1
CO3	1	2	2	2	2	-	-	-	-	-	-	1
CO4	2	1		1	1							

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

Second Year of BSc Sem IV (2024-25 Course)

PEC-BCS-401: Discipline Specific Elective -4(Cloud Developer tools and Ecosystem)

Teaching Scheme:	**Credit**	**Examination Scheme:**
TH: 2 Hours/Week	**4**	**Internal (TH): 20 Marks** **External (TH): 30 Marks**

Prerequisite Courses, if any:

- Fundamentals of Embedded Systems, IoT
- Basic of Computer Networking, data communication ,

Companion Course, if any: Embedded Systems and IoT

Course Objectives:

1. To introduce the fundamentals of cloud computing, its technologies, Challenges and Applications
2. To give Insights into the virtualization technologies and Architecture
3. To know the relationship between Cloud
4. To classify and evaluate Cloud Security Issues
5. To apply theory to practical knowledge through case Studies

Course Outcomes:

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

CO1: Various basic concepts related to cloud computing Technologies.(Understand)

CO2: To demonstrate an understanding of Service models, deployment models, Virtualization. (Understand)

CO3: Understand different cloud programming platforms and Developer tools. (Understand)

CO4: Create application by utilizing cloud platforms such as Google app Engine and Amazon Web Services (AWS) (Apply)

CO5: Be familiar with cloud programming using Google's 'Go' Programming language. (Apply)

Course Contents

Unit I	Overview of Distributed Computing	(09 Hours)

Overview of Distributed Computing Overview of Distributed Computing, Cluster Computing and Grid Computing – Technologies for Network based systems – Software environments for Distributed Systems and Clouds – Overview of Services and Service oriented Architecture, Motivation for cloud computing, Cloud Computing principles.

#Exemplar/Case Studies	General Electric
Mapping of Course Outcomes for Unit I	CO1

Unit II	Virtual Machines and Virtualization	(09 Hours)

Virtual Machines and Virtualization–Implementation levels of Virtualization–Virtualization structures/tools and Mechanisms–Virtualization of CPU, Memory and I/O Devices–Storage Virtualization. Cloud system architectures, Delivery models – infrastructure-as-a-service, platform-as-a-service and software-as-a-service, Types of Clouds – public, private and hybrid clouds, Infrastructure and Data storage Management, Architecture and design of storage and compute clouds

#Exemplar/Case Studies	BookMyShow

Mapping of Course Outcomes for Unit II	CO2, CO3	
Unit III	**Authorization and Accounting**	**(08 Hours)**
Authorization and Accounting - Authentication, Authorization and Accounting, Cloud Security, privacy, policy and compliance, Cloud reliability, disaster recovery and fault-tolerance, Cloud Economics – Metering, Monitoring and Pricing, Viability of Cloud.		
#Exemplar/Case Studies	Canva	
Mapping of Course Outcomes for Unit III	CO2,CO3	
Unit IV	**Cloud programming frameworks**	**(08 Hours)**
Cloud programming frameworks - Cloud programming frameworks, cloud interfaces, Interoperability and standards, Case studies such as Amazon Web Services, Windows Azure and Google AppEngine.		
#Exemplar/Case Studies	MakemyTrip	
Mapping of Course Outcomes for Unit IV	CO3, CO4	
Unit V	**Moving Applications to the Cloud**	**(06 Hours)**
Moving Applications to the-Cloud Migration Strategies and Process,Issues in Inter Cloud,Applications in the Clouds,Cloud Service Attributes,Cloud Bursting,Data Migration in Cloud,Quality of Services in cloud Computing		
#Exemplar/Case Studies	**Airbnb**	
Mapping of Course Outcomes for Unit V	CO3, CO5	
Unit VI	**Cloud Security & Implementation of Cloud**	**(06 Hours)**
Cloud Security & Implementation of Cloud- Cloud Security Fundamentals,Cloud Security Architecture ,Cloud Computing Security Challenges,Privacy and Security in Cloud,Identity Management and Access control,Demonstrate the commercial cloud computingInfrastructures,Introduction to Dockers Container		

#Exemplar/Case Studies	**Pinterest**
Mapping of Course Outcomes for Unit VI	CO6

Learning Resources

Text Books:

1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier, 2012.
2. Antohy T Velte, Cloud Computing: A Practical Approach, McGraw Hill.

Reference Books:

1. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy An Enterprise
   Perspective on Risks and Compliance", O'Reilly 2009.
2. John W. Rittinghouse, James F. Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press.
3. Barrie Sosinsky, "Cloud Computing Bible" John Wiley & Sons, 2010.
4. Buyya R., Broberg J., Goscinski A. M., Cloud Computing – Principles and Paradigms, Wiley Publication

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CO1	3	1	2	1	2	3	-	-	1	-	-	1
CO2	3	2	3	1	3	-	-	-	1	-	-	-
CO3	3	2	3	1	3	-	-	-	1	-	-	-
CO4	3	2	3	1	1	-	-	-	1	-	-	-
CO5	3	2	3	1	1	-	-	-	1	-	-	1
CO6	3	2	3	1	1	-	-	-	1	-	-	1

Cloud Developer tools and Ecosystem Lab

Teaching Scheme Practical: 02 Hours/Week		Examination Scheme and Marks Internal: 40 Marks External: 60 Marks

Companion Course: PEC-BCS-401: Discipline Specific Elective -4 (Cloud Developer tools and Ecosystem)

Course Objectives:

- To understand and Analyzing client/business requirements and designing appropriate cloud-based systems and architectures.
- Developing, testing and debugging cloud-native applications using programming languages like Azure,.net and JavaScript.
- To Understand a Cloud Ecosystem refers to the interconnected network of cloud computing services, solutions, technologies, and providers that collectively enable the delivery, management, and consumption of cloud resources and services.

Course Outcomes:

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

CO1: Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
CO2: Explain the key and enabling technologies that help in the development of cloud
CO3 : Make use of NIST cloud computing architecture to solve architecture design challenges
CO4 : Explain the core issues of cloud computing such as resource management and security.
CO5 : Install and use current cloud technologies

Guidelines for Instructor's Manual

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The instructor should craft assignments by considering the topic's prerequisites, technological dimensions, practical applications, and current trends. The assignment policy should cater to the needs of average students while also incorporating elements to engage and challenge the more advanced learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended: - Windows

Programming tools recommended: - Android

Virtual Laboratory:

1. https://cloudlabs.ai/virtual-labs/

Part I: Applied Cryptography & Network Security Lab

Suggested List of Laboratory Experiments/Assignments

(8 assignments are compulsory)

Sr. No.	Group A
1.	To understand MS Azure and Microsoft Azure Install
2.	Development and deployment of web applications with features for content delivery, push notifications.
3.	Understand the networking components such as virtual networks, dedicated gateways, etc, and services like traffic management, load balancing, network protection against attacks like DDoS, etc.
4.	Integration Services such as backup plan, site recovery, etc.
5.	Project collaboration tools using Azure.
6.	Sharing code and testing applications through software development kits (SDK). Azure ,JavaScript, .Net, etc.
7.	Understand the Kubernetes applications within the cloud ecosystem. They provide the infrastructure for deploying and managing containers efficiently.
	Group B
1	Application diagnostics.(Mini Project)
2.	API management, reporting.

@The CO-PO Mapping Matrix

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	-	-	-	1	-	-	1
CO2	2	1	1	2	1	1	1	1	1	3	3	1
CO3	3	2	2	1	3	1	1	1	1	3	3	1
CO4	2	1	1	1	1	1	3	1	1	1	1	1
CO5	2	2	2	1	1	-	-	-	1	-	-	1

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

Second Year B.Sc. (4th SEM) (2024-25 Course)

PEC-BCS-401 : Data Wrangling with Python

Teaching Scheme:	Credit	Examination Scheme:
TH: 2 Hours/Week	**02**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Fundamentals Data Wrangling and data analysis
- Basic knowledge of python programming language.
- Students should install Python on Linux platform.

Companion Course, if any:

Course Objectives:

- To learn data wrangling techniques.
- To understand basics of python programming to prepare for data manipulation and analysis processes.
- To learn and use python programming libraries like NumPy, Pandas, and more to efficiently manipulate and analyses datasets
- To acquire and develop skills in cleaning, formatting, and wrangling datasets to keep them ready for analysis and decision making

Course Outcomes:

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

CO1: Perform data wrangling
CO2: Examine Python programming and be fluent in the use of Python flow control and functions.
CO3: Write efficient python code to solve problems and perform basic data analysis.
CO4: Interpret the concepts of Object-Oriented Programming as used in Python.
CO5: Apply data formatting and cleaning to ensure data quality for further modeling.
CO6: Manipulate and analyze datasets using python libraries for performing advanced analytics tasks.

Course Contents

Unit I	Data Wrangling	(04 Hours)
Introduction, Data Wrangling: Need of data cleanup, data clean up basics – formatting, outliers, duplicates, Normalizing and standardizing data.		
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Introduction to Python Programming**	**(08 Hours)**
Introduction to Python, Significance in Problem Solving, Overview of Python for Analytics, Comments, Variables and Their Scope, Standard Data Types, Python Identifiers, Reserved Words, Operators, Statements and Expressions, Basic Input and Output, Keyboard Input, If Statement, If-Else Statement, If-Elif-Else Statement, Nested Conditional Statement, For Loop, While Loop, Break Statement, Continue Statement, Return Statement, Role of Functions, Function Definition, Parameters, and Arguments, Built-In Functions, Introduction of Strings, Lists, Tuples, and Dictionary.		
Mapping of Course Outcomes for Unit II	CO2, CO3	
Unit III	**Python Programming: NumPy**	**(04 Hours)**
Understanding Data Types in Python, The Basics of NumPy Arrays: 1D, Computation on NumPy Arrays, Aggregations: min, max, Basic Indexing and Slicing, Sorting, Transposing, and Swapping Axes of Arrays, Multidimensional Array, Array Manipulations.		
Mapping of Course Outcomes for Unit III	CO3, CO4	
Unit IV	**Python Programming: Pandas**	**(04 Hours)**
Introduction to Pandas Data Structures: Series and Data Frames, Hierarchical Indexing, Handling Missing Data, Data Transformation, String Manipulation, Aggregating, Combining, Grouping and Joining Pandas Data Frame, Pivot Tables, Summarizing and Computing Descriptive Statistics, Exploratory Data Analysis.		

Mapping of Course Outcomes for Unit IV	CO3, CO4	
Unit V	**Data Formatting and Cleaning Techniques**	**(06 Hours)**
Handling Large and Imbalanced Datasets - Large Datasets, Handling Techniques, Imbalanced Dataset, Down Sampling, Up Sampling, Handling Sparse Data. Handling Missing Data - Complete Case Analysis, Handling Missing Numerical Data, Mean or Median Imputation, End of Distribution, Arbitrary Value Imputation, Handling Missing Categorical Data, Frequency Category Imputation, Missing Category Imputation, Handling Mixed Values, Handling Date Data Type, Handling Time Data Type.		
Mapping of Course Outcomes for Unit V	CO5, CO6	
Unit VI	**Data Transformation and Wrangling**	**(06 Hours)**
Encoding Categorical Data - One Hot Encoding, Label Encoding, Frequency Encoding, Ordinal Encoding, Mean Encoding. Data Discretization - Equal Width Discretization, Equal Frequency Discretization, Custom Discretization. Outlier Treatment - Outlier Trimming, Outlier Capping using IQR, Outlier Capping using Mean and Standard Deviation, Outlier Capping with Quantiles, Outlier Capping using Custom Values. Feature Scaling - Standardization, Min-Max Normalization, Mean Normalization, Maximum Absolute Scaling, Median and Quantile Scaling.		
Mapping of Course Outcomes for Unit VI	CO6	

Learning Resources

Text Books:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.
2. E. Balaguruswamy, “Introduction to Computing and Problem Solving with Python”, McGraw Hill Education, 2018.
3. Martin, “Python : The Complete Reference”, McGraw Hill Education, 2018.
4. Ayodele Oluleye, “Exploratory Data Analysis with Python Cookbook”, 1st Edition, Packt Publishing, 2023

Reference Books:

1. Wes McKinney, “Python for Data Analysis”, 3rd Edition, O’Reilly Media Inc., August 2022
2. Avinash Navlani, Armando Fandango, Ivan Idris, “Python Data Analysis”, 3rd Edition, Packt Publishing, February 2021
3. Scott McCoy, “Murach’s Python for Data Analysis”, Murach, August 2021
4. Jake VanerPlas, “Python Data Science Handbook”, 2nd Edition, O’Reilly Media Inc., December 2022.
5. Dr. Tirhtjyoti Sarkar, Shubhadeep Roychowdhury, “Data Wrangling with Python”, Packt Publisher, 2019
6. Jason Osborne, “Best Practices in Data Cleaning – A Complete Guide to Everything You Need to Do Before and After Collecting Your Data”, 2012.
7. Ihab F. Ilyas, “Data Cleaning”, Association for Computing Machinery, 2019.

@The CO-PO mapping table

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CO1	3	1	3	-	-	-	-	-	1	-	-	1
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CO3	3	2	3	1	1	-	-	-	1	-	-	1
CO4	3	2	3	1	1	-	-	-	1	-	1	1
CO5	3	2	3	1	1	-	-	-	1	-	1	1
CO6	3	2	3	1	1	-	-	-	1	-	1	1

PEC-BCS-401 Discipline Specific Elective – 4 (Data Wrangling with Python Lab)

Teaching Scheme **Practical: 04 Hours/Week**		**Examination Scheme and Marks** **Internal: 40 Marks** **External: 60 Marks**

Companion Course: Python Programming

Course Objectives:

- To be able to introduce core programming basics and program design with functions using Python programming Language.
- To learn and use python programming libraries and more to efficiently manipulate and analyses datasets.
- To acquire and develop skills in cleaning, formatting, and wrangling datasets to keep them ready for analysis and decision making.

- To understand the high-performance programs designed to strengthen the practical expertise.

Course Outcomes:

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

CO1: Write efficient python code to solve problems and perform basic data analysis.
CO2: Ability to explore python especially the object oriented concepts, and the built in objects of Python.
CO3: Handle outliers and perform data imputation with Pandas
CO4: Practice data wrangling and modeling using data generation techniques

Guidelines for Instructor's Manual

The instructor's manual should be created as a comprehensive guide and practical tool. It should encompass an introduction (detailing information about the University, program, institute, department, foreword, and preface), the course curriculum, guidelines for conducting classes and assessments, topics covered, concepts, objectives, outcomes, a selection of typical applications/assignments/guidelines, and reference materials..

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among students. Adhering to these principles will solidify our collective efforts for a promising beginning to students' academic journey.

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Operating System recommended :- MS Office

Programming tools recommended: - Python Programming

Virtual Laboratory:

- https://www.learningtree.com/courses/python-data-wrangling/
- https://python-iitk.vlabs.ac.in/

Data Wrangling with Python

Suggested List of Laboratory Experiments/Assignments

(6 assignments are compulsory)

Sr. No.	Group A
1.	To load data into a data frame from different sources
2.	Program for Merge Operation in Data Wrangling
3.	**Program for Data Replacing in Data Wrangling**
4.	Program to manipulate data by : a. Renaming columns b. Replacing values c. Filtering data
5.	Program for pivoting the data frames and removing duplicates
6.	Program to replace the null values in a column having integer values by the mean of the integers in the column.
7.	Sorting the data and renaming the columns to meaningful names using dataset
8.	Program to show the statistic information

	Group B (Mini Project) **Select any one problem statement**
9.	**Explore New York City Department of Health and Mental Hygiene (NYC DOHMH) dataset to work through some data wrangling processes**
10	**To perform Data Wrangling and Transformation with Pandas for any dataset from kaggle**
11	**Perform Exploratory Data Analysis to wrangle a Jeopardy dataset. Export to SQL.**

@The CO-PO Mapping Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	1	-	-	-	-	-	-	-	1
CO2	2	3	2	1	-	-	-	-	-	-	-	1
CO3	2	3	2	2	1	-	-	-	-	-	-	1
CO4	1	2	2	1	-	-	-	-	-	-	-	1

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

B.Sc. Sem-IV (2024-25 Course)

PEC-BCS-401: Applied Cryptography

Teaching Scheme:	Credit	Examination Scheme:
TH: 2 Hours/Week	**4**	**Internal (TH): 40 Marks** **External (TH): 60 Marks** **Practical :100 Marks**

Prerequisite Courses, if any:

Programming Language, Basics of Communication System

Companion Course, if any:

Course Objectives:

- Understand the principles and practices of cryptographic techniques.
- Understand information security goals for designing secure systems.
- Apply security algorithms in solving real-life security problems in communicating systems.
- Apply security to information over the network and world wide web.

Course Outcomes:

On completion of the course, learner will be able to–
CO1 Describe the history, types, and implementation aspects of classical cryptographic techniques.
CO2 Demonstrate their understanding of modern cryptographic algorithms and their computational efficiency.
CO3 Use advanced cryptographic algorithms and public-key systems to implement secure data encryption and authentication.
CO4 Assess the security of messages using MACs, hash functions, and digital signatures, and evaluate the standards for digital signatures.
CO5 Evaluate the effectiveness of security measures and tools in protecting networks and systems from malware, IP threats, and other vulnerabilities.
CO6 Investigate the malware attack and develop a comprehensive security strategy to protect the network and email systems.

Course Contents

Unit I	History of cryptography	(07 Hours)
History of cryptography, some background in probability and algorithms, classical cryptography (shift cipher, monoalphabetic substitution cipher, polyalphabetic substitution cipher), encryption with perfect secrecy, one-time pad; implementation aspects: shared secret randomness vs perfect secrecy		
#Exemplar/Case Studies	Deciphering Historical Ciphers	
Mapping of Course Outcomes for Unit I	CO1	

Unit II	Modern cryptography principles	(08 Hours)
Some background in algorithms and complexity theory, modern cryptography principles, one-way functions, trapdoor functions, hard-core bits, construction of a public-key cryptosystem based on general cryptographic primitives, implementation aspects: computational efficiency vs hardness		
#Exemplar/Case Studies	Designing a Public-Key Cryptosystem	

Mapping of Course Outcomes for Unit II	CO2, CO3	
Unit III	**Advanced Cryptography**	**(07 Hours)**
Chinese Remainder Theorem and its implication in Cryptography, Diffie-Hellman key exchange algorithm, RSA algorithm, Elgamal Arithmetic, Elliptic Curve Cryptography, Message Digest and Cryptographic Hash Functions, MD5 and SHA-1, Digital Signatures and Authentication.		
#Exemplar/Case Studies	Implement and analyze various cryptographic algorithms.	
Mapping of Course Outcomes for Unit III	CO2,CO3	
Unit IV	**Public key cryptography**	**(08 Hours)**
RSA, RSA proof, RSA attacks, Rabin cryptosystem, Key management: Diffie Hellman Key Exchange Algorithm		
#Exemplar/Case Studies	Analyze and implement strategies to mitigate RSA attacks.	
Mapping of Course Outcomes for Unit IV	CO3	
Unit V	**Message Authentication and Hash functions**	**(06 Hours)**
Authentication requirements, functions, Message authentication codes (MAC), Hash functions, security of Hash functions, Hash algorithms, Digital Signatures, SHA- 512, Basics, digital signature standards.		
#Exemplar/Case Studies	Analyzing the security and integrity of messages using MAC and hash functions	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Network and System Security**	**(06 Hours)**
Understanding of Worms, Virus, Trojan Horse, Malwares, IP and Network Security ,Web security Email Security, System Security, tools.		
#Exemplar/Case Studies	Investigating a malware attack and developing a strategy to secure the network	
Mapping of Course Outcomes for Unit VI	CO6	
Learning Resources		

Text Books:

William Stallings: "Cryptography and Network Security – Principles and Practice",Pearson Education.

Reference Books:

1 BruiceSchneier , Applied Cryptography- Protocols, Algorithms and Source code in C, Algorithms,

Wiely India Pvt Ltd, 2nd Edition, ISBN 978-81-265-1368-0.

2. CK Shyamalaet el., Cryptography and Security, Wiley India Pvt. Ltd, ISBN-978-81-265-2285-9.

3. BerouzForouzan, Cryptography and Network Security, TMH, 2 edition, ISBN -978-00-707-0208-0.

@The CO-PO mapping table

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CO1	3	2	2	1	-	-	-	-	3	-	-	-
CO2	3	2	2	1	-	-	-	-	3	-	2	-
CO3	3	2	2	1	-	-	-	-	3	-	3	-
CO4	3	2	3	1	1	-	-	-	3	-	-	-

PEC-BCS-401: Applied Cryptography Lab

Examination Scheme: **4 hrs/Week**	**Credit Scheme** **04**	**Examination Scheme and Marks** **Internal: 40 Marks** **External: 60 Marks**

Companion Course: PEC-BCS-401: Applied Cryptography

Course Objectives:

- To understand role of expert system and its applications.
- To understand how expert system in AI can resolve many issues which generally would require a human expert.
- To understand implementation of different network and puzzle programs.
- To experiment with different algorithms and techniques.

Course Outcomes:

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

CO1: Implement an expert system for various applications.
CO2: Understand decision making process using cryptography.

CO3: Implement different classical planning algorithms.
CO4: Develop agent programs for real problems.

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Operating System recommended: - Windows

Programming tools recommended: - As per Subject Teacher

Virtual Laboratory:

Part I: Applied Cryptography & Network Security Lab

Suggested List of Laboratory Experiments/Assignments

(8 assignments are compulsory)

Sr. No.	Group A
1.	Write a program to implement and break the shift cipher and monoalphabetic substitution cipher.
2.	Implement the one-time pad encryption and decryption algorithm.
3.	Write a program to demonstrate a one-way function and a trapdoor function.
4.	Develop a basic public-key cryptosystem using RSA principles
5.	Implement the Diffie-Hellman key exchange algorithm.
6.	Implement MD5 and SHA-1 hash functions.
7.	Write a program to implement RSA encryption and decryption.
8.	Implement a secure key management system using the Diffie-Hellman key exchange.
9.	Implement a digital signature scheme using SHA-512 and RSA.
	Group B
1	Select two cryptographic algorithms (e.g., AES, RSA, SHA-256) and analyze their strengths, weaknesses, and real-world applications.
2.	Develop a secure messaging application that utilizes end-to-end encryption and digital signatures for message authentication.
3.	Design and implement a simplified cryptocurrency system with features such as blockchain, public-key cryptography for transactions, and proof-of-work consensus mechanism.

4.	Build a password manager application that securely stores and manages user passwords using encryption and hash functions.
5.	Develop a network security analyzer tool that scans network traffic for vulnerabilities, such as packet sniffing, unauthorized access attempts, and suspicious activity.
6.	Conduct a digital forensics investigation on a simulated crime scene, analyzing digital evidence such as hard drive images, network logs, and metadata.
7.	Create a security awareness campaign aimed at educating users about common cybersecurity threats, best practices for secure computing, and the importance of strong passwords and encryption.

@The CO-PO Mapping Matrix

PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	-	-	-	-	-	-	1
CO2	3	2	2	2	2	-	-	-	-	-	-	1
CO3	3	2	2	2	2	-	-	-	-	-	-	1
CO4	3	2	2	2	2	-	-	-	-	-	-	1

Dr. D. Y. Patil Vidyapeeth, Dr. D. Y. Patil School of science & Technology
Third Year BSC (2023 Course)
(With effect from Academic Year 2023-24)

SEMESTER V

Course Code	Course Type	Course Name	Teaching Scheme			Examination Assessment Scheme				Credit scheme			
			Lecture	Tutorial	Practical	CA	End Sem	Practical	Total	L	T	P	C
BSC-BCS-501	Major	Artificial Intelligence	3	0	4	40	60	100	200	3	0	4	5
BSC-BCS-502	Major	Data Warehousing & Mining	4	0	0	40	60	-	100	4	0	0	4
BSC-BCS-503	Major	Mobile Applications	4	0	0	40	60	-	100	4	0	0	4
PCC-BCS-501	VA	Financial Education & Investment Awareness	1	0	2	20	30	-	50	1	0	2	2
PEC-BCS-501	DSE	A: Cloud Migration & Disaster Recovery B: Multivariate Analysis C: Intrusion Detection & Prevention System	2	0	4	40	60	100	200	2	0	4	4
HSMC-BCS-501	AEC	Ability/Skill Enhancement	2	0	2	50	-	-	50	2	0	2	3
			16	**0**	**12**	**230**	**270**	**200**	**700**	**16**	**0**	**12**	**22**

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Dr. D. Y. Patil School of Science & Technology

Third Year BSc(SEM 5) (2024-25 Course)

BSC-BCS 501: Artificial Intelligence

Teaching Scheme:	Credit	Examination Scheme:
TH: 3 Hours/Week	**5**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Students need to have basic knowledge of probability, Propositional Logic & python programming.

Companion Course, if any:

Course Objectives:

- To impart artificial intelligence principles, techniques and its history.
- To assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving engineering problems.
- To develop intelligent systems by assembling solutions to concrete computational problems.

Course Outcomes:

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

CO1: Evaluate Artificial Intelligence (AI) methods and describe their foundations.

CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation and learning.

CO3: Demonstrate knowledge of reasoning and knowledge representation for solving real world problems.

CO4: Analyze and illustrate how search algorithms and planning play a vital role in problem solving.

CO5: Discuss current scope and limitations of AI and societal implications.

CO6: Illustrate and implement the construction of basic AI models and expert systems.

Course Contents

Unit I	Introduction, Overview of Artificial intelligence	(06 Hours)
Problems of AI, AI technique, Tic - Tac - Toe problem. Intelligent Agents, Agents & environment, nature of environment, structure of agents, goal-based agents, utility-based agents, learning agents.		
#Exemplar/Case Studies	Autonomous Vehicle Routing with Utility-Based Agents	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Problem Solving & search techniques**	**(08 Hours)**
Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs. Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Heuristic search strategies Greedy best-first search, A* search, AO* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search.		
#Exemplar/Case Studies	Pathfinding in video games using A* search	
Mapping of Course Outcomes for Unit II	CO2, CO3	
Unit III	**Constraint satisfaction problems**	**(06 Hours)**
Local search for constraint satisfaction problems. Adversarial search, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.		
#Exemplar/Case Studies	Developing an efficient AI for playing chess requires evaluating a vast number of possible move sequences.	
Mapping of Course Outcomes for Unit III	CO3, CO4	
Unit IV	**Knowledge and Reasoning**	**(08 Hours)**

Knowledge representation issues, representation & mapping, approaches to knowledge representation. Using predicate logic, representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction. Representing knowledge using rules, Procedural versus declarative knowledge, logic programming, forward versus backward reasoning, matching, control knowledge.		
#Exemplar/Case Studies	Use of AI to enhance the decision-making process in healthcare for improving efficiency, and contributes to better patient outcomes.	
Mapping of Course Outcomes for Unit IV	CO2	
Unit V	**Probabilistic Reasoning**	**(06 Hours)**
Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster Shafer theory, Planning Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.		
#Exemplar/Case Studies	To construct a model showing the relationships between the disease, symptoms, test results, and risk factors using Bayesian network.	
Mapping of Course Outcomes for Unit V	CO3, CO5	
Unit VI	**Expert Systems and Contemporary Issues**	**(06 Hours)**
Representing and using domain knowledge, expert system shells, and knowledge acquisition. Recent trends in Artificial Intelligence.		
#Exemplar/Case Studies	DENDRAL - An Expert System for Chemical Analysis, MYCIN	
Mapping of Course Outcomes for Unit VI	CO6	
Learning Resources		

Text Books:

1. Russell, S. and Norvig, P. —Artificial Intelligence - A Modern Approach, 3rd edition, Prentice Hall., 2015.

2.Poole, D. and Mackworth, A. —Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2010.

3. Elaine Rich, Kevin Knight —Artificial Intelligence, Mc-Graw Hill.

4. Dan W. Patterson —Introduction to AI & Expert System, PHI.

Reference Books:

1. Ric, E., Knight, K and Shankar, B. —Artificial Intelligence, 3rd edition, Tata McGraw Hill. 2009.

2. Luger, G.F. —Artificial Intelligence -Structures and Strategies for Complex Problem Solving, 6th edition, Pearson, 2008

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CO3	3	3	1	2	-	-	-	-	-	-	-	-
CO4	3	2	1	3	-	-	-	-	-	-	-	-
CO5	1	1	3	2	1	-	-	-	-	-	-	-
CO6	1	1	2	3	2	-	-	-	-	-	-	-

BSC-BCS 501: Artificial Intelligence Lab

Teaching Scheme Practical: 04 Hours/Week		Examination Scheme and Marks Internal: 40 Marks External: 60 Marks

Companion Course:

Course Objectives:

- To impart artificial intelligence principles, techniques and its history.
- To assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving engineering problems.
- To develop intelligent systems by assembling solutions to concrete computational problems.

Course Outcomes:

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

CO1: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation and learning.

CO2: Demonstrate knowledge of reasoning and knowledge representation for solving real world problems.

CO3: Analyze and illustrate how search algorithms and planning play a vital role in problem solving.

CO4: Development of different AI based models.

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Operating System recommended: - Windows

Programming tools recommended: - Python

Virtual Laboratory:

Part I : Artificial Intelligence Lab

Suggested List of Laboratory Experiments/Assignments

(6 assignments are compulsory)

Sr. No.	Group A
1.	Study & list tuple, set, dictionary, classes, inheritance in Python.
2.	Study and understand simple reflex and Model Based Agent.
3.	Implement basic searching algorithm for given AI problem
4.	Write a program to solve 8 Queens’ problem.
5.	Implement memory bounded A* & A* algorithm for given problem.

6.	Implement Alpha Beta Tree search.
7.	Implement classical planning algorithm.
8.	Solve Robot Obstacle/transversal problem means end analysis.
	Group B (Mini Project) **Select any one problem statement**
1.	Solving Missionaries and cannibals problems.
2.	Water Jug Problem.
3.	Monkeys and Bananas Problem using Logic.
4.	Bayesian Classification Problem.
5.	Developing a sentiment analysis system.
6.	Solving Wampus Problem using Logic
7.	Development of Medical Expert system with Recommendation system.
8.	Travelling Salesman Problem.

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PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	-	-	-	-	-	1
CO2	3	2	3	2	2	-	-	-	-	-	-	1
CO3	3	2	2	2	3	-	-	-	-	-	-	1
CO4	3	2	3	3	2	-	-	-	-	-	-	1
CO5												

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Dr. D. Y. Patil School of Science & Technology

Third Year (5th SEM) B.Sc. (2024-25 Course)

BSC-BCS-502 : Data warehousing and Mining

Teaching Scheme:	Credit	Examination Scheme:
TH: 4 Hours/Week	**4**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Fundamentals of Data Analysis and Processing

Companion Course, if any:

Course Objectives:

- To understand the principles of Data warehousing and Data Mining.
- To be familiar with the Data warehouse architecture and its Implementation.
- To know the Architecture of a Data Mining system.
- To understand the various Data preprocessing Methods.
- To perform classification, association, and prediction of data.

Course Outcomes:

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

CO1: Learn and understand the usage, need and cost of Data Warehouse
CO2: Able to understand and demonstrate data mining and Market Basket Analysis.
CO3: Learn various techniques for Data Warehouse and Data Mining.
CO4: Technical knowledge of Data Mining principles and techniques for real time applications.
CO5: Evaluate mathematical methods underlying the effective application of data mining.
CO6: Able to analyze the data using statistical methods and compare various conceptions of data mining as evidenced in both research and application.

Course Contents

Unit I	Data Warehousing: Introduction and Design	(05 Hours)

Overview and Concepts: Data Warehousing Components, Building a Data Warehouse, Data Warehouse Architecture, Infrastructure and Metadata. Data Design and Data Representation: Principles of Dimensional Modeling, Data Extraction, Transformation and Loading, Data Quality, Online Analytical Processing (OLAP)–OLAP and Multidimensional Data Analysis.

Mapping of Course Outcomes for Unit I	CO1

Unit II	Data Mining – Pre-processing	(05 Hours)
Steps in Data mining process, Data Mining Functionalities, Architecture of a Typical Data Mining Systems, Classification of Data Mining Systems, Knowledge Discovery in Databases (KDD), KDD Process, Data Preprocessing, Data Cleaning, Data Transformation, Data Compression and Dimension Reduction, Principal Component Analysis, Binning Methods.		
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Data Mining Techniques**	**(04 Hours)**
Association Rule Mining, Classification and Prediction: Efficient and Scalable Frequent Item set Mining Methods, Mining, Various Kinds of Association Rules, Association Rules, Market Basket Analysis, Apriori Algorithm, and Tree Based Algorithms.		
Mapping of Course Outcomes for Unit III	CO2, CO3	
Unit IV	**Classification and Prediction**	**(06 Hours)**
Issues Regarding Classification and Prediction, Classification by Decision Tree Introduction, Bayesian Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Ensemble Methods, Model Section, Regression Models.		
Mapping of Course Outcomes for Unit IV	CO3, CO4	
Unit V	**Clustering Analysis**	**(06 Hours)**
Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, and Outlier Analysis.		
Mapping of Course Outcomes for Unit V	CO4, CO5	
Unit VI	**Web Mining and Web Data**	**(04 Hours)**
Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Web Content Mining, Web Structure Mining, Web Usage Mining.		
Mapping of Course Outcomes for Unit VI	CO5, CO6	
Learning Resources		

Text Books:

1. J. Han and M. Kamber, " Data Mining Tools and Technique s", Morgan Kaufmann Publishers.
2. M.H. Dunham, " Data Mining Introductory and Adv anced Topics", Pear son Education.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, " Introduction to Data Mining", Pearson Education

Reference Books:

1. Prabhu, "Data warehousing - concepts, Techniques, Products and Applications", Prentice Hall of India.
2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Pearson Education.
3. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
4. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
5. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.

@The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	3	2	-	-	-	-	-	-	-	
CO2	3	1	3	2	-	-	-	-	1	-	-	-
CO3	3	3	3	2	1	-	-	-	1	-	-	1
CO4	3	3	3	2	1	-	-	-	1	-	-	1
CO5	3	3	3	2	1	-	-	-	1	-	-	1
CO6	3	3	3	2	1	-	-	-	1	-	-	1

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

B.Sc. Sem-V (2024-25 Course)

BSC-BCS-503 : Mobile Applications and Development Using Android

Teaching Scheme:	Credit-	Examination Scheme:
TH: 4 Hours/Week	4	Internal (TH): _40_ Marks External (TH): 60__ Marks

Prerequisite Courses, if any:

- Database Management Systems, Advanced Java and Web Technologies

Companion Course, if any: -

Course Objectives:

- About the Mobile Application programming features.
- To learn the internals of the Android OS
- To learn the Mobile application development using the Android SDK.

Course Outcomes:

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

CO1) To understand the key features of various Mobile Operating Systems (especially Android)
CO2) To know essential Android programming concepts
CO3) To develop Android Applications using GUI Components.
CO4) To demonstrate and implement Database Connectivity Applications.
CO5) Deploy applications to the Android marketplace for distribution
CO6) Explain Security and Implement Application Deployment

Course Contents

Unit I	Android Introduction and Basics	(07 Hours)

Introduction to Android Platform, Android vs. other mobile platforms, Android Stack, Android Versions and Installing Android SDK components, updating SDK components, Android emulator, Sample programs on emulator.

#Exemplar/Case Studies	Install android application.
Mapping of Course Outcomes for Unit I	CO1

Unit II	Android Applications and its Anatomy	(08 Hours)

Android programming model vs. traditional programming models, Activities, Intents and Tasks, Other Android Components, Component Life Cycles, Static Application Resources and Context Android Application Runtime Environment: Activity life cycle, Manifest File, Layout XML Code, Strings		
#Exemplar/Case Studies	Context Android Application Runtime Environment.	
Mapping of Course Outcomes for Unit II	CO2, CO3	
Unit III	**Android Frame Work and User Interface Design:**	**(07 Hours)**
Android GUI Architecture, Assembling a Graphical Interface, different layouts – Linear Layout and Table Layout etc., Draw able Resources, Draw able Resources, Resolution and density independence Working with common widgets, List View and Adapters, The Menu and the Action Bar, View Debugging		
#Exemplar/Case Studies	List View, Menu and the Action Bar, View Debugging	
Mapping of Course Outcomes for Unit III	CO2,CO3	
Unit IV	**Using Common Android APIs**	**(08 Hours)**
Using Android Data and Storage APIs, Managing data using SQLite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.		
#Exemplar/Case Studies	Public API	
Mapping of Course Outcomes for Unit IV	CO3, CO4	
Unit V	**Security and Application Deployment**	**(10 Hours)**
SMS telephony, Location Based Services, Creating the project, Getting the Maps API key, Displaying the map, Displaying the zoom control, Navigating to a specific location, Getting Location data, Monitoring location, Android Security Model		
#Exemplar/Case Studies	Android Security Model	
Mapping of Course Outcomes for Unit V	CO5, CO46	
Learning Resources		

Text Books:

1. Programming Android, 2nd Edition(Oct-2012), by Zigurd Mednieks, Larid Dornin, G.Blake Meike, Masumi Nakamura , O"reilly (SPD) Publications.
2. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)

Reference Books:

1. Beginning Android 4 Application Development, by Wei-Meng Lee , Wiley India
2. Beginning Android 4, (2012) , by Grant Allen , Apress publications.
3. Android Application Development (programming with Google SDK), by Rick Rogers, Jhon Lombarado, Zigurd M
4. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
5. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
6. Android Application Development All in one for Dummies by Barry Burd, Edition: I

MOOC / NPTEL Courses: https://onlinecourses.swayam2.ac.in/nou21_ge41/preview

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CO4	3	2	3	1	1	-	-	-	1	-	-	-
CO5	3	2	3	1	1	-	-	-	1	-	-	1
CO6	3	2	3	1	1	-	-	-	-	-	-	-

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

Second Year of Bachelor of Science (2024-25 Course)

PCC-BCS-501: Financial Education and Investment Awareness

Teaching Scheme:	Credit	Examination Scheme:
TH: 01 Hours/Week **PR: 02 Hours/Week**	**02**	**Internal (TH): 20 Marks** **External (TH): 30 Marks**

Prerequisite Courses, if any:

- Students must have knowledge about mathematics and statistics.

Companion Course, if any: - PCC-BCS-301 Project Management

Course Objectives:

- To understand the operational nuances of a Finance Manager
- Comprehend the technique of making decisions related to finance function

Course Outcomes:

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

CO1: Develop various portfolio models
CO2: Develop fast, efficient and accurate excel skills
CO3: Recognize efficient financial budgeting and forecasting techniques
CO4: Familiarize the students with the valuation modelling of securities
CO5: Design and construct useful and robust financial modelling applications
CO6: Identify the business opportunities.

Course Contents

Unit I	FOUNDATIONS OF FINANCE	(03 Hours)
Financial management – An overview- Time value of money- Introduction to the concept of risk and return of a single asset and of a portfolio- Valuation of bonds and shares-Option valuation.		
#Exemplar/Case Studies	Fundamental Analysis of Bharat Electronics Limited	
Mapping of Course Outcomes for Unit I	CO1	

Unit II	INVESTMENT DECISIONS	(05 Hours)
Capital Budgeting: Principles and techniques - Nature of capital budgeting- Identifying relevant cash flows - Evaluation Techniques: Payback, Accounting rate of return, Net Present Value, Internal Rate of Return, Profitability Index - Comparison of DCF techniques - Project selection under capital rationing - Inflation and capital budgeting - Concept and measurement of cost of capital - Specific cost and overall cost of capital.		
#Exemplar/Case Studies	Adidas: Sustainability Bond	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**FINANCING AND DIVIDEND DECISION**	**(04 Hours)**
Financial and operating leverage - capital structure - Cost of capital and valuation – designing capital structure. Dividend policy - Aspects of dividend policy - practical consideration - forms of dividend policy - forms of dividends - share splits		
#Exemplar/Case Studies	Johnson & Johnson Spin-off	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**WORKING CAPITAL MANAGEMENT**	**(04 Hours)**
Principles of working capital: Concepts, Needs, Determinants, issues and estimation of working capital - Accounts Receivables Management and factoring - Inventory management – Cash management - Working capital finance : Trade credit, Bank finance and Commercial paper.		
#Exemplar/Case Studies	Reliance`s Foreign Currency Bond	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**LONG TERM SOURCES OF FINANCE**	**(03 Hours)**
Indian capital and stock market, New issues market Long term finance: Shares, debentures and term loans, lease, hire purchase, venture capital financing, Private Equity.		
#Exemplar/Case Studies	Tesla`s Convertible Bonds	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**BUSINESS AND FINANCING**	**(05 Hours)**

Small Enterprises – Characteristics, Ownership Structures – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project 100 Appraisal –Sources of Finance, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.	
#Exemplar/Case Studies	Stock Split: A Case of IRCTC
Mapping of Course Outcomes for Unit VI	CO6

Learning Resources

TEXT BOOKS:

1. M.Y. Khan and P.K. Jain Financial management, Text, Problems and cases Tata McGraw Hill, 6th edition, 2011.
2. M. Pandey Financial Management, Vikas Publishing House Pvt. Ltd., 10th edition, 2012.

Reference Books:

1. Aswat Damodaran, Corporate Finance Theory and practice, John Wiley & Sons, 2011.
2. James C. Vanhorne –Fundamentals of Financial Management– PHI Learning, 11th Edition, 2012.
3. Brigham, Ehrhardt, Financial Management Theory and Practice, 12th edition, Cengage Learning 2010.
4. Prasanna Chandra, Financial Management, 9th edition, Tata McGraw Hill, 2012.
5. Srivatsava, Mishra, Financial Management, Oxford University Press, 2011.

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CO3	2	-	1	-	1	-	-	-	2	-	2	-
CO4	-	-	2	-	-	-	-	-	-	-	2	-
CO5	2	1	-	-	2	-	-	-	-	-	-	1
CO6	2	1	-	-	-	-	-	-	-	-	-	-

PCC-BCS-501: Financial Education and Investment Awareness

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
PR: 02 Hours/Week	**02**	**Internal (PR): 40 Marks** **External (PR): 60 Marks**

Companion Course: PEC-CA-401: Software Project Management

Course Objectives:

- To understand the operational nuances of a Finance Manager
- Comprehend the technique of making decisions related to finance function

Course Outcomes:

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

CO1: Recognize efficient financial budgeting and forecasting techniques
CO2: Familiarize the students with the valuation modelling of securities
CO3: Design and construct useful and robust financial modelling applications
CO4: Identify the business opportunities.

Guidelines for Instructor's Manual

The instructor's manual should be created as a comprehensive guide and practical tool. It should encompass an introduction (detailing information about the University, program, institute, department, foreword, and preface), the course curriculum, guidelines for conducting classes and assessments, topics covered, concepts, objectives, outcomes, a selection of typical applications/assignments/guidelines, and reference materials..

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The formulation of problem statements should be a collaborative effort between the internal and external examiners. In practical assessments, utmost importance should be placed on successfully executing the problem statement. Evaluation may include relevant questions to gauge students' grasp of fundamental concepts and their ability to implement solutions effectively and efficiently. This approach promotes transparent evaluation and fairness, thereby alleviating any uncertainty or doubt among students. Adhering to these principles will solidify our collective efforts for a promising beginning to students' academic journey.

Guidelines for Laboratory Conduction

The instructor should craft assignments by considering the topic's prerequisites, technological dimensions, practical applications, and current trends. The assignment policy should cater to the needs of average students while also incorporating elements to engage and challenge the more advanced learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended: - Windows / Linux

Programming tools recommended: MS Excel

Part I : Software Application Architecture

Suggested List of Laboratory Experiments/Assignments

(6 assignments are compulsory)

Sr. No.	Group A
1.	Case study on Implementing a Zero Debtor Policy through Channel Financing in an MNC
2.	An Analysis of Small Savings Schemes in India
3.	Analyzing the Risk Weighted Performance of Equity Mutual Funds
4.	Study of Efficient Market Hypothesis: Evidence from Bonus Issue
5.	Study of The Microfinance Industry in India
6.	Study of Maruti Udyog's Accounting Policies

7.	Study of Film Insurance & Financing in India
8.	Study of Coimbatore Bypass Road Project
	Group B (Mini Project) **Select any one problem statement**
1	**ICICI Prudential Life Insurance – The Importance of a Strong Brand Image**
2.	**A Study on Mergers and Acquisitions in the Indian Banking Sector**
3.	**Evaluating the Capital at South Central Railway**
4.	**Evaluating the Performance of Private and Public Mutual Funds**
5.	**The Impact of Demonetization on Tourism in Goa**
6.	**Comparative Analysis of Regional Rural Banks in India**

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CO1	1	2		2	3	-	-	-	-	-	-	1
CO2	1		2	2	2	-	-	-	-	-	-	1
CO3	1	2	2	2	2	-	-	-	-	-	-	1
CO4	2	1		1	1							

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

Third Year of BACHELOR OF SCIENCE (COMPUTER SCIENCE)

(2024-25 Course)

PEC-BCS-501: Discipline Specific Elective (Cloud Migration and Disaster Recovery)

Teaching Scheme:	Credit	Examination Scheme:
TH: 2 Hours/Week	**4**	**Internal (TH): 20 Marks** **External (TH): 30 Marks**

Prerequisite Courses, if any:

- Application and legacy data
- Cloud Migration Utility
- Port, firewall, internet connection

Companion Course, if any:

Course Objectives:

- To get introduced to cloud migration and its strategies and To Analyze enterprise cloud adaption techniques.
- To explain migration of large scale services to the cloud with benefits of cloud adoption.
- To learn migrating services to AWS cloud using cloud adoption framework.
- Determine and Analyze cloud adaption framework and risk migration methodology for cloud migration
- To Apply the concepts of migrating web application to cloud

Course Outcomes:

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

CO1:To get introduced to cloud migration and its strategies and To Analyze enterprise cloud adaption techniques (Understand).

CO2: Cloud migration based on a client requirement and ensuring business continuity even after migration (Plan)

CO3: Define and identify various migrating strategies that can be used for a given scenario (Define)

CO4: Various risks involved in a big scale migration (Define).

CO5: Migrating an on-premise application to Cloud (Apply)

Course Contents

Unit I	Getting started with moving to cloud	(04 Hours)

Getting started with moving to cloud -Introduction to Cloud Migration – Migrating Business Applications to Public Cloud Services, Benefits of Migrating data and workloads to the Cloud, Types of Cloud Migration Strategies, Migration Tools, Cloud Transformation Maturity Model, Ensuring Successful Cloud Adoption– Cloud Storage, Application performance, Data Integration, Security, Interoperability, Moving Organization to Cloud – Delivering Business Processes from the Cloud, Cloud Migration Strategy and Plan, Efficient Steps for cloud migration.

1.

#Exemplar/Case Studies	**Evernote**
Mapping of Course Outcomes for Unit I	

Unit II	Cloud Migration Plan	(08 Hours)

Cloud Migration Plan – Key elements of a Cloud Migration Plan, Migration plan considerations – Time Management, Workloads being migrated, Migration priorities, Definition of process and roles, Security, Vendor Selection, Selecting the deployment model, Validating the services to be moved to cloud, Performance metrics, Effectiveness of cloud migration, Migration and deployment options, Optimization and Cost Management in an effective cloud migration, Business continuity after Migration, Case Study on Cloud Migration

#Exemplar/Case Studies	ETSY
Mapping of Course Outcomes for Unit II	CO1,CO2

Unit III	Migrating Services to Cloud: Challenges	(09 Hours)
Migrating Services to Cloud: Challenges - Migrating Services to AWS, Cloud Adoption Framework, Successful Migration, Understanding Onpremises cost, Migration cost considerations, Broad Aspects of Migration into Cloud, Migration of virtual Machines and techniques, Fault Tolerance Mechanisms, Migration Risks – Architectural complexity, Poor Application selection, Application dependencies, Unwanted Latency, Privacy and Security Considerations, Fault tolerance and Availability, Organizational concerns – Measuring and assessment of risks, Risk Mitigation methodology for Cloud Migration		
#Exemplar/Case Studies	WASE	
Mapping of Course Outcomes for Unit III	CO3,CO4	
Unit IV	**Migrating Large scale services to the cloud**	**(9 Hours)**
Migrating Large scale services to the cloud - Steps for ensuring successful large scale cloud migration, Handling Failures, Risks involved in working at a big scale migration, Pre-release and deployment considerations, Monitoring and Alerting, Mitigation.		
#Exemplar/Case Studies	AdvancedMD	
Mapping of Course Outcomes for Unit IV	CO5	
Unit V	**Migration Case Studies**	**(9 Hours)**
Migration Case Studies Migrating an on-premise application to cloud, migrating web applications to AWS cloud and Google cloud, Migrating Batch Processes to the cloud, Migrating Backend Processing pipeline to the cloud, migrating from an End-of-Life Data Center to AWS.		
#Exemplar/Case Studies	Dropbox	
Mapping of Course Outcomes for Unit V	CO4,CO5	
Unit VI	**Introduction to Disaster Management and Recovery and Rehabilitation**	**(7 Hours)**
1. **Introduction to Disaster Management and Recovery and Rehabilitation :** Definition and Types of Disasters,Historical Perspectives,Importance of Disaster Management, Post-Disaster Assessment,Infrastructure Reconstruction,Psycho-social Support,Economic Recovery		
#Exemplar/Case Studies	Sanitation and Hygiene,Healthcare Infrastructure	

Mapping of Course Outcomes for Unit VI	CO4,CO5

Learning Resources

Text Books:

1. "Migrating Large-Scale Services to the Cloud"Eric Passmore 1st Edition, ISBN:978-1484218723
2. The Great Cloud Migration: Your Roadmap to Cloud Computing, Big Data and Linked Data by Michael Daconta
3. A Practical Guide to Cloud Migration by Kieran Broadfoot ISBN: 9781492095170

Reference Books:

1. "A Practical Guide to Cloud Migration - Migrating Services to AWS (AWS Whitepaper)" Amazon Web Services, AWS White Paper December 2015, Kindle Edition

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Discipline Specific Elective -1 Cloud Migration & Disaster Recovery Lab

Teaching Scheme Practical: 02 Hours/Week		Examination Scheme and Marks Internal: 40 Marks External: 60 Marks

Companion Course: PEC-BCS-501: Discipline Specific Elective -1 (Cloud Migration and Disaster Recovery)

Course Objectives:

- To understand role of expert system and its applications.
- To understand how expert system in AI can resolve many issues which generally would require a human expert.

- To understand implementation of different migration strategies applications.
- To application with different Rehosting, Replatforming

Course Outcomes:

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

CO1: Implement an expert system for various applications.
CO2: Understand 5 R's process using Cloud Migration.
CO3: Implement the Checklist.
CO4: Develop Application using Cloud Migration and Diaster Recovery.

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Operating System recommended: - Windows

Programming tools recommended: - Android

Virtual Laboratory:

Part I: Applied Cryptography & Network Security Lab

Suggested List of Laboratory Experiments/Assignments

(8 assignments are compulsory)

Sr. No.	Group A
1.	Develop the process of Rehost.
2.	Develop the process of Refactor.
3.	Develop the process of Revise.
4.	Develop the process of ReBuid.
5.	Develop the process of Replace.
6.	Complete the Process of Cloud Migration and Disaster Recovery Checklist
	Group B
1	Migration to the Cloud: A Banking Sector Perspective (Mini Project)
2.	Develop a traditional bank migrated its infrastructure to a public cloud..
3.	Develop a security considerations and challenges faced during the migration.

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CO3	3	2	2	2	2	-	-	-	-	-	-	1
CO4	3	2	2	2	2	-	-	-	-	-	-	1

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Dr. D. Y. Patil School of Science & Technology

Third Year of BSc (2024-25 Course)

PEC-BCS-501: Multivariate Analysis

Teaching Scheme:	Credit	Examination Scheme:
TH: 2 Hours/Week	**4**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Basics of statistics and linear algebra

Companion Course, if any:

Course Objectives:

- Develop an understanding of multivariate data structures and the methods used to analyze them.
- Gain knowledge of the properties of the multinomial and multivariate normal distributions and how they are used in statistical analysis.
- Learn techniques for estimating and testing parameters in multivariate data sets.
- Understand various data reduction methods, such as principal component analysis and factor analysis, and their applications in multivariate data analysis.
- Apply multivariate data analysis techniques to real-world research problems in various fields.

Course Outcomes:

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

CO1: Understand the basic concepts of multivariate variables and their distributions.

CO2: Understand and apply the likelihood ratio tests for testing hypotheses about mean vectors and covariance matrices of multivariate normal populations.

CO3: Conduct multivariate analysis of variance (MANOVA) of one- and two-way classified data.

CO4: Conduct discriminant analysis for several multivariate data.

CO5: Apply principal component analysis and their applications.

CO6: Apply factor analysis and their applications.

Course Contents

Unit I	Introduction	(08 Hours)
Basic concepts on multivariate variable. Multivariate normal distribution, Marginal and conditional distribution, Concept of random vector: Its expectation and Variance, Covariance matrix. Marginal and joint distributions. Conditional distributions and Independence of random vectors. Multinomial distribution. Sample mean vector and its distribution.		
#Exemplar/Case Studies	Marginal and Conditional Distributions in Customer Segmentation Analysis	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Distribution**	**(07 Hours)**
Sample mean vector and its distribution. Likelihood ratio tests: Tests of hypotheses about the mean vectors and covariance matrices for multivariate normal populations. Independence of sub vectors and sphericity test.		
#Exemplar/Case Studies	Likelihood Ratio Test for Model Comparison in Financial Risk Assessment	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Multivariate Analysis**	**(06 Hours)**
Multivariate analysis of variance (MANOVA) of one and two- way classified data. Multivariate analysis of covariance. Wishart distribution.		

#Exemplar/Case Studies	MANOVA for Assessing the Impact of Exercise Programs on Physical Fitness	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Classification and Discriminant Procedures**	**(07 Hours)**
Bayes, minimax, and Fisher's criteria for discrimination between two multivariate normal populations. Sample discriminant function. Tests associated with discriminant functions. Probabilities of misclassification and their estimation.		
#Exemplar/Case Studies	Fisher's Criteria for Hypothesis Testing in Clinical Trials	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Principal Component Analysis**	**(07 Hours)**
Principal components, sample principal components asymptotic properties. Canonical variables and canonical correlations: definition, estimation, computations. Test for significance of canonical correlations.		
#Exemplar/Case Studies	Canonical Correlation Analysis in Marketing Research. It serves as a powerful tool for uncovering the complex interrelationships between advertising channels and consumer preferences in marketing research.	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Factor Analysis**	**(06 Hours)**
Factor analysis: Orthogonal factor model, factor loadings, estimation of factor loadings, factor scores, Applications.		
#Exemplar/Case Studies	Factor analysis serves as a valuable tool for uncovering the underlying dimensions of personality and understanding their implications for academic achievement and student success.	
Mapping of Course Outcomes for Unit VI	CO6	
Learning Resources		

Text Books:

1. Anderson, T.W., —An Introduction to Multivariate Statistical Analysis, 3rd 862. Edition, John Wiley, 2009.
2. Everitt B, Hothorn T, —An Introduction to Applied Multivariate Analysis with R, Springer, 2011.
3. Barry J. Babin, Hair, Rolph E Anderson, and William C. Blac, —Multivariate Data Analysis, Pearson New International Edition, 2013.

Reference Books:

1. Giri, N.C., —Multivariate Statistical Inference. Academic Press, 1977.
2. Chatfield, C. and Collins, A.J., —Introduction to Multivariate analysis, Prentice, 1982.
3. Srivastava, M.S. and Khatri, C.G., —An Introduction to Multivariate Statistics, North Holland, 1979.

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CO5	3	2	3	2	1	-	-	-	-	-	-	1
CO6	3	2	2	3	2	-	-	-	-	-	-	1

Multivariate Analysis Lab

Teaching Scheme Practical: 04 Hours/Week		Examination Scheme and Marks Internal: 40 Marks External: 60 Marks

Companion Course: **DSE 5: Multivariate Analysis**

Course Objectives:

- To understand the R programming software.
- To be able to use multivariate statistical methods properly with R.
- To be able to carry out multivariate statistical techniques and methods programs efficiently and effectively.

Course Outcomes:

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

CO1: Plot multivariate data using R software.

CO2: Perform different statistical tests with R.

CO3: Implement programs for Discriminant analysis.

CO4: Implement programs for factor analysis and Principal component analysis.

Guidelines for Instructor's Manual

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Operating System recommended: - Windows

Programming tools recommended: - R

Virtual Laboratory:

Part I: Multivariate Analysis Lab

Suggested List of Laboratory Experiments/Assignments

(6 assignments are compulsory)

Sr. No.	Group A
1.	Plotting multivariate data
2.	Calculating summary statistics for multivariate data
3.	Canonical correlation analysis for multivariate data
4.	MANOVA test

5.	Discriminant analysis and classification
6.	Allocation rule and misclassification rates
7.	Principal component analysis
8.	Factor analysis
	Group B (Mini Project) **Select any one problem statement**
1.	Analysis of Mortality rate
2.	Survey Analysis
3.	Profile Analysis
4.	The Role of Multivariate Analysis in Psychology and Social Sciences
5.	Usage of Multivariate Analysis in Business and Marketing
6.	How Multivariate Analysis is Applied in Medical and Health Research
7.	Climate change modelling
8.	How Multivariate Analysis is used in optimizing manufacturing process

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PO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	3	-	-	-	-	-	-	1
CO2	2	2	3	2	2	-	-	-	-	-	-	1
CO3	2	2	3	2	3	-	-	-	-	-	-	1
CO4	2	2	3	2	3	-	-	-	-	-	-	1
CO5												

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

B.Sc. Sem-V (2024-25 Course)

PEC-BCS-501: Intrusion Detection and Prevention System

Teaching Scheme:	Credit	Examination Scheme:
TH: 2 Hours/Week	**4**	**Internal (TH): 40 Marks** **External (TH): 60 Marks** **Practical :100 Marks**

- **Prerequisite Courses, if any:**
  Fundamental knowledge in Operating Systems, and Networks

Companion Course, if any:

Course Objectives:

- Understand when, where, how, and why to apply Intrusion Detection tools and techniques in order to improve the security posture of an enterprise.
- Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems
- Analyse intrusion detection alerts and logs to distinguish attack types from false alarms

Course Outcomes:

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

CO1	Describe the history of intrusion detection, different types of threats and attacks, and the need for intrusion detection systems (IDS).
CO2	Demonstrate their ability to install, configure, and use intrusion detection systems like Snort, understanding different analysis schemes and response techniques.
CO3	Analyze network traffic, work with Snort rules, understand architecture models, and utilize various tools to enhance network and system security.
CO4	Assess the performance and efficiency of intrusion detection and prevention systems, evaluate the architecture models, and analyze the impact of security tools on network and system security
CO5	Design and implement intrusion detection and prevention strategies, develop Snort rules, and create architecture models to enhance network and system security.
CO6	Communicate their understanding of network and system security concepts, intrusion detection techniques, and incident response strategies through written reports, presentations, and case studies.

Course Contents

Unit I	History of Intrusion detection	(07 Hours)
History of Intrusion detection, Audit, Concept and definition , Internal and external threats to data, attacks, Need and types of IDS, Information sources Host based information sources, Network based information sources.		
#Exemplar/Case Studies	Analyze the evolution of intrusion detection from early manual methods to modern automated systems.	
Mapping of Course Outcomes for Unit I	CO1	

Unit II	Intrusion Prevention Systems	(08 Hours)
Intrusion Prevention Systems, Network IDs protocol based IDs, Hybrid IDs, Analysis schemes, thinking about intrusion. A model for intrusion analysis , techniques Responses requirement of responses, types of responses mapping responses to policy Vulnerability analysis, credential analysis non credential analysis		
#Exemplar/Case Studies	Design and implement a hybrid intrusion detection system (IDS) that combines network-based and protocol-based detection techniques.	

Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Introduction to Snort**	**(07 Hours)**
Introduction to Snort, Snort Installation Scenarios, Installing Snort, Running Snort on Multiple Network Interfaces, Snort Command Line Options. Step-By-Step Procedure to Compile and Install Snort Location of Snort Files, Snort Modes Snort Alert Modes.		
#Exemplar/Case Studies	Install and configure Snort, an open-source network intrusion detection system (NIDS), in a simulated network environment.	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Working with Snort Rules**	**(08 Hours)**
Working with Snort Rules, Rule Headers, Rule Options, The Snort Configuration File etc. Plugins, Preprocessors and Output Modules, Using Snort with MySQL		
#Exemplar/Case Studies	Develop custom Snort rules to detect specific types of network attacks and anomalies.	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Architecture models**	**(06 Hours)**
Using ACID and Snort Snarf with Snort, Agent development for intrusion detection, Architecture models of IDs and IPs.		
#Exemplar/Case Studies	Design a scalable and resilient intrusion detection architecture for a large enterprise network.	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Network and System Security**	**(06 Hours)**
Understanding of Worms, Virus, Trojan Horse, Malwares, IP and Network Security ,Web security Email Security, System Security, tools.		
#Exemplar/Case Studies	Respond to a simulated security incident involving malware infection and unauthorized access to network resources.	
Mapping of Course Outcomes for Unit VI	CO6	
Learning Resources		

Text Books:

Rafeeq Rehman : " Intrusion Detection with SNORT, Apache, MySQL, PHP and ACID," 1st Edition, Prentice Hall , 2003

Reference Books:

1. Christopher Kruegel,Fredrik Valeur, Giovanni Vigna: "Intrusion Detection and Correlation Challenges and Solutions", 1st Edition, Springer, 2005.

2. Carl Endorf, Eugene Schultz and Jim Mellander " Intrusion Detection & Prevention", 1st Edition, Tata McGraw-Hill, 2004.

3. Stephen Northcutt, Judy Novak : "Network Intrusion Detection", 3rd Edition, New Riders Publishing, 2002.

4. T. Fahringer, R. Prodan, "A Text book on Grid Application Development and Computing Environment". 6th Edition, KhannaPublihsers, 2012.

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CO3	3	2	2	1	-	-	-	-	3	-	3	-
CO4	3	2	3	1	1	-	-	-	3	-	-	-

PEC-BCS-501 Intrusion Detection and Prevention System Lab

Teaching Scheme		Examination Scheme and Marks
Practical: 04 Hours/Week		Internal: 40 Marks External: 60 Marks

Companion Course: PEC-BCS-501: Intrusion Detection and Prevention System

Course Objectives:

- To understand role of expert system and its applications.
- To understand how expert system can resolve many issues which generally would require a human expert.
- To understand implementation of different network and puzzle programs.
- To experiment with different algorithms and techniques.

Course Outcomes:

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

CO1: Implement an expert system for various applications.
CO2: Understand decision making process using programming language.
CO3: Implement different classical planning algorithms.
CO4: Develop agent programs for real problems.

Guidelines for Instructor's Manual

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among students. Adhering to these principles will solidify our collective efforts for a promising beginning to students' academic journey.

Guidelines for Laboratory Conduction

The instructor should craft assignments by considering the topic's prerequisites, technological dimensions, practical applications, and current trends. The assignment policy should cater to the needs of average students while also incorporating elements to engage and challenge the more advanced learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended: - Windows

Programming tools recommended: - As per Subject Teacher

Virtual Laboratory:

Part I: Applied Cryptography & Network Security Lab

Suggested List of Laboratory Experiments/Assignments

(8 assignments are compulsory)

Sr. No.	Group A
1.	Configure a virtual network environment using software like VirtualBox or VMware to simulate various network configurations.
2.	Install and configure Snort, an open-source intrusion detection system (IDS), on a Linux-based system.
3.	Create custom Snort rules to detect specific network traffic patterns indicative of potential security threats.
4.	Deploy an IDS in a simulated network environment to monitor and analyze network traffic for suspicious activity.
5.	Use Wireshark, a network protocol analyzer, to capture and analyze network traffic in real-time.
6.	Perform vulnerability assessment and penetration testing on a target system to identify and exploit security vulnerabilities.
7.	Simulate a security incident and practice incident response procedures to contain and mitigate the impact of the incident.
8.	Develop a comprehensive security policy outlining organizational security objectives, procedures, and guidelines.

	Group B
1	Network Traffic Analyzer
2.	Intrusion Detection Dashboard
3	Secure File Transfer Application
4.	Network Security Monitoring System
5.	Vulnerability Scanner
6.	Malware Analysis Sandbox
7.	Secure Authentication System
8.	Agent development for intrusion detection
9.	Security Awareness Training Platform

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CO2	3	2	2	2	2	-	-	-	-	-	-	1
CO3	3	2	2	2	2	-	-	-	-	-	-	1
CO4	3	2	2	2	2	-	-	-	-	-	-	1

Dr. D. Y. Patil Vidyapeeth, Dr. D. Y. Patil School of science & Technology
Third Year BSC (2023 Course)
(With effect from Academic Year 2023-24)

SEMESTER VI

Course Code	Course Type	Course Name	Teaching Scheme			Examination Assessment Scheme				Credit scheme			
			Lecture	Tutorial	Practical	CA	End Sem	Practical	Total	L	T	P	C
BSC-BCS-601	Major	Intelligent Systems	3	0	4	40	60	100	200	3	0	4	5
BSC-BCS-602	Major	Big Data Analytics	4	0	0	40	60	-	100	4	0	0	4
BSC-BCS-603	Major	Compiler Design	4	0	0	40	60	-	100	4	0	0	4
PCC-BCS-601	VA	Research Methodology& Ethics	1	0	2	20	30	-	50	1	0	2	2
PEC-BCS-601	DSE	A: DevOps B: Data Visualization & Modelling C: Cyber Crime Investigation & Digital Forensics	2	0	4	40	60	100	200	2	0	4	4
HSMC-BCS-601	AEC	Ability/Skill Enhancement	2	0	2	50	-	-	50	2	0	2	3
			16	**0**	**12**	**230**	**270**	**200**	**700**	**16**	**0**	**12**	**22**

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Dr. D. Y. Patil School of Science & Technology

Third Year of B.Sc. (2024-25 Course)

BSC-BCS-601 Intelligent Systems

Teaching Scheme:	Credit	Examination Scheme:
TH: 3 Hours/Week	**5**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- NIL

Companion Course, if any:

Course Objectives:

- Basics of Neural networks and fuzzy logic.
- Acquire knowledge about different searching techniques and definitions.
- Study the concept of representing knowledge of ANN architecture and genetic algorithm.
- Use of Artificial intelligence in control of Mechatronics systems.

Course Outcomes:

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

CO1: Understanding of the basic of fuzzy logic.

CO2: Explain the characteristics of AI systems with different searching techniques and algorithms.

CO3: Design a simple AI system.

CO4: Demonstrate the Genetic algorithms programming

CO5: Apply Hybrid techniques for Industrial Applications of intelligent systems

CO6: Evaluate the applications of types of AI algorithms for real time industrial applications

Course Contents

Unit I	Fuzzy Set Theory and Fuzzy Logic System	(07 Hours)

Basic concepts in Fuzzy Set theory – Operations of Fuzzy sets – Fuzzy relational equations –Fuzzy inference – Fuzzification – Defuzzification –Decision making logic – Membership functions – Rule base.

#Exemplar/Case Studies	Fuzzy-Logic based Air conditioning system	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Adaptive fuzzy systems**	**(06 Hours)**
Performance index – Modification of rule base – Modification of membership functions – simultaneous modification of rule base and membership functions.		
#Exemplar/Case Studies	Performance Evaluation of Fuzzy Logic-Based Traffic Signal Control System	
Mapping of Course Outcomes for Unit II	CO1, CO2	
Unit III	**Introduction to Artificial Neural Networks**	**(07 Hours)**
Fundamentals of Neural networks – Neural network architectures – Learning methods– multilayer perceptron -Back propagation algorithm and its variants – Different types of learning.		
#Exemplar/Case Studies	Handwritten Digit Recognition Using Backpropagation Neural Network	
Mapping of Course Outcomes for Unit III	CO2, CO3	
Unit IV	**Mapping and Recurrent Networks**	**(06 Hours)**
Counter propagation – Cognitron and Neocognitron - Hopfield Net- Kohonnen Nets Grossberg Nets- Adaptive Resonance Theory.		
#Exemplar/Case Studies	Using Counter propagation Neural Network for Pattern Classification	
Mapping of Course Outcomes for Unit IV	CO3, CO4	
Unit V	**Genetic Algorithms and Hybrid Techniques**	**(08 Hours)**

Introduction to genetic algorithm –initialization, selection, mutation and termination classification of genetic programming, Neuro-fuzzy systems – genetic neuro systems – genetic fuzzy systems. **Probabilistic techniques:** Tree search – Monte-Carlo techniques – Radial basis function – Gaussian – Probabilistic neural networks.

#Exemplar/Case Studies	Genetic Fuzzy System for Energy Management in Smart Grids
Mapping of Course Outcomes for Unit V	CO4, CO5

Unit VI	**Industrial Applications of Intelligent Systems**	**(06 Hours)**

Application of fuzzy logic, Neural network and Genetic algorithm in Mechatronics application.

#Exemplar/Case Studies	Fault Diagnosis in Industrial Robots
Mapping of Course Outcomes for Unit VI	CO6

Learning Resources

Text Books:

1. Timothy J. Ross, —Fuzzy Logic with Engineering Applications (2016), Wiley 4th edition.
2. J.M. Zurada, —Introduction to artificial neural systems, Jaico Pub.

Reference Books:

1. David E. Goldberg, —Genetic Algorithm in Search Optimization and Machine Learning (2013), Pearson Education.
2. Rajasekaran, S., Vijayalakshmi Pai, G.A., —Neural networks, Fuzzy logic and Genetic algorithms (2011), Prentice Hall of India.

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CO4	3	2	3	1	-	-	-	-	-	-	-	1
CO5	3	2	3	1	-	-	-	-	-	-	-	1
CO6	3	2	3	1	-	-	-	-	-	-	-	1

BSC-BCS-601 Intelligent Systems Lab

Teaching Scheme		**Examination Scheme and Marks**
Practical: 04 Hours/Week		**Internal: 40 Marks** **External: 60 Marks**

Companion Course: BSC_BCS_ 601: Intelligent Systems

Course Objectives:

- To get introduced with soft computing tools.
- To use this tool for carrying out fuzzy related experiment.
- To do experiments related to neural networks.
- To implement genetic algorithms using tool lab.

Course Outcomes:

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

CO1: Understand fuzzy logic and their implementation

CO2: Implement programs on numerical simulations.

CO3: Implement neural network concepts.

CO4: Implement genetic algorithms for different modelling.

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Operating System recommended: - Windows

Programming tools recommended: - Matlab

Virtual Laboratory:

- http://vlabs.iitkgp.ac.in/scte/#

Part I: Intelligent Systems Lab	
Suggested List of Laboratory Experiments/Assignments **(6 assignments are compulsory)**	
Sr. No.	**Group A**
1.	Fuzzy Logic Fundamentals and Basic Operations
2.	Fuzzy Inference System(FIS)
3.	Fuzzy control
4.	Neural Networks and Perceptron
5.	Multilayer Perceptron
6.	Radial Basis Function
7.	Probabilistic Neural Networks
8.	Genetic Algorithms
	Group B (Mini Project) **Select any one problem statement**
1.	To implement FIS editor.
2.	Write a program for Perceptron net for an AND function with bipolar inputs and target.
3.	Write a program for back propagation algorithm.
4.	Develop a radial basis neural network.
5.	Train a neural network for pattern recognition.
6.	Check performance of a neural network.
7.	Apply genetic algorithm to solve an optimization problem.
8.	

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CO3	3	2	1	2	2	-	-	-	-	-	-	1
CO4	3	2	1	2	2	-	-	-	-	-	-	1
CO5												

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

Third Year B.Sc. (6th SEM) (2024-25 Course)

BSC-BCS-602 : BIG DATA ANALYTICS

Teaching Scheme:	Credit	Examination Scheme:
TH: 4 Hours/Week	**4**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Fundamentals of Big Data Systems and Analytics
- Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

Companion Course, if any:

Course Objectives:

- To gain the knowledge about Big Data Analytics for grounding in basic and advanced methods to big data technology and tools.
- To understand the foundation level training practical participation in big data projects.
- To introduce Big Data tools like Map Reduce and Hadoop and its ecosystem.
- Provide Hadoop concepts and Interfacing with HDFS
- To acquire knowledge of storing and maintaining data in cluster, reading data from and writing data to Hadoop cluster.
- To optimize the performance of Map-Reduce application.

Course Outcomes:

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

CO1: Apply non-Learn tips and tricks for Big Data use cases and solutions.

CO2: Acquire knowledge of HDFS components , Namenode, Datanode, etc. and maintain files in HDFS

CO3: Able to write Map Reduce applications to access data present on HDFS.

CO4: Able to read different formats of files into Map Reduce application.

CO5: Able to develop Map Reduce applications to analyze Big Data related to the real world use cases.

CO6: Able to optimize the performance of Map-Reduce application.

Course Contents

Unit I	Introduction to Big Data	(04 Hours)

Introduction –Distributed File System – Big Data and its importance, Characteristics of Big Data, Limitation of Conventional Data Processing Approaches, Need of big data frameworks, Big data analytics, Limitations of Big Data and Challenges, Big data applications.

Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Hadoop**	**(06 Hours)**
Basic Concepts of Hadoop and its features -The Hadoop Distributed File System (HDFS)- Anatomy of a Hadoop Cluster - Hadoop cluster modes - Hadoop Architecture, Hadoop Storage - Hadoop daemons (Name node-Secondary name node-Job tracker-Task tracker-Data node, etc.) - Anatomy of Read & Write operations – Interacting HDFS using command-line (HDFS Shell and FS shell commands) - Interacting HDFS using Java APIs – Dataflow – Blocks –Replica - YARN.		
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Hadoop Ecosystem System**	**(04 Hours)**
Introduction about Hadoop Ecosystem, Schedulers- Fair and Capacity. Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase: HBasics Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction		
Mapping of Course Outcomes for Unit III	CO2, CO3	
Unit IV	**Hadoop Cluster Setup**	**(04 Hours)**
Introduction about Hadoop Cluster Setup, SSH & Hadoop Configuration –HDFS Administering –Monitoring & Maintenance, Hadoop 2.0 Vs Hadoop 3.0 and its new features.		
Mapping of Course Outcomes for Unit IV	CO2, CO3	
Unit V	**Hadoop Map Reduce**	**(06 Hours)**
Introduction - Phases in Map Reduce Framework - Anatomy of Map Reduce Job run - Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features. Understanding Basic Map Reduce Program (Word Count program): The Driver Code - The Mapper class - The Reducer class.		
Mapping of Course Outcomes for Unit V	CO3, CO4	
Unit VI	**Map Reduce Program**	**(06 Hours)**

Writing first Map Reduce Program - Hadoop's Streaming API - Using Eclipse for Rapid Development – YARN Vs Map Reduce Advanced Map Reduce Concepts: Partitioner – Combiner – Joins – Map-side Join – Reduce-side Join - Case Study: Weblog Analysis done using Mapper, Reducer, Combiner, Partitioner, etc.	
Mapping of Course Outcomes for Unit VI	CO5, CO6

Learning Resources

Text Books:

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

Reference Books:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Boris lublinsky, Kevin t. Smith Alexey Yakubovich, "Professional Hadoop Solutions". Wiley, ISBN: 9788126551071, 2015.
4. Chris Eaton, Dirk Deroos et al., "Understanding Big Data", McGraw Hill , 2010.
5. Tom White, "HADOOP" : The definitive Guide", O Reilly 2012.
6. Srinath Perera, Thilina Gunarathne, "Hadoop MapReduce Cookbook", PACKT publishing, 2013.

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CO5	3	2	3	1	1	-	-	-	1	-	-	1
CO6		2	3	1	1	-	-	-	1	-	-	1

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

BSc Third Year Semester-VI (2024-25 Course)

BSC-BCS-603: Compiler Design

Teaching Scheme:	Credit	Examination Scheme:
TH: 4 Hours/Week	**4**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Fundamentals of Theory of Computation
- Basics of Data Structure

Companion Course, if any: Automata Theory & Formal Languages

Course Objectives:

- Understand the fundamental principles of Compiler design
- Gain Practical experience in implementing various phases of a Compiler.
- Explore Advanced Topics in Compiler theory and practice such as language translator.

Course Outcomes:

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

CO7: Student will able to understand compiler principles, types, front-end/back-end components, analysis-synthesis model.

CO8: Student will able to understand top-down parsing and bottom-up parsing for comprehensive language understanding.

CO9: Student will able to understand type checking with translation rules.

CO10: Student will able to produce intermediate code for all types of statement.

CO11: Student will able to describe new code optimization techniques.

CO12: Student will able to define machine architecture and advanced compiler Algorithm.

Course Contents

Unit I	Introduction to compiling & Lexical Analysis	(07 Hours)
Introduction of Compiler, Major data Structure in compiler, types of Compiler, Front-end and Back-end of compiler, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, **Lexical analysis:** Input buffering, Specification & Recognition of Tokens, Design of a Lexical Analyzer Generator, LEX.		
#Exemplar/Case Studies	Case Study: Exploring Compiler Fundamentals Sarah, a computer science student, delves into compilers, exploring their introduction, major data structures, compiler types, front-end/back-end components, analysis-synthesis model, phases, and lexical analysis intricacies like input buffering, token recognition, and LEX's role. Her newfound understanding equips her for compiler design and implementation.	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Syntax Analysis &Syntax Directed Translation Syntax Analysis**	**(08 Hours)**
CFGs, Top down parsing. Brute force approach, recursive descent parsing. transformation on the grammars, predictive parsing, bottom up parsing, operator precedence parsing, LR parsers (SLR,LALR, LR),Parser generation. Syntax directed definitions: Construction of Syntax trees, Bottom up evaluation of S-attributed definition, L-attribute definition, Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation, Analysis of Syntax directed definition.		
#Exemplar/Case Studies	Case Study: Language Mastery Journey Through mastering CFGs, top-down & bottom-up parsing, transformations, LR parsers, and syntax-directed definitions, students attain comprehensive language understanding, empowering them in software development and language design.	
Mapping of Course Outcomes for Unit II	CO2	

Unit III	Type Checking & Run Time Environment	(07 Hours)
Type checking: type system, specification of simple type checker, equivalence of expression, types, type conversion, overloading of functions and operations, polymorphic functions. Run time Environment: storage organization, Storage allocation strategies, parameter passing, dynamic storage allocation, Symbol table, Error Detection & Recovery, Ad-Hoc and Systematic Methods.		
#Exemplar/Case Studies	Case study: Language Mastery Expedition: Alex, an aspiring software engineer, delves into mastering language intricacies including type checking fundamentals, polymorphism, runtime environment nuances, and error handling, emerging as a proficient software engineer.	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Code Generation Intermediate code generation**	**(08 Hours)**
Declarations, Assignment statements, Boolean expressions, Case statements, Back patching, Procedure calls Code Generation: Issues in the design of code generator, Basic block and flow graphs, Register allocation and assignment. DAG representation of basic blocks, peephole Optimization, generating code from DAG.		
#Exemplar/Case Studies	Case Study on Cross compilation using XMLVM	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Code Optimization Introduction to Code optimization**	**(06 Hours)**
sources of optimization of basic blocks, loops in flow graphs, dead code elimination, loop optimization, Introduction to global data flow analysis, Code Improving transformations Data flow analysis of structure flow graph Symbolic debugging of optimized code.		
#Exemplar/Case Studies	NVCC (case study for parallel compilation), LLVM	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Introduction to Advanced Compiler**	**(06 Hours)**
Overview of machine dependent and machine independent optimization, machine dependent algorithm, machine independent algorithm. Introduction to advanced topics – JIT, Dynamic compilation, Interpreters (JVM / Dalvik). Parallel and Distributed Compilers, Parallel programming models, Processes and threads, Shared variables Message passing, Parallel Object Oriented languages.		

#Exemplar/Case Studies	Case studies GCC, g++, nmake, cmake.
Mapping of Course Outcomes for Unit VI	Student will able to define machine architecture and advanced compiler Algorithm.

Learning Resources

Text Books:

1. A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools, Pearson Education

2. Raghavan, Compiler Design, TMH Pub.

3. Dick Grune, Bal, Jacobs, Langendoen, Modern Compiler Design, Wiley,ISBN 81-265-0418-8

Reference Books:

1. Louden. Compiler Construction: Principles and Practice, Cengage Learning
2. C. Holub. Compiler Design in C, Prentice-Hall Inc., 1993.
3. Make, writing compiler & Interpreters, Willey Pub.
4. K Muneeswaran, "Compiler Design", Oxford University press, ISBN 0-19-806664-3
5. Compiler Construction Using Java, JavaCC and Yacc, Anthony J. Dos Reis, Wiley ISBN 978-0-470-94959-7
6. J R Levin, T Mason, D Brown, "Lex and Yacc", O'Reilly, 2000 ISBN 81-7366-061-X

@The CO-PO mapping table

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CO1	2	2	2	2	2	1	1	2	2	2	1	2
CO2	2	2	2	2	1	1	-	-	2	2	2	1
CO3	2	2	2	2	1	-	-	-	1		1	1
CO4	2	2	3	2	2	1	-	-	1	1	2	2
CO5	2	2	3	1	2	1	-	1	2	2	2	2
CO6	2	2	3	2	2	1	-	2	2	1		2

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Dr. D. Y. Patil School of Science & Technology

Third Year of Bachelor in Computer Application (2024-25 Course)

PCC-BCS 601 : Research Methodology & Ethics (VA)

Teaching Scheme:	Credit	Examination Scheme:
TH: 3 Hours/week	**2**	**Internal (TH): 20 Marks** **External (TH): 30 Marks**

Prerequisite Courses, if any:

- In depth knowledge research and appropriate applicable solutions

Companion Course, if any:

Course Objectives:

- Developing research sense, formulating hypotheses, in case the research topic demands, and then applying appropriate techniques and methods to test the hypotheses.
- Students will also be trained in undertaking descriptive researches.
- Students will select an area of interest and develop a research question. They will use a cluster of techniques, methods, and tools as discussed in class and understand the appropriate methodology to be followed while conducting independent research.

Course Outcomes:

After successful completion of the course, students will able to:
CO1: Develop Summarize different kinds of research, and designs process.
CO2: Analyze the existing literature and deriving conclusions.
CO3: Apply different data collection techniques.
CO4: Apply different statistical tools for data collection and analysis.
CO5: Apply the ethical principles for research.
CO6: Apply different techniques of report writing.

Course Content

Unit -1	RESEARCH FORMULATION AND DESIGN	4 hours

Motivation and objectives, Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of Applied and basic research process, criteria of good research. Defining and formulating the research Problem, selecting the problem, necessity of defining the problem.

#Exemplar/Case Studies	Machine Learning for Software Engineering
Mapping of Course Outcomes for Unit I	CO1

Unit -II	LITERATURE REVIEW	4 hours

Importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.

#Exemplar/Case Studies	Analysis of Block chain Technology in Cybersecurity
Mapping of Course Outcomes for Unit II	CO2, CO3

Unit-III	DATA COLLECTION AND ANALYSIS	06 Hours

Collections of Primary Data, Collection of Data through questionnaire and Schedules, other Observation, Interview Methods, Collection of Secondary Data, Selection of appropriate method for data collection, Case Study, Focus Group Discussion, Techniques of developing research tools viz. Questionnaire and rating scales etc. Reliability and validity of Research tools.

#Exemplar/Case Studies	Social media platform

Mapping of Course Outcomes for Unit III	CO3, CO4	
Unit-IV	**RESEARCH ETHICS, IPR AND SCHOLARY PUBLISHING**	**06 Hours**
Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing, design of research paper, citation and acknowledgement, Research Metrics, Impact factor, Metrics: h-index, g-index, i10 index, altmetrics, Open access publishing, plagiarism, reproducibility and accountability.		
#Exemplar/Case Studies	Intellectual Property Rights	
Mapping of Course Outcomes for Unit IV	CO5	
Unit-V	**INTERPRETATION AND REPORT WRITING**	**06 Hours**
Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions		
#Exemplar/Case Studies	Mistakes during Report Writing	
Mapping of Course Outcomes for Unit IV	CO6	

Text Books:

T1. A Hand Book of Methodology of Research, Rajammall, P. Devadoss and K. Kulandaivel, RMM Vidyalaya press, 1976.

T2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.

T3. Fundamentals of Mathematical statistics, S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons, New Delhi,1999

Reference Books:

R1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.

R2. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.

R3. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.

R4. Wadehra, B.L. 2000. Law relating to patents, trade-marks, copyright designs and geographical indications.

Universal Law Publishing

@The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	2	2	-	-	1	-	-	1
CO2	1	1	-	1	-	1	2	-	1	3	-	-
CO3	1	1	-	1	-	-	-	3	1	-	-	-
CO4	3	2	3	1	2	-	-	-	1	-	-	-
CO5	3	2	3	3	1	-	-	1	1	-	-	1
CO6	2	3	2	1		-	-	-	1	-	-	-

PCC-BCS 601 : Research Methodology & Ethics (VA)

Teaching Scheme Practical: 02 Hours/Week		Examination Scheme and Marks Internal: 20 External: 30

Companion Course: **PCC-BCS 601, Research Methodology & Ethics (VA)**

Course Objectives:

- Understand the principles and fundamentals of research methodology
- Develop proficiency in research design and planning
- Acquire skills in data collection and analysis
- Understand ethical considerations in research
- Enhance critical thinking and problem-solving skills
- Prepare for advanced studies and professional practice

Course Outcomes:

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

CO1: Demonstrate an understanding of the research process
CO2: Identify and evaluate research designs
CO3: Conduct a literature review
CO4: Communicate research findings effectively
CO5: Demonstrate research skills in practical applications
CO6: Reflect on the role of research in academic and professional contexts

Guidelines for Instructor's Manual

The instructor's manual should be created as a comprehensive guide and practical tool. It should encompass an introduction (detailing information about the University, program, institute, department, foreword, and preface), the course curriculum, guidelines for conducting classes and assessments, topics covered, concepts, objectives, outcomes, a selection of typical applications/assignments/guidelines, and reference materials..

Guidelines for Student's Laboratory Journal

Students are required to submit their laboratory assignments in the form of a journal. This journal should include a certificate, a table of contents, and a handwritten write-up for each assignment. The write-up should cover the assignment title, completion date, objectives, problem statement, software and hardware requirements, assessment grades/marks with the assessor's signature, a brief overview of the theory/concepts, algorithm, flowchart, test cases, test data set (if applicable), mathematical models (if applicable), and conclusion/analysis. Additionally, softcopies of program codes along with sample outputs for all assignments must be submitted. In an effort to promote environmental consciousness and contribute to Green IT, please refrain from attaching printed papers to the journal. Instead, it is encouraged to utilize a DVD containing students' programs, which will be maintained by the Laboratory In-charge. For reference purposes, one or two journals with program prints may be retained in the Laboratory.

Guidelines for Laboratory /Internal Assessment

The Continuous Assessment of laboratory work should consider a student's overall performance on laboratory assignments. Each assessment of laboratory assignments will allocate grades/marks based on various criteria, including adherence to deadlines, performance, creativity, effective coding, and punctuality.

Guidelines for Practical Examination

The formulation of problem statements should be a collaborative effort between the internal and external examiners. In practical assessments, utmost importance should be placed on successfully executing the problem statement. Evaluation may include relevant questions to gauge students' grasp of fundamental concepts and their ability to implement solutions effectively and efficiently. This approach promotes transparent evaluation and fairness, thereby alleviating any uncertainty or doubt among students. Adhering to these principles will solidify our collective efforts for a promising beginning to students' academic journey.

Guidelines for Laboratory Conduction

The instructor should craft assignments by considering the topic's prerequisites, technological dimensions, practical applications, and current trends. The assignment policy should cater to the needs of average students while also incorporating elements to engage and challenge the more advanced learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended :- Windows, Linux (e.g., Ubuntu, CentOS, Fedora), macOS

Programming tools recommended: - Programming Languages, Frameworks and Libraries.

Virtual Laboratory:

- https://www.rmols.org/
- https://vlabs.ac.in/
- https://lab.github.com

Part I : PCC-BCS 601 : Research Methodology & Ethics (VA)	
Suggested List of Laboratory Experiments/Assignments **(6 assignments are compulsory)**	
Sr. No.	**Group A**
1.	Literature Review Techniques
2.	Research Proposal Development
3.	Data Collection Methods
4.	Experimental Design and Hypothesis Testing
5.	Qualitative Research Techniques
6.	Ethical Considerations in Research
7.	Research Presentation Skills
8.	Research Paper Writing
	Group B (Mini Project) **Select any one problem statement**
1	Developing an Intelligent Tutoring System for Programming Education
2.	Enhancing Cybersecurity Measures for Small Businesses
3.	Improving Accessibility in Web Development
4.	Optimizing Resource Allocation in Cloud Computing Environments
5.	Automating Software Testing Processes
6.	Detecting and Preventing Fake News Spread on Social Media

7.	Predicting Stock Market Trends Using Machine Learning
8.	Enhancing User Experience in Mobile App Development

@The CO-PO mapping table												
PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	3	-	2	2	-	-	1	-	-	1
CO2	1	1	-	1	-	1	2	-	1	3	-	-
CO3	1	1	-	1	-	-	-	3	1	-	-	-
CO4	3	2	3	1	2	-	-	-	1	-	-	-
CO5	3	2	3	3	1	-	-	1	1	-	-	1
CO6	2	3	2	1		-	-	-	1	-	-	-

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

Third Year of Bachelor of Science (Computer Science) (2024-25 Course)

PEC-BCS-601 : Discipline Specific Elective-6

Teaching Scheme:	Credit	Examination Scheme:
TH: 2 Hours/Week	**4**	**Internal (TH): 20 Marks** **External (TH): 30 Marks**

Prerequisite Courses, if any:

- For planning: Jira
- For building: Maven, Gradle, Docker, Github, Gitlab
- For Continuous integration: Jenkins, Travis CI

Companion Course, if any: Embedded Systems and IoT

Course Objectives:

- Understand the key concepts and principles of DevOps
- List the most common DevOps tools
- Identify the business benefits of DevOps and continuous delivery.
- Recall the specific DevOps methodologies and frameworks

Course Outcomes:

On completion of the course, learner will be able to–
CO1: Describe the evolution of technology & timeline (Understand)
CO2: Explain Introduction to various Devops platforms (Remember)
CO3: Demonstrate the building components / blocks of Devops and gain an insight of the Devops Architecture. (Understand)
CO4: Apply the knowledge gain about Devops approach across various domains (Apply)
CO5: Build DevOps application (Apply)

Course Contents

Unit I	Introduction to DevOps.	(04 Hours)

Introduction to DevOps.-Define Devops ,What is Devops,SDLC models, Lean, ITIL, Agile,Why Devops? , History of Devops,Devops Stakeholders,Devops Goals,Important terminology,Devops perspective,DevOps and Agile,DevOps Tools,Configuration management,Continuous Integration and Deployment,Linux OS Introduction,Importance of Linux in DevOps,Linux Basic Command Utilities,Linux Administration,Environment Variables,Networking,Linux Server Installation,RPM and YUM Installation

#Exemplar/Case Studies	Continuous Compliance Monitoring
Mapping of Course Outcomes for Unit I	CO1

Unit II	Version Control-GIT	(03 Hours)

Introduction to GIT,What is Git,About Version Control System and Types ,Difference between CVCS and DVCS ,A short history of GIT,GIT Basics ,GIT Command Line,Installing Git ,Installing on Linux , Installing on Windows , Initial setup,Git Essentials,Creating repository,Cloning, check-in and committing,Fetch pull and remote , Branching,Creating the Branches, switching the branches, merging,The branches.		
#Exemplar/Case Studies	**GitHub.com**	
Mapping of Course Outcomes for Unit II	CO2, CO3	
Unit III	**Chef for configuration management**	**(13 Hours)**
Chef for configuration management- Overview of Chef; Common Chef Terminology (Server, Workstation, Client, Repository Etc.) Servers and Nodes Chef Configuration Concepts. Workstation Setup: How to configure knife Execute some commands to test connection between knife and workstation., Organization Setup: Create organization; Add yourself and node to organization., Test Node Setup: Create a server and add to organization, check node details using knife., Node Objects and Search: How to Add Run list to Node Check node Details., Environments: How to create Environments, Add servers to environments. Roles: Create roles, Add Roles to organization., Attributes: Understanding of Attributes, Creating Custom Attributes, Defining in Cookbooks., Data bags: Understanding the data bags, Creating and managing the Data bags, Creating the data bags using CLI and Chef Console, Sample Data bags for Creating Users.		
#Exemplar/Case Studies	MultiTier Development Application	
Mapping of Course Outcomes for Unit III	CO2,CO3	
Unit IV	**Build tool- Maven**	**(10 Hours)**
Build tool- Maven - Maven Installation,Maven Build requirements,Maven POM Builds (pom.xml),Maven Build Life Cycle,Maven Local Repository (.m2),Maven Global Repository ,Group ID, Artifact ID, Snapshot,Maven Dependencies,Maven Plugins		
#Exemplar/Case Studies	TeamCity	
Mapping of Course Outcomes for Unit IV	CO3, CO4	
Unit V	**Docker– Containers & Build tool- Maven**	**(12 Hours)**

Docker– Containers & Build tool- Maven - Introduction: What is a Docker, Use case of Docker, Platforms for Docker, Dockers vs. Virtualization,Architecture: Docker Architecture., Understanding the Docker components, Installation: Installing Docker on Linux. Understanding Installation of Docker on windows. Some Docker commands. Provisioning. Docker Hub.: Downloading Docker images. Uploading the images in Docker Registry and AWS ECS, Understanding the containers, Running commands in container. Running multiple containers.,Custom images: Creating a custom image. Running a container from the custom image. Publishing the custom image, . Docker Networking: Accessing containers, linking containers, Exposing container ports, Container Routing.

#Exemplar/Case Studies	Healthcare
Mapping of Course Outcomes for Unit V	CO3, CO5,CO6

Learning Resources

Text Books:

1. DevOps For Beginners: A Complete Guide To DevOps Best Practices (Including How You Can Create World-Class Agility, Reliability, And Security In ... With DevOps): 2 (Code Tutorials)
   By Craig Berg, ISBN: 979-8653362941
2. Effective DevOps: - Building a Culture of Collaboration, Affinity, and Tooling at Scale (English, Paperback, Davis Jennifer), ISBN: 9789352133765, 9789352133765
3. DevOps For Dummies by Freeman , ISBN: 9788126553495

Reference Books:

1. DevOps for Developers: Michael Hüttermann
2. DevOps: A Software Architect's Perspective: Ingo M. Weber, Len Bass, and Liming Zhu
3. Building a DevOps Culture: Jennifer Davis, Katherine Daniels. Publisher: O'Reilly
4. Practical DevOps: Joakim Veronal
5. DevOps for Dummies: Gene Kim, Kevin Behr, George, Publisher: John Wiley & Sons

@The CO-PO mapping table

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CO1	1	1	1	1	-	-	-	-	1	-	-	1
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CO3	3	2	3	1	3	1	1	1	1	3	3	1
CO4	3	2	3	1	1	1	3	1	1	1	1	1

CO5	3	3	3	1	1	-	-	-	1	-	-	1

Discipline Specific Elective -6 DevOPsLab		
Teaching Scheme **Practical: 02 Hours/Week**	**Credit Scheme** **04**	**Examination Scheme and Marks** **Internal: 40 Marks** **External: 60 Marks**
Companion Course: PEC-BCS-601: Discipline Specific Elective -6 (DevOps)		

Course Objectives:

- To understand DevOps practices which aims to simplify Software Development Life Cycle
- To be aware of different Version Control tools like GIT, CVS or Mercurial
- To Integrate and deploy tools like Jenkins and Maven, which is used to build, test and deploy applications in DevOps environment
- To be familiarized with selenium tool, which is used for continuous testing of applications deployed.
- To use Docker to Build, ship and manage applications using containerization
- To understand the concept of Infrastructure as a code and install and configure Ansible tool

Course Outcomes:

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

CO1: To understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies, concepts, benefits, and deployment options to meet your business requirements CO2: To obtain complete knowledge of the "version control system" to effectively track changes augmented with Git and GitHub.
CO3: To understand the importance of Jenkins to Build and deploy Software Applications on server environment.
CO4: Understand the importance of Selenium and Jenkins to test Software Applications.
CO5 : To understand concept of containerization and Analyze the Containerization of OS images and deployment of applications over Docker and To understand concept of containerization and Analyze the Containerization of OS images and deployment of applications over Docker

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learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended: - Windows

Programming tools recommended: - Android

Virtual Laboratory:

Part I: Applied Cryptography & Network Security Lab

Suggested List of Laboratory Experiments/Assignments

(8 assignments are compulsory)

Sr. No.	Group A
1.	To understand DevOps: Principles, Practices, and DevOps Engineer Role and Responsibilities.
2.	To understand Version Control System / Source Code Management, install git and create a GitHub account.
3.	To Perform various GIT operations on local and Remote repositories using GIT Cheat-Sheet
4.	To Setup and Run Selenium Tests in Jenkins Using Maven.
5.	To understand Continuous Integration, install and configure Jenkins with Maven/Ant/Gradle to setup a build Job.
6.	To understand Docker Architecture and Container Life Cycle, install Docker and execute docker commands to manage images and interact with containers.
7.	To Build the pipeline of jobs using Maven / Gradle / Ant in Jenkins, create a pipeline script to Test and deploy an application over the tomcat server.
8.	To understand Jenkins Master-Slave Architecture and scale your Jenkins standalone implementation by implementing slave nodes.
	Group B
9.	To install and Configure Pull based Software Configuration Management and provisioning tools using Puppet.
10	To provision a LAMP/MEAN Stack using Puppet Manifest.
11	To learn Software Configuration Management and provisioning using Puppet Blocks(Manifest, Modules, Classes, Function) (Mini Project)

@The CO-PO Mapping Matrix												
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CO1	1	1	1	1	-	-	-	-	1	-	-	1
CO2	3	3	3	3	1	1	1	1	1	3	3	1
CO3	3	2	3	1	3	1	1	1	1	3	3	1
CO4	3	2	3	1	1	1	3	1	1	1	1	1
CO5	3	3	3	1	1	-	-	-	1	-	-	1

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

BSc Third Year Semester-VI (2024-25 Course)

PEC-BCS-601: Data Visualization & Modelling

Teaching Scheme:	Credit	Examination Scheme:
TH: 2 Hours/Week	**4**	**Internal (TH): 40 Marks** **External (TH): 60 Marks**

Prerequisite Courses, if any:

- Basics of Data Science

Companion Course, if any: Automata Theory & Formal Languages

Course Objectives:

- Master fundamental principles in information visualization to effectively communicate quantitative information.
- Develop proficiency in applying advanced visualization techniques for analyzing complex datasets.
- Gain skills in developing interactive dashboards for visual analytics and exploratory visualization.

Course Outcomes:

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

CO1: Understand the fundamental principles of information visualization to effectively communicate quantitative information.

CO2: Apply advanced graphical models and interactive dynamics for visual analysis in complex datasets.

CO3: Demonstrate proficiency in creating accurate cartograms and thematic maps for spatial data representation.

CO4: Develop interactive dashboards for visual analytics, utilizing various visualization tools effectively.

CO5: Explore advanced topics in information visualization to address complex data analysis challenges.

CO6: Apply principles of narrative visualization and ethical data visualization to communicate insights effectively.

Course Contents

Unit I	Introduction	(07 Hours)

Information Visualization, Visual Display of Quantitative Information, Power of Representation, Data-Ink and Graphical Redesign, Data Density, Interactive Data Visualization for the Web. Scalable, Versatile and Simple Constrained Graph Layout, Visualization of Adjacency Relations in Hierarchical Data

#Exemplar/Case Studies	COVID-19 Dashboard Visualization	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Graphical Models**	**(08 Hours)**
Theory, Experimentation and the Application to the Development of Graphical Models, Layering Interactive Dynamics for Visual Analysis, Animated Transitions in Statistical Data Graphics Effectiveness of Animation in Trend Visualization		
#Exemplar/Case Studies	Social Network Analysis of Online Communities	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Cartogram**	**(07 Hours)**
Cartogram: Value-by-Area Mapping. Cartography Thematic Map Design and Adaptive Composite Map Projections. Information Visualization for Search Interfaces, Information Visualization for Text Analysis, Supporting Asynchronous Collaborative Information Visualization, Designing for Social Data Analysis,		
#Exemplar/Case Studies	Election Results Cartogram Visualization	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Tools**	**(08 Hours)**
Tool based Visualization of different data, Visual analytics, Dashboard development, Exploratory visualization		
#Exemplar/Case Studies	Financial Dashboard Development for Stock Market Analysis	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Advanced Topics in Information Visualization**	**(06 Hours)**

Multivariate Visualization Techniques: Exploring methods for visualizing data with multiple variables simultaneously, including parallel coordinates, scatterplot matrices, and Chernoff faces.

Spatial Data Visualization: Techniques for visualizing geographic and spatial data, including choropleth maps, heatmaps, and spatial clustering.

Temporal Data Visualization: Methods for representing temporal trends and patterns in data, such as time series plots, calendar heatmaps, and event sequence visualizations.

Network Visualization: Introduction to visualizing network data, including techniques for representing nodes, edges, and attributes, as well as analyzing network structure and connectivity.

Interactive Visualization Tools: Exploring advanced interactive visualization tools and libraries, such as D3.js, Plotly, and Tableau, and techniques for creating interactive dashboards and visualizations for the web.

#Exemplar/Case Studies	Visualizing Climate Change Data: Using multivariate techniques to explore relationships between temperature, precipitation, and other environmental variables over time and space.
Mapping of Course Outcomes for Unit V	CO5

Unit VI	**Data-driven Storytelling and Visual Communication**	**(06 Hours)**

Narrative Visualization: Introduction to storytelling techniques in data visualization, including principles of narrative structure, visual rhetoric, and storytelling with data.

Visual Communication Principles: Exploring principles of visual perception, cognition, and communication, and their application to designing effective visualizations and data-driven narratives.

Ethical and Responsible Visualization: Considerations for ethical and responsible data visualization, including issues of accuracy, bias, privacy, and transparency.

Data Journalism and Infographics: Techniques for creating data-driven journalism and infographics, including sourcing and analyzing data, designing compelling visualizations, and communicating key insights to a broad audience.

Interactive Data Stories: Creating interactive data stories and visual essays using a combination of narrative, data visualization, and multimedia elements.

#Exemplar/Case Studies	Visualizing Global Health Trends: Creating a data-driven narrative exploring trends in global health indicators, such as disease prevalence, vaccination rates, and healthcare access.
Mapping of Course Outcomes for Unit VI	CO6

Learning Resources

Text Books:

1. The Visual Display of Quantitative Information (2nd Edition). E. Tufte. Graphics Press, 2001.
2. Envisioning Information, E. Tufte. Graphics Press, 1990.

Reference Books:

7.

@The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	1	1	2	2	2	1	2
CO2	2	2	2	2	1	1	-	-	2	2	2	1
CO3	2	2	2	2	1	-	-	-	1		1	1
CO4	2	2	3	2	2	1	-	-	1	1	2	2
CO5	2	2	3	1	2	1	-	1	2	2	2	2
CO6	2	2	3	2	2	1	-	2	2	1		2

Discipline Specific Elective -6 Data Visualization Lab

Teaching Scheme	Credit Scheme	Examination Scheme and Marks
Practical: 02 Hours/Week	**04**	**Internal: 40 Marks** **External: 60 Marks**

Companion Course: PEC-BCS-601: Discipline Specific Elective -6

Course Objectives:

- Master fundamental principles in information visualization to effectively communicate quantitative information.
- Develop proficiency in applying advanced visualization techniques for analyzing complex datasets.
- Gain skills in developing interactive dashboards for visual analytics and exploratory visualization.

Course Outcomes:

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

CO1: Apply advanced graphical models and interactive dynamics for visual analysis in complex datasets.
CO2: Demonstrate proficiency in creating accurate cartograms and thematic maps for spatial data representation.
CO3: Develop interactive dashboards for visual analytics, utilizing various visualization tools effectively.
CO4: Apply principles of narrative visualization and ethical data visualization to communicate insights effectively.

Guidelines for Instructor's Manual

The instructor's manual should be created as a comprehensive guide and practical tool. It should encompass an introduction (detailing information about the University, program, institute, department, foreword, and preface), the course curriculum, guidelines for conducting classes and assessments, topics covered, concepts, objectives, outcomes, a selection of typical applications/assignments/guidelines, and reference materials..

Guidelines for Student's Laboratory Journal

Students are required to submit their laboratory assignments in the form of a journal. This journal should include a certificate, a table of contents, and a handwritten write-up for each assignment. The write-up should cover the assignment title, completion date, objectives, problem statement, software and hardware requirements, assessment grades/marks with the assessor's signature, a brief overview of the theory/concepts, algorithm, flowchart, test cases, test data set (if applicable), mathematical models (if applicable), and conclusion/analysis. Additionally, softcopies of program codes along with sample outputs for all assignments must be submitted. In an effort to promote environmental consciousness and contribute to Green IT, please refrain from attaching printed papers to the journal. Instead, it is encouraged to utilize a DVD containing students' programs, which will be maintained by the Laboratory In-charge. For reference purposes, one or two journals with program prints may be retained in the Laboratory.

Guidelines for Laboratory /Internal Assessment

The Continuous Assessment of laboratory work should consider a student's overall performance on laboratory assignments. Each assessment of laboratory assignments will allocate grades/marks based on various criteria, including adherence to deadlines, performance, creativity, effective coding, and punctuality.

Guidelines for Practical Examination

The formulation of problem statements should be a collaborative effort between the internal and external examiners. In practical assessments, utmost importance should be placed on successfully executing the problem statement. Evaluation may include relevant questions to gauge students' grasp of fundamental concepts and their ability to implement solutions effectively and efficiently. This

approach promotes transparent evaluation and fairness, thereby alleviating any uncertainty or doubt among students. Adhering to these principles will solidify our collective efforts for a promising beginning to students' academic journey.

Guidelines for Laboratory Conduction

The instructor should craft assignments by considering the topic's prerequisites, technological dimensions, practical applications, and current trends. The assignment policy should cater to the needs of average students while also incorporating elements to engage and challenge the more advanced learners. Utilization of open-source software is encouraged, aligning with the learned concepts. Additionally, the instructor must include an assignment or mini-project tailored to the specific branch, extending beyond the syllabus scope.

Operating System recommended: - Windows

Programming tools recommended: - Android

Virtual Laboratory:

Part I: Applied Cryptography & Network Security Lab

Suggested List of Laboratory Experiments/Assignments

(8 assignments are compulsory)

Sr. No.	Group A
1.	Create basic visualizations using a dataset of student grades, exploring different chart types such as bar charts, line plots, and scatter plots to represent various trends and patterns.
2.	Design and implement an interactive dashboard using a real-world dataset, allowing users to explore and analyze different aspects of the data through interactive filters, sliders, and dropdown menus.
3.	Develop choropleth maps and heatmaps to visualize spatial data, such as population density or crime rates, and analyze geographical patterns and trends.
4.	Analyze a social network dataset (e.g., Facebook friends or Twitter followers) using network visualization techniques to identify community structures, influential nodes, and patterns of interaction.
5.	Visualize time series data (e.g., stock prices, temperature fluctuations) using line charts, area charts, and calendar heatmaps to identify temporal trends and patterns.
6.	Explore multivariate visualization techniques by creating parallel coordinates plots and scatterplot matrices to visualize relationships between multiple variables in a dataset.
7.	Design and create cartograms to represent election results or demographic data, experimenting with different projection methods and thematic map designs to accurately visualize value-by-area data..

8.	Develop a data-driven storytelling project or infographic using a self-selected dataset, combining narrative elements with interactive visualizations to communicate key insights and trends effectively to a specific audience.
	Group B
1	Interactive COVID-19 Dashboard
2.	Social Network Analysis of Online Communities
3.	Election Results Visualization
@The CO-PO Mapping Matrix	

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	-	-	-	-	1	-	-	1
CO2	3	3	3	3	1	1	1	1	1	3	3	1
CO3	3	2	3	1	3	1	1	1	1	3	3	1
CO4	3	2	3	1	1	1	3	1	1	1	1	1
CO5	3	3	3	1	1	-	-	-	1	-	-	1

Dr. D. Y. Patil Vidyapeeth, Pimpiri, Pune

Dr. D. Y. Patil School of Science & Technology

B.Sc. Sem VI (2024-25 Course)

PEC-BCS-601: Cyber Crime Investigation & Digital Forensics

Teaching Scheme:	Credit	Examination Scheme:
TH: 2 Hours/Week	**4**	**Internal (TH): 40 Marks** **External (TH): 60 Marks** **Practical :100 Marks**

Prerequisite Courses, if any:

Programming Language, Basics of Communication System

Companion Course, if any:

Computer Networks

Course Objectives:

- To correctly define and cite appropriate instances for the application of computer forensics correctly collect and analyse computer forensic evidence.
- Identify the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Computer Forensics.

Course Outcomes:

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

CO 1 Describe the types of cybercrimes, electronic evidence, and the process of handling electronic media.

CO 2 Demonstrate their understanding of computer organization and various components by explaining how they function and their relevance in digital forensics.

CO 3 Use forensic tools and techniques to collect, analyze, and authenticate data from various operating systems and file systems.

CO 4 Analyze different types of electronic evidence, utilizing forensic tools to recover data, assess vulnerabilities, and counter anti-forensics measures.

CO 5 Assess the procedures for processing digital evidence, including strategies for recovering multimedia files and data from damaged devices.

CO6 Compile and document their forensic investigation results, demonstrating proficiency in data recovery methods and the proper handling and processing of digital evidence.

Course Contents

Unit I	Cyber Crime and computer crime	(07 Hours)
Introduction to Digital Forensics, Definition and types of cybercrimes, electronic evidence and handling, electronic media, collection, searching and storage of electronic media, introduction to internet crimes, hacking and cracking, credit card and ATM frauds, web technology, cryptography, emerging digital crimes and modules.		
#Exemplar/Case Studies	Investigate the breach to identify how the hackers accessed the system, what data was compromised, and suggest measures to prevent future breaches.	
Mapping of Course Outcomes for Unit I	CO1	
Unit II	**Basics of Computer**	**(08 Hours)**
Computer organization, components of computer- input and output devices, CPU, Memory hierarchy, types of memory, storage devices, system software's, application software's, basics of computer languages.		
#Exemplar/Case Studies	Analyze the computer systems to identify unauthorized access and data transfer.	
Mapping of Course Outcomes for Unit II	CO2	
Unit III	**Computer Forensics**	**(07 Hours)**
Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications.		

#Exemplar/Case Studies	Perform a forensic analysis on the infected systems to understand the malware's behavior and impact.	
Mapping of Course Outcomes for Unit III	CO3	
Unit IV	**Forensic Tools**	**(08 Hours)**
Introduction to Forensic Tools, Usage of Slack space, tools for Disk Imaging, Data Recovery, Vulnerability Assessment Tools, Encase and FTK tools, Anti Forensics and probable counters, retrieving information.		
#Exemplar/Case Studies	Use forensic tools to recover data from the damaged hard drive.	
Mapping of Course Outcomes for Unit IV	CO4	
Unit V	**Processing of Electronic Evidence**	**(06 Hours)**
Process of computer forensics and digital investigations, processing of digital evidence, digital images, damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, compressed files.		
#Exemplar/Case Studies	Process the electronic evidence to establish the timeline and identify the perpetrators.	
Mapping of Course Outcomes for Unit V	CO5	
Unit VI	**Legal Aspects and Ethics in Digital Forensics**	**(06 Hours)**
Introduction to Legal Aspects in Digital Forensics, Understanding Cyber Laws and Regulations , Chain of Custody and Evidence Handling, Ethical Issues in Digital Forensics, Privacy Concerns and Data Protection, Testifying as an Expert Witness, Case Law Studies and Legal Precedents, International Standards and Best Practices in Digital Forensics		
#Exemplar/Case Studies	Analyzing a cybercrime case with respect to legal procedures	
Mapping of Course Outcomes for Unit VI	CO6	

Learning Resources

Text Books:

- Altheide& H. Carvey Digital Forensics with Open Source Tools, Syngress, 2011. ISBN: 9781597495868..

Reference Books:

Online Course management System: https://esu.desire2learn.com/

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CO2	3	2	2	1	-	-	-	-	3	-		-
CO3	3	2	2	1	-	-	-	-	3	-	1	-
CO4	3	2	3	1	1	-	-	-	2	-	-	-

PEC-BCS-601: Cyber Crime Investigation & Digital Forensics		
Credit 4		**Examination Scheme and Marks** **Internal: 40 Marks** **External: 60 Marks**
Companion Course:		
Course Objectives: • To understand role of expert system and its applications. • To understand how expert system in AI can resolve many issues which generally would require a human expert. • To understand implementation of different network and puzzle programs. • To experiment with different algorithms and techniques.		
Course Outcomes: On completion of the course, learner will be able to– CO1: Implement an expert system for various applications. CO2: Understand decision making process using cryptography. CO3: Implement different classical planning algorithms. CO4: Develop agent programs for real problems.		
Guidelines for Instructor's Manual The instructor's manual should be created as a comprehensive guide and practical tool. It should encompass an introduction (detailing information about the University, program, institute, department, foreword, and preface), the course curriculum, guidelines for conducting classes and assessments, topics covered, concepts, objectives, outcomes, a selection of typical applications/assignments/guidelines, and reference materials..		

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Operating System recommended: - Windows

Programming tools recommended: - As per Subject Teacher

Virtual Laboratory:

Part I: Applied Cryptography & Network Security Lab

Suggested List of Laboratory Experiments/Assignments

(8 assignments are compulsory)

Sr. No.	Group A(Two Assignments are compulsory)
1.	Write a program take text file as an input and print word, character count and ascii value of each characters as output. (Hint: Use open (), read () and split ())
2.	Write an encryption program: Input: computer science engineering mrecw Output: gsqtyxivwgmirgiirkmriivmrkwvqyrmzivwmxc Hint: key =4 (play with ascii value).
3.	Raju send an encrypted message (cipher text) “PHHW PH DIWHU WKH WRJD SDUWB” to Rani. Can you build decryption process and find out what is the message (plain text) send to Rani? Hint: try all keys.
4.	Raju sends encrypted message “ZICVTWQNGKZEIIGASXSTSLVVWLA” to Rani. Can you build decryption process and find out what is the message send to Rani. Hint: try all keys for each character.
5.	Kohli have plain text “wewishtoreplaceplayer”. Can you build encryption process and find out what is the cipher text he needs send to BCCI. Help him out by using monoalphabatic cipher. Hint: use any one-to-one mapping between alphabets. One to one mapping A B C D E F G H I J K L M N O P Q R S T U V W X Y Z A N D R E W I C K S O H T B F G J L M P Q U V X Y Z

6.	Kohli sent encrypted message (Cipher text) “SEEMSEAOMEDSAMHL” to Anushka. Can you build decryption process and find out what is the message (plain text) send to Anushka. Hint: use above one to one mapping between alphabets
7.	Raju wants to build encrypted and decryption algorithms of Playfair Cipher. Help him to build a key matrix using the key “mrecwautonomous”
8.	By using key “CBDE” Raju would like send message (plain text)“HELLO WORLD” to Rani. Can you build encryption process and find out what is the encrypted message (cipher text) to Raju by using Hill Cipher.Also Can you build decryption process and find out what is the decrypted message (plain text) of cipher text "SLHZYATGZT" by using Hill Cipher.
9.	Implementation of Encryption and Decryption of Vigenère Cipher keyword deceptive Key: deceptivedeceptivedeceptive Plaintext: wearediscoveredsaveyourself Cipher text: ZICVTWQNGRZGVTWAVZHCQYGLMGJ
	Group B
1	Implement the Euclidean Algorithm for integers and polynomials
2.	Implement AES Key Expansion.
3.	Implementation of AES encryption and decryption
4.	Implementation of Simplified DES Encryption and decryption
5.	Implementation of RC4
6.	Implementation of RSA algorithm
7.	Implementation of Diffie-Helman key exchanges

@The CO-PO Mapping Matrix												
PO/CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	2	3	-	-	-	-	-	-	1
CO2	3	2	2	2	2	-	-	-	-	-	-	1
CO3	3	2	2	2	2	-	-	-	-	-	-	1
CO4	3	2	2	2	2	-	-	-	-	-	-	1

Dr. D. Y. Patil Vidyapeeth, Dr. D. Y. Patil School of science & Technology Fourth Year BSC (2023 Course) (With effect from Academic Year 2023-24)													
SEMESTER VII													
Course Code	**Course Type**	**Course Name**	**Teaching Scheme**			**Examination Assessment Scheme**				**Credit scheme**			
			Lecture	**Tutorial**	**Practical**	**CA**	**End Sem**	**Practical**	**Total**	**L**	**T**	**P**	**C**
PCC-BCS_701	Major	Research Project -I	0	0	32	200	-	200	400	0	0	32	16

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Dr. D. Y. Patil School of Science & Technology

Fourth Year of Bachelor in Computer Application (2024-25 Course)

PCC-BCS 701 : Research Project-I

Teaching Scheme:	Credit	Examination Scheme:
TH: 32 Hours/week	**16**	**Internal (TH): 200 Marks** **External (TH): 200 Marks**

Prerequisite Courses, if any:

- In depth knowledge about societal/research/innovation/ entrepreneurial problems and appropriate applicable solutions

Companion Course, if any:

Course Objectives:

- To Apply the knowledge for solving realistic problem
- To develop problem solving ability
- To Organize, sustain and report on a substantial piece of team work over a period of several months
- To Evaluate alternative approaches, and justify the use of selected tools and methods
- To Reflect upon the experience gained and lessons learned
- To Consider relevant social, ethical and legal issues
- To find information for yourself from appropriate sources such as manuals, books, research journals and from other sources, and in turn increase analytical skills.
- To Work in Team and learn professionalism

Course Outcomes:

Course Outcomes:

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

CO1: Solve real life problems by applying knowledge.

CO2: Analyze alternative approaches, apply and use most appropriate one for feasible solution.

CO3: Write precise reports and technical documents in a nutshell.

CO4: Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work

CO5: Interpersonal relationships, conflict management and leadership quality.

Research Project -I	**Supporting Activities to be completed under Research Project -I**	32 hours/ Week

Guidelines

- Project work Stage – I is an integral part of the Project work. In this, the student shall complete the partial
- Work of the Project which will consist of problem statement, literature review, SRS, Model and Design. The
- Students are expected to complete the project at least up to the design phase. As a part of the progress report of
- project work Stage-I, the candidate shall deliver a presentation on the advancement in Technology pertaining
- To the selected project topic. The student shall submit the duly certified progress report of Project work Stage-I in standard format for satisfactory completion of the work by the concerned guide and head of the
- Department/Institute. The examinee will be assessed by a panel of examiners of which one is necessarily an external examiner.
- The assessment will be broadly based on work undergone, content delivery, presentation skills, documentation, question-answers and report.

@The CO-PO mapping table

PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	3	-	2	2	-	-	1	-	-	1
CO2	1	1	-	1	-	1	2	-	1	3	-	-

CO3	1	1	-	1	-	-	-	3	1	-	-	-
CO4	3	2	3	1	2	-	-	-	1	-	-	-
CO5	3	2	3	3	1	-	-	1	1	-	-	1

Dr. D. Y. Patil Vidyapeeth, Dr. D. Y. Patil School of science & Technology Fourth Year BSC (2023 Course) (With effect from Academic Year 2023-24)													
SEMESTER VIII													
Course Code	**Course Type**	**Course Name**	**Teaching Scheme**			**Examination Assessment Scheme**				**Credit scheme**			
			Lecture	**Tutorial**	**Practical**	**CA**	**End Sem**	**Practical**	**Total**	**L**	**T**	**P**	**C**
PCC-BCS_801	Major	Research Project -II	0	0	32	200	-	200	400	0	0	32	16

Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune

Dr. D. Y. Patil School of Science & Technology

Fourth Year of Bachelor in Computer Application (2024-25 Course)

PCC-BCS 801 : Research Project-II

Teaching Scheme:	Credit	Examination Scheme:
TH: 32 Hours/week	**16**	**Internal : 160 Marks** **External : 240 Marks**

Prerequisite Courses, if any:

- In depth knowledge about societal/research/innovation/ entrepreneurial problems and appropriate applicable solutions

Companion Course, if any:

Course Objectives:

- To meet the objectives of proposed work
- To test rigorously before deployment of system
- To validate the work undertaken
- To consolidate the work as furnished report

Course Outcomes:

Course Outcomes:

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

CO1: Show evidence of independent investigation

CO2: Critically analyze the results and their interpretation.

CO3: Report and present the original results in an orderly way and placing the open questions in the right perspective.

CO4: Link techniques and results from literature as well as actual research and future research lines with the research.

CO5: Appreciate practical implications and constraints of the specialist subject

Research Project -II	Supporting Activities to be completed under Research Project -II	32 hours/ Week

Guidelines

- In Project Work Stage–II, the student shall complete the remaining project work which consists of Selection of Technology and Tools, Installations, UML implementations, testing, Results,
- Performance discussions using data tables per parameter considered for the improvement with existing/known algorithms/systems and comparative analysis and validation of results and conclusions.
- The student shall prepare and submit the report of Project work in standard format for satisfactory completion of the work that is duly certified by the concerned guide and head of the Department/Institute.

@The CO-PO mapping table

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	2	2	-	-	1	-	-	1
CO2	1	1	-	1	-	1	2	-	1	3	-	-
CO3	1	1	-	1	-	-	-	3	1	-	-	-
CO4	3	2	3	1	2	-	-	-	1	-	-	-
CO5	3	2	3	3	1	-	-	1	1	-	-	1