Laboratory Manual

(Version 4.0)

for

Cloud Computing Lab.

(MCA-265)

MCA - III Semester

Compiled by:

Dr. Arpita Nagpal

(Assistant Professor, BVICAM, New Delhi)

Bharati Vidyapeeth's
Institute of Computer Applications and Management (BVICAM)
A-4, Paschim Vihar, Rohtak Road, New Delhi-63
Visit us at: www.bvicam.in

Index

List of Abbreviations

BTL	Bloom's Taxonomy Level
CE	Communication Efficacy
CICP	Conduct Investigations of Complex Computing Problems
CK	Computational Knowledge
CO	Course Outcome
DAC	Departmental Advisory Committee
DDS	Design and Development of Solutions
I&E	Innovation and Entrepreneurship
I&T	Individual & Team Work
IQAC	Internal Quality Assurance Cell
LLL	Life-Long Learning
MTU	Modern Tool Usage
PA	Problem Analysis
PE	Professional Ethics
PEO	Programme Educational Objective
PMF	Project Management and Finance
PO	Programme Outcome
SEC	Societal and Envoirnmental Concern

Declaration

Department	:	Department of Computer Science and Applications
Course, Year and the Semester to which Lab is offered	:	MCA - II Year, III Semester
Name of the Lab Course	:	Cloud Computing Lab.
Course Code	:	MCA-265
Version No.	:	3.0
Name of Course/Lab Teacher(s)	:	Dr. Arpita Nagpal
Laboratory Manual Committee	:	1. Mrs. Vaishali Joshi, Chairperson 2. Dr. Ritika Wason, Member 3. Mr. Manish Kumar, Member 4. Mr. Uttam Singh Bist, Member 5. Prof. P. S. Grover, Margdarshak 6. Mr. Amit Sharma, Alumni & Industry Expert 7. Dr. Arpita Nagpal, Concerned Subject Teacher, Convener
Approved by	:	DAC Date:
Approved by	:	IQAC Date:

_____   _____   _____

Signature   **Signature**   **Signature**
(Course Teacher)   (Head of Department)   (IQAC Coordinator)

1. Vision of the Department

To become a centre of excellence in the field of Computer Science and Applications to produce quality professionals in software development.

2. Mission of the Department

M_1 To produce quality software professionals as per global industry standards.

M_2 To foster innovation, entrepreneurial skills, research capabilities and bring all-round development amongst budding professionals.

M_3 To promote analytical and collaborative life-long learning skills, among students and faculty members.

M_4 To inculcate strong ethical values and professional behaviour while giving equal emphasis to social commitment and nation building.

3. Programme Educational Objectives (PEOs)

The PEOs for the MCA programme are as follows:

PEO_1 Exhibit professional competencies and knowledge for being a successful technocrat.

PEO_2 Adopt creative and innovative practices to solve real-life complex problems.

PEO_3 Be a lifelong learner and contribute effectively to the betterment of the society.

PEO_4 Be effective and inspiring leader for fellow professionals and face the challenges of the rapidly changing multi-dimensional, contemporary world.

4. Programme Outcomes (POs)

PO$_1$ Computational Knowledge (CK)

Demonstrate competencies in fundamentals of computing, computing specialization, mathematics, and domain knowledge suitable for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.

PO$_2$ Problem Analysis (PA)

Identify, formulate, and analyze complex real-life problems in order to arrive at computationally viable conclusions using fundamentals of mathematics, computer sciences, management and relevant domain disciplines.

PO$_3$ Design and Development of Solutions (DDS)

Design efficient solutions for complex, real-world problems to design systems, components or processes that meet the specifications with suitable consideration to public health, and safety, cultural, societal, and environmental considerations.

PO$_4$ Conduct Investigations of Complex Computing Problems (CICP)

Ability to research, analyze and investigate complex computing problems through design of experiments, analysis and interpretation of data, and synthesis of the information to arrive at valid conclusions.

PO$_5$ Modern Tool Usage (MTU)

Create, select, adapt and apply appropriate technologies and tools to a wide range of computational activities while understanding their limitations.

PO$_6$ Professional Ethics (PE)

Ability to perform professional practices in an ethical way, keeping in mind cyber regulations & laws, responsibilities, and norms of professional computing practices.

PO7   Life-Long Learning (LLL)

Ability to engage in independent learning for continuous self-development as a computing professional.

PO8   Project Management and Finance (PMF)

Ability to apply knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.

PO9   Communication Efficacy (CE)

Ability to effectively communicate with the technical community, andwith society at large, about complex computing activities by being able to understand and write effective reports, design documentation, make effective presentations, with the capability of giving and taking clear instructions.

PO10   Societal and Envoirnmental Concern (SEC)

Ability to recognize and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities applicable to professional computing practices.

PO11   Individual & Team Work (I&T)

Ability to work in multi-disciplinary team collaboration both as a member and leader as per need.

PO12   Innovation and Entrepreneurship (I&E)

Ability to apply innovation to track a suitable opportunity to create value and wealth for the betterment of the individual and society at large.

5. Institutional Policy for Students' Conduct

The following guidelines shall be followed:-

5.1   All the students in their introductory Lab. shall be assigned a system, which shall be their workplace for the complete semester. Students can store records of all their Lab. assignments on their individual workstations.

5.2   Introductory Lab. shall include an introduction to the appropriate software/tool, followed by a basic Introductory Assignment having Practice Questions. All the students are expected to complete this assignment within a week time, as the same shall be assessed through a Lab. Test.

5.3   Each week the instructor, in parallel to respective topics covered in the theory lecture, shall assign a set of practical problems to the students in form of Assignments (A, B, C, ...). The problems in these assignments shall be divided into two parts. The first set of Problems shall be compulsory for all the students and its record need to be maintained in the Prcatical File, having prescribed format, as given in Appendix-A. All the students should get the weekly assigntment checked and signed in thePractical File by the respective teacher in the immediate succeeding week.The second set of problems is Advanced Problems and shall be optional. Student may solve these advanced problems for their further practice.

5.4   Cellular phones, pagers, CD players, radios and similar devices are prohibited in the classrooms, laboratories and examination halls.

5.5   Laptop-size computers/Tablets may be used in lectures for the purpose of taking notes or working on team-projects.

5.6   The internal practical exam shall be conducted towards the end of the semester and shall include the complete set of Lab exercises conducted as syllabus. However, students shall be assessed on continuos basis through

overall performances in regular Lab. Tests, both announced and surprise and viva-voce.

5.7   The respective faculty shall prepare and submit sufficient number of practical sets of computing problems to the Dean (Examinations), atleast two weeks prior to the actual exam. It is the responsibility of the faculty to ensure that a set should not be repeated for more than 5 students in agiven batch.

5.8   The exam shall be of 3 hours duration where the student shall be expected to implement solutions to his/her assigned set of problems on appropriate software tools in the lab.

5.9   Once implemented, student shall also appropriately document code implemented in the assigned answer sheets, which shall be submitted at the end of the examination. All the students shall also appear for viva- voce examination during the exam.

5.10   Co-operate, Collaborate and Explore for the best individual learning outcomes but copying or entering into the act of plagiarism is strictly prohibited.

6. Learning Outcomes of Laboratory Work

The student shall demonstrate the ability to:

- Verify and Implement the concepts and theory learnt in class.

- Code and use Software Tools to solve problems and present their optimal solutions.

- Apply numerical/statistical formulas for solving problems/questions.

- Develop and apply critical thinking skills.

- Design and present Lab as well as project reports.

- Apply appropriate methods for the analysis of raw data.

- Perform logical troubleshooting as and when required.

- Work effectively as a member of a team in varying roles as need be.

- Communicate effectively, both oral and written.

- Cultivate ethics, social empathy, creativity and entrepreneurial mindset.

7. Course/Lab Outcomes (COs)

CO_1 Demonstrate the cloud platform on an appropriate tool (BTL2)

CO_2 Apply virtualization n in clouds (BTL3)

CO_3 Distinguish between at least two cloud-based platform (BTL4)

CO_4 Choose and implement best security practices of cloud (BTL5)

CO_5 Create automation on load balancing in cloud (BTL6)

8. Mapping of CO's with PO's

Table 1: Mapping of CO's with PO's

PO/CO	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_{10}	PO_{11}	PO_{12}
CO_1	√	√	√		√							
CO_2	√	√	√	√	√	√				√		
CO_3	√	√	√	√	√	√				√		
CO_4	√	√	√	√	√	√				√	√	
CO_5	√	√	√	√	√	√	√	√	√	√	√	√

9. Course/Lab Description

Course (Lab) Title	:	Cloud Computing Lab.
Course (Lab) Code	:	MCA-265
Credits	:	01
Pre-requisites	:	Computer Networks, Linux, Web Technologies and Computer Architecture
Academic Session	:	August to December
Contact Hours/Week	:	02 (01 Lab of 02 Hours/Week)
Internal Assessment	:	40 Marks
External Assessment	:	60 Marks

10. Grading Policy

Item	Points	Marks	Remarks
Weekly Lab Assignments including Practical Files	10	10	Closed Book/Open Book
Internal End-Term Practical Examination	20	10	Closed Book
Viva-Voce	10	10	Closed Book
Project	10	10	Innovative Applications of Programming
External End-Term Examinations	60	60	Closed Book (conducted and evaluated by the University)
	Total	**100**	

11. Lesson Plan

Week No.	Lab No.	Topics/Concepts to be Covered	Reference of Lab Manual
1.	1.	Creating Virtual machine in AWS	P1
2.	2.	Virtualization and Hypervisor -I	P3
3.	3.	Virtualization and Hypervisor-II	P2
4.	4.	Distinguishing the cloud platforms	P4
5.	5.	Learn EC2 instances on AWS Cloud	P1, P4, P6
6.	6.	Learn how to manage storage in AWS Cloud	P5
7.	7.	Learn How to manage Identity using IAM tool in cloud	P6
8.	8.	Containers and Docker in cloud	P7
9.	9.	To create a load balancer using the AWS Management Console	P8
10.	10.	Install Security and permissions to the EC2 instances of AWS.	P8
11.	11.	Knowledge of Different cloud platforms and providers	P9

12. Lab Problems

P1	*P1.1* Find a procedure to set up an account with AWS, services it offers. Support your procedure with screenshots. *P1.2* Demonstrate the steps with screenshots to add a new instance and create a virtual machine in Amazon Web Service using EC2.
P2	You are requested to manage multiple OS like Windows 7, Ubuntu 18.04, and CentOS concurrently in single host machine. The host machine may have any of the following host OS for Hypervisor-II: 1. MS Windows 7 or later 2. Mac OSX or later Linux (Ubuntu 18.04 (min), Fedora, RedHat or any Linux basedGUI)
P3	*P3.1* Install the VMWare ESXi 6.5 either in VMWare Workstation or Oracle Virtual Box. *P3.2* Install multiple guest OS like Ubuntu Server, CentOS, Fedora etc. and manage the guest OS.
P4	Suppose you are an AWS cloud consultant. Mr. Hemant came to you with following constraints: 1. Need to deploy a basic webapp to demonstrate the importance of cloud. 2. Apache Web Server 2 must be installed on EC2 Machine (having Ubuntu 20.04). 3. SSD must be less than 30GB. 4. Traffic must be covered from all over the web. SSH secured login only from the IP provided by Mr. Hemant.
P5	*P5.1* Create notes on Cloud deployment models in word file. Upload this file as a storage on cloud using S3 service of Amazon. *P5.2* Create a URL such that anyone with the link can access your notes. Update your file on local system, also update it on S3 storage keeping in mind its previous version is not lost.
P6	Assume, you are technical advisor in your organization. The organization's vision is to provide use the cloud services in AWS. You are directed to give Roles, authentication and authorizations to employees using a particular service of cloud.
P7	*P7.1* Install Docker Engine in Ubuntu or Windows. *P7.2* Demonstrate the following in Docker: a) Container Management: Create, Update, Delete, Remove the container b) Network on Docker

	c) Dockerfile d) Docker-compose e) Docker Swarm
P8	Demonstration Elastic Load balancing using ECS in AWS.
P9	Assume you have started your own entrepreneur and your work is increasing at a high speed, you employ more workers. Now you will take the help of cloud providers. Give the details of different providers.

13. Advanced Lab Problems

AQ1	Create a virtual network for exchanging the packets or information within a virtual network. Demonstration must have two virtual machines, for instacnce, A and B are in a network called vNET0 and one machine C is in another network called vNET1. Now shift virtual machine A from vNET0 to vNET1 and demonstrate the communication between A and C.
AQ2	Host a static website in S3.
AQ3	Deploy a dummy project using elastic beans in AWS.
AQ4	Suppose you are a solution architect of your organization. You are requested to deploy at least one instance of web-based application i.e. service, in all the machines (let 100 machines) in a given cluster using docker orchestration. The web based application has following constraints: 1. Create a container having NodeJs version 14.12 for backend server (on 25 Machines) 2. Create another container installed ReactJS 16.0.0 for the frontend server (on 60 Machines) 3. Create a mysql database server any version. (on 15 machines) Design and implement an appropriate solution for the given problem.
AQ5	Create a cloud based solution for MX player with following constraints: 1. Storage and Streaming of videos 2. Auto-scaling while a new series released. Provide the architectural diagram for the proposed solution. Steps must be included in your sheet.
AQ6	Create a cloud based solution for imagur.com. The imagur.com have the collection of 100TBs of Images i.e. free of cost to every anonymous user. Users may upload the images from the web-application interface. Any user may access any image at free of cost. Provide the solution for the same with following constraints: User may access any image around the globe without any delayed. It means user accessing the image from the USA having the same time to user who is accessing the same image from the INDIA.

Appendix A: Index of Lab File

Exp. No.	Description of Lab Exercise	BTL	CO	Date	Page No.	Sign. Of teacher
1.						
2.						