

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce, and Science College

Ahmednagar (Autonomous)

(Affiliated to Savitribai Phule Pune University, Pune)



National Education Policy (NEP)
Choice Based Credit System (CBCS)

Programme Framework
B.Sc. Cloud Computing

Implemented from

Academic Year 2024-25

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Board of Studies in Computer Applications

Sr. No.	Name	Designation
1.	Prof.Arun D.Gangarde	Chairman
2.	Prof.Priyamvada U. Patil	Member
3.	Prof.Deepali V.Jagdale	Member
4.	Prof.Shivaji Tarate	Member
5.		Member
6.		Academic Council Nominee
7.		Academic Council Nominee
8.		Vice-Chancellor Nominee
9.		Alumni
10.		Industry Expert

1. Prologue/ Introduction of the programme:

The Bachelor of Science degree in Cloud Computing is a comprehensive program that is designed to provide students with the knowledge and skills needed to become experts in the field of cloud computing. This program is ideal for individuals who are interested in pursuing careers in the rapidly evolving technology industry, particularly in areas such as cloud infrastructure, security, and software development. The Bachelor of Science degree in Cloud Computing is a comprehensive program that covers a variety of topics related to cloud computing. Major areas of study in this program include introduction to cloud computing, cloud economics, cloud infrastructure, security, software development, networking, virtualization and DevOps. By the end of this program, graduates will be equipped with the skills and knowledge needed to pursue a variety of careers in cloud computing, including roles such as cloud architects, cloud engineers, cloud developers, cloud security specialists, and more. Whether you are a recent high school graduate or a working professional looking to advance your career in the technology industry, this program offers a comprehensive and practical approach to cloud computing education. Major areas of study included in the program are –

Introduction to cloud computing: Learning about the fundamentals of cloud computing, its history, types, models, and its benefits to businesses and organizations. Cloud economics: Learning about the financial aspects of cloud computing, including cost models, pricing structures, and how to analyze the costs and benefits of cloud-based solutions. Cloud infrastructure: Students learn about the design and deployment of scalable and reliable cloud- based systems and services, including various types of cloud architectures and deployment models. Security: Understanding the threats to cloud computing and how to implement security measures to protect data and infrastructure, including encryption, access control, and compliance. Software development: Gaining skills in developing and deploying cloud-based software applications using various programming languages, development platforms, and tools. Networking: Studying the principles and practices of cloud networking, including virtual private networks, load balancing, and content delivery networks, as well as cloud-based storage and data management. Virtualization: Understanding how to create and manage virtualized environments using hypervisors such as VMware, Hyper-V, and KVM. DevOps: Understanding how to integrate development and operations to improve the efficiency and reliability of cloud-based systems and services, using tools such as continuous integration, continuous delivery, and infrastructure as code.

2. Programme Outcomes (POs)

Upon completion of the Bachelor of Science Cloud Computing degree program, students will be able to:

- Design and implement cloud-based solutions that meet the requirements of modern businesses and organizations.
- Evaluate and select appropriate cloud technologies and deployment models for specific use cases.
- Implement and maintain cloud-based infrastructure and services in a secure, reliable, and scalable manner.
- Develop and deploy cloud-based applications using various programming languages, development platforms, and tools.
- Analyze the costs and benefits of cloud-based solutions and make informed decisions about cloud adoption and migration.
- Apply principles of DevOps to manage cloud-based systems and services throughout their lifecycle, including continuous integration and delivery, and infrastructure as code.
- Understand the ethical and legal considerations associated with cloud computing, including privacy, data protection, and compliance.
- Communicate effectively with stakeholders in the organization about the value and benefits of cloud computing solutions.
- Work effectively in a team-based environment to design, develop, and deploy cloud-based solutions that meet business needs.
- Continuously learn and adapt to emerging trends and technologies in the field of cloud computing to stay current and relevant in the industry.

Features of Cloud Computing:

- **Scalability:** Cloud computing enables the rapid and flexible deployment of computing resources, allowing businesses to easily scale up or down as needed.
- **Cost-effectiveness:** Cloud computing reduces the need for upfront hardware and infrastructure investment, making it more cost-effective for businesses.
- **Availability:** Cloud computing enables 24/7 access to applications and services from anywhere with an internet connection, improving business continuity.
- **Security:** Cloud computing providers implement a range of security measures to protect data and infrastructure, often providing better security than traditional on-premises solutions.
- **Virtualization:** Cloud computing heavily relies on virtualization technologies, enabling the creation of virtual machines and containers to provide computing resources.
- **Automation:** Cloud computing enables the automation of many processes, including scaling, deployment, and monitoring, leading to more efficient and effective operations.
- **Big data:** Cloud computing provides an ideal environment for big data processing and analysis, due to its ability to scale rapidly and handle large datasets.
- **Mobility:** Cloud computing enables the use of mobile devices for accessing applications and services, leading to increased mobility and flexibility for businesses.

- **Internet of Things (IoT):** Cloud computing is a key enabler of IoT applications, providing the necessary infrastructure for processing and analyzing data from connected devices.
- **Global reach:** Cloud computing enables businesses to operate globally with ease, providing access to requirements, set pricing, and develop marketing strategies to promote the product.

B.Sc. Cloud Computing Programme Framework: Credit Distribution

Level / Difficulty	Sem	Subject-1 (Selected as Major)						Subject-2		Subject-3		(SEC)	GE/OE		IKS	AEC	VEC	CC	Total	
		T		P				T	P	P	T	P	T	P						
Certificate 4.5 / 100	I	02		02				02	02	02	02	-	02		02	02	02	02	22	
	II	02		02				02	02	02	02	02	-	02		--	02	02	02	22
		Credits Related to Major						Selected as Minor												
		Core		Elective		VSC	FP / OJT / CEP/ RP													
		T	P	T	P	P	P	T	P	-	P	T	P	-	-	-	-	-	-	
Diploma 5.0 / 200	III	04	02	--		02	02	02	02	-	02	02		-	02	-	02	22		
	IV	04	02	--		02	02	02	02	-	02		02	--	02	-	02	22		
Degree 5.5 / 300	V	06	04	02	02	2	2	02	-	-	-	-	-	02	-	-	-	22		
	VI	06	04	02	02	2	4	02	-	-	-	-	-	-	-	-	-	22		
Total		24	16	04	04	08	10	10	08	04	04	06	08	04	08	04	08	132		
6.0/400 Honours	VII	08	06	02	02	-	RM-04											22		
	VIII	08	06	02	02		OJT-04											22		
6.0/400 Honours with Research	VII	06	04	02	02		RM-04 RM-04											22		
	VIII	06	04	02	02		RM-08											22		
Total		40/36	28/24	08	08	08	18/26	10	08	04	04	06	04	04	04	08	04	08	176	

B.Sc. Cloud Computing Programme Framework: Course Distribution

Level / Difficulty	Sem	Subject-1 (Selected as Major)						Subject-2		Subject-3		(SEC)	GE/OE		IKS	AEC	VEC	CC	Total
		T		P				T	P	P	T	P	T	P					
Certificate 4.5 / 100	I	01		01				01	01	01	01	-	01		01	01	01	01	11
	II	01		01				01	01	01	01	01	-	01	--	01	01	01	11
		Credits Related to Major						Selected as Minor											
		Core		Elective		VSC	FP / OJT / CEP / RP												
		T	P	T	P	P	P	T	P	-	P	T	P	-	-	-	-	-	
Diploma 5.0 / 200	III	02	01	--		01	FP-01	01	01	-	01	01		-	01	-	01	11	
	IV	02	01	--		01	CEP-01	01	01	-	01		01	--	01	-	01	11	
Degree 5.5 / 300	V	03	02	01	01	01	FP-01	01	-	-	-	-		01	-	-	-	11	
	VI	03	02	01	01	01	OJT-01	01	-	-	-	-		-	-	-	-	10	
Total		12	08	02	02	04	04			02	02	03	04	02	04	02	04	65	
6.0/400 Honours	VII	03	03	01	01	-	RM-01											09	
	VIII	03	03	01	01		OJT-01											09	
6.0/400 Honours with Research	VII	02	02	01	01		RM-01 RM-01											08	
	VIII	02	02	01	01		RM-01											07	
Total		18/16	14/12	04	04	04	06/07	06	04	02	02	03	04	02	04	02	04	83/80	

B.Sc. Cloud Computing Credit and Course Distribution in Brackets

Level / Difficulty	Sem	Subject-1							Total
		T		P					
4.5	I	02 (01)		02 (01)				04(02)	
	II	02 (01)		02 (01)				04(02)	
		Credits Related to Major						IKS	
		Core		Elective		VSC	FP / OJT/ CEP		
		T	P	T	P	P	P	T	
5.0	III	04(02)	02(01)	--		02(01)	FP-02(01)		10(05)
	IV	04(02)	02(01)	--		02(01)	CEP-02(01)		10(05)
5.5	V	06(03)	04(02)	02(01)	02(01)	02(01)	FP-02(01)	02(01)	20 (10)
	VI	06(03)	04(02)	02(01)	02(01)	02(01)	OJT-04(01)		20(09)
Total		12	08	(02)	(02)	04	04	(01)	33
6.0	VII	03	03	(01)	(01)	-	RM-04(01)		22(09)
	VIII	03	03	(01)	(01)		OJT-04(01)		22(09)
6.0	VII	(02)	(02)	(01)	(01)		RM-04(01) RP-04(01)		22(08)
	VIII	(02)	(02)	(01)	(01)		RM-08(01)		22(07)
		18/16	14/12	04	04	04	06/07	(01)	51/48

Programme Framework (Courses and Credits): B.Sc. Cloud Computing

Str. No.	Year	Semester	Level	Course Type	Course Code	Title	Credits
1.	I	I	4.5	DSC-01	BS-CC 111T-A	Programming Fundamentals for Cloud Computing	02
2.	I	I	4.5	DSC-01	BS-CC 111T-B	Database Management Systems	02
3.	I	I	4.5	DSC-02	BS-CC 112P-A	Laboratory on Programming Fundamentals for Cloud Computing	02
4.	I	I	4.5	DSC-02	BS-CC 112P-B	Laboratory on Database Management Systems	02
5.	I	II	4.5	DSC-03	BS-CC 121T-A	Introduction to Cloud Computing	02

6.	I	II	4.5	DSC-03	BS-CC 121T-B	Data Structures using C	02
7.	I	II	4.5	DSC-04	BS-CC 122P-A	Laboratory on Introduction to Cloud Computing	02
8.	I	II	4.5	DSC-04	BS-CC 112P-B	Laboratory on Data Structures using C	02
9.	II	III	5.0	DSC-05	BS-CC 231T	Cloud Computing Architecture and Deployment Models	02
10.	II	III	5.0	DSC-06	BS-CC 232T	Python Programming	02
11.	II	III	5.0	DSC-07	BS-CC 233P	Laboratory Course on Cloud Computing Architecture and Deployment Models	02
12.	II	III	5.0	VSC-01	BS-CC 234P	Laboratory Course on Python Programming	02
13.	II	III	5.0	FP-01	BS-CC 235P	Field Project	02
14.	II	IV	5.0	DSC-08	BS-CC 241T	Foundations of Data Storage	02
15.	II	IV	5.0	DSC-09	BS-CC 242T	Big Data analytics using Hadoop	02
16.	II	IV	5.0	DSC-10	BS-CC 243P	Laboratory on Hbase	02
17.	II	IV	5.0	VSC-02	BS-CC 243P	Laboratory on Hadoop	02
18.	II	IV	5.0	CEP-01	BS-CC 245P	Community Engagement Project	02
19.	III	V	5.5	DSC-11	BS-CC 351T	Container Technology	02
20.	III	V	5.5	DSC-12	BS-CC 352T	Data Processing Using Spark	02
21.	III	V	5.5	DSC-13	BS-CC 353T	DevOps	02
22.	III	V	5.5	DSC-14	BS-CC 354P	Laboratory Course on Container Technology	02
23.	III	V	5.5	DSC-15	BS-CC 355P	Laboratory on Data Processing Using Spark	02
24.	III	V	5.5	DSE-01	BS-CC 356T	Fundamentals of Data Science	02
25.						OR Network security	
26.	III	V	5.5	DSE-02	BS-CC 357P	Laboratory on Fundamentals of Data Science OR Network security	02
27.	III	V	5.5	VSC-03	BS-CC 358P	Laboratory Course on DevOps	02
28.	III	V	5.5	FP-02	BS-CC 359P	Field Project	02
29.	III	V	5.5	IKS-02	BS-CC 360T	IKS (Major Specific)	02
30.	III	VI	5.5	DSC-16	BS-CC 361T	Data Virtualization Techniques	02
31.	III	VI	5.5	DSC-17	BS-CC 362T	Hive Technology	02

32.	III	VI	5.5	DSC-18	BS-CC 363T	Cloud Computing Security Concepts	02
33.	III	VI	5.5	DSC-19	BS-CC 364P	Laboratory on Data Virtualization Techniques	02
34.	III	VI	5.5	DSC-20	BS-CC 365P	Laboratory on Hive Technology	02
35.	III	VI	5.5	DSE-03	BS-CC 366T	Cloud Testing <u>OR</u> Software Engineering	02
36.	III	VI	5.5	DSE-04	BS-CC 367P	Laboratory on Cloud Testing <u>OR</u> Software Engineering	02
37.	III	VI	5.5	VSC-04	BS-CC 368P	Laboratory on Cloud Computing Security Concepts	02
38.	III	VI	5.5	OJT-01	BS-CC 369P	On Job Training	04

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
B. Sc. -I (Cloud Computing)

Title of the Course: Programming Fundamentals for Cloud Computing								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-01	BS-CC 111T-A	02	00	02	30	15	35	50

Learning Objectives:

1. Ability to develop algorithmic solutions for use on computers
2. Ability to perform console input and output, utilize basic operators, and perform sequential
3. Processing
4. Ability to utilize the basic control structures for selection logic and repetition logic
5. Ability to develop programs in a functional form
6. Ability to process data in arrays

Course Outcomes (Cos)

Upon completion of the course, the students will be able to:

1. Write, compile and debug programs in C language.
2. Use different data types in a computer program.
3. Design programs involving decision structures, loops, arrays and functions.
4. Use pointers to understand the dynamics of memory
5. Create and perform different file operations.

Detailed Syllabus:

UNIT I: Fundamentals of Programming

(05 hrs)

- 1.1 What is a Computer?
- 1.2 Algorithms and flowcharts in programming
- 1.3 What is a Program(Code)?
- 1.4 Programming Basics: What is programming?,What is a programming language?
- 1.5 Writing source code,Running your code
- 1.6 Compiler and interpreters,Understanding Programing environment.

UNIT II: C programming fundamentals

(08 hrs)

- 2.1 Structure of a C Program, componenets of a program.
- 2.2 Basic building blocks: Constants, Variable and Data Types,Tokens
- 2.3 Managing Input and Output Operations

2.4 Operators and Expressions:

2.5 Control Structures: Decision Making and Branching(IF-Else, switch case,goto),Decision Making and Looping(for,while,do-while)

UNIT III: Introduction To Arrays And Strings (07 hrs)

3.1 Arrays: Declaration,Initialization,Memory representation.

3.2 2 D Arrays: Declaration,Initialization,Memory representation

3.3 Strings: Declaration,Initialization,Memory representation

3.4 2 D Strings : Declaration,Initialization,Memory representation

UNIT IV: Functions And Introduction To Pointers (08 hrs)

4.1 Functions: Definition, types

4.2 User defined functions: Elements of user defined functions,category(with arguments , without

arguments,return type),arrays , strings and functions

4.3 Library functions: Definition,Examples,String Library Functions

4.4 Pointers: Definition, types, memory allocation,dynamic memory allocation.

UNIT V: Structures And File Management (07 hrs)

5.1 Structures:definition, declaration,initialization, member accessing operator,array of structure variables.

5.2 Pointers and structures.

5.3 Unions: Diference between structure and union

5.4 File Management: Introduction ,Types of files

5.5 Opening and closing a file,Varios file handling operations

Suggested Readings/Material:

Text Books:

E. Balaguruswamy, “Programming in ANSI C”, 8th Edition, 2019, McGraw Hill Education, ISBN:978-93-5316-513-0.

Reference Books:

1. Pradip Dey, Manas Ghosh, “Programming in C”, 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

2. Kernighan B.W and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.

3. Yashavant P. Kanetkar, “Let Us C”, 16th Edition, 2019, BPB Publications, ISBN: 978- 93-8728-449-4.

4. Jacqueline A Jones and Keith Harrow, “Problem Solving with C”, Pearson Education. ISBN: 978-93-325-3800-9.

5. Dr. Guruprasad Nagraj, “C Programming for Problem Solving”, Himalaya Publishing House. ISBN-978-93-5299-361-1.

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New Arts, Commerce and Science College, Ahmednagar
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Syllabus
B. Sc. -I (Cloud Computing)

Title of the Course: Database Management Systems								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-01	BS-CC 111T-B	02	00	02	30	15	35	50

Learning Objectives:

1. Provide a strong foundation in database concepts, technology, and practice.
2. Practice SQL programming through a variety of database problems.
3. Demonstrate the use of concurrency and transactions in database
4. Design and build database applications for real world problems.

Course Outcomes (Cos) The student will be able to:

1. Identify, analyse and define database objects, enforce integrity constraints on a database using RDBMS.
2. Use Structured Query Language (SQL) for database manipulation.
3. Design and build simple database systems Artificial Intelligence & Data Science
4. Develop application to interact with databases.

Detailed Syllabus:

Unit I: Introduction of DBMS

05 hrs

- 1.1 Introduction –Basic concept of File, File system, File operations
- 1.2 Physical / logical files
- 1.3 Record organization (fixed, variable length)
- 1.4 Types of file organization (heap, sorted, indexed, hashed)
- 1.5 Overview- Data, information, database, DBMS, field, record
- 1.6 File system Vs. DBMS
- 1.7 Component of database system: Database Architecture
- 1.8 Describing & storing data (Data models - relational, hierarchical, network),
- 1.9 Levels of abstraction
- 1.10 Data independence
- 1.11 Structure of DBMS
- 1.12 Users of DBMS
- 1.13 Advantages of DBMS

Unit II Conceptual Database Design (E-R model)**08 hrs**

- 2.1 Overview of Database design
- 2.2 ER data model- E-R diagram (entities, attributes, entity sets, relations, relationship sets)
- 2.3 Additional constraints (key constraints, participation constraints, strong entities, weak entities)
- 2.4 Additional features of database design: aggregation, generalization, specialization
- 2.5 Relational Database design: Pitfalls in Relational-Database Design (undesirable properties of a RDB design like repetition, inability to represent certain information)
- 2.6 Functional dependencies (Basic concepts, Closure of set of functional dependencies, Closure of an Attribute set)
- 2.7 Concept of Decomposition, Desirable Properties of Decomposition (Lossless join and Dependency preservation)
- 2.8 Concept of Normalization - Normal forms (only definitions) 1NF, 2NF, 3NF, BCNF

Unit III Relational Algebra and Calculus**05 hrs**

- 3.1 Relational algebra: Introduction, Selection and projection, set operations, renaming, Joins, Division, syntax, semantics. Operators, grouping and ungrouping, relational comparison.
- 3.2 Calculus: Tuple relational calculus, Domain relational Calculus, calculus vs algebra, computational capabilities.

Unit IV Constraints and SQL**09 hrs**

- 4.1 What is constraints, types of constraints, Integrity constraints
- 4.2 SQL: data definition, aggregate function, Null Values, nested sub queries
- 4.3 PL/PostgreSQL: Language Structure, Controlling the Program Flow, Conditional Statements, Loops
- 4.4 Views
- 4.5 Functions and procedures
- 4.6 Handling Errors and Exceptions
- 4.7 Cursors
- 4.8 Triggers

Unit V: Current Trends:**02 hrs**

Object Oriented Databases – Need for Complex Data types- OO data Model

Suggested Readings/Material:**TEXT BOOKS**

1. A. Silberschatz, H.F. Korth and S. Sudharshan, "Database System Concepts" , Fifth Edition, Tata McGraw Hill, New Delhi, 2006.
2. G. V. Post, "Database Management Systems Designing and Building Business Application" ,McGraw Hill International edition, 1999.

REFERENCE BOOKS

- 1 J. D. Ullman, "Principles of Database Systems", Galgotia Publishers, Second Edition, New Delhi, 1988
- 2 C.J. Date, An Introduction to Database Systems, Third Edition, Narosa, New Delhi, 1985

E BOOKS

- 1 <https://www.amazon.com/Database-Management-Systems-Raghu-Ramakrishnan/dp/0072465638> 1. <https://www.coursera.org/learn/core-database>
2. <https://swayam.gov.in/courses/4598-database-and-content-organisation>

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
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Syllabus
B. Sc. -I (Cloud Computing)

Title of the Course: Laboratory on Programming Fundamentals for Cloud Computing								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-02	BS-CC 112P-A	00	02	02	60	15	35	50

Learning Objectives:

1. Ability to develop algorithmic solutions for use on computers
2. Ability to perform console input and output, utilize basic operators, and perform sequential Processing
3. Ability to utilize the basic control structures for selection logic and repetition logic
4. Ability to develop programs in a functional form
5. Ability to process data in arrays

Course Outcomes (Cos): Upon completion of the course, the students will be able to:

1. Write, compile and debug programs in C language.
2. Use different data types in a computer program.
3. Design programs involving decision structures, loops, arrays and functions.
4. Use pointers to understand the dynamics of memory
5. Create and perform different file operations.

Detailed Syllabus:

Assignment 1: "Hello world" program, basic input and output programs

Assignment 2: Programs using different types of operators

Assignment 3: Programs to illustrate use of IF-Else, Switch case, goto

Assignment 4: Programs to illustrate use of loops

Assignment 5 : Programs to illustrate use of arrays

Assignment 6: Programs to illustrate use of Strings

Assignment 7: Programs to illustrate use of functions

Assignment 8: Programs to illustrate use of pointers and dynamic memory allocation

Assignment 9: Programs to illustrate use of structures

Assignment 10: Programs to illustrate File handling operations

Suggested Readings/Material:

Text Books:

E. Balaguruswamy, “Programming in ANSI C”, 8th Edition, 2019, McGraw Hill Education, ISBN:

978-93-5316-513-0.

Reference Books:

1. Pradip Dey, Manas Ghosh, “Programming in C”, 2nd Edition, 2018, Oxford University Press, ISBN: 978-01-9949-147-6.

2. Kernighan B.W and Dennis M. Ritchie, “The C Programming Language”, 2nd Edition, 2015, Pearson Education India, ISBN: 978-93-3254-944-9.

3. Yashavant P. Kanetkar, “Let Us C”, 16th Edition, 2019, BPB Publications, ISBN: 978- 93-8728-449-4.

4. Jacqueline A Jones and Keith Harrow, “Problem Solving with C”, Pearson Education. ISBN: 978-93-325-3800-9.

5. Dr. Guruprasad Nagraj, “C Programming for Problem Solving”, Himalaya Publishing House. ISBN-978-93-5299-361-1.

6. Workbook prepared by the college.

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Syllabus
B. Sc. -I (Cloud Computing)

Title of the Course: Laboratory on Database Management Systems								
Year: I				Semester: I				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-02	BS-CC 112P-B	00	02	02	60	15	35	50

Learning Objectives:

1. Provide a strong foundation in database concepts, technology, and practice.
2. Practice SQL programming through a variety of database problems.
3. Demonstrate the use of concurrency and transactions in database
4. Design and build database applications for real world problems.

Course Outcomes (Cos) After completion of the course students will be able to:

1. Formulate SQL queries using advanced features.
2. Write stored procedures, cursors and triggers using PL/PostgreSQL.
3. Design a database using database normalization technique

Detailed Syllabus:

Assignment 1 Design a Database and create required tables. For e.g. Bank, College Database

Assignment 2 Apply the constraints like Primary Key , Foreign key, NOT NULL to the tables.

Assignment 3 Write a sql statement for implementing ALTER, UPDATE and DELETE

Assignment 4 Write the queries to implement the joins

Assignment 5 Write the query for implementing the following aggregate functions: MAX(), MIN(), AVG(), COUNT()

Assignment 6 Write the query to implement the concept of Intergrity constrains

Assignment 7 Perform the following operation for demonstrating the insertion , updation and deletion using the referential integrity constraints

Assignment 8 Nested Queries

Assignment 9 Designing a Database using normalization theory for the given application/database design

Assignment 10 Assignment on Views Creation

Assignment 11 Assignment on Stored Functions

A Simple Stored Function

A Stored Function that returns

A Stored Function recursive

Assignment 12 Assignment on Cursors

Simple Cursor

Parameterize Cursor

Assignment 13 Assignment on Error and Exception handling

Simple Exception- Raise Debug Level Messages

Simple Exception- Raise Notice Level Messages

Assignment 14 Assignment on Triggers

Suggested Readings/Material:

TEXT BOOKS

1. A. Silberschatz, H.F. Korth and S. Sudharshan, "Database System Concepts" , Fifth Edition, Tata McGraw Hill, New Delhi, 2006.

2. G. V. Post, "Database Management Systems Designing and Building Business Application" ,McGraw Hill International edition, 1999.

REFERENCE BOOKS

1 J. D. Ullman, "Principles of Database Systems", Galgotia Publishers, Second Edition, New Delhi, 1988

2 C.J. Date, An Introduction to Database Systems, Third Edition, Narosa, New Delhi, 1985

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B. Sc. -I (Cloud Computing)

Title of the Course: Introduction to Cloud Computing								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-03	BS-CC 121T-A	02	00	02	30	15	35	50

Learning Objectives:

1. To understand the basic concepts and functions of operating
2. To understand I/O management and File systems.
3. To be familiar with the basics of Linux system
4. To be familiar with the history, basic concepts , advantages ,challenges and applications of cloud

Course Outcomes (Cos)

After completion of the subject content student will :

1. Understand the functionality of file systems.
2. Understand and use various Linux Commands
3. The remote server connectivity
4. cloud models and services fundamentals

Detailed Syllabus:

Unit I: Introduction to Operating Systems

(05)

1.1 Introduction:

What is an Operating System?
 Basics of Popular Operating Systems

1.2 Operating system structure :

monolithic layered, virtual machine and Client server

1.3 Types of operating system :

real time systems
 multi-user System,
 distributed system

1.4 File Systems in Operating System

What is a File System?

File Directories
Operations performed on directory.

1.5 Linux Operating system:

History, Overview of Linux

File Management in Linux :

The file: Ordinary file, Directory file, Device file, File name,
The parent-child relationship,
UNIX file system tree,
The Unix file system

Unit II : Storage Fundamentals

(05)

2.1 Types

Primary
secondary

2.2 Hard disk

What is hard disk?
Components of hard disk
Hard disk types

2.3 File Allocation Methods

IO vs Throughput, Capacity vs speed

2.4 RAID

What is data redundancy?
Raid Levels

2.5 Understanding server:

What is a server?
Compute evaluation
Server form factor explained
Server architecture explained
Major server components
How servers are different than desktops

Unit III : Networking Basics:

(05)

3.1 Introduction

Network Fundamentals
Protocols

3.2 Common access types

What is secure remote access
Types: https,rdp,ssh,vpn, Secure
Shell (SSH) remote access, Network access control (NAC), Single
sign-on (SSO),direct connect ,software defined networking, load
balancing, domain name system

Unit IV : Introduction to Cloud

(15)

4.1 Introduction:

Brief History
Definitions
Business Drivers : Cost reduction, Business agility;

Technology Innovations:

Clustering, Grid Computing, Capacity Planning virtualization,
containerization, serverless environment.

4.2 Basic Concepts and Basic Concepts and Terminology :

Cloud

IT Resource

On-Premise Cloud Consumers and Cloud Providers;

Scaling : Horizontal Scaling ,Vertical Scaling ;

Cloud Service: Cloud Service Consumer .

4.3 Goals and Benefits

Reduced Investments and Proportional Costs

Increased Scalability

Increased Availability and Reliability .

4.4 Risks and Challenges

Increased Security Vulnerabilities

Reduced Operational Governance Control

Limited Portability Between Cloud Providers

Multi-Regional Compliance and Legal Issues

4.5 Roles and Boundaries

Cloud Provider

Cloud Consumer

Cloud Service Owner

Cloud Resource Administrator

Additional Roles

Organizational Boundary

Trust Boundary

4.6 Cloud Characteristics

On-Demand Usage

Ubiquitous Access

Multitenancy (and Resource Pooling)

Elasticity

Measured Usage

Resiliency

4.7 Cloud Models

Introduction to Delivery Models:

Infrastructure-as-a-Service (IaaS)

Platform-as-a-Service (PaaS)

Software-as-a-Service (SaaS)

Comparing Cloud Delivery Models

Combining Cloud Delivery Models

IaaS + PaaS

IaaS + PaaS + SaaS

Introduction to Deployment Models :

Public Clouds

Community Clouds

Private Clouds

Hybrid Clouds

Other Cloud Deployment Models

Suggested Readings/Material:

1. Rajkumar Buyya ,Christian Vecchiola,S. Thamarai Selvi , Mastering Cloud Computing Foundations and Applications Programming MK publications ISBN: 978-0-12-411454-8 2.
2. Thomas Erl, Zaigham Mahmood, and Ricardo Puttini , Cloud Computing Concepts, Technology & Architecture, The Prentice Hall Service Technology Series ISBN-10 : 9780133387520 ISBN-13 : 978- 0133387520

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
B. Sc. -I (Cloud Computing)

Title of the Course: Data Structures using C								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-03	BS-CC 121T-B	02	00	02	30	15	35	50

Learning Objectives:

1. Learning about data structures and algorithms is important. It helps manage data better and makes coding easier for data scientists.
2. Analyze step by step and develop algorithms to solve real world problems.
3. Implementing various data structures viz. Stacks, Queues, Linked Lists,
4. Trees and Graphs.
5. Understanding various searching & sorting techniques

Course Outcomes (Cos)

1. Be able to check the correctness of algorithms using inductive proofs and loop invariants.
2. Be able to compare functions using asymptotic analysis and describe the relative merits of worst-, average-, and best-case analysis.
3. Be able to solve recurrences using the master, the iteration, and the substitution method.
4. Become familiar with a variety of sorting algorithms and their performance characteristics (eg, running time, stability, space usage) and be able to choose the best one under a variety of requirements.

Detailed Syllabus:

Unit I: Basics 02 hrs

1.1 Basics Analysis on Algorithm, Complexity of Algorithm

1.2 Algorithm Specifications: Performance Analysis and Measurement (Time and space analysis of algorithms- Average, best and worst case analysis).

Unit II: Introduction To Data Structure: 02 hrs

2.1 Data types – primitive and non-primitive

2.2 Types of Data Structures- Linear & Non Linear Data Structures.

Unit III: Linear Data Structure 10 hrs

- 3.1 Array: Representation of arrays, Applications of arrays, sparse matrix and its representation.
- 3.2 Stack: Stack-Definitions & Concepts, Operations On Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression And Their Compilation, Recursion, Tower of Hanoi
- 3.3 Queue: Representation Of Queue, Operations On Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Double Ended Queue, Applications of Queue.
- 3.4 Linked List: Singly Linked List, Doubly Linked list, Circular linked list, Linked implementation of Stack, Linked implementation of Queue, Applications of linked list.

Unit IV: Nonlinear Data Structure : 08 hrs

- 4.1 Tree: Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder)
- 4.2 Threaded binary tree
- 4.3 Binary search trees, Conversion of General Trees To Binary Trees, Applications Of Trees- Some balanced tree mechanism, eg. AVL trees, 2-3 trees, Height Balanced, Weight Balance.
- 4.4 Graph-Matrix Representation Of Graphs, Elementary Graph operations, (Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree).

Unit V: Sorting And Searching 06 hrs

- 5.1 Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Sorting On Several Keys, List and Table Sort,
- 5.2 Linear Search, Binary Search.

Unit VI : Hashing And File Structures 06 hrs

- 6.1 Hashing: The symbol table
- 6.2 Hashing Functions, Collision-Resolution Techniques.
- 6.3 File Structure: Concepts of fields, records and files, Sequential, Indexed and Relative/Random File Organization
- 6.4 Indexing structure for index files, hashing for direct files, Multi-Key file organization and access methods.

Suggested Readings/Material:

1. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Publisher-Tata McGraw Hill.
2. Data Structures using C & C++ -By Ten Baum Publisher – Prentice-Hall International.
3. Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub. 2001 ed.
4. Fundamentals of Data Structures in C++-By Sartaj Sahani.
5. Data Structures: A Pseudo-code approach with C -By Gilberg & Forouzan Publisher-Thomson Learning.

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Syllabus
B. Sc. -I (Cloud Computing)

Title of the Course: Laboratory on Introduction to Cloud Computing								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
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DSC-04	BS-CC 122P-A	00	02	02	60	15	35	50

Learning Objectives:

1. Configure various virtualization tools such as Virtual Box, VMware workstation
2. Design and deploy a web application in a PaaS environment
3. Learn how to simulate a cloud environment to implement new schedulers
4. Install and use a generic cloud environment that can be used as a private cloud.
5. Manipulate large data sets in a parallel environment

Course Outcomes (Cos) On completion of the course, students will be able to–

1. Design and Implement applications on the Cloud.
2. Design and implement applications on the Grid.
3. Use the grid and cloud tool kits

Detailed Syllabus:

List of Assignments:

Assignment 1 :Install the Linux Operating System.

Complete the Installation process

Assignment 2:Execute general purpose Linux commands.

- 1) cal 2) date 3) echo 4) printf 5) bc 6) script 7) mailx 8) man 9) clear
 10) passwd 11) who 12) whoami 13) uname 14) tty 15) stty 16) ps 17) kill 18) sleep

Assignment 3: Execute file and Directory manipulation commands.

Execute the following file and Directory manipulation commands along with different options. 1) pwd 2) cd 3) mkdir 4) rmdir 5) ls 6) cat 7) rm 8) mv 9) cp 1) touch 2) more 3) lp 4) file 5) wc 6) cmp 7) comm 8) diff 9) split

Assignment 4: Execute Linux commands for compressing, decompressing, and archiving files.

Execute the following Linux commands for compressing decompressing and archiving files.1) gzip 2) gunzip 3) tar 4) tar -c 5) tar -x 6) zip 7) unzip

Assignment 5 : Change file and directory permissions.

Execute the following commands to change file and directory permissions. 1) ls -l, ls -ld 2) chmod (with all options) 3) chown 4) chgrp

Use the vi editor to create and edit files.

Assignment 6: Use vi editor and execute all editor commands.

Editor commands

Assignment 7 : Use wildcard characters.

Use wildcard characters (e.g., *, ?, []) to list and manipulate specific sets of files within the directory.

Assignment 8: Use of Pipes in Linux.

a) Create a text file with various lines of text. b) Create a complex pipeline by chaining multiple commands together using pipes (|).

Suggested Readings/Material:

1. Richard Blum , Linux command line and shell scripting Wiley India ISBN Number 9 78-1118983843
2. Khalid Husain, Linux Commands for Beginners
3. Pritma Jashnani, A Hand Book on Linux : From Simple commands to Shell Scripting

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		Theory	Practical			CIE	ESE	Total
DSC-04	BS-CC 112P-B	00	02	02	60	15	35	50

Learning Objectives:

- Learning about data structures and algorithms is important. It helps manage data better and makes coding easier for data scientists.
- Analyze step by step and develop algorithms to solve real world problems.
- Implementing various data structures viz. Stacks, Queues, Linked Lists, Trees and Graphs.
- Understanding various searching & sorting techniques

Course Outcomes (Cos)

- Be able to check the correctness of algorithms using inductive proofs and loop invariants.
- Be able to compare functions using asymptotic analysis and describe the relative merits of worst-, average-, and best-case analysis.
- Be able to solve recurrences using the master, the iteration, and the substitution method.
- Become familiar with a variety of sorting algorithms and their performance characteristics (eg, running time, stability, space usage) and be able to choose the best one under a variety of requirements.

Detailed Syllabus:

Assignmnet 1: Introduction to structures & pointers in C.

Assignmnet 2: Stack operations

Write a program to perform PUSH, POP, PEEP & CHANGE operations on Stack.

Assignmnet 3 : Queue Operations

Write a program to implement insertion & deletion in a queue.

Assignmnet 4: Circular Queue Operations

Write a program to implement insertion & deletion in a circular queue

Assignmnet 5: Write a program for linked list insertion, deletion & copy

Assignment 6: Sorting and searching

Write a program to perform:

- Selection sort
- To sort the given number using bubble sort
- Merge sort
- Quick sort
- Sequential and binary search

Suggested Readings/Material:

1. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. Sorenson Publisher-Tata McGraw Hill.
2. Data Structures using C & C++ -By Ten Baum Publisher – Prentice-Hall International.
3. Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub. 2001 ed.
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