Source book
for
Certificate Course in Advanced Web Technology

Source Book for Certificate Course in Advanced Web Technology **Batch:**

1. **Eligibility:** Any Engineering /Science graduate with mathematics up to 10+2 level

2. **Course Pre-requisites:** Sound knowledge of Computing Fundamentals and Fundamentals of Programming.

3. **Course Focus:** The objective of this course is to provide the student with an expertise in Website development.

4. **Teaching Schema:**

Sl. No.	Modules	Hours
1	Database Concepts	20
2	Web Programming – II (PHP, Java scripts)	80
3	Laravel Framework (PHP)	40
4	DevOps	20
5	GitHub	40
6	Continuous Integration/Continuous Delivery	80
7	Project	40
	Total	**320**

5. **Suggested Schedule**

Week	Teaching Sessions & Academic Activity
1	Database Concepts (20/20)
2	Web Programming – II (PHP, Java scripts) (20/80)
3	Web Programming – II (PHP, Java scripts) (20/80)
4	Web Programming – II (PHP, Java scripts) (20/80)
5	Web Programming – II (PHP, Java scripts) (20/80)
6	Laravel Framework (PHP) (20/40)
7	Laravel Framework (PHP) (20/40)
8	DevOps (20/20)
9	GitHub (20/40)
10	GitHub (20/40)
11	Continuous Integration/Continuous Delivery (20/80)
12	Continuous Integration/Continuous Delivery (20/80)
13	Continuous Integration/Continuous Delivery (20/80)
14	Continuous Integration/Continuous Delivery (20/80)
15	Project (20/40)
16	Project (20/40)
17	1st Day – Exam, Two Days – Project Evaluation, 5th Day – Re-exam

6. **Session wise Breakup**
Note: Each single session is of two hours duration for all subjects mentioned below.

Database Concepts (10 Theory + 10 Lab Hrs)
Session 1:
- Introduction to DBMS – What is DBMS, Its need
- Areas where DBMS are used
- Types of DBMS:
- Codd's 12 rules for a Relational Database (conclusion)
- Need for Normalization.

Session 2:
- Various normalization forms1st normal form, 2nd normal form
- 3rd normal form,
- Introduction to 4th, BCNF, etc
- Need for Denormalization

Session 3 & 4 & 5:
- DDL Commands
- DML & DCL Commands

Session 6 and 7:
- Inbuilt Functions
- Grouping Things Together (Group By, Having Clause)
- Set Operators (UNION, UNION ALL, INTERSECT, MINUS)

Session 8 & 9:
- Subqueries
- Joins

Session 10:
- Indexes and Views

Assignment – Lab:
- SQL Practice Questions:-
  - Correlated Queries, SubQueries, Outer Joins
- Number Functions: -
  - Single Value Functions:NVL,ABS,CEIL etc
  - Group Value Functions:AVG,COUNT,MAX etc
- SQL Practice Questions:-
  - Queries containing Group By, Having Clause and set operations
  - SQL Practice Questions Including:-
  - DDL Commands: Create/Alter/Drop/Grant/Revoke
  - DML Commands: Select/Insert/Update/Delete/Truncate
  - DCL Commands: RollBack Commit

Web Programming – II (PHP, Javascript) (40 Theory + 40 Lab Hrs)

Session 1, 2 & 3: JavaScript
- Introduction to JavaScript
- What is JavaScript?
- Advantages of using Java Script on client side over VB Script
- How to embed JavaScript in HTML Page?
- How it works?
- How to handle events?

- Variables in Java Script
  - "Var" type
  - Scope of variables
- Array in Java Script
- Using array methods (length, reverse, sort etc)

Session 4 & 5: JavaScript (Cont…)

- Creating Objects in Java Script
  - Date
  - String
  - Using Object methods
- Operators
  - Arithmetic
  - Logical
  - Bitwise
  - this
  - new
  - delete
- Control and Looping Statements

Session 6 & 7: JavaScript (Conti.)
Functions

- Common Events
  - onClick
  - onLoad
  - onMouseOver
  - onReset
  - onSubmit
- Different functions:
  - alert(), prompt(), confirm().
  - eval
  - isFinite
  - isNaN
  - parseInt and parseFloat
  - Number and String
  - escape and unescape
- DOM
- Object hierarchy in Java Script
- Working With
  - Window
  - Form
  - Document
  - Frame

Session 8:

- Introducing to jQuery
- Selecting the elements
- Bringing pages to life with jQuery

Session 9 & 10:

- JQuery Events
- Energizing pages with animations and effects
- DOM with jQuery utility functions

Session 11:

- Introduction of UI Scripting Framework

Session 12 & 13: PHP

- Basic rule of PHP
- PHP in action
- Working with text, variable and numbers
- Making decisions and repeating yourself
- Arrays
- Working with Arrays
- Looping through array
- Sorting arrays
- Functions

Session 14 & 15: PHP

- Making web forms
  - Form processing with functions
  - Validating data
  - Display default value
- Working with cookies and Sessions
  - Login and User Identification
  - Parsing, display date and times

Session 16,1 7 & 18: PHP

- Storing information with databases
  - Connection to database
  - Create a table
  - Inserting and retrieving data from database
  - Inserting and retrieving form data safely
  - MySQl with out PEAR DB
- XML
  - Generating and Parsing an XML Document
  - Advanced XML processing
- Debugging
  - Fixing parsing error and database error

Session 19 & 20: PHP

- Working with files
  - File permissions
  - Reading and writing files
  - Working with CSV Files
  - Checking for errors
- Command line PHP
- Running Shell command
- IMAP, POP3 and NNTP
- Graphics, PDF
- Sending and receiving mails

Assignment – Lab:

- Implement factorial in Java Script.
- Write a program to sort input strings.
- Display a complete date with the name of the Session and name of the month
- Validate the above resume form using the Java Script

- Write a simple program in PHP.
- Write a program in PHP that uses the increment operator (++) and combined multiplication (*=) operator to print out the numbers from 1 to 5 and powers of 2 from 2(2^1) to 32(2^5)
- Write a simple program to remembering user with cookies and Sessions
- Write a program to implement various databases queries.
- Write a program to implement various file operation.
- Write a program to implement Command line PHP
- Write a program in PHP for Sending and receiving mails

Laravel Framework (PHP) (26 Theory + 14 Lab Hrs)

Session 1 & 2: Web Services

- Creating a Windows web service
- Web services and Ajax
- JPSpan
- DWR

Session 3 & 4: Application Deployment

- Deployment of application on the World Wide Web
- Installation of PHP application/website on LAN

Session 5: Application Maintenance

- How to do application maintenance
- Effects of maintenance on other web pages

Session 6 & 7: Introduction to Laravel

- What is MVC and its benefits
- Why Laravel Framework
- Laravel features
- How to update local host PHP version
- How to install Laravel
- Laravel File Structure

Session 8 & 9: CRUD Fundamental

- Create page by Laravel Material Design
- Create database and configuration
- Create Laravel Routes
- Create Laravel Controller
- Create Laravel Model and Migrate
- Design Create Page
- How to perform CRUD operations
- How to add pagination

Session 10 & 11: Default Authentication System

- Create database and configuration
- Default authentication login, register
- Default authentication reset password
- Default authentication change password
- Update authentication page

Session 12 & 13: Multi-authentication User and Roles

- Create database and configuration
- Design database table
- Multi-auth user and roles
- What is middleware

- How to use middleware
- Multi-auth login with middleware
- Update register form

DevOps (20 Theory Hrs)

Session 1, 2 & 3: Foundational Terminology

- Software development lifecycle
- The Waterfall approach
- Agile methodology
- Operational methodologies: ITIL
- Development, testing, release and deployment concepts
- Provisioning, version control
- Test-driven development, feature-driven development
- Behaviour-driven development

Session 4, 5 & 6: Why and What is DevOps

- Problems of delivering software
- Principles of software delivery
- Need for DevOps
- Evolution of DevOps
- DevOps practices

Session 7 & 8: DevOps Lifecycle and Culture

- The Continuous DevOps lifecycle process
- DevOps culture
- Case study

Session 9 & 10: DevOps Dimensions

- Three dimensions of DevOps
- DevOps - Tools
- DevOps - Process
- DevOps - People
- Tools/technology as enablers for DevOps

GitHub (20 Theory + 20 Lab Hrs)

Session 1: Introduction

- What is Git?
- Git vs GitHub
- Installing git

Session 2: The Terminal

- Introduction to Terminal
- Moving between directories
- Working with files and directories

Session 3 & 4: Basics

- The Git workflow
- Creating a new repository
- Adding & removing files
- Commit
- Checkout
- Revert & reset
- Types of Git reset
- Creating a .gitignore

Session 5: Git Branches

- What are branches
- Working with branches
- Editing branches
- Merging branches

Session 6 & 7: GitHub

- What is GitHub?
- Creating a GitHub account
- Creating GitHub repository
- Viewing other repositories
- Download GitHub repository

Session 8: Using Git Remotely

- Creating a new remote repository
- The Push & Pull system
- Pushing & pulling to & from a GitHub repository
- Deleting remote branches

Session 9 & 10: Git GUI with SourceTree

- What is SourceTree
- Installing SourceTree
- Setting up a new repository
- Introduction to the SourceTree environment
- Stage & commit
- Interaction in SourceTree
- Create & remove branches
- Merge branches
- Push/pull requests

Continuous Delivery/Continuous Integration (40 Theory + 40 Lab Hrs)

Session 1 & 2: Continuous Build

- Manage dependencies
- Automate the process of assembling software components
- Use of build tools – Maven, Gradle

Session 3 & 4: Code quality

- Unit testing
- Enable fast & reliable automated testing
- Setting up automated test suite – Selenium
- Continuous code inspection – code quality
- Code quality analysis tool – SonarQube

Session 5 & 6: Continuous Integration (CI)

- Introduction to CI
- CI - Version control, automated build, test
- Prerequisites for CI
- CI practices
- Team responsibilities
- CI tool – Jenkins
- Jenkins architecture

Session 7 & 8: Continuous Delivery (CD)

- Integrating source code management, build, testing tools etc. with Jenkins – plugins
- Artifacts management
- Setting up CI pipeline
- CD to staging environment
- Self-healing systems

Session 9 & 10: Deployment Automation

- Deployment pipeline
- Human-free deployments
- Implementing and automating the deployment process
- Deploying to testing environments
- Releasing software into production

Session 11 & 12: Continuous Deployment

- Environment-based release patterns
- Rolling back deployments and zero-downtime releases
- Blue/green deployment
- Rolling upgrade
- The canary release pattern – dark launches

Session 13 & 14: Continuous Monitoring

- Need for continuous monitoring
- Goals of monitoring
- Challenges of monitoring under continuous change
- Alert management

Session 15 & 16: Feedback & Optimization

- Analytics
- Continuous customer feedback
- Optimization
- Use of ELK stack

Session 17 & 18: Managing Infrastructure

- Infrastructure as code
- Managing infrastructure and environments
- Environment provisioning

Session 19 & 20: Configuration Management

- Automating and managing server provisioning
- Configuration management tools
- Managing on-demand infrastructure
- Auto scaling

7. List of Reference Books

Name of the Module	Title of the Book	Author/Publication	Edition	ISBN
Database Concepts	Mysql: The Complete Reference	Paperback/ TMH	2004	9780070586840
	Php And Mysql 24-hour Trainer PB	Paperback/ Wiley	2011	9788126533473
	Upgrading to PHP?5 (Covers MySQL 4.1)	Paperback	2004	9788173666209
Web Programming – II (PHP, Java scripts)	Php: The Complete Reference	Steven Holzner /TMH	2007	9780070223622
	Beginning PHP and MySQL: From Novice to Professional	W. Jason Gilmore/Apress	2010	9788184897456
	Head First PHP & MySQL	Lynn Beighley/Shrof	2009	9788184046588
Laravel Framework (PHP)	PHP Project for Beginners	Sharanam Shah/X-Team	2010	9788184048445
	Laravel: Up & Running, 2e: A Framework for Building Modern PHP	Matt Stauffer/O'Reilly	2019	9781492041214
DevOps	DevOps: A Software Architect's Perspective (SEI Series in Software Engineering)	Len Bass, Ingo Weber, Liming Zhu / Addison Wesley	2015	9780134049847
Continuous Integration/Continuous Delivery	Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation	Jez Humble, David Farley	2011	9780321601919

8. Evaluation Guidelines

8.1. Evaluation

Evaluation is a necessary and essential part of conducting the C-DAC Certificate Course in Advanced Web Technology, as it provides important feedback and inputs to both the institute as well as the student. The institute gets an idea about the relative performance of each student, which also serves as feedback about the design and conduct of the programme. The student gets a clear picture of his academic standing, individually and in comparison to his fellow students.

In order to ensure timely and efficient evaluation and certification of all students, the following guidelines are being issued and should be followed religiously.

8.2. Evaluation Methodology

8.2.1 Each centre should have a Designated Responsible Member (DRM) for Evaluation.

8.2.2 The DRM Evaluation would be responsible for coordinating all activities relating to evaluation at the training centre and for communicating with CDAC ACTS, Pune.

8.2.3 Evaluation is a compulsory part of the process of obtaining Certificate Course in Advanced Web Technology. All students are required to pass in each subject of the course in order to be eligible to receive the C-DAC Certificate.

8.2.4 The faculty of every subject should outline the objectives of the evaluation to be conducted for that particular subject, so as to enable the student to prepare himself/ herself properly.

8.2.5 The performance of students is constantly evaluated through surprise quizzes, hourly examinations, assignments throughout the term, submission of term reports, presentations and final examinations at the end of the course.

8.2.6 Mode of exams will be in online / offline, but prior information will be given by C-DAC, ACTS about the mode of the exam and it will be final.

8.3. EVALUATION METHODS

8.3.1 Course End Evaluation

After completion of the all subjects, a written examination CEE (Course End Examination) will be held, which will test the knowledge of the students of each subject and it is a compulsory part of the evaluation. Conducting CEE involves performing duty with responsibility. A small mistake in the process may hamper the whole system. Everyone has to play their role in an effective manner. It is a joint effort work which has to be carried out in a combined way. Right from receiving question paper from ACTS, C-DAC to sending the OMR answer sheet (in case of offline exam) and the response file (in case of online exam) for evaluation dealt with lot of responsibility.

ACTS, C-DAC in its pursuit of excellence, believes in providing a congenial atmosphere to the students during all exams in order to get them to perform at their optimum level. However, there are certain norms which the students are expected to be aware of and observe both in letter and spirit. These norms are:

8.3.1.1 Impersonation may lead to permanent expulsion from the Institute.

8.3.1.2 Cell phones are strictly prohibited in the exam hall/room.

8.3.1.3 Valid ID card is mandatory for entry to the exam room / hall.

8.3.1.4 Punctuality is most important at all times. Students are expected to check their exam location and be seated at least 10 minutes prior to the exam time.

8.3.1.5 In case of offline exam, as per ACTS, C-DAC policy all question papers are to be returned along with the answer script.

8.3.1.6 Students are required to bring their own stationary as no lending or borrowing is permitted during examination.

8.3.1.7 Programmable calculators or any other kind of electronic devices are strictly prohibited inside the exam area.

8.3.1.8 Indiscipline in the exam hall/ room will not be tolerated.

8.3.1.9 Possession of any written material related to the subject or communication with their fellow students, will result in disciplinary actions.

8.3.1.10 A student must score a minimum of 40 percent marks, in order to successfully clear the course.

8.3.1.11 It is recommended that the students should ensure 100% attendance for each course. 10% absences are permissible, only in case of illness, or emergencies. These have to be approved by the Centre Head. Approval is contingent upon the evidence provided.

8.3.1.12 There will be 150 questions to answer in 3 hours duration in CEE as per the following distribution mentioned in Table – 1.

Table – 1

Sl. No.	Module Name	Hours	No. of Questions
1	Database Concepts	20	15
2	Web Programming – II (PHP, Java scripts)	80	45
3	Laravel Framework (PHP)	40	20
4	DevOps	20	10
5	GitHub	40	20
6	Continuous Integration/Continuous Delivery	80	40
	Total	**320**	**150**

8.3.2 GENERAL GUIDELINES FOR AWARD OF GRADES:

The marks of obtained in the CCEE shall be calculated to get total marks out of 100. The rounding off shall be done on the higher side. The grades shall be awarded on the basis of cut off in the absolute marks, as mentioned in Table – 2.

Table 2

Lower range of marks	Grade	Upper range of marks
91	≤ A+ <	100
81	≤ A <	90
71	≤ B+ <	80
61	≤ B <	70
51	≤ C+ <	60
41	≤ C <	50
0	≤ F <	40

8.3.3 Guidelines of CEE:

CEE will be conducted normally before the commencement of Project work of the course.

The written examination should be of 180 minutes duration. It should consist of objective questions. A typical objective type exam paper should contain the following types of questions: –

- Multiple choice
- Yes or No
- True or False

Objective questions are useful in testing the recognition and recall abilities of students. They also help in keeping the exam short and easier to evaluate.

For the pure objective type question papers, there will be 150 objective type questions with 4 maximum answer options having only one correct option. The value of each objective type question is of one mark only. There will not be any negative marks for the wrong answers given by the students.

8.3.4 Guidelines for setting Question Papers:

While setting the question papers for theory Exam the following weightages should be assigned as per the difficulty level of the questions.

Levels	Requirements	Weightage
Level A – Easy	Requires elementary knowledge which may be obtained by attending all lectures and completion of mandatory lab assignments	25%
Level B – Intermediate	Requires thorough study of all course material, attendance at all lectures and completion of mandatory assignments	50%
Level C – Difficult	Requires study and lab work beyond the prescribed course material and mandatory assignments	25%

8.4 Guidelines for generating questions:

8.4.1 Question paper setter has to use sample paper format provided by C-DAC, ACTS Pune

8.4.2 Mention the subject name without fail.

8.4.3 Language of the question should be easy to understand.

8.4.4 The answers must have relevant objective type choices and “only one” correct answer.

8.4.5 The questions must be prepared by referring appropriate books, reference books, reference material, and course material having good information.

8.4.6 The question must be created by the domain expert afresh and should not be copied directly from any book, website, existing previous question papers etc.

8.4.7 The question should be unique and should have not been published anywhere.

8.4.8 Please mention the source of the question wherever possible, as it may help us in referring the same for detailing if required.

8.4.9 The caliber of the question should suffice the growing need of competition.

8.4.10 The question paper should have questions covering the entire syllabus.

8.4.11 The questions have to be typed in MS Word with “Arial” having letter size 12 point. Do not bold any letter, word or sentence in any part of the question paper.

8.4.12 It is essential to give password to the word document and send/tell the password separately.

8.4.13 It is essential that utmost care is taken at your end to maintain the secrecy of the soft copy at all time.

8.4.14 An expert team will review all questions. The questions will be filtered as per following:

- If the question is incomplete
- If the answer of the question is wrong
- If the question is not there in the syllabus
- If the question appears more than once
- If the question is too lengthy
- If the question is irrelevant
- If the options to the questions are irrelevant

8.4.1 Template for generation of Questions

Date:

Question generated by: Mr. /Ms.

Subject Name:

Q. No.
Question: <Text of the question>

Answer Choices
A:
B:
C:
D:

Difficulty Level: Easy / Intermediate / Difficult

Reference: (Name of books)
(If question taken from book) (Mention name of the book, author, ISBN)
Total Number of Questions Generated: _____

8.4.2 Template for Answer Key:

Module name:			
Question No.	**Answer Keys**	**Question No.**	**Answer Keys**
1		|	
2		|	
3		141	
4		142	
5		143	
6		144	
7		145	
8		146	
9		147	
10		148	
|		149	
|		150	

8.4.3 Evaluation of answer papers:

For Offline mode: Use of OMR sheets will be useful for processing the result of multiple choice exams. OMR is an effective way to collect data, process for the result and also it takes less time with greater accuracy in less effort. Centres need to follow the best way for scanning the OMR sheets, process the result and publish the result. Centres which are not using OMR can user OCR to conduct the exams and evaluate the students. Centre which are not using OMR or OCR can evaluate the students manually and process the result.

For Online mode: Course end exam will be through online s/w. Evaluation will be through that Exam s/w.

If a student requests for re-evaluation then the student has to pay `150 /- and it should be routed through training centre. The Re-evaluation fee should be paid to respective C-DAC training Centres, in case of Authorized Training Centres associated to C-DAC, Pune, payment to be made in favour of "C-DAC, ACTS" and payable at Pune. (This is applicable only for theory exam)

8.5 Moderation:

Grace marks would be awarded as per the methodology below:

8.5.1. Maximum of 4% of total term end theory exam marks can be awarded to a candidate.

S No.	Name of the course	Total Marks	Maximum grace marks for the course
1	Certificate Course in Advanced Web Technology	140	6

On completion of the moderation exercise the revised marks should be updated in the marks database.

8.6 Re-examinations:

The following conditions will be applicable for the course end re-exam:

8.6.1. Students who do not appear for an exam on the scheduled date will not have an automatic right to re-examination. Only those students who, in the opinion of the centre/course coordinator have a genuine reason for being absent may be allowed to appear for a re-exam.

8.6.2. Students who have failed an exam may be allowed to appear for a re-exam.

8.6.3. The re-exam should be conducted following the same process as the regular examination.

8.6.4. Students, who failed/remained absent in the Course End Examination conducted by C-DAC, shall be allowed to appear in the re-examination only once.

8.6.5. Students who remain absent or fail in the re-examination will not get any further chance for appearing for a third attempt or further. In such case the candidate can receive the Performance Statement and the certificate of participation without any grade.

8.6.6. On evaluation of their answer sheets 20% of the marks obtained by the students will be deducted (towards de-rating for re-examination) for arriving at the final score, i.e. in order to clear the module test the student has to score a minimum of 50% marks instead of 40%.

8.7 Project Module:

8.7.1. Project work should be start as soon as possible.

8.7.2. After that students should be ready with all mandatory documents with database design and then completion of all teaching modules they can do the project.

8.7.3. Performance in the Project module will be awarded in grade. The Project grade will be mentioned separately on the certificate & will have no effect on the overall grade obtained by a student.

8.7.4. Students may do industry-sponsored projects, but will be required to do the project work within the centre.

8.7.5. Evaluation of the Project module will take place as following:

8.7.5.1. Internal evaluation will be take place at mid of the module

8.7.5.2. External evaluation will take place at the end of the module

Based on both evaluations, final grade will be awarded & communicated to C-DAC ACTS, Pune

8.7.6 Guidelines for Project Evaluation

Evaluation of Project work needs to be carried out as per the following guidelines:

a. Literature study.
b. Submission of abstract for their colloquium/seminar/project work along with the references.
c. Submission of the detailed work report
d. Two presentations each for 15 minutes on the work done restricted to 15 – 20 slides followed by evaluation.
e. The evaluation for 100 marks will be split up as follows:

i.	Literature survey	10
ii.	Contents of the project work	20
iii.	Contents Flow of Presentation	15
iv.	Communication and Presentation Skills	20
v.	Depth of Knowledge in the topic	15
vi.	Viva Voce	15
vii.	Attendance	5

f. Soft copy of the presentation should be submitted to C-DAC, ACTS, Pune

8.8 Ensuring Security of Evaluation data/records:

8.8.1 Ensure that all data relating to evaluation of students is stored in a secure place that cannot be accessed by unauthorized personnel.

8.8.2 All question papers must be prepared and stored in a separate area specifically designated for the purpose.

8.8.3 Whenever any external faculty sets a question paper, ensures that he should follows the guidelines given by C-DAC ACTS Pune.

8.8.4 Ensure that only one copy of any question paper is prepared in physical (printed) form for review and revision.

8.8.5 When the question paper is finalized, print out one master copy and gets it signed by the paper setter, Reviewer and DRM Evaluation.

8.8.6 Prepare required number of photocopies of the question paper and store them in a safe and secure location before the exam.

8.8.7 The data relating to evaluation of students, such as soft copies of question papers and answer keys, student marks database and performance statements etc. must be kept in a separate domain/directory which is accessible only to authorized personnel. Ensure that the data is regularly backed up.

8.8.8 The question papers for the theory as well as the laboratory examinations at all the centres will be set by CDAC, ACTS Pune. The centres according to guidelines provided by C-DAC, ACTS Pune, will conduct the evaluation of the laboratory and assignments locally.

Note: The Evaluation Guidelines, Rules and Regulations issued by C-DAC, ACTS – Pune from time to time shall be binding on all the centers and all the students. C-DAC, ACTS, Pune reserves the right to add, modifies or deletes any or entire contents of this document at any point of time without giving any notice. It's the responsibility of the centre coordinator to inform such changes to the students in form of a formal notice with a duly signed copy to C-DAC, ACTS, Pune.

9 Requirements (S/W and H/W)

Computing Facilities for C-DAC Certificate Course in Advanced Web Technology	
A. Servers	
1. Unix / Linux / Server	
2. Windows 2008 / Windows 2012	
3. Application / Dummy Servers Configured for various modules	
Severs Configuration	
1. Processor (min 3.2 Ghz)	
2. RAM (min 8 GB)	
3 HDD (min 500 GB)	
4. Network Card	
5. AGP Card with 4/8 MB VRAM	
6. 2 Serial ports, 1 parallel port, 104 Keys Keyboard.	
7. DVD RW Drive	
B. Clients Machines Configuration	
1. Processor (Min 3.2 GHz)	
2. RAM (Min 4 GB)	
3. HDD IDE / EIDE (min 250 GB)	
4. AGP-64 bit Card with 8 MB / 4MB VRAM	
5. PCI Network Card 10/100 Base T, UTP Ethernet	
6. Multimedia Kit	
C. Network	
1. 10/100 Base T UTP Hub(s)	
2. UTP CAT-5 Cabling with RJ-45 connectors	
3. UTP Patch Cables	
D. Communication and Internet	
1 Internet Access	
2. ISDN Connectivity	
3. Modem 512 KBPS	
E. Printers	
1. Laser Printer	
F. Additional Lab Equipments	
1. Amplified Speakers, Headphones & Mikes	
2. Hi-Lumen OHP	
3. Video Projector (XGA / SVGA Compatible)	
4. TWAIN Compliant Color Scanner	
G. Module Specific Software Environments, Operating Systems and Hardware	
Database Concepts	MySQL
Web Programming – II (PHP, Java scripts)	PHP, Eclipse
Laravel Framework (PHP)	IIS, Apache, Tomcat
	Docker Desktop, WSL2
Continuous Integration/Continuous Delivery	Maven, Selenium, SonarCube, Jenkins, ELK Stack, Puppet, Chef, Ansible