Curriculum for

POST GRADUATE DIPLOMA COURSE
In COMPUTER APPLICATION
For the State of Uttar Pradesh

Prepared by:

IRDT, Kanpur

Approved By:

BTE,UP,LUCKNOW

APPROVED IN CDC COMMITTEE MEETING OF BTE,UP,LKO DATED:26-09-2021
@RASHMI SONKAR

CONTENTS

PREFACE

An important issue generally debated amongst the planners and academician's world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization have created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and open economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by the State Board of Technical Education, UP to revise the existing curricula of diploma programmes as per the needs of the industry and making them NSQF compliant, are laudable.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected from the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

Manoj Kumar
Director
Institute of Research Development & Training
Kanpur, U.P.

ACKNOWLEDGEMENTS

We gratefully acknowledge the guidance and contribution received from the following persons:

1. Sh. Alok Kumar-III, IAS, Secretary, Technical Education Department, U.P. Govt.

2. Sh. Sunil Kumar Chaudhary, Special Secretary, Technical Education Department, U.P. Govt.

3. Sh. Manoj Kumar, Director, Technical Education, UP & I.R.D.T., Kanpur, for taking keen interest in the review of this curriculum.

4. Secretary, Board of Technical Education, UP for initiating this project of review of curriculum.

5. All the participants from industry/field organizations, engineering colleges, polytechnics and other technical institutions for their professional inputs during curriculum workshops.

6. Faculty/Subject Experts from U.P. Government polytechnics

Coordinator
Institute of Research Development & Training,
Kanpur, U.P.

1. SALIENT FEATURES OF Post Graduate DIPLOMA IN COMPUTER APPLICATION

1)	Name of the Programme	:	P.G. Diploma in Computer Application
2)	Duration of the Programme	:	Two year (Four Semesters)
3)	Entry Qualification	:	Graduation or equivalent NSQF Level as Prescribed by State Board of Technical Education, UP
4)	Intake	:	60 (or as prescribed by the Board)
5)	Pattern of the Programme	:	Semester Pattern
6)	NSQF Level	:	Level - 8
7)	Ratio between theory and Practice	:	1 : 1.5 (Approx.)

8) Industrial Training

One Month of industrial training is included after IInd semester during summer vacation. Total marks allotted to industrial training will be 50.

9) Student Centred Activities

A provision of 3-6 hrs. per week has been made for organizing Student Centred Activities for overall personality development of students. Such activities will comprise of co–curricular activities such as expert lectures, self study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and other cultural activities, disaster management and environmental safety etc.

10) Project work

A project work in the 2nd semester has been included in the curriculum to enable the students to get familiar with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

2. EMPLOYMENT OPPORTUNITIES FOR PG DIPLOMA HOLDERS IN COMPUTER APPLICATION

PG Diploma holders in Computer Application can find employment in following sectors:

(1) Service Division (IT enabled services, maintenance service and installation of computer services)
(2) Assembly and Quality Control Division
(3) Software Development and Testing Industries
(4) Web Development Industries
(5) Mobile Applications Development
(6) Junior Level Data Analytics
(7) Industry Automation
(8) E-Commerce Support Engineer
(9) News and Newspaper/Agencies, Magazines
(10) Data Entry and MIS/ERP Operator
(11) Lab. Assistant/Technician
(12) Hospitals/Healthcare/Institutions/Schools
(13) Cloud Services Support Engineer
(14) Publishing Industry
(15) Animation Industry
(16) Data Processing Industry
(17) Marketing Division (Corporate Handling, SME, Institutional Segment, Government Tender Business)
(18) Telecommunication Sector
(19) Teaching Organizations (Polytechnics, Vocational Institutions etc)
(20) Networking (LAN, WAN etc)
(21) Defense Services/Police Services/Cyber Services/Forensic Services
(22) Call Centres, BPO etc.

While in employment, the following areas of activity in different organizations (industry and service sector) are visualized for PG diploma holders in Computer Application:

- Programming customer based applications including web page designing
- Testing and maintenance of web applications
- Marketing of software and hardware
- Teaching and training at educational institutions
- Self employment – call centres, BPO, EPO etc.
- Cyber Cafés

Various Designations for PG diploma holders in Computer Application:

(1) Service engineer/customer support engineer/maintenance engineer in installation, maintenance and service of computer systems and networking
(2) Assembly supervisor in manufacturing and production activity
(3) Data entry operator, computer operator, DTP operator, technician
(4) Technical Assistant/junior engineer in quality control and testing activities of computer systems manufacturing
(5) Junior marketing executive/junior sales executive/sales engineer in marketing activities
(6) Junior/senior technical assistant in R&D laboratories and educational institutions to help in maintaining computers and networks
(7) Test engineers in process industry
(8) Web Server administrator

3. **LEARNING OUTCOMES OF PG DIPLOMA HOLDERS IN COMPUTER APPLICATION :**

After undergoing this programme, students will be able to:

1.	Understand a computer system that has hardware and software components, which controls and makes them useful.
2.	Write Python programs using various collection data types
3.	Setup computer networks and diagnose & solve network problems
4.	Use file mangers, word processors, spreadsheets, presentation software's
5.	Understand various types and services of operating system
6.	Identify the programming problem and formulate an algorithm for it.
7.	Understanding the problem and corresponding requirement for development of software.
8.	Understand the concept of Database system and Client Server Architecture
9.	Debug and compile the program written in Java.
10.	Explain core concepts of cloud computing paradigm.
11.	Comprehend the importance of ecosystem and sustainable
12.	Demonstrate interdisciplinary nature of environmental issues
13.	Understand the concepts of Internet of Things.
14.	Develop a mobile application using different components of Android.
15.	To develop in-depth knowledge and understanding of the big data analytic domain.
16.	Identify core concepts of digital marketing and the role of digital marketing in business.
17.	Work on different Web Designing Tools for manipulating images, creating web graphics, animation etc.
18.	Write, compile and debug program using different programming constructs
19.	Create, manage and secure database
20.	Design, develop and host websites using internet technologies
21.	Communicate effectively in English with others
22.	Writing cv/ resume
23.	Facing a Mock Interview
24.	Set-up, diagnose problems, troubleshoot computers, servers & networks and implementing security measures for web development.
25.	Write and debug simple as well as complex program in Python/PHP
26.	Apply the acquired knowledge and skills in solving live problems in the Computer and I.T. industry
27.	Perform data backups
28.	Use open-source tools and software
29.	Handle malware and viruses
30.	Install and manage operating system and application software

31.	Implementing security measure for web-based applications
32.	Create and manage Blogs, Websites using Laravel

4. DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME PG DIPLOMA HOLDERS IN COMPUTER APPLICATION :

The following curriculum area subjects have been derived from learning outcomes:

1.	Understand a computer system that has hardware and software components, which controls and makes them useful.	Basics of computer and information technology
2.	Write Python programs using various collection data types	Computer programming using python
3.	Setup computer networks and diagnose & solve network problems	Data communication and computer networks
4.	Use file mangers, word processors, spreadsheets, presentation software's	Office automation tools
5.	Understand various types and services of operating system	Operating systems
6.	Identify the programming problem and formulate an algorithm for it.	Data structure using python
7.	Understanding the problem and corresponding requirement for development of software.	Software engineering
8.	Understand the concept of Database system and Client Server Architecture	Database management system
9.	Debug and compile the program written in Java.	Object oriented programming using java
10.	Explain core concepts of cloud computing paradigm.	Cloud computing
11.	Comprehend the importance of ecosystem and sustainable	Environmental studies
12.	Demonstrate interdisciplinary nature of environmental issues	Environmental studies
13.	Understand the concepts of Internet of Things.	Internet of things
14.	Develop a mobile application using different components of Android.	Development of android applications
15.	To develop in-depth knowledge and understanding of the big data analytic domain.	Big data
16.	Identify core concepts of digital marketing and the role of digital marketing in business.	E-commerce and digital marketing
17.	Work on different Web Designing Tools for manipulating images, creating web graphics, animation etc.	Web designing tools
18.	Write, compile and debug program using different programming constructs	Computer programming using python
19.	Create, manage and secure database	Database management system

20.	Design, develop and host websites using internet technologies	Internet and web technology
21.	Communicate effectively in English with others	Soft skills, student centered activities
22.	Writing cv/ resume	Soft skills
23.	Facing a Mock Interview	Soft skills
24.	Set-up, diagnose problems, troubleshoot computers, servers & networks and implementing security measures for web development.	Information security and it laws, web server administration
25.	Write and debug simple as well as complex program in Python/PHP	Computer programming using python, web development using php
26.	Apply the acquired knowledge and skills in solving live problems in the Computer and I.T. industry	Project
27.	Perform data backups	Database management system
28.	Use open-source tools and software	Computer programming using python, web designing tools, database management system
29.	Handle malware and viruses	Information Security and IT Laws
30.	Install and manage operating system and application software	Basics of Computer and Information Technology
31.	Implementing security measure for web-based applications	Information security and IT laws
32.	Create and manage Blogs, Websites using Laravel	Web development using Laravel Framework

5. ABSTRACT OF CURRICULUM AREAS

a) General Studies

1. Soft Skills
2. Environment Studies

b) Basic Courses in Engineering/Technology

3. Basics of Computer and Information Technology
4. Office automation tools

c) Advance Courses in Engineering/Technology

5. Computer programming using python
6. Operating system
7. Web designing tools
8. Data structure using python
9. Software engineering
10. Database management system
11. Internet and web technology
12. Information security & IT laws
13. Data communication & computer network
14. Object oriented programming using java
15. Internet of things
16. E-commerce and digital marketing
17. Computer hardware and maintenance
18. Cloud computing
19. Elective:
    - 1- Web Development Using Laravel Framework
    - 2- Computer Based Accounting
    - 3- Development of Android Applications
    - 4.Big Data

d) Industrial Training

20. Project Work

6. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution in Periods per week in Various Semesters			
		I	II	III	IV
1.	Basics of computer and information technology	8	-	-	-
2.	Computer programming using python	10	-	-	-
3.	Data communication & computer network	09	-	-	-
4.	Office automation tools	08	-	-	-
5.	Internet and web technology	08	-	-	-
6.	Operating system	-	09	-	-
7.	Web designing tools	-	08	-	-
8.	Data structure using python	-	11	-	-
9.	Software engineering	-	06	-	-
10.	Database management system	-	10	-	-
11.	Object oriented programming using java	-	-	12	-
12.	Internet of Things	-	-	08	-
13.	E-Commerce and Digital Marketing	-	-	06	-
14.	Computer hardware and maintenance	-	-	10	-
15.	Soft skills	-	-	06	-
16.	Cloud computing	-	-	-	08
17.	Environment studies	-	-	-	05
18.	Information security and it laws	-	-	-	08
19.	Elective: 1- Web Development Using Laravel Framework 2- Computer Based Accounting 3- Development of Android Applications 4.Big Data	-	-	-	12
20.	Project				08
21.	Student centered activities	02	02	03	02
Total		**45**	**46**	**45**	**45**

7. STUDY AND EVALUATION SCHEME FOR PG DIPLOMA PROGRAMME IN COMPUTER APPLICATION

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		*Th*	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1	BASICS OF COMPUTER AND INFORMATION TECHNOLOGY *	4	-	4	4	20	10	30	50	2 ½	20	3	70	100
1.2	COMPUTER PROGRAMMING USING PYTHON*	4	-	6	5	20	30	50	50	2 ½	50	3	100	150
1.3	DATA COMMUNICATION & COMPUTER NETWORK *	5	-	4	6	20	30	50	50	2 ½	50	3	100	150
1.4	OFFICE AUTOMATION TOOLS*	-	-	8	2	-	30	30	-	-	50	3	50	80
1.5	INTERNET AND WEB TECHNOLOGY*	4	-	4	6	20	30	50	50	2 ½	50	3	100	150
#Student Centered Activities		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		**17**	**-**	**28**	**24**	**80**	**160**	**240**	**200**	**-**	**220**	**-**	**420**	**660**

* Common course Content with CS/IT diploma programmes

^ Common course Content with PG diploma in Web designing

Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, self-study etc.

SECOND SEMESTER (PG DIPLOMA PROGRAMME IN COMPUTER APPLICATION)

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		*Th*	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1	OPERATING SYSTEM*	4	-	5	5	20	30	50	50	2 ½	50	3	100	150
2.2	WEB DESIGNING TOOLS^	4	-	4	3	20	30	50	50	2 ½	50	3	100	150
2.3	DATA STRUCTURE USING PYTHON	5	-	6	5	20	30	50	50	2 ½	50	3	100	150
2.4	SOFTWARE ENGINEERING*	4	-	2	3	20	30	50	50	2 ½	50	3	100	150
2.5	DATABASE MANAGEMENT SYSTEM*	5	-	5	6	20	30	50	50	2 ½	50	3	100	150
#Student Centred Activities		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		**22**	**-**	**24**	**23**	**100**	**180**	**280**	**250**	**-**	**250**	**-**	**500**	**780**

*Common course Content with CS/IT diploma programmes

^ Common course Content with PG diploma in Web designing

Student Centred Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

Note: ** Four Weeks of Industrial Training to be assessed in third Semester. ** Student will be required to complete four week industrial training after the completion of 2nd semester.

STUDY AND EVALUATION SCHEME FOR PG DIPLOMA PROGRAMME IN COMPUTER APPLICATION

THIRD SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		*Th*	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
3.1	Object Oriented Programming Using Java*	4	-	8	6	20	30	50	50	2 ½	50	3	100	150
3.2	Internet of Things*	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
3.3	E-Commerce and Digital Marketing*	2	-	4	3	20	30	50	50	2 ½	50	3	100	150
3.4	Computer Hardware And Maintenance	4	-	6	5	20	30	50	50	2 ½	50	3	100	150
3.5	Soft Skills^	2	-	4	3	20	30	50	50	2 ½	50	3	100	150
3.6	Industrial Training (One Month)	-	-	-	2	-	-	-	-	-	50	3	50	50
#Student Centered Activities		-	-	3	1	-	30	30	-	-	-	-	-	30
Total		**16**	**-**	**29**	**25**	**100**	**180**	**280**	**250**	**-**	**300**	**-**	**550**	**830**

* Common course Content with CS/IT/PGDCHN diploma programmes

^ Common course Content with Web designing PG diploma programme

\# Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, self-study etc.

STUDY AND EVALUATION SCHEME FOR PG DIPLOMA PROGRAMME IN COMPUTER APPLICATION
FOURTH SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
						INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	**T**	**P**		*Th*	**Pr**	**Tot**	**Th**	**Hrs**	**Pr**	**Hrs**	**Tot**	
4.1	Cloud Computing *	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
4.2	Environment Studies~	3	-	2	3	20	10	30	50	2 ½	20	3	70	100
4.3	Information Security And IT Laws*	4	-	4	5	20	30	50	50	2 ½	50	3	100	150
4.4	Elective: 1- Web Development Using Laravel Framework 2- Computer Based Accounting 3- Development of Android Applications* 4.Big Data*	6	-	6	6	20	30	50	50	2 ½	50	3	100	150
4.5	Project	-	-	8	2	-	50	50	-	-	100	-	100	150
#Student Centered Activities		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		**17**	**-**	**26**	**22**	**80**	**180**	**260**	**200**	**-**	**270**	**-**	**470**	**730**

* Common course Content with CS/IT diploma Programmes
^ Common course Content with Web designing PG diploma programme
~ Common course Content with other Engineering Diploma Programmes
# Student Centered Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, self-study etc.

8. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 30 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

A) i. 10 Marks for general behavior and discipline
(by HODs in consultation with all the teachers of the department)

ii. 5 Marks for attendance as per following:
(by HODs in consultation with all the teachers of the department)

a)	75 - 80%	2 Marks
b)	80 - 85%	4 Marks
c)	Above 85%	5 Marks

iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)

a)	15	-	State/National Level participation
b)	10	-	Participation in two of above activities
c)	5	-	Inter-Polytechnic level participation

Note: There should be no marks for attendance in the internal sessional of different subjects.

1.1 BASICS OF COMPUTER AND INFORMATION TECHNOLOGY

L	T	P
4	-	4

RATIONALE

The PG diploma holders in Computer Application needs to understand computer fundamentals and information technology. They should be able to operate basic software related to computer. Hence this subject is introduced in the curriculum.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Understand a computer system that has hardware and software components, which controls and makes them useful.
- Understand the operating system as the interface to the computer system.
- Outline various application of IT
- Differentiate between assembly and high-level language
- Identify various web browser
- Use the Internet to send mail and surf the World Wide Web

DETAILED CONTENTS

1. Fundamentals of Computer (12 Periods)

   Historical evolution of computers, Generations of computers, Classification of computers – based on size, processor, Usefulness of Computers. Applications of computers, Block Diagram along its components and characteristics, Interaction between the CPU, Memory Input/output devices, function of CPU and major functional parts of CPU. State the relevance of speed and word length for CPU Performance, Recognize the current family of CPUs used in Computers, Types of Memory- RAM ROM, Monitor, Mouse, Keyboard, Disk, joysticks, Storage Devices, floppy disk, CD, DVD, Pen drive, trackballs, Printers Types of printers, Scanner, Modem, Video, Sound cards, Speakers

2. Data Representation (08 Periods)

   Definition Of Information, difference between data and information ,importance of Binary Number System, various number systems, Conversion from Decimal to Binary, Conversion from Binary to Decimal, binary number into hexadecimal number, hexadecimal number into binary number System, Memory Addressing and its Importance, ASCII and EBCDIC coding System

3. DOS & Windows Operating Systems (12 Periods)

   Hardware and Software, Types of Software, Introduction and need of operating system, Types of operating system, dos operating system, Types of dos Commands, operating system as a resource manager; BIOS; System utilities – Editor, Loader, Linker, File Manager. Concept of

GUI and CUI standards. Directories and files , wild cards, autoexec.bat, config.sys, features of Window desktop, components of Window, function of each component of Window, method of starting a program using start button, Understand maximize, minimize, restore down and close button, uses of file and folder, method of viewing the contents of hard disk drive using explore option, control panel,disk defragmentation installation and un installation of the application software.

4. Linux Operating System (12 Periods)

Structure, Kernel and Shell, Basic command, File system, VI editor, LINUX Installation

5. Fundamentals of Internet (12 Periods)

Concepts of computer Network, Client Server Model, Peer to Peer Model, Networking Devices: Switch, Router, Hub, Bridge, Gateway, LAN, MAN, WAN, Topology, Internet, Intranet, Extranet, internet service provider and its relevance, role of the modem in accessing the internet, installation procedure of a modem using control panel, purpose of web browser software, URL,URI, URN, WWW, FTP,HTTP,RDC(Remote Desktop Connection), Telnet, Email, process of sending and receiving e-mail, transmission modes, IP address and its format, MAC Address, DNS, search engines, social network sites, internet security, Firewall, Cloud Computing and its services

LIST OF PRACTICALS

1. Familiarization with Computer System and its peripheral devices
2. Familiarization with Operating System
3. Practice of internal and external commands of DOS
4. Working practice on windows operating system : creating file, folder. Copying, moving, deleting file, folder
5. Installing and uninstalling of new software using control panel.
6. Installation and uninstallation of new hardware drivers using control panel.
7. Disk defragmentation using system tool
8. Procedure of disk partition and its operation (Shrinking, Extending, Delete, Format).
9. Installation of Operating Systems
10. Practice of Basic Linux Commands
11. Changing System Date and Time.
12. User Account creation and its feature on Windows Operating System
13. Email Account creation, reading, writing and sending emails with attachments.
14. Internet browsing using browsers.

15. Using of Search Engine to get information from internet

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals, connectors etc. and proficient in making use of operating system functionalities in addition to working on internet. The student should be made capable of working on computers independently

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Fundamentals of Computer by E Balagurusamy,Tata McGraw Hill EducationPvt. Ltd, New Delhi
2. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
3. Computer Fundamentals by RS Salaria; Khanna Book Publishing Co. (P) Ltd., New Delhi
4. Computers Today by SK Basandara, Galgotia publication Pvtltd. Daryaganj, New Delhi.
5. Computer Fundamentals and Programming in C by ReemaThareja; Oxford University Press, New Delhi
6. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
7. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in
http://spoken-tutorial.orgs

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	12	20
2	08	20
3	12	20
4	12	20
5	12	20
Total	**56**	**100**

1.2 COMPUTER PROGRAMMING USING PYTHON

L	T	P
4	-	6

RATIONALE

This course introduces to the students the Python language. Upon completion of this course, the student will be able to write non trivial Python programs dealing with a wide variety of subject matter domains. Topics include language components, the IDLE/IDE environment, control flow constructs, strings, I/O, collections, classes, modules, and regular expressions.

LEARNING OUTCOMES

After undergoing the course, the students will be able to:

- Execute Python code in a variety of environments
- Use correct Python syntax in Python programs
- Use the correct Python control flow construct
- Write Python programs using various collection data types
- Write home grown Python functions
- Use standard Python modules such as os, sys, math, and time
- Trap various errors via the Python Exception Handling model
- Use the IO model in Python to read and write disk files
- Create their own classes and use existing Python classes.
- Understand and use the Object Oriented paradigm in Python programs
- Use the Python Regular Expression capabilities for data verification

DETAILED CONTENTS

1. Introduction (04 Periods)

    - Brief History of Python
    - Python Versions
    - Installing Python
    - Environment Variables
    - Executing Python from the Command Line
    - IDLE
    - Editing Python Files
    - Python Documentation
    - Getting Help
    - Dynamic Types
    - Python Reserved Words
    - Naming Conventions

2. Basic Python Syntax (04 Periods)

- Basic Syntax
- Comments
- String Values
- String Methods
- The format Method
- String Operators
- Numeric Data Types
- Conversion Functions
- Simple Output
- Simple Input
- The % Method
- The print Function

3. Language Components (06 Periods)

- Indenting Requirements
- The if Statement
- Relational and Logical Operators
- Bit Wise Operators
- The while Loop
- break and continue
- The for Loop

4. Collections (10 Periods)

- Introduction
- Lists
- Tuples
- Sets
- Dictionaries
- Sorting Dictionaries
- Copying Collections
- Summary

5. Functions (08 Periods)

- Introduction
- Defining Your Own Functions
- Parameters
- Function Documentation
- Keyword and Optional Parameters
- Passing Collections to a Function

- Variable Number of Arguments
- Scope
- Functions - "First Class Citizens"
- Passing Functions to a Function
- map
- filter
- Mapping Functions in a Dictionary
- Lambda
- Inner Functions
- Closures

6. Modules (04 Periods)

- Modules
- Standard Modules - sys
- Standard Modules - math
- Standard Modules - time
- The dir Function

7. Exceptions (04 Periods)

- Errors
- Runtime Errors
- The Exception Model
- Exception Hierarchy
- Handling Multiple Exceptions
- Raise
- assert

8. Input and Output (04 Periods)

- Introduction
- Data Streams
- Creating Your Own Data Streams
- Access Modes
- Writing Data to a File
- Reading Data From a File
- Additional File Methods
- Using Pipes as Data Streams
- Handling IO Exceptions

9. Classes in Python (06 Periods)

- Classes in Python
- Principles of Object Orientation
- Creating Classes
- Instance Methods
- File Organization
- Special Methods
- Class Variables
- Inheritance
- Polymorphism

10. Regular Expressions (06 Periods)

- Introduction
- Simple Character Matches
- Special Characters
- Character Classes
- Quantifiers
- The Dot Character
- Greedy Matches
- Grouping
- Matching at Beginning or End
- Match Objects
- Substituting
- Splitting a String
- Compiling Regular Expressions
- Flags

LIST OF PRACTICALS

1. Getting started with Python and IDLE in interactive and batch modes
2. What do the following string methods do?
   - lower
   - count
   - replace
3. Write instructions to perform each of the steps below
   (a) Create a string containing at least five words and store it in a variable.
   (b) Print out the string.
   (c) Convert the string to a list of words using the string split method.
   (d) Sort the list into reverse alphabetical order using some of the list methods (you might need to use dir(list) or help(list) to find appropriate methods).
   (e) Print out the sorted, reversed list of words.
4. Write a program that determines whether the number is prime.
   What is your favorite number? 24
   24 is not prime

What is your favorite number? 31
31 is prime

5. Find all numbers which are multiple of 17, but not the multiple of 5, between 2000 and 2500?
6. Swap two integer numbers using a temporary variable. Repeat the exercise using the code format: a, b = b, a. Verify your results in both the cases.
7. Find the largest of n numbers, using a user defined function largest().
8. Write a function myReverse() which receives a string as an input and returns the reverse of the string.
9. Check if a given string is palindrome or not.
10. WAP to convert Celsius to Fahrenheit
11. Find the ASCII value of charades
12. WAP for simple calculator

INSTRUCTIONAL STRATEGY

Teachers should put emphasis on practicals and experts from industries may be invited to deliver lectures and share experiences with the students.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Software installation, operation, development
- Actual laboratory and practical work exercises
- Viva-voce

RECOMMENDED BOOKS

1. Learning Python by Mark Lutz; Pratham Books, Bangalore
2. Foundations of Python Network Programming by John Goerzen and Brandeu Rhodes; Apress-eBook distributed by Springer Science and Business Media, New York
3. Dive Into Python by Mark Pilgrim; Pratham Books, Bangalore
4. Think Python by Allen B. Downey; O'Reily Media
5. Python Programming For Beginners: A Must Read Introduction to Python Programming by Robert Richards; Pratham Books, Bangalore
6. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	04	06
2.	04	06
3.	06	10
4.	10	20
5.	08	14

6.	04	06
7.	04	06
8.	04	08
9.	06	12
10.	06	12
Total	**56**	**100**

1.3 DATA COMMUNICATION AND COMPUTER NETWORKS

L	T	P
5	-	4

RATIONALE

The future of computer technology is in Data Communication and Computer Networks. Global connectivity can be achieved through computer networks. A PG diploma holder in Computer Application should therefore understand the function of networks and get exposure to different existing and upcoming communication technologies. Knowledge about hardware and software requirements of networks is essential.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Know about signal types, transmission media
- Know about different communication methodologies
- Setup computer networks
- Setup basic wireless network
- Diagnose & solve network problems
- Diagnose & solve network problems remotely
- Provide security to networks
- Manage & handle wan
- Prevent external network attacks
- Identify network troubleshooting methods.

DETAILED CONTENTS

1. Introduction to Data Communication (07 Periods)

   1.1 Basics of the Communications
   1.2 Direction of the Data flow(simplex, half-duplex, full-duplex)
   1.3 Network Topologies, signals and transmission (analog and digital)
   1.4 Transmission media (guided and unguided)
   1.5 Concept of digital signals, Bit rate, Bit length, Transmission impairment (attenuation, distortion, noise, Signal to Noise Ratio)

2. Communication Methodologies (10 Periods)

   2.1 Need for modulation in communication system
   2.2 Concepts AM, FM, PM, FSK, TSK, PCM (No Mathematical model)
   2.3 Concept of bandwidth and channel capacity of different communication systems such as radio, microwave etc.
   2.4 Multiplexing techniques (TDM, FDM, WDM, CDMA)

3. Networks Basics (14 Periods)

3.1 Concept of network
3.2 Models of network computing
3.3 Networking models
3.4 Peer-to –peer Network
3.5 Client-Server Network
3.6 LAN, MAN and WAN
3.7 Network Services
3.8 Switching Techniques

4. Networking Models (05 Periods)

4.1 OSI model: Definition, Layered Architecture
Functions of various layers
4.2 TCP/IP Model: Definition, Functions of various layers
4.3 Comparison between OSI and TCP/IP model

5. TCP/IP Addressing (10 Periods)

5.1 Concept of physical and logical addressing
5.2 IPV4 addresses – Address space, Notations
5.3 Classful Addressing- Different IP address classes, Classes & Blocks, Net-id & Host-Id, Masks, Address depletion
5.4 Classless Addressing – Address blocks, Masks
5.5 Special IP Addresses
5.6 Subnetting and Supernetting
5.7 Loop back concept
5.8 Network Address Translation
5.9 IPV4 Header
5.10 IPV6 Header
5.11 Comparison between IPV4 and IPV6

6. Network Architecture (04 Periods)

Ethernet specification and standardization: 10 Mbps (Traditional Ethernet), 10 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet)

7. Network Connectivity (05 Periods)
7.1 Network connectivity Devices
7.2 NICs
7.3 Hubs, Switches, Routers, Repeaters, Modem, Gateway
7.4 Configuration of Routers & Switches

8. Network Administration (10 Periods)

8.1 Network Security Principles, Cryptography, using secure protocols
8.2 Trouble Shooting Tools: PING,IPCONFIG, IFCONFIG, NETSTAT, TRACEROOT, Wireshark, Nmap, TCPDUMP, ROUTEPRINT
8.3 DHCP Server
8.4 Workgroup/Domain Networking

9. Introduction to Wireless Networks. (05 Periods)

9.1 Introduction to wireless LAN IEEE 802.11, WiMax and Li-Fi
9.2 Wireless Security
9.3 Introduction to bluetooth - architecture, application
9.4 Comparison between bluetooth and Wifi

LIST OF PRACTICALS

1. Recognize the physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
2. Recognition and use of various types of connectors RJ-45, RJ-11,BNC and SCST
3. Making of cross cable and straight cable
4. Install and configure a network interface card in a workstation.
5. Identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation
6. Managing user accounts in windows and LINUX
7. Sharing of Hardware resources in the network.
8. Use of Netstat and its options.
9. Connectivity troubleshooting using PING, IPCONFIG, IFCONFIG
10. Installation of Network Operating System
11. (NOS)
12. Visit to nearby industry for latest networking techniques
13. Create a network of at least 6 computers.

Required Software

- Windows Server/Linux Server

Required Tools and Supplies

1) Crimping tool, Cable tester,
2) RJ 45 connectors, RJ-11, BNC, SCST
3) Coaxial Cable, UTP, STP, OFC cable
4) Screw Driver Kit
5) Switch/Hub
6) Manageable Switch

INSTRUCTIONAL STRATEGY

Since the facilities are not available in the polytechnic, students need exposure to various security systems and software available in some organizations, universities and engineering colleges. For this, visits may be organized for students. The teachers should also be exposed in this area. Some practicals can be conducted in the laboratory.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
2. Data Communications and Networking by Forouzan, (Edition 2nd and 4th), Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Data and Computer Communication by William Stallings, Pearson Education, New Delhi
4. Local Area Networks by Peter Hudson
5. Network+ Lab manual,- BPB Publications -by Tami Evanson
6. Networking Essentials – BPB Publications New Delhi
7. Computer Network and Communications By V.K. Jain and Narija Bajaj, Cyber Tech Publications, New Delhi.
8. Cloud Computing Bible by BerrieSarinby
9. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:
http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	07	10
2.	10	15
3.	14	20
4.	05	07
5.	10	15
6.	04	05
7	05	06
8.	10	15
9.	05	07
Total	**70**	**100**

1.4 OFFICE AUTOMATION TOOLS

L	T	P
-	-	8

RATIONALE

This subject aims to cover the handling of word processing software. It also involves various clerical tasks, such as organizing customer data or creating reports. It enables people with lower skill levels to perform higher-level tasks. In Today's commercial world, automation helps the users with a sophisticated set of commands to format, edit, and print text documents. It is used as valuable and important tools in the creation of applications such as newsletters, brochures, charts, presentation, documents, drawings and graphic images. This will make the students proficient in office automation applications.

LEAR NING OUTCOMES

After undergoing the subject, the students will be able to:

- Use file mangers, word processors, spreadsheets, presentation software's
- Describe the features and functions of the categories of application software.
- Present conclusions effectively, orally and in writing.
- Understand the dynamics of an office environment.
- Demonstrate the ability to apply application software in an office environment.
- Use Google Suite for office data management tasks.

DETAILED CONTENTS

1. Word Processing

MS Word concepts : Creating, saving, closing, Opening an existing document, Using Featured Word Templates, Exploring Template and Formation of Documents, Selecting text, Editing text, Finding and replacing text, Character and Paragraph Formatting, Automatic Formatting And Styles, Inserting and removing page breaks, Header and footers, Page No, Border & Shading, Change Case, Checking Spelling, Working With Tables, Insert Table, Delete Cells, Merge Cell, Graphics And Frames , Page Design and Layout, Creating and Printing Merged Documents, Encrypting document with a password, Printing documents

2. Spread Sheet

MS Excel Concept: Creating, Saving, closing, editing a Workbook, Inserting, Deleting Work Sheets, entering data in a cell, Copying and Moving from selected cells, entering formula, handling operators in Formula, Functions: Mathematical, Logical, statistical, text, financial, Date and Time functions, Using Function Wizard. Formatting a Worksheet: Formatting Cells – changing data alignment, changing date, number, character or currency format, changing font, adding borders and colors, Printing worksheets, Charts and Graphs – Creating, Previewing, Modifying Charts, LOOKUP/VLOOKUP

3. Presentation

MS Power Point Concept : Creating, Opening and Saving Presentations, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows using templates, Rehearse timing, Narration, Multimedia effects- Apply Transitions between Slides, Animate Slide Content, Set Timing for Transitions and Animations, Insert and Format Media, Encrypting presentations with a password, Running and Controlling a Slide Show, Printing Presentations

4. Database

MS Access Concepts: Database, Relational Database, Integrity. Operations: Creating, dropping, manipulating table structure. Manipulation of Data: Query, Data Entry Form, Reports

5. Google Office Tools

Creating, saving, downloading, sharing files/folders from Google drive, creating and sharing Google docs, import and export docs, creating and sharing Google sheet, import and export Google sheet, Google forms and form responses, creating Google slides to present your ideas

LIST OF PRACTICALS

Tools to be used: Microsoft office/ Libre Office / Open Office / G Suite

1. Creating a document using different font, changing font size and color, changing the appearance through bold/italic/underline.
2. Creating a document using subscript and superscript, justification of the document.
3. Create a document using Bullets and Numbering.
4. Create a document using page number, header and footer.
5. Create a document using inserting page breaks and column break, line spacing.
6. How to use mail merge and macro in MS Word.
7. Creating table, formatting cells, use of different border styles, shading in tables, merging of cells, and partition of cells, inserting and deleting a row in a table in MS word document.
8. Apply spelling checker, grammar mistakes, thesaurus in a document.
9. Create a Boucher using templates, page setup and print preview, and then print that document.
10. Working on spreadsheet like adding, deleting, merging cells, layout and style.
11. Create a table and perform operation using predefined function on it.
12. In MS Excel procedure to switching between different spreadsheets and workbook.
13. Create a spreadsheet and print selected as well as full workbook.
14. Create a spreadsheet with LOOKUP/VLOOKUP features.
15. Create different charts in excel and implement formulas (automatic and use defined).
16. Create a Power Point presentation using slide template.
17. Create a Power Point presentation using animation.
18. Create a Power Point presentation using transition
19. Create a Power Point Presentation with Adding movie and sound.
20. Create a Power Point Presentation with Adding tables and chart etc.
21. Changing slide color scheme in presentation.
22. Viewing the presentation using slide navigator.
23. Create, Save, Run and Print the Power Point Presentation.
24. Create a database table using predefined template.
25. Create a database form using form wizard.

26. Create and share files/folders in Google drive
27. Create and share Google docs.
28. Create and share Google sheets.
29. Create and share Google Forms.
30. Create and share Google slides.

INSTRUCTIONAL STRATEGY

As the subject is practice oriented, more stress should be given to students to do the work practically. The features of software packages MS Office/ Libre Office to be demonstrated in class using LCD projector.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

- Microsoft Office 2010 For Dummies By Wallace Wang
- 2007 Microsoft Office System Plain & Simple by Jerry Joyce Microsoft Press
- Office XP : The Complete Reference- Stephen L. Selson - Tata McGraw Hill Education.
- Working in Microsoft Office - Richard Mansfield - Tata McGraw Hill Education.

Websites for Reference

- http://office.microsoft.com/en-us/training/CR010047968.aspx
- https://gsuite.google.com/learning-center
- http://spoken-tutorial.org

1.5 INTERNET AND WEB TECHNOLOGY

L	T	P
4	-	4

RATIONALE

It is important for P.G. diploma holders in Computer Application s to understand about Internet, Web Space and how to develop static website. They should be able to develop basic static websites by using different platform independent front-end Technologies which can run on mobile llbrowsers as we. Hence this subject is introduced in the curriculum.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Understand working of Internet/ Websites, Client Server Model and Internet Tools.
- Understand and develop HTML Web pages.
- Provide logics on the web pages by using JavaScript
- Use Bootstrapto develop responsive website
- Control the Look and feel of web pages by using CSS
- Use JQuery for developing the Web Pages
- Develop Static webpage/web portal

DETAILED CONTENTS

1. Web Development Introduction (04 Periods)
   Internet, WWW, Browser, Search engine Client Server Model, URL, Web Pages, Website and Web Services, Types of Websites (Static, Dynamic and Responsive), Developer options of Browser (View page source, Developer Tools, Inspect Element etc)

2. HTML (10 Periods)
   Basics:
   HTML Document, Basic Structure of HTML, Syntax, HTML Tags and Attributes, Types of HTML Tags, Rules of nesting, Basic Tags (HTML Tag. Head Tag, Title Tag, Body Tags).
   Page Formatting:
   Adding a new Paragraph, Adding a line break, Inserting a blank space , changing page background , Divand Span tags
   Text Formatting:
   Html Headings, Formatting elements (<b> Bold text , Important text ,<i> Italic text , Emphasized text , <mark> Marked text, <small> Small text, <del> Deleted text, <ins> Inserted text, <sub> Subscript text, <sup> Superscript text), Comments, Horizontal Lines
   Creating Lists:Ordered List, Unordered Lists, Definition Lists
   Others:
   Images, Text Links, Image Links, opening a page in New Window or Tab, Linking to an area of same page, Introduction to Table Tags, Advantages and limitations of tables, Frames &IFrame, HTML Forms , XHTML

3. Cascading Style Sheets (08 Periods)
   Introduction, Benefits of CSS, CSS Syntax, CSS Implementation (inline, internal and external), CSS Selectors (ID Selectors, Class Selectors, Grouping Selectors, Universal Selectors, CSS Pseudo-classes), CSS properties (background-color, background-image, border-style, height, width, color, text-align, font-family, font-style, font-size, font-weight), Box Model in CSS(margin, border, padding)

4. Java Scripts (10Periods)
   Java Script Introduction , variables , data types , operators, control flow (if-else, for loop , while loop , do-while loop) , Declaring Functions , Calling functions with parameters, Adding JavaScript to Web Documents, JavaScript Objects , Document Object Models, HTML Events and calling Java Script functions on Events.

5. JQUERY (09 Periods)
   JQuery Concept, Adding JQuery to Web Page, JQuery Selectors, JQuery Event Methods, JQuery Effects (Hide/Show, Fade, Slide), Insertion of header /footer in HTML Pages using JQuery

6. Bootstrap (09 Periods)
   Color Management, Buttons, Table, drop-down, navigation-bar, images, pagination, jumbotron, alerts, forms, progress bar, grid, utilities & filters

7. XML & JSON (06 Periods)
   Introduction and use of XML, Difference between XML and HTML, XML Elements, Attribute, Name space, Syntax Rules, XML DTD and XML Schema, RSS FEED, JSON Introduction and uses, JSON v/s XML, JSON Syntax.

LIST OF PRACTICALS

1. Install, configure and start using developer tools /Code Editor/Browser
2. Creating web pages using different HTML tags and design the look & feel of web page by using CSS.
3. Write JavaScript functions and control the different companonets of Web page by predeifned javascript objects
4. Validation of Formfields using Java Script
5. Use jQuery libraryto apply different features on web pages.
6. Use Bootstrap library and icons to develop a responsive websites

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of websites/WebPages to students while doing practical exercises. The students should be made familiar with developing web pages by code editor/browsers, working on internet. The student should be made capable of developing static websites by using HTML, JavaScript, CSS and jQuery and Bootstrap

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Head First HTML and CSS: A Learner's Guide to Creating Standards-Based Web Pages , O Reilly Publications by Elisabeth Robson Eric Freeman
2. Head First JavaScriptProgramming, O Reilly Publications by Eric FREEMAN
3. Head First jQuery, O Reilly by Ryan Benedetti, Ronan Cranley
4. Web Technologies, Black Book ,Kogent Learning Solutions Inc
5. Developing Web Applications, 2ed ,Wiley Publications, M.T.Savaliya
6. Mastering Bootstrap 4 ,by Benjamin Jakobus and Jason Marah, Packt Publishing
7. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR, Chandigarh.

Websites for Reference:

1. http://swayam.gov.in
2. http://spoken-tutorial.org

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	04	7
2	10	18
3	08	15
4	10	18
5	09	16
6	09	16
7	06	10
Total	**56**	**100**

II Semester

2.1 OPERATING SYSTEMS

L	T	P
4	-	5

RATIONALE

This course provides the students with an understanding of human computer interface existing in computer system and the basic concepts of operating system and its working. The students will also get hands-on experience and good working knowledge to work in windows and Linux environments. The aim is to gain proficiency in using various operating systems after undergoing this course. While imparting instructions, the teachers are expected to put more emphasis on concepts and principles of operating systems, its features and practical utility.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Describe various types and services of operating system
- Identify the concept of process, various states in the process and their scheduling.
- Classify different types of schedulers and scheduling algorithms.
- Identify the significance of inter-process communication and synchronization.
- Describe deadlock and the various ways to recover from deadlock
- Identify memory management techniques
- Describe virtual memory and its underlying concepts.
- Describe the features and brief history of Linux
- Use General purpose commands and filters of Linux
- Use of shell scripts in Linux

DETAILED CONTENTS

1. Overview of Operating Systems (10 Periods)

   Definition of Operating Systems, Types of Operating Systems, Operating System Services, User operating system interface, System Calls, Types of System Calls, System Programs, Operating System Structure, Virtual Machine, Benefits of Virtual Machine

2. Process Management (Principles and Brief Concept) (10 Periods)

   Process concept, Process State, Process Control Block, Scheduling Queues, Scheduler, Job Scheduler, Process Scheduler, Context Switch, Operations on Processes, Interprocess Communication, Shared Memory Systems, Message-Passing Systems, CPU Scheduler,

Scheduling Criteria, Scheduling Algorithms, Preemptive and Non Preemptive, First come first serve (FCFS), Shortest Job first
(SJF), Round Robin (RR), Multiprocessor scheduling, Process Synchronization.

3. Deadlocks (Principles and Brief Concept) (06 periods)

Deadlock, Conditions for Dead lock, Methods for handling deadlocks, Dead Prevention, Deadlock Avoidance, Deadlock detection, Recovery from deadlock.

4. Memory Management Function (Principles and Brief Concept) (10 periods)

Definition – Logical and Physical address Space, Swapping, Memory allocation, Contiguous Memory allocation, Fixed and variable partition, Internal and External fragmentation and Compaction, Paging – Principle of operation, Page allocation, Hardware support for paging, Protection and sharing, Disadvantages of paging, Segmentation, Virtual Memory.

5. I/O Management Functions (Principles and Brief Concept) (04 periods)

Dedicated Devices, Shared Devices, I/O Devices, Storage Devices, Buffering, Spooling.

6. File Management (Principles and Brief Concept) (06 periods)

Types of File System; Simple file system, Basic file system, Logical file system, Physical file system, Various Methods of Allocating Disk Space

7. Linux Operating System (10 Periods)

History of Linux and Unix, Linux Overview, Structure of Linux, Linux releases, Open Linux, Linux System Requirements, Linux Commands and Filters: mkdir, cd, rmdir, pwd, ls, who, whoami, date, cat, chmod, cp, mv, rm, pg, more, pr, tail, head, cut, paste, nl, grep, wc, sort, kill, write, talk, mseg, wall, merge, mail, news Shell: concepts of command options, input, output, redirection, pipes, redirecting and piping with standard errors, Shell scripts, vi editing commands

LIST OF PRACTICALS

- Demonstration of all the controls provided in windows control panel.
- Exercise on Basics of windows.
- Installation of Linux Operating System
- Usage of directory management commands of Linux: ls, cd, pwd, mkdir, rmdir
- Usage of File Management commands of Linux: cat, chmod, cp, mv, rm, pg, more, find
- Use the general purpose commands of Linux: wc, od, lp, cal , date, who, whoami
- Using the simple filters: pr, head, tail, cut, paste, nl, sort
- Communication Commands: news, write, talk, mseg, mail, wall
- Write a shell program that finds the factorial of a number.
- Write a shell program that finds whether a given number is prime or not.
- Write a shell program to find the average of three numbers.
- Write a shell program that will convert all the text of the file from lowercase to uppercase.

INSTRUCTIONAL STRATEGY

This subject is both theory and practical oriental. Therefore, stress must be given on particulars along with theory. Laboratory must have windows as well as Linux operating system. Concepts of O.S. must be taught practically.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Operating System Concepts by Silberschatz, Galvin; Wiley Publication
2. Operating Systems by Stallings; Tata McGraw Hill.
3. Operating Systems- A Concept Based Approach by DhamDhare; Tata McGraw Hill Education Pvt Ltd , New Delhi
4. Operating Systems by Achyut S Godbole and AtulKahate; Tata McGraw Hill Education Pvt Ltd , New Delhi
5. Unleashed Linux by Tech Media Publishers, New Delhi
6. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

- http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	18
2.	10	18
3.	06	10
4	10	18
5	04	8
6	06	10

7	10	18
Total	**56**	**100**

2.2 WEB DESIGNING TOOLS

L	T	P
4	-	4

RATIONALE

This subject aims to cover the study of various tools related to development of websites and blogs with adequate knowledge of web development technology. Student can work on tools related to content management or learning management system to develop/build website with focus on designing aspects of websites.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Use Image editing tools for editing and enhancing the images
- Use Animation tools for creating 2D & 3D Animation.
- Differentiate various type of websites
- Prepare presentation for explaining/ demonstrating the required topic.
- Differentiate between CMS and LMS
- Develop Content Management & Learning Management websites.

DETAILED CONTENTS

1. Image Editing Tools (16 Periods)

File formats, Raster Vs. Vector images, an overview of menus, work area, tool bars, tool box usages, Starting and opening document, getting image, Exploring basic features of like palettes, using context menu, using rulers and guidelines, closing files and quitting color modes of images, working with layers, transparency.

2. Animation Tools (06 Periods)

Concept of Timeline, 2D & 3D animation, morphing, text effects, creating gif animation. Creating slideshows for websites.

3. Blogging & Social Networking Web designing (08 Periods)

Introduction, Advantages, creating a blog using different open source tools like WordPress, Ghost, Anchor CMS etc., Adobe Spark, Google sites, Principles for designing a social networking website.

4. Presentation Tools (10 Periods)

4.1 Presentation Concept : Creating, Opening and Saving Presentations, Working in Different Views, Working with Slides, Adding and Formatting Text, Formatting Paragraphs, Checking Spelling and Correcting Typing Mistakes, Making Notes Pages and Handouts, Drawing and Working with Objects, Adding Clip Art and other pictures, Designing Slide Shows using templates, Rehearse timing, Narration, Multimedia effects- Apply Transitions between Slides, Animate Slide Content, Set

Timing for Transitions and Animations, Insert and Format Media, Encrypting presentations with a password, Running and Controlling a Slide Show, Printing Presentations

4.2 Designing slides: Web-based slides (such as Google Slides), Prezi or other open source tools.

5. CMS & LMS (16 Periods)

5.1 Introduction, difference between CMS & LMS

5.2 Applications and Advantages of using CMS & LMS

5.3 Drupal-An Open source Content Management System: Installation, Architecture, User interface, Themes management, creating a sub-theme, Activate & Deactivate default modules, Install & configure new modules, Get familiar with blocks, Manage existing blocks, create new blocks, Menu management, User management, Setting up the Home page, working with CSS in Drupal, Website backup & upgradation.

5.4 Moodle- An Open Source Learning Management System: Installation, Architecture, User interface, Themes management, managing courses & categories, Activities, Resources & blocks, User Management: Authentication & Enrollment, File management, Setting up the Home page, Roles & Permissions, Security, Performance & backup, Server settings.

LIST OF PRACTICALS

1. Designing a Webpage using photoshop/gimp
2. Design a Website logo and header image.
3. Create a slideshow for your website.
4. Create an animated gif file.
5. Create a presentation with animation and zoom-in effects.
6. Create a blog using any open source tool.
7. Create a website using Drupal.
8. Create a website using Moodle.

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of tools mentioned in detailed contents of syllabus to students while doing practical exercises. The students should be made familiar with developing web pages by using these tools, working on internet.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

- Drupal-7 First look by Mark Noble (http://www.allitebooks.org/drupal-7-first-look/)

- Moodle 3 Administration, Third Edition By Alex Buchner (http://www.allitebooks.org/moodle-3-administration-third-edition/)
- GIMP 2.6 cookbook by Juan Manuel Ferreyra (http://www.allitebooks.org/gimp-2-6-cookbook/)

Websites for Reference

- http://office.microsoft.com/en-us/training/CR010047968.aspx
- https://gsuite.google.com/learning-center
- http://spoken-tutorial.org

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	16	20
2	06	10
3	08	10
4	10	25
5	16	35
Total	**56**	**100**

2.3 DATA STRUCTURE USING PYTHON

L	T	P
5	-	6

RATIONALE

Data structures are the techniques of designing the basic algorithms for real-life projects. Understanding of data structures is essential and this facilitates the understanding of the language. The practice and assimilation of data structure techniques is essential for programming. The knowledge of Python language and data structures will be reinforced by practical exercises during the course of study. This course will help students to develop the capability of selecting a particular data structure.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Identify the problem and formulate an algorithm for it.
- Identify the best data structures to solve the problem
- Store data, process data using appropriate data structures
- Sort the data in ascending or descending order.
- Implement trees and various traversing techniques.
- Implement various searching and sorting algorithms and to compare them for checking efficiency.

DETAILED CONTENTS

1. Data Structures: Data Structures in Python, Introduction to Built-in Data Structures, Introduction to User-defined Data Structures, Algorithms, Elements of a Good Algorithm, Basic algorithmic analysis: input size, asymptotic complexity, O() notation (10 Periods)

2. Strings: Working with series of characters that can represent plaintext messages, passwords, and more, including all the complexities of combining human language with programming code. (08 Periods)

3.List-Based Collections: definitions and examples of list-based data structures, arrays, linked lists, stacks, queues, Examine the efficiency of common list methods, Arrays vs lists (10 Periods)

4. Searching and Sorting: search and sort with list-based data structures, binary search and insertion sort, bubble sort, merge sort, quick sort, use of recursion in searching and sorting. (10 Periods)

5. Maps and Hashing: concepts of sets, maps (dictionaries), hashing, common problems and approaches to hashing, hash tables and hash maps. (10 Periods)

6. Trees: concepts and terminology associated with tree data structures, common tree types, binary search trees, heaps, self-balancing trees, efficiency of traversals and common tree functions.

(12 Periods)

7. Graph: concept of a graph and understand common graph terms, coded representations, properties, traversals and paths.

(10 Periods)

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Software installation, operation, development and viva-voce

LIST OF PRACTICALS

1. Write a Python program to create an array contains six integers. Also print all the members of the array
2. Given a two list. Create a third list by picking an odd-index element from the first list and even index elements from second.
3. Given an input list removes the element at index 4 and add it to the 2nd position and also, at the end of the list
4. Given a list iterate it and count the occurrence of each element and create a dictionary to show the count of each element
5. Given a two list of equal size create a set such that it shows the element from both lists in the pair
6. Given a following two sets find the intersection and remove those elements from the first set
7. Iterate a given list and Check if a given element already exists in a dictionary as a key's value if not delete it from the list
8. Remove duplicate from a list and create a tuple and find the minimum and maximum number
9. Swapping of two tuples.
10. Perform Insertion sort
11. Exercise based on Bubble sort
12. Binary Search exercise
13. Exercise based on merge & quick sort
14. Use of recursion in sorting
15. Use of recursion in searching
16. Write a Python program to triple all numbers of a given list of integers. Use Python map
17. Write a Python program to square the elements of a list using map() function.

18. Write a Python program to compute the square of first N Fibonacci numbers, using map function and generate a list of the numbers.
19. Using two Arrays of equal length, create a Hash object where the elements from one array (the keys) are associated with the elements of the other (the values)
20. Exercise based on Build in Hash Functions
21. Write a Python program to create a Balanced Binary Search Tree (BST) using an array (given) elements where array elements are sorted in ascending order.
22. Write a Python program to check whether a given a binary tree is a valid binary search tree (BST) or not.
23. Write a Python program to convert a given array elements to a height balanced Binary Search Tree (BST).
24. Exercise based on graph traversal

RECOMMENDED BOOKS

1. Data Structures and Algorithms in Python, Publisher(s): Wiley
2. Programming and Problem Solving with Python by Ashok Namdev Kamthane and Amit Ashok Kamthane, McGraw Hill.
3. Problem Solving with Algorithms and Data Structures Using Python By Bradley N. Miller, David L. Ranum
4. Data Structures and Algorithms with Python by Kent D. Lee, Steve Hubbard
5. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

- http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	08	10
3	10	15
4	10	20
5	10	15
6	12	15
7	10	10
Total	**70**	**100**

2.4 SOFTWARE ENGINEERING

L	T	P
4	-	2

RATIONALE

The system analysis and design is the backbone of Application software development. After studying this subject the students will be able to develop and design the system according to given requirements. It involves various steps in analysis and design of the system. It includes the knowledge of preparing project systematically. It is important to know about various aspects of the system analysis and design so that the students will be able to understand the responsibilities while designing and implementation of software project.

LEARNING OUTCOMES

After undergoing this subject, the students will be able to:

- Understanding the problem and corresponding requirement for development of software.
- Describe the various phases of the system development life cycle.
- Identify the expected benefits and scope of the projects.
- Prepare and develop data flow diagrams and decision tables.
- Perform a feasibility study of the system.
- Write detailed design specifications for programmes and database.
- Select methods for evaluating the effectiveness and efficiency of a system.
- Apply different testing techniques on simple programme.

DETAILED CONTENTS

1. Introduction to Software Engineering (10 periods)

System Concepts: Types of systems : (open, closed, static and dynamic systems).
Introduction, Programmes v/s Software Products
Emergence of Software Engineering- Early Computer Programming, High-level Language Programming, Control flow based Design, Data Structure Oriented Design, Object Oriented Design

2. Software Life Cycle Models (12 periods)

Requirement of Life Cycle Model, Classic Waterfall Model, Prototyping Model, Evolutionary Model, Spiral Model, introduction to agile methodology.
Comparison of different Life Cycle Models

3. Software Planning (10 periods)

Responsibilities of Software Project Manager
- Metrics for Project Size Estimation- LOC(Lines of Code), Function Point Metric
- Project estimation Techniques- Using COCOMO Model.

4. Requirement Analysis and Specification (06 periods)

Requirement gathering and Analysis, Software Requirement Specifications(SRS), Characteristics of good SRS

5. Software Design and Implementation (10 periods)

Characteristics and features of good Software Design Cohesion and Cupling, Software design Approaches- Function Oriented Design (Data flow diagrams, Data dictionary, Decision Trees and tables), Object Oriented Design, Structured Coding Techniques, Coding Styles, and documentation

6. Software Testing (08 periods)

Concept of Testing, Testing type cycle (V-Model), Verification v/s Validations, Unit Testing, Black Box Testing, White Box Testing, Integration testing, System testing, Configuration management, Overview of test cases.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Software installation, operation, development and viva-voce

LIST OF PRACTICALS

1. Develop a SRS on a given topic/project/problem.
2. Develop DFD Model (level 0 and level 1 DFD) of the problem.
3. Develop sequence diagram
4. Develop class diagrams
5. Use testing tools such as J-meter, Canoo Web Test
6. Use a project management tool such as Microsoft project or Gantt project etc (Team week, Target process, Gantt project)
7. Write test cases for any known application
8. Take any system and study its system specification and report the various bugs.

RECOMMENDED BOOKS

1. Software Engineering by Rajib Mall, PHI Publishers, New Delhi

2. An Integrated Approach to Software Engineering by Pankaj Jalote, Narosa Publishing House Pvt Ltd, Darya Ganj, New Delhi 110002
3. Software Engineering, Sangeeta Sabharwal, New Age International, Delhi
4. Software Engineering by KK Aggarwal and Yogesh Singh
5. Software Engineering – A Practitioner's Approach by RS Pressman, Tata McGraw Hill Publishers, New Delhi
6. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

- http://swayam.gov.in
- www.emetechnologies.com/UP-SE-Sheets.zip

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	18
2	12	24
3	10	18
4	06	10
5	10	18
6	08	12
Total	**56**	**100**

2.5 DATABASE MANAGEMENT SYSTEM

L	T	P
5	-	4

RATIONALE

The PG diploma holders in Computer Application need to understand about Relational Database to manage the data at backend for different applications. They should be able to develop basic table and write query to fetch the required data. Hence this subject will remain the part of this curriculum.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Understand the concept of Database system and Client Server Architecture
- Understand and develop the concepts of Data Modeling, Security and Integrity.
- Convert and compare the designs and differentiate between the keys
- Understand and execute different SQL queries and PL / SQL programs
- Convert database in the form of table
- Normalize the database using normal forms.
- Understand the concept of query processing and Transaction processing

DETAILED CONTENTS

1. Database System Concept & Data Modeling (10 Periods)

   Basic concepts, Advantages of a DBMS over file processing system, Data Abstraction, Database Languages, Data Independence. , Components of a DBMS and overall structure of a DBMS. ,Three views of Data (External View, Conceptual View, Internal View), Three level architecture of DBMS, Data Independence, , Client Server Architecture

2. Data Model (10 Periods)

   Define data model, Data Models : Network Model Hierarchical Model, E-R Model, Advantage & Disadvantages of each Data Model

   ER Model :
   Entity sets and relationship sets- Attributes - Keys in entity and relationship sets : (a) Super Key (b) Candidate Key (c) Primary Key (e) Unique Key - Mapping constraints, Participation Constraint, E-R diagram, Notations. Strong Entity Set and Weak Entity Set

3. Relation Model (10 Periods)

Advantages, Disadvantages, Codd's 12 rules , Definition of Relations, Schema, Sub schema. Relational Model Constraints (Domain, Tuple Uniqueness, Key Constraints, Integrity Constraints, Entity constraints).
Relations algebra (Basic operation: Union intersection difference and Cartesian product), Additional Relational Algebraic Operations (Projection, Selection rows, Division, rename and join) , Converting ER Model to Relational Model.

4. Relational Database Design (11 Periods)

Purpose of Normalization, Data redundancy and updating anomalies, Functional Dependencies and Decomposition, Process of Normalization using 1NF, 2NF, 3NF, multivalued dependencies and BCNF , Forth Normal Form, Fifth Normal Form,

5. MYSQL/SQL (11 Periods)

Data definition language, Data manipulation language, SQL, Object naming conventions, Object naming guidelines, Data types, Tables (Creating , Inserting, Updating and deleting tables and using constraints), Views, Indexes,

SQL Command :- DESCRIBE, SELECT, WHERE CLAUSE, DISTINCT CLAUSE, ORDER BY,HAVING, LOGICAL OPERATIONS, SQL OPERATORS, JOIN

Aggregate functions, String functions and date time functions, Null values

6. PL-SQL (10 Periods)

User defined function, Control of flow statement of PL/SQL, Procedures/Stored procedures, transaction, triggers, cursors, granting and revoking.

7. NO-SQL: Inroducton ,Usages,And Application. (03 Periods)

8. SECURITY (05 Periods)

Authorization and View- Security constraints - Integrity Constraints- Encryption

LIST OF PRACTICALS

1.Installation of MYSQL

STRUCTURED QUERY LANGUAGE
2. Creating Database
   - Creating a database
   - Creating a table

- Specifying relational data types
- Specifying constraints
- Creating indexes

3. Table and Record Handling
   - INSERT statement
   - Using SELECT and INSERT together
   - DELETE, UPDATE, TRUNCATE Statement.
   - DROP, ALTER statement

4. Retrieving Data From a Database
   The SELECT statement
   - Using the WHERE clause
   - Using Logical Operators in the WHERE clause
   - Using In, BETWEEN, LIKE, ORDER BY, GROUP BY & HAVING clause
   - Using Aggregate Functions
   - Combining Tables Using JOINS

5. Design of database for any application.

INSTRUCTIONAL STRATEGY

Explanation of concepts using real time examples, diagrams etc. For practical sessions books along with CDs or learning materials with specified activities are required. Various exercises and small applications should be given along with theoretical explanation of concepts.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. An Introduction to Database System - C. J. Date
2. Database System Concepts - A. Silberschatz, S. Sudarshan& H. F. Korth

3. Database Concepts and Systems - LvanBayroos/SPD

4. Fundamental of Database System - R. Elmashri& S. B. Navathee-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in
http://spoken-tutorial.orgs

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	10	15
3	10	15
4	11	17
5	11	17
6	10	10
7	03	04
8	05	07
Total	**70**	**100**

3.1 OBJECT ORIENTED PROGRAMMING USING JAVA

L	T	P
4	-	8

RATIONALE

Object orientation is a new approach to understand the complexities of the real world. In contrast to the earlier approaches like procedural etc, object orientation helps to formulate the problems in a better way giving high reliability, adaptability and extensibility to the applications. The students are already familiar with this concept of programming in C which is the basic for JAVA. This course offers the modern programming language JAVA that will help the students to implement the various concept of object orientation practically. The students will be able to program in the object-oriented technology with the usage of JAVA.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- install Java IDE, Compiler, Java virtual machines
- debug and compile the program written in Java.
- explain and implement class programs.
- explain and execute the language construct concepts.
- explain and execute member functions.
- explain the concepts of OOPS
- describe and implement inheritance concepts.
- explain and implement Polymorphism using Java program.
- explain and implement the abstract class and interface.
- implement the exception handling in projects
- develop and understand multithreaded programs

DETAILED CONTENTS

1. Introduction and Features (05 Periods)

Fundamentals of object-oriented programming – procedure-oriented programming Vs. object oriented programming (OOP), Object oriented programming concepts – Classes, object, object reference, abstraction, encapsulation, inheritance, polymorphism, Introduction of eclipse (IDE) for developing programs in Java

2. Language Constructs (07 Periods)

variables, types and type declarations, data types : Integer, floating point type, character, Boolean, all Operators, iteration and jump statement, if then else clause; conditional expressions, input using scanner class and output statement, loops, switch case, arrays, methods.

3. Classes and Objects (08 Periods)

Class fundamentals, constructors, declaring objects (Object & Object Reference), creating and accessing variables and methods, static and non static variables/methods defining packages, Creating and accessing a package, Importing packages, Understanding CLASSPATH, auto boxing , String , String Buffer

4. Inheritance (06 Periods)

Definition of inheritance, protected data, private data, public data, constructor chaining, order of invocation, types of inheritance, single inheritance, multilevel inheritance, hierarchical inheritance, hybrid inheritance , access control (Private Vs PublicVs Protected Vs Default)

5. Abstract Class and Interface (08 Periods)

Defining an interface, difference between classes and interface, Key points of Abstract class & interface, difference between an abstract class & interface, implementation of multiple inheritance through interface.

6. Polymorphism (06 Periods)

Method and constructor overloading, method overriding, up-casting and down-casting.

7. Exception Handling (07 Periods)

Definition of exception handling, implementation of keywords like try, catches, finally, throw& throws, built in exceptions, creating own exception sub classes importance of exception handling in practical implementation of live projects

8. Multithreading (09 Periods)

Difference between multi threading and multi tasking, thread life cycle, creating threads, thread priorities, synchronizing threads.

LIST OF PRACTICALS

1. WAP to create a simple class to find out the area and perimeter of rectangle and box using super and this keyword.
2. WAP to design a class account using the inheritance and static that show all function of bank (withdrawal, deposit).
3. WAP to design a class using abstract methods and classes.
4. WAP to design a string class that perform string method (equal, reverse the string, change case).
5. Consider we have a Class of Cars under which Santro Xing, Alto and Wagon R represents individual Objects. In this context each Car Object will have its own, Model, Year of

Manufacture, Colour, Top Speed, etc. which form Properties of the Car class and the associated actions i.e., object functions like Create(), Sold(), display() form the Methods of Car Class.

6. In a software company Software Engineers, Sr. Software Engineers, Module Lead, Technical Lead, Project Lead, Project Manager, Program Manager, Directors all are the employees of the company but their work, perks, roles, responsibilities differs. Create the Employee base class would provide the common behaviors of all types of employee and also some behaviors properties that all employee must have for that company.
7. Using the concept of multiple inheritance create classes: Shape, Circle, Square, Cube, Sphere, Cylinder. Your classes may only have the class variable specified in the table below and the methods Area and/or Volume to output their area and/or volume.

Class	Class Variable	Constructor	Base class
Shape	String name	Shape()	
Circle	double radius	Circle(double r, String n)	Shape
Square	double side	Square(double s, String n)	Shape
Cylinder	double height	Cylinder(double h, double r, String n)	Circle
Sphere	None	Sphere(double r, String n)	Circle
Cube	None	Cube(double s, String n)	Square

8. WAP to handle the exception using try and multiple catch block.
9. WAP that implement the Nested try statements.
10. WAP to create a package that access the member of external class as well as same package.
11. WAP that show the partial implementation of interface.
12. WAP to create a thread that implement the Runnable interface.

INSTRUCTIONAL STRATEGY

The subject is totally practical based. Students should be given clear idea about the basic concepts of programming. In practical session student should be asked to draw flow chart write algorithm and then write program for algorithm and run on computer. It is required that students should maintain records (files with printouts).

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Programming with Java: A Primer; E. Balagurusamy
2. Head First Java, O-REILLY, Kathy Sierra & Bert Bates.
3. OCA Java SE Programmer I Certification Guide , Wiley Publisher , Mala Gupta
4. PROGRAMMER'S GUIDE TO JAVA SE 8 , Pearson , Khalid E Mughal
5. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

Websites for Reference:

http://www.spoken-tutorial.org
http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	5	14
2.	7	12
3.	8	13
4.	6	13
5.	8	13
6.	6	12
7.	7	12
8.	9	11
Total	**56**	**100**

3.2 INTERNET OF THINGS

L	T	P
4	-	4

RATIONALE

Internet of Things (IoT) is presently a hot technology worldwide. Government, academia, and industry are involved in different aspects of research, implementation, and business with IoT. IoT cuts across different application domain like agriculture, space, healthcare, manufacturing, construction, water, and mining. IoT-based applications such as innovative shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems, are gradually relying on IoT based systems. Therefore, it is very important to learn the fundamentals of this emerging technology. This introductory syllabus will enable learners to leverage their business and/or technical knowledge across IoT-related functions in the workplace.

LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- understand the concepts of Internet of Things.
- understand what constitutes an IoT design solution
- identify the sensors and other devices needed for different IoT solutions
- understand the component parts of an IoT network and its connections
- build small IoT applications.

DETAILED CONTENTS

1. Introductionto Internet Of Things (IoT) (10 Periods)

Introduction to IoT, Defining IoT, Things in IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT,IoT Protocols,IoT communication Models, IoT communication API's,IoT enabling Technologies.

2. IoT Devices (12 Periods)

How electronic devices fit with the Internet of Things, and why they are important

Electronic Components : Breadboard and its internal connections,Seven segment display on bread board,LED and its connections, Tri-color LED, Resistor
Introduction to the many 'end devices', sensors and actuators, differentiate between different sensor types

3. IoT Networks (12 Periods)

Introduction to the components of basic IoT networks, the types of network connections and how data travels through them, and the role of Internet Protocols.Basicunderstanding of microcontrollers/Arduino and communication protocols

4. Arduino (12 Periods)

Ardunino device introduction, feature of arduino device ,Components of Arduino board,Understanding of basic of Arduino IDE, Arduino Programming Language (C Language) : variables ,datatype, loops, control statement, function

5. IoT and M2M (10 Periods)

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software defined networking, network function virtualization, IoT and WoT.

LIST OF PRACTICALS

Practical using Arduino-Interfacing Sensors :

1. Installation of Arduino IDE
2. Interfacing Light Emitting Diode (LED)- Blinking LED
3. Interfacing Button and LED – LED blinking when button is pressed.
4. Interfacing Light Dependent Resistor (LDR) and LED, displaying automatic night lamp
5. Interfacing Temperature Sensor (LM35) and/or humidity sensor (e.g. DHT11)
6. Interfacing Liquid Crystal Display (LCD) – display data generated by sensor on LCD
7. Interfacing Air Quality Sensor-pollution (e.g. MQ135) - display data on LCD, switch on LED when data sensed is higher than specified value.
8. Interfacing Bluetooth module (e.g. HC05)- receiving data from mobile phone on Arduino and display on LCD
9. Interfacing Relay module to demonstrate Bluetooth based home automation application. (using Bluetooth and relay).

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment, seminar or case study method. The teacher will discuss case studies with students to feel the importance of the subject, since this subject is practical oriented, the teacher should demonstrate functioning of various sensors and demonstrate building of IoT applications. Solution to various regression and classification problems should also be built

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- viva-voce
- Actual laboratory and practical work exercises
- Software installation, operation, development

RECOMMENDED BOOKS

1. The Internet of Things: Connecting Objects to the Web,Wiley Publisher Hakima Chaouchi

2. Internet of Things: A Hands On Approach, University Press,Vijay Madisetti, Arshdeep Bahga.
3. 21 Internet Of Things (IOT) Experiments,BPB Publications Yashavant Kanetkar
4. Arduino Projects For Engineers ,BPB Publications ,Neerparaj Rai
5. Internet of Things – A Hands on Approach, By Arshdeep Bahga and Vijay Madisetti Universities Press, ISBN: 9788173719547
6. The Internet of Things , Pearson, By Michael Miller ISBN: 9789332552456
7. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR, Chandigarh.

Websites for Reference:

http://www.spoken-tutorial.org
http://swayam.gov.in

LIST OF COMPONENTS

1. One kit for 3-4 students : Arduino Uno, sensors(Bluetooth module(HC05), MQ135, DHT11, breadboard , LCD, 2-relay module etc)
2. Consumables : LED, button, connecting wires, LDR, LM35, battery, etc

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	16
2.	12	22
3.	12	22
4.	12	22
5.	10	18
Total	**56**	**100**

3.3 E-COMMERCE AND DIGITAL MARKETING

L	T	P
2	-	4

RATIONALE

The course is designed to help you master the essential disciplines in digital marketing, including search engine optimization (SEO), social media, conversion optimization, web analytics, content marketing, email and mobile marketing. Digital marketing is one of the world's fastest growing disciplines.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Understand concepts of e-commerce.
- Identify core concepts of digital marketing and the role of digital marketing in business.
- Develop marketing strategies based on product, price, place and promotion objectives.
- Understand how they can use digital marketing to increase sales and grow their business
- Formulate marketing strategies that incorporate psychological and sociological factors which influence consumers.
- Hands on experience in using analytics tools eg: google analytics for report extraction and campaign measurement.
- Analyze marketing problems and provide solutions based on a critical examination of marketing information.
- Understand the opportunities for deploying emerging digital marketing media and techniques.
- Implement online campaigns for your business and marketing problems within the organization by learning adwords campaign management

DETAILED CONTENTS

1. Electronics Commerce, advantages and disadvantages. E-Commerce Business model B2B, B2C, C2C, E-Governance. Four C's (Convergence, collaborative, computer content management and call center), Supply Chain Management. (10 Periods)
2. E-Commerce Payment: (06 Periods)

   Payment Gateway, Modes of Electronic Payment, Threats & protections for e-commerce payment system

3. Principles of Digital Marketing (06 Periods)
   Defining Digital Marketing , Setting Digital Marketing Objectives, Set of activities of digital marketing: Search Engine Optimization, SEO, Search Engine Marketing – Google AdWords, Social Media Marketing: Facebook, LinkedIn, YouTube, Display Advertising – Contextual, Behavioral, Targeted, Content Marketing & Blogging, Lead Generation : Marketing Offer – Attractive / Relevant Offer, Landing Page – Offer's details with form, Conversion Page – Thank you page, Email Marketing, Video Marketing, Responsive Design, Google Analytics
4. Search Engine Optimization (10 Periods)

What is SEO?, Why SEO?, How Search Engine works?, Essential SEO guidelines for website owner, designer, blogger and content writer : Keyword Research - Creating Content Hierarchy, Brainstorming – Think and discuss them, Google Suggest, Related Searches, Google Keyword Planner, Keyword Tools, Google Trends – Finding Search Trends, Most Search Terms, How to translate keywords?, Organizing the keywords, Writing Headlines (Page Titles) with examples, Writing Summary (META Descriptions) with examples, SEO for Images, Structuring the Content- SEO-friendly Domain Name, SEO-friendly URL Structure, Plan your Site's Hierarchy, Internal Linking – Site Navigation, How Google reads our pages?, Localized SEO, Website Speed Testing, HTML Improvements using Google Search Console, Links from YouTube Videos, Users' Engagement , Links to Related Stories , Enable Social Sharing , Embedding videos , Enabling site search feature

5. Google AdWords (06 Periods)

Setting up Google AdWords Campaigns – that avails high ranking at low cost, Content Structuring, Understanding Quality Score, Finding and selecting the right Keywords, Keywords Matching Options, Campaign Setup procedure, Ads and Ad Groups, Organizing Ad Groups, Creating Effective Ads, Optimizing Landing Pages, Bid Management, Negative Keywords, Analytics – Measure and fine-tune, Remarketing Campaigns – How to configure, Setup and Monitor them?, YouTube Video Ad Campaigns

6. Google Analytics (08 Periods)

Getting Started with Google Analytics, Understanding Dashboard – Audience | Advertising | Traffic Source | Content | Conversions, Taking decisions based on Analytics Reporting, Defining Business Goals and Objectives, Tracking Social Media Traffic, Tracking SEO Traffic, Integrating your Google AdWords campaigns into Google Analytics, Measuring Tools and Methods, Measuring your Site's ROI, Introduction to Goal Conversion – Tracking the Conversions, Configuring UTMs (Custom URLs), Google Tag Manager – a brief overview.

7. Social Media Marketing (10 Periods)

Social Media Marketing Strategy : Setting up Goals- Finding out where your targeted people connect, Popular Social Media Networks, KnowEm – Check Social Media Username Availability, Knowing your Audience - Google Alerts – Monitoring your brands, competitions, and industry trends using, TweetDeck – a monitoring tool similar to Google Alerts for Twitter, Hashtags – Best Practices & Tools, Facebook / Instagram / LinkedIn- Setting up a Facebook Business Page, Facebook Graph Search – SEO for Facebook, Facebook Fans vs Talking about this, Promoting your Page, Boost Post, Facebook/Instagram Advertising using Facebook Ads Manager, Remarketing/Retargeting using Facebook Custom Audiences, LinkedIn Advertising: Text Ads | Sponsored Content, Measuring Success- Fans, Likes, Comments & Share, Track performance using Google Analytics, UTMs – URL Builder, Bounce Rate, Time Spent on Site and Conversions!, Tracking Offline Conversions, Tracking your emails, Viral Videos Examples, Instagram, Facebook and Pinterest – Best Practices, Tips and Tools

LIST OF PRACTICALS

1. Create SEO Friendly Web Pages
2. Submit Website in various search Engines
3. Content Writing
4. Build a Network of Partner Websites to Get Influence on the SERP and Jump up to 30+ Positions
5. Develop a Facebook Customized Page Tab

6. Create and write a blog.
7. Write an email newsletter
8. Make a video and Youtube Channel
9. Create infographics
10. Create Google Adword Account and make use of Keyword Planner
11. Create and Use Google Analytics Account
12. Create "refer-a-friend" or "bookmark this page" links on your site
13. Create Google Map on Places for Business
14. Understanding Plagiarism Checker tools
15. Understanding various SEO Tools like woorank, seo site checkup, seo quake, similar web, site liner, etc.
16. Creating XML Sitemap and robot.txt files

INSTRUCTIONAL STRATEGY

The subject is totally practical based. Students should be given clear idea about the basic concepts of E-Commerce and digital marketing. In practical session student should be asked carried out the basic concepts related to this subject.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Digital Marketing by Vandana Ahuja, published by Oxford Publication
2. Fundamentals of Digital Marketing by Puneet Bhatia, published by Pearson.
3. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Times Allocated (Hrs.)	Marks Allocated (%)
1.	05	15
2.	03	10
3.	03	08
4.	05	15
5.	03	15
6.	04	15
7.	05	22
Total	**28**	**100**

3.4 COMPUTER HARDWARE & MAINTENANCE

L	T	P
4	-	6

Rationale :

Servicing of computer peripherals and system such as Key Board, Disk Drives, Printers, Power Supplies and different stages of the computer results in increasing efficiency and life of the Computer Centre. A technician having skills of servicing the above peripherals and systems will prove useful for a Computer Centre.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Assemble Computer System & it's peripherals
- Repair & Maintenance of Computer System & it's peripherals
- Understanding of various components of a computer system

DETAILED CONTENTS

1. Component and peripheral devices Connected with computer. (02 Periods)

2. Mother Board : BUS, Motherboard components & it's type, Battery, Connections on the Mother Board, Keeping CPU cool, Mother board trouble shooting. (10 Periods)

3. Key Board : Switches, Keyboard organization, Key board type trouble shooting. (03 Periods)

4. Mouse : Mouse type, Connecting Mouse: Wired & Wireless, Troubleshooting Mouse. (03 Periods)

5. HDD : Magnetic recording, Data Encoding Method, HDD feature, Head barking, HDD trouble shooting. (05 Periods)

6. SDD : SSD Concept, Structure, advantages, features, applications(02 Periods)

7. RAM: Definition, Types of RAM, advantages, Removable RAM Vs. Soldered RAM (02 Periods)

6. Compact Disc Drive : CD-R, CD-W, CD-RW, DVD-R, DVD-RW, Blue Ray. Working and Maintenance. (02 Periods)

7. Printers : Image formation method, Printing mechanism, DMP, Ink Jet, Laser Printer, Multi-functional printer. How printer works and Trouble shooting. (05 Periods)

8. Network Devices: Hub, Switch, Router, Bridge, Gateway, Ethernet Card, Network Cables (CAT-6 & OFC), Cabling Tools, Troubleshooting (08 Periods)

9. Scanner- Flat Bed. (02 Periods)

10. External Devices- Pen Drive, Flash Drive, External Hard Disk.

11. Power Supply : Operating characteristics, Types and maintenance.

12. OS Troubleshooting & Software Installation : Troubleshooting Process of Operating System: Windows and Linux, Installation of popular application software (MS-Office/Libre Office, Video Editing Tools)

HARDWARE MAINTENANCE LAB

List Of Practical's

1. Understand the mother board component
2. Understand the power requirements for various components in a computer system
3. Study the different connectors and ports of a PC
4. Understand the various cables in a computer system
5. Familiarize the different types of memory modules: DDR1, DDR2, DDR3, DDR4.
6. Study various secondary storage- Hard disk, Flash drive, CD/DVD, SSD,
7. Understand the procedure of assembling a computer system.
8. Study the various techniques for formatting/partitioning.
9. Familiarize the hard disk partitioning using different tools.
10. Familiarize the interfacing of printers and installing driver software
11. Understand the interfacing, installation, working of various device such as Scanner, Projector, etc.
12. Understand the system Maintenance and trouble shooting.
13. Wi-Fi Concepts/Bluetooth concepts and troubleshooting.
14. Installation of Operating Systems in Dual booting.
15. Taking Data Backup and System Formatting.
16. Setup of Live-OS.
17. Converting file system FAT to NTFS Using MS-DOS.
18. Study of various OS troubleshooting issues in computer system.
19. Prevention and recovery of hard disk failures.
20. Manage Disk through computer disk management.
21. To connect and built computers in different ways in a LAN (Topologies-star, ring, bus, tree)
22. To connect and understand different network devices used in LAN- Hubs, Switches, Routers, Bridges, Repeaters, Gateways, Modems.
23. To study the constructional details of transmission media- co-axial cables, twisted pair cables, optical fiber cable.
24. To create network cable using RJ 45 connectors.
25. Connections of two hubs by creating cross over connections.
26. To install a network interface card (NIC) and locate mac address of computer
27. Setting up a work group in windows PC.
28. To discover and assign IP address in windows & linux.

INSTRUCTIONAL STRATEGY

Since the entire course content is practical based, students can practice it lab. The teachers should have practice on this framework. Entire course is hands-on based so practicals should be conducted in the laboratory.

MEANS OF ASSESSMENT

- Assignments
- Viva-voce
- Written examination
- Practical Tasks

RECOMMENDED BOOKS

1. Electronics and Radio Engineering M.L. Gupta Dhanpat rai & Sons, New Delhi
2. PC And Clones Hardware, Troubleshooting and Maintenance B. Govinda rajalu, Tata Mc-graw-Hill Publication
3. PC Troubleshooting and Repair Stephen J. Bigelow Dream tech Press, New Delhi
4. Computer Installation & Servicing, D. Balasubramanian, Tata McGraw Hill
5. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR, Chandigarh.

Websites for Reference:

1. http://swayam.gov.in
2. http://spoken-tutorial.org

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	02	05
2.	10	15
3.	03	05

4.	03	05
5.	05	10
6.	02	05
7.	02	05
8.	02	05
9.	05	05
10.	10	15
11.	02	05
12.	02	05
13.	02	05
14.	06	10
Total	**56**	**100**

3.5 Soft Skills

L T P
2 - 4

RATIONALE

Soft Skills plays an important role in career development. This subject aims at introducing basic concepts of communication besides laying emphasis on developing listening, speaking, reading and writing skills as parts of Communication Skill and focuses on learning various interview techniques.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

.

- Understand the importance of effective communication
- Describe the process of communication
- Communicate effectively in different contexts
- Reproduce and match words and sentences in a paragraph
- Write various types of paragraphs, notices for different purposes and composition on picture with appropriate format
- Read unseen texts with comprehension
- Acquiring skills to prepare CV/Resume
- Acquiring skills to face an interview

DETAILED CONTENTS

1. Basics of Communication (04 periods)

1.1 Definition and process of communication
1.2 Types of communication - formal and informal, oral and written, verbal and non-verbal
1.3 Communications barriers and how to overcome them
1.4 Barriers to Communication, Tools of Communication

2. Reading Skill (06 periods)
Unseen passage for comprehension (one-word substitution, prefixes, suffixes, antonyms, synonyms etc. based upon the passage to be covered under this topic)

3. Writing Skill (04 periods)
Picture composition, Writing paragraph, Notice writing

4. Curriculum Vitae and Resume: Overview, types of CV, Covering Letter, Resume, Types of Resume, Difference between CV and Resume. (08 periods)

5. Interview Techniques & Interview Preparation Preparing for an interview, Interview Formats, Types of Interview Questions, Mock Interviews, the benefits of mock interviews. (06 periods)

LIST OF PRACTICALS

Note: Teaching Learning Process should be focused on the use of the language in writing reports and making presentations. Topics such as Effective listening, effective note taking, group discussions and regular presentations by the students need to be taught in a project oriented manner where the learning happens as a by product.

Listening and Speaking Exercises

1. Self and peer introduction
2. Newspaper reading
3. Just a minute session-Extempore
4. Greeting and starting a conversation
5. Leave taking
6. Thanking
7. Wishing well
8. Talking about likes and dislikes
9. Group Discussion
10. Listening Exercises.
11. Mock Interview

INSTRUCTIONAL STRATEGY

Student should be encouraged to participate in role play and other student centered activities in class room and actively participate in listening exercises.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-semester and end-semester written tests
- Actual practical work, exercises and viva-voce
- Presentation and viva-voce

RECOMMENDED BOOKS

1. Communicating Effectively in English, Book-I by RevathiSrinivas; Abhishek Publications, Chandigarh.
2. Communication Techniques and Skills by R. K. Chadha; DhanpatRai Publications, New Delhi.
3. High School English Grammar and Composition by Wren & Martin; S. Chand & Company Ltd., Delhi.
4. Excellent General English-R.B.Varshnay, R.K. Bansal, Mittal Book Depot, Malhotra
5. The Functional aspects of Communication Skills – Dr. P. Prsad, S.K. Katria & Sons, New Delhi
6. Q. Skills for success – Level & Margaret Books, Oxford University Press.
7. e-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

Websites for Reference:

1. http://www.mindtools.com/ page 8.html
2. http://www.letstalk.com.in
3. http://www.englishlearning.com
4. http://learnenglish.britishcouncil.org/en/
5. http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	04	20
2	06	15
3	04	15
4	08	30
5	06	20
Total	**28**	**100**

INDUSTRIAL TRAINING OF STUDENTS

It is needless to emphasize further the importance of Industrial Training of students during their 3 years of studies at Polytechnics. It is industrial training, which provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice. Polytechnics have been arranging industrial training of students of various durations to meet the above objectives.

This document includes guided and supervised industrial training of 4 weeks duration to be organised during the semester break starting after second year i.e. after 4th semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An external assessment of 50 marks has been provided in the study and evaluation scheme of 5th Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

Teachers and students are requested to see the footnote below the study and evaluation scheme of 3rd semester for further details.

The teacher along with field supervisors will conduct performance assessment of students. The components of evaluation will include the following:

a) Punctuality and regularity 15%
b) Initiative in learning new things 15%
c) Presentation and VIVA 15%
d) Industrial training report 55%

4.1 CLOUD COMPUTING

L	T	P
4	-	4

RATIONALE

This course offers a good understanding of cloud computing concepts and challenges faced in implementation of cloud computing.

LEARNING OUTCOMES

After undergoing the subject, the students would be able to:

- Explain core concepts of cloud computing paradigm.
- Explain various service models
- Explain various deployment models.
- Describe sla management in cloud computing
- Explain and apply the concept of virtualization.
- Describe the scheduling of tasks in cloud.
- Illustrate the fundamental concepts of cloud storage.
- Describe various security issues in the cloud.
- Make use of cloud.

DETAILED CONTENTS

- Introduction (08 Periods)
  Evolution of Cloud Computing, Cloud Computing Overview, Characteristics, Applications, Benefits, Challenges.

- Service and Deployment Models (08 Periods)
  Cloud Computing Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service;
  Cloud Computing Deployment Models: Private Cloud; Public Cloud, Community Cloud, Hybrid Cloud, Major Cloud Service providers.

- Service Level Agreement (SLA) Management (06 Periods)
  Overview of SLA, Types of SLA, SLA Life Cycle, SLA Management Process.

- Virtualization Concepts (08 Periods)
  Overview of Virtualization, Types of Virtualizations, Benefits of Virtualization, Hypervisors.

- Cloud Security (06 Periods)
  Infrastructure Security, Data Security & Privacy Issues, Legal Issues in Cloud Computing.

- Cloud Storage (08 Periods)
  Overview; Storage as a Service, Benefits and Challenges, Storage Area Networks (SANs).

- Scheduling in Cloud (12 Periods)
  Overview of Scheduling problem, Different types of scheduling, Scheduling for independent and dependent tasks, Static vs. Dynamic scheduling.

LIST OF PRACTICALS

1. Introduction to Cloud Vendors: Amazon, Microsoft, IBM.
2. Setting up Virtualization using Virtualbox/VMWare Hypervisor
3. Introduction to OwnCloud
4. Installation and configuration of OwnCloud software for SaaS
5. Accessing Microsoft AZURE cloud-services
6. Cloud Simulation Software Introduction: CloudSim

INSTRUCTIONAL STRATEGY

In addition to classroom teaching, the teacher should demonstrate the practical usage of cloud using real cloud services.

MEANS OF ASSESSMENT

- Assignments and Quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work and Viva-Voce

RECOMMENDED BOOKS

- Rajkumar Buyya, James Broberg, Andrzej Goscinski (Editors): Cloud Computing: Principles and Paradigms, Wiley, 2011
- Kumar Saurabh, Cloud Computing, Wiley, 2012.
- Barrie Sosinsky: Cloud Computing Bible, Wiley, 2011.
- Judith Hurwitz, Robin Bloor, Marcia Kaufman,Fern Halper: Cloud Computing for Dummies, Wiley, 2010
- E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	08	14
2.	08	14
3.	06	11
4.	08	14
5.	06	11
6.	08	14
7.	12	22
Total	**56**	**100**

SUGGESTED DISTRIBUTION OF MARKS

4.2 ENVIRONMENTAL STUDIES

L	T	P
3	-	2

RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the ecosystem and controlling pollution by various control measures. He should also be aware of environmental laws related to the control of pollution. He should know how to manage the waste. Energy conservation is the need of hour. He should know the concept of energy management and its conservation.

LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Comprehend the importance of ecosystem and sustainable
- Demonstrate interdisciplinary nature of environmental issues
- Identify different types of environmental pollution and control measures.
- Take corrective measures for the abatement of pollution.
- Explain environmental legislation acts.
- Define energy management, energy conservation and energy efficiency
- Demonstrate positive attitude towards judicious use of energy and environmental protection
- Practice energy efficient techniques in day-to-day life and industrial processes.
- Adopt cleaner productive technologies
- Identify the role of non-conventional energy resources in environmental protection.
- Analyze the impact of human activities on the environment

DETAILED CONTENTS

1. Introduction (04 Periods)
   - 1.1 Basics of ecology, eco system- concept, and sustainable development, Resources renewable and non renewable.

2. Air Pollution (04 Periods)
   - 2.1 Source of air pollution. Effect of air pollution on human health, economy, plant, animals. Air pollution control methods.

3. Water Pollution (08 Periods)
   - 3.1 Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of dissolved O_2, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.

4. Soil Pollution (06 Periods)
   - 4.1 Sources of soil pollution
   - 4.2 Types of Solid waste- House hold, Hospital, From Agriculture, Biomedical, Animal and human, excreta, sediments and E-waste
   - 4.3 Effect of Solid waste
   - 4.4 Disposal of Solid Waste- Solid Waste Management

5. Noise pollution (06 Periods)

Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimize noise pollution.

6. Environmental Legislation (08 Periods)
Introduction to Water (Prevention and Control of Pollution) Act 1974, Introduction to Air (Prevention and Control of Pollution) Act 1981 and Environmental Protection Act 1986, Role and Function of State Pollution Control Board and National Green Tribunal (NGT), Environmental Impact Assessment (EIA).

7. Impact of Energy Usage on Environment (06 Periods)
Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings.

LIST OF PRACTICALS

1. Determination of pH of drinking water
2. Determination of TDS in drinking water
3. Determination of TSS in drinking water
4. Determination of hardness in drinking water
5. Determination of oil & grease in drinking water
6. Determination of alkalinity in drinking water
7. Determination of acidity in drinking water
8. Determination of organic/inorganic solid in drinking water
9. Determination of pH of soil
10. Determination of N&P (Nitrogen & Phosphorus) of soil
11. To measure the noise level in classroom and industry.
12. To segregate the various types of solid waste in a locality.
13. To study the waste management plan of different solid waste
14. To study the effect of melting of floating ice in water due to global warming

INSTRUCTIONAL STRATEGY

In addition to theoretical instructions, different activities pertaining to Environmental Studies like expert lectures, seminars, visits to green house, effluent treatment plant of any industry, rain water harvesting plant etc. may also be organized.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-term and end-term written tests

RECOMMENDED BOOKS

1. Environmental and Pollution Awareness by Sharma BR; Satya Prakashan, New Delhi.
2. Environmental Protection Law and Policy in India by Thakur Kailash; Deep and Deep Publications, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi
4. Environmental Science by Deswal and Deswal; Dhanpat Rai and Co. (P) Ltd. Delhi.
5. Engineering Chemistry by Jain and Jain; Dhanpat Rai and Co. (P) Ltd. Delhi.
6. Environmental Studies by Erach Bharucha; University Press (India) Private Ltd., Hyderabad.

7. Environmental Engineering and Management by Suresh K Dhamija; S K Kataria and Sons, New Delhi.
8. E-books/e-tools/relevant software to be used as recommended by AICTE/ NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	04	10
2	04	10
3	08	20
4	06	14
5	06	14
6	08	20
7	06	12
Total	**42**	**100**

4.3 INFORMATION SECURITY AND IT LAWS

L	T	P
4	-	4

RATIONALE

Contents of this course provide understanding of Information Security & theirs measures. Content of this course will enable students to use techniques like Cryptography, VPNs, IDS etc. and IT Laws in the field of Information Technology.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Understand the need for security, Security principles related to Information Management.
- Understand the various computer related attacks.
- Apply different types of cryptography techniques to encrypt/decrypt data or information.
- Understand the network security measures and the concept of VPNs.
- Understand concept of IDS, Operating system security and web security
- Understand the IT Laws and latest amendments applicable in India as well as Intellectual property laws

DETAILED CONTENTS

1. **INTRODUCTION AND SECURITY TRENDS :** (06 Periods)

   1.1 Need for security, Security principles, Authentication, Access control.

   1.2 Threats to security : Viruses and Worms, Intruders, Insiders, Criminal organization, Terrorist, Information Warfare (IW), Avenues of attack, Steps in Attack.

   1.3 Types of attack : Active and Passive attacks, Denial of service, backdoors and trapdoors, sniffing, spoofing, man in the middle, replay, TCP/IP Hacking, Encryption attacks, Malware : Viruses, Logic bombs.

2. **ORGANIZATIONAL/ OPERATIONAL SECURITY :** (07 Periods)

   2.1 Role of people in security : Password selection, Piggybacking, Shoulder surfing, Dumpster diving, Installing unauthorized software/hardware, Access by non-employees, Security awareness, Individual users responsibilities.

   2.2 Physical security : Access controls Biometrics : Fingerprints, hand prints, retina, patterns, voice patterns, signature and writing patterns, keystrokes and physical barriers.

2.3 Network security basics, model for network security.

3. **CRYPTOGRAPHY AND PUBLIC KEY INFRASTRUCTURE :** (13 Periods)

3.1 Introduction: Cryptography, Cryptanalysis, Cryptology, Substitution techniques; Caesar's cipher, monoalphabetic and polyalphabetic transposition techniques- Rail fence technique, simple columnar, steganography.

3.2 Hashing - Concept

3.3 Symmetric and asymmetric cryptography : Introduction Symmetric encryption: DES (Data Encryption Standard) algorithm, Diffle-Hellman algorithm, Problem of key distribution, Asymmetric key cryptography : Digital signature, key escrow.

3.4 Public key encryption : Basics, digital certificates, certificate authorities, registration authorities, steps for obtaining a digital certificate, steps for verifying authenticity and integrity of a certificate.

4. NETWORK SECURITY : (08 Periods)

4.1 Firewalls : Concept, design, principles, limitations, trusted system, Kerberos- concept.

4.2 Security topologies - Security zones, DMZ, Internet, Intranet, VLAN, Security implication, Tunnelling.

4.3 IP security : Overview, architecture, IPSec, IPSec configuration, IPSec security.

4.4 Virtual Private Network.

4.5 Email security : Email security standards : Working principles of SMTP, PEM, PGP, S/MINE, spam.

5. **SYSTEM SECURITY :** (08 Periods)

5.1 Intruders, Intrusion detection system (IDS), Host Based IDS, Network based IDS.

5.2 Password Management, Vulnerability of password, Password selection strategies, Components of good password.

5.3 Operating system security : Operating system hardening, General steps for securing windows operating system, Hardening UNIX/LINUX based operating system, Updates : Hot Fix, Patch, Service pack.

6. **APPLICATION AND WEB SECURITY :** **(**06 Periods)

6.1 Application hardening, application patches, Web servers, Active director.

6.2 Web security threats, Web traffic security approaches, Secure socket layer and transport layer security, secure electronic transaction software development : secure code techniques, buffer overflow, code injection, least privilege, good practices, Testing.

7. **IT LAWS :** (08 Periods)

7.1 Information Security Standards - ISO, IT Act, Copyright Act, Patent Law, IPR, Cyber Laws in India. IT Act 2000 Provisions and latest amendments.

7.2 Intellectual property law : Copy Right Law, Software License, Semiconductor Law and Patent Law.

LIST OF PRACTICAL

1. Knowledge the security provided with windows operating system.
2. Recovery the password of window machines using password recover utility (John the ripper) or any other utility.
3. Tracing of email origin using email trace pro utility.
4. Use of Keylogger and anti-keylogger to secure yours system.
5. Encrypt and decrypt the message using simple transposition - Permutation (Cryptool)
6. Encrypt and decrypt the message using Caesar Cipher With variable key (Cryptool)
7. Encrypt and decrypt the message using 3 X 3 Hill Ciper (Cryptool)
8. Create Digital Signature document using (Cryptool)
9. Send and receive secret message using stenography techniques using steghide.
10. Recover the data from formatted Pen Drive and Hard Disk using Power Data Recovery Utility or any other utility.

INSTRUCTONAL STRATEGY

The content of this course is to be taught on conceptual basis with real world examples. Since this subject is practice oriented, the teacher should demonstrate the capabilities of websites/Webpages to students while doing practical exercises for information security. The students should be made familiar with preventive measures for information and computer security.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Information Security Handbook by Darren Death ,Packt Publishing
2. Principles of Information Security by Whitman , Cengage Publisher
3. Cyber Security by Nina Godbole, Wiley Publisher
4. Introduction to Information Security And Cyber Laws by Dr. Surya Prakash Tripathi
5. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley Publisher
6. Cryptography and Network Security - Principles and Practice by Stallings William, Pearson Education Publisher.
7. Cyber Law & Cyber Crimes Simplified ,by Cyber Infomedia Publisher
8. Information Technology Act, 2000 Along with Rules & Regulations by Universal Law Publishing
9. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR, Chandigarh.

Websites for Reference:

1. http://swayam.gov.in
2. http://spoken-tutorial.org

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	10
2	07	15
3	13	15
4	08	15
5	08	15
6	06	15
7	08	15
Total	**56**	**100**

4.4 Elective

4.1 WEB DEVELOPMENT USING LARAVEL FRAMEWORK

L	T	P
6	-	6

RATIONALE

This course will enable the students to understand and develop competency amongst the students to design professional database backed dynamic and feature based web sites. The course covers the use of programming with PHP and the concepts of database with MySQL Students will be introduced to popular web application frameworks for building scalable web applications. The main objective for this course is to motivate student's interest in learning Web-app development by giving them an insight into its possibilities through practical applications. In addition, the course also provides a sufficiently broad but practical introduction to Server-side web technologies. Hence this paper is introduced in this curriculum.

LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- perform various logical operations in PHP
- create simple program to validate forms in PHP
- perform database connectivity using PHP
- apply the basic concepts, principles and practices of Web-site development using server-side technologies (PHP &MySQL)
- Setup Laravel framework
- create and manage Blogs, Websites using Laravel

DETAILED CONTENTS

1. PHP Introduction (20 Periods)
   Introduction to PHP: How PHP Works , The php.ini File, Basic PHP Syntax, PHP variables, statements, operators, decision making, loops, arrays, strings, PHP OOPs concept, PHP forms (form handling , validation) , get and post methods, functions.
   Introduction to cookies, storage of cookies at client side, Using information of cookies. Creating single or multiple server side sessions. Timeout in sessions.

2. PHP and MySQL (10 Periods)
   Introduction to MySQL, connecting to MySQL, database, creation, insertion, deletion and retrieval of MySQL data using PHP.

3. MVC Framework – Laravel Introduction (24 Periods)
   Introduction of Laravel, Installation, Artisan CLI (command-line interface), Directory Structure, Configuring a new Laravel project, Basic Routing, Routing Parameters,

Middleware, Controllers, Views, Passing Data to Views, Sharing data with all views, Blade Template, Errors & logging.

4. Working with Laravel (30 Periods)

Print Variable, Control Statement, Form Handling, Connecting Database, Insert, Retreive, update and delete records, Localization, MODEL, jQuery AJAX, Error Handling, File Uploading, Validation & Preserving the Data, Sessions- Accessing, Storing & Deleting , Crud Operations (CREATE, READ, UPDATE, DELETE, SEARCH), Redirecting to control instructions and named routes.

LIST OF PRACTICALS

1. Design PHP based web pages using correct PHP, CSS, and XHTML syntax, structure.
2. Create Web forms and pages that properly use HTTP GET and POST protocol as appropriate.
3 Design SQL language within MySQL and PHP to access and manipulate databases.
4. Install and configure both PHP and MySQL.
5 Create PHP code that utilizes the commonly used API library functions built in to PHP.
6. Design and create a complete web site that demonstrates good PHP/MySQL client/server design using ajax
7. To store a cookie using PHP on client side.
8. To save the user session on server side.
9. Design website using LARAVEL
10. Creation of basic Blogging website

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of websites/WebPages to students while doing practical exercises. Since the entire course content is web based, students can practice it online. The teachers should have practice on this framework. Entire course is hands-on based so practicals should be conducted in the laboratory.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Head First PHP & MySQL , O'Reilly Media, Inc , Michael Morrison, Lynn Beighley
2. Sams Teach Yourself PHP, MySQL, and Apache All in One" by Julie C. Meloni, Publisher: SAMS ,ISBN 0-672-32976-X
3. Web enabled development application by Ivan Byross: Commercial; TMH
4. PHP: The Complete Reference , by Steven Holzner Mcgraw Higher Ed
5. PHP and MySQL Web Development , by Luke Welling , Pearson Education india
6. Beginning Laravel by Sanjib Sinha, 2016.
7. Design Patterns in PHP and Laravel by Kelt Docking, 2016.
8. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in
http://spoken-tutorial.org

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	20	25
2	10	15
3	24	30
4	30	35
Total	**84**	**100**

4.4.2 COMPUTER BASED ACCOUNTING

L	T	P
6	-	6

RATIONALE

This course will enable students to understand & develop accounting features of different organizations. The students are able to create different vouchers, ledgers. The students are able to calculate TDS & GST of different entities like individual, company etc. Hence this subject is introduced in the curriculum.

LEARNING OUTCOME:

After undergoing the subject, the students will be able to:

- Perform various accounting operations
- Calculate TDS of different entities like individual, company
- Calculate GST of organizations, products etc.
- To create ledger, inventory, vouchers etc.
- To create update vouchers.

DETAILED CONTENTS

1. INTRODUCTION TO TALLY (Including ERP) : Installing Tally, Getway of Tally, Creating Company, Company Features (Accounting Features, Inventory Features, Statuory and Takation Features), Configuring Tally.

2. CREATING MASTERS IN TALLY : Creating Account Masters, account information, creating an account group, Ladger, Creating Ledgers, Creating Multiple Ledger, Creating Inventory Masters, Stock Groups, Stock items, Unit of measure, Vouchers type.

3. ENTERING VOUCHERS IN TALLY : Voucher types (Payment voucher, Reciept voucher, Contra voucher, Sales voucher, Purchase voucher, Journal voucher, Memo voucher), Simple voucher entry, Pure inventory voucher, Types of inventory vouchers.

4. TAX DEDUCTION AT SORUCE (TDS) :Introduction to TDS, Features of TDS in Tally, Flowchart of TDS, TDS accounts, TDS transactions, Configuring Tally for TDS, Creation of Masters, Voucher entry for TDS, TDS deduction voucher, Printint TDS challans.

5. GST : What is GST. General terminologies used in GST, Advantages of GST, Advances of GST over VAT, GST rates, Computation of GST, GST documents, Ledger Masters, Sales Ledger, Vouchers and transactions, GST calculation, Major Amendments in GST .

LIST OF PRACTICALS

1. Exercises Based on above all topics

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of websites/WebPages to students while doing practical exercises. Since the entire course content is web based, students can practice it online. The teachers should have practice on this framework. Entire course is hands-on based so practicals should be conducted in the laboratory.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Computer Based Accounting, Sandeep K. Bansal & Rama Bansal C. Mohan Juneja, Kalyani Publishers
2. Computerized Accounting, P.H. Bassett, NCC Services.
3. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR.

Websites for Reference:

http://swayam.gov.in
http://spoken-tutorial.org

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	15	15
3	20	25
4	20	25
5	19	20
Total	**84**	**100**

4.4.3 DEVELOPMENT OF ANDROID APPLICATIONS

L	T	P
6	-	6

RATIONALE

Knowing the details of Mobile and their working principle are need of every common man. Mobile Application development is the very hot business domain. Majority of the corporate have a separate division for the development of mobile applications. It is essential that diploma students must know the way to apply advanced data communicating methods and networking protocols for wireless and mobile devices. Hence this subject is introduced in this course.

LEARNING OUTCOMES

After undergoing this subject, the students will be able to:

- Illustrate the usage of different components of Android OS in detail.
- Develop a mobile application using different components of Android.
- Choose appropriate controls to design the GUI to meet desired needs.
- Consume JSON data and call web services from Android mobile app.
- Write a program in Android to store data in databases.
- Develop Mobile applications using Android.

DETAILED CONTENTS

1. Introduction to ANDROID (10 periods)

What is Android? Dalvik Virtual Machine & .apk file extension, Fundamentals: Basic Building blocks - Activities, Services, Broadcast Receivers & Content providers, UI Components - Views & notifications, Components for communication -Intents & Intent Filters, Android API levels (versions & version names)

2. Environment Setup and Basic Project Structure (08 periods)

Setting up development environment Android, Manifest.xml, Gradle, Uses-permission & uses-sdk, Resources & R.java, Assets, Layouts & Drawable Resources, First sample Application, Launching emulator, Editing emulator settings, Emulator shortcuts, Logcat usage, Introduction to DDMS, Hello World App, Creating your first project The manifest file Layout resource, Running your app on Emulator, Debugging the Android App.

3. Android Fundaments and User Interface Design (12 periods)

Activities and Activity lifecycle, Permission System Basic UI Components: Text View, Button, Radio Button, Edit Text, Image View for image, Check Box , Progress Bar, Event Handling in Android

Layouts: Liner Layout, Relative Layout, Frame Layout, Coordinate Layout, [dip, dp, sip, sp] versus px

Intents: Intents introduction and importance, Types of Intents (Explicit Intents, Implicit intents)

4. Menus and Preferences (10 periods)

Introduction to Menus, Types of Menus (Option menu, Context menu), Uses of Shared Preferences

5. Advanced UI Components (12 periods)

Time and Date, List View, Grid View, Card View, recycler view Adaptors (Base Adaptor, Array Adaptor) & View Holder, Dialogs, Toast, Popup, Fragments, Material Design (Introduction, Navigation, Floating Button, Tool bar).

6. Threads in Android (12 periods)

Threads running on UI thread (run on UI Thread), Worker thread, Handlers & Runnable, AsynTask, calling web services and consuming JSON data from Web Services.

7. Notifications & Services (10 periods)

Broadcast Receivers (Introduction, different ways to register a broadcast receiver), Introduction to Notification, Overview & Types of services, implementing a Service, Service lifecycle

8. Storage and Content Provider (10 periods)

Supported Storage in Android (Internal memory, External memory, Shared Preferences and network), SQLite introduction, CRUD Operations in SQLite database (cursor, content values etc), Basics of Content Provider

LIST OF PRACTICALS

1. Install the Android Studio and Setup the Development Environment

2. Write a program to demonstrate activity (Application Life Cycle)

3. Write a program to demonstrate different types of layouts

4. Write a program to implement simple calculator using text view, edit view, option button and button

5. Write a program to develop app having multiple activities and user should be able switch between the activities by using intents.

6. Write a program to demonstrate list view

7. Write a program to demonstrate photo gallery

8. Write a program to demonstrate Date picker and time picker

9. Develop and simple application with context menu and option menu.

10. Write a program to demonstrate the functionality of Shared Preferences.

11. Develop a sample Android application having navigation items similar to Gmail Application.

12. Write a program to demonstrate a service

13. Write a program to demonstrate the application of intent class

14. Write a program to create a text file in a external memory

15. Write a program to store and fetch data from SQL life database.

INSTRUCTIONAL STRATEGY

Since this subject is practice oriented, the teacher should demonstrate the capabilities of Android app to students while doing practical exercises. The students should be made familiar with developing mobile app and understand the basic concept of Android Platform.

MEANS OF ASSESSMENT

−Assignments and quiz/class tests, mid-term and end-term written tests
− Software installation, operation, development
− Actual laboratory and practical work, exercises and viva-voce

RECOMMENDED BOOKS

1. Beginning Android 4 Application Development by Wei-Meng Lee; Wiley India

2. Android Apps for Absolute Beginners by Jackson; Apress

3. Head First Android Development: A Brain-Friendly Guide, by David Griffiths and Dawn Griffiths, O`Relilly

4. Android Programming for Beginners, by John Horton, Packt Publishing

5. Professional Android, 4th Edition, by Reto Meier, lan Lake, Wrox Press

6. Beginning Android Programming with Android Studio (Wrox Beginning Guides), by Jerome DiMarzio, Wrox Press 7. E-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

http://swayam.gov.in
http://spoken-tutorial.org
https://developer.android.com

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1.	10	14
2.	08	08
3.	12	14
4.	10	12
5.	12	14
6.	12	14
7.	10	12
8.	10	12
Total	**84**	**100**

4.4.4 BIG DATA

L	T	P
6	-	6

RATIONALE

Business data subject provides an introduction to Big data and analytics, which include the use of data, statistical and quantitative analysis, exploratory and predictive models, to inform decisions and actions related to data.

LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- To explore the fundamental concepts of big data analytics
- To develop in-depth knowledge and understanding of the big data analytic domain.
- To learn to analyse the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.
- To understand the applications using Map Reduce Concepts

DETAILED CONTENTS

1. **Introduction to Big Data & Hadoop:** (18 Periods)

   1.1. Introduction to Big Data
   1.2. Big Data Challenges
   1.3. Big Data Architecture
   1.4. Hadoop & its Features
   1.5. Hadoop Ecosystem
   1.6. Hadoop 2.x Core Components
   1.7. Hadoop Storage: HDFS (Hadoop Distributed File System)
   1.8. Hadoop Processing: MapReduce Framework
   1.9. Different Hadoop Distributions

2. **Hadoop Architecture & Commands:** (18 Periods)
   1.1. Hadoop 2.x Cluster Architecture
   1.2. Federation and High Availability Architecture
   1.3. Typical Production Hadoop Cluster
   1.4. Hadoop Cluster Modes
   1.5. Common Hadoop Shell Commands
   1.6. Hadoop 2.x Configuration Files
   1.7. Single Node Cluster & Multi-Node Cluster set up
   1.8. Basic Hadoop Administration
3. **MapReduce:** (18 Periods)
   1.1. Traditional way vs MapReduce way
   1.2. Why MapReduce

1.3. YARN(Yet Another Resource Negotiator) Components
1.4. YARN Architecture
1.5. YARN MapReduce Application Execution Flow
1.6. YARN Workflow
1.7. Anatomy of MapReduce Program
1.8. Input Splits, Relation between Input Splits and HDFS Blocks
1.9. MapReduce: Combiner & Partitioner

4. **Features of MapReduce** (15 Periods)
   1.1. Counters
   1.2. Distributed Cache
   1.3. MRunit
   1.4. Reduce Join
   1.5. Custom Input Format
   1.6. Sequence Input Format
   1.7. XML file Parsing using MapReduce

5. **Project Work:** (15 Periods)

LIST OF PRACTICAL

1. Write a very simple Hadoop program that counts the number of occurrences of each word in a text file.

2. Suppose we use an input file that contains the following text:
   Don't judge a book by its cover
   Don't put off until tomorrow what you can do today
   Hope for the best, prepare for the worst

3. Write a Hadoop program to take a text file as input now convert all characters in upper case and save into another text file.

4. Write a Hadoop program to take a text file as input now search a word in the file and count number of occurrence of that word in the file.

5. Write a Hadoop program to take a text file as input now search a word in the file now replace that word with another word.

Projects:-

1. Public Interest Analysis Based on Implicit Feedback of IPTV(Internet Protocol television) Users.
2. Dynamic Job Ordering and Slot Configurations for MapReduce Workloads.

INSTRUCTONAL STRATEGY

The subject is totally practical based. Students should be given clear idea about the basic concepts of programming related to Big Data.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests, mid-term and end-term written tests
- Actual laboratory and practical work, exercises and viva-voce
- Software installation, operation, development and viva-voce

RECOMMENDED BOOKS

1. Big Data Analytics with R and Hadoop by Vignesh Prajapati
2. Data Science for Business: What You Need to Know about Data Mining by om Fawcett
3. Hadoop for Dummies by Dirk Deroos
4. The Human Face of Big Data by Rick Smolan and Jennifer Erwitt
5. Big Data: A Revolution That Will Transform How We Live, Work, and Think by Kenneth Cukier and Viktor Mayer-Schönberger
6. Hadoop – The Definitive Guide by Tom White
7. e-books/e-tools/relevant software to be used as recommended by AICTE/UPBTE/NITTTR, Chandigarh.

Websites for Reference:

1. http://swayam.gov.in
2. http://spoken-tutorial.org

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	18	20
2	18	20
3	18	20
4	15	20
5	15	20
Total	**84**	**100**

4.5 PROJECT WORK

L	T	P
-	-	8

RATIONALE

Major Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective department may have a brainstorming to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The students should identify themselves or accept the given project assignment at least two to three months in advance. The project work identified in collaboration with industry should be preferred. Each teacher is expected to guide the project work of 5–6 students.
The project assignments may consist of:

- Programming customer-based applications
- Web page designing (Only dynamic)
- Database applications
- Software Development

LEARNING OUTCOMES

After undergoing this subject, the student will be able to:

- Use effectively oral, written and visual communication
- Demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.
- Identify, analyse and solve problems creatively through sustainment critical investigation.
- Develop, leadership abilities..
- Apply fundamental and disciplinary concepts and methods in ways appropriate to their areas of study.

A suggestive criterion for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

Sr. No	***Performance criteria***	**Max.** marks**	***Rating Scale***				
			Excellent	**Very Good**	**Good**	***Fair***	**Poor**
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4

4.	Providing solution of the problems or production of final product	20	20	16	12	8	4
5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/ communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9.	Viva voce	10	10	8	6	4	2
Total marks		**100**	**100**	**80**	**60**	**40**	**20**

The overall grading of the practical training shall be made as per following table

	Range of maximum marks	**Overall grade**
i)	More than 80	Excellent
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance of undergoing 8 -10 weeks of project oriented professional training in the same industry and re-evaluated before being disqualified and declared "not eligible to receive diploma ". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

Important Notes

1. **These criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**

2. **The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**

3. **The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**

4. **It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve another criterion of assessment, depending upon the type of project work.

The students must submit a project report of not less than 50 pages (excluding coding). The report must follow the steps of Software Engineering Concepts

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organizations in such an exhibition. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.

10. RESOURCE REQUIREMENT

10.1 Physical Resources

10.1.1 Space Requirement:

Norms and standards laid down by All India Council for Technical Education (AICTE) may be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

10.1.2 Laboratoires/Shops

- Communication Skill Lab
- Programming Lab
- Hardware and Networking Lab
- Internet of Things (IoT) Lab
- Environment Engineering Laboratory

LIST OF EQUIPMENT FOR PG DIPLOMA IN WEB DESIGNING

Sr. No.	Description	Qty	Total Price (Rs)
COMMUNICATION SKILL LABORATORY			
1.	Stools	40ss	10,000
2.	Display Board/Screen	2	6,000
3.	Sound recording and playing system	1	6,000
4.	Audio cassettes	60	2,000
5.	Overhead Projector	1	5,000
6.	Transparencies slides	100	500
7.	TV, VCR and camera for video recording	1 each	20,000
8.	English spoken course	1	2,000
9.	A Quiz room equipped with two way audio system, back projection system and slide projector	1	30,000
10.	Miscellaneous	LS	1,500

PROGRAMMING LAB			
Sr. No.	**Description**	**Qty**	**Approx. Price (Rs)**
1.	Computer Server (Quad core, intel processor 32 GB RAM)	1	5,00,000/-
2.	Computer Desktop (i7,8th Generation, 1TB Hard disk, 8Gb RAM, Pre loaded window with 5 year warranty)	60	48,00,000/-
3.	Switch with 24 port speed 10/100/1000 (Manageable)	3	1,50,000/-
4.	Multifunctional Laser/Ink tank Printer	3	90,000/-
5.	Laptop	1	75,000/-
6.	Online UPS, 6KVA with battery	2	2,00,000/-
7.	Internet Connectivity	60 Nodes	3,00,000/-
8.	LCD/DLP Projector with Screen (HD/Full HD/4K)	1	60,000/-
9.	Linux Operating System (Open Source)	-	-
10.	Visual Studio Community Edition (Freeware, Open Source)	-	-
11.	Visual Studio Code (Open Source)	-	-
12.	Multimedia Tools – Software - Blender (Freeware) - Gimp Animation Tool (Freeware)	-	-
13.	Mongo DB (Freeware)	-	-
14.	Python IDE (PyCharm/Eclipse with PyDev/VS Code etc) – Freeware	-	-

15.	HTML & CSS, Java Script, Ajax (Open Source)	-	-
16.	PHP IDE XAMPP/WAMPP/VS Code (Freeware)	-	-
17.	Word press (Open Source)	-	-
18.	Oracle XE (Freeware)/MySql (Open Source)	-	-
19.	Rstudio (Open Source)	-	-
20.	Java for Internet Environment (latest version) – software	-	-
21.	MS Office latest or equivalent FOSS - Libre Office/Open Office (Freeware)	1 -	20,000/- Per year -
22.	Compiler Turbo C, C++ or equivalent FOSS	1	10,000/-
23.	Web camera, Mike and speakers	LS	20,000/-
24.	Air Conditioner 2 ton	2	70,000/-
25.	STARUML (Open Source)	-	-
26.	J-Meter (Performance Testing)- Open Source	-	-
27.	Lucid Chart (Developing DFD Model)- Open Source	-	-
28.	Selenium (functional Testing and Web Application)- Open Source	-	-
29.	J Unit (Java Testing) Open Source	-	-
30.	Cross browser Testing (Compatibility Testing) - Open Source	-	-
31.	Gantt Project (Project Plan)- Open Source	-	-
32.	Video Editing Tools (Open Source)	-	-
33.	- Eclipse IDE for Java programming/JDK (Open Source) - Apache Tomcat Web Server for Advanced Java Web Applications	- -	- -
34.	Antivirus Software	5 Users	10,000/-
35.	Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc.	LS	30,000/-
Total Approx. Price			63,35,000/-

HARDWARE AND NETWORKING LAB			
1.	Computer Server (Quad core, intel processor 32 GB RAM)	1	5,00,000/-
2.	Computer Desktop (i7,8th Generation, 1TB Hard disk, 8Gb RAM, Pre loaded window with 5 year warranty)	20	16,00,000/-
3.	Online UPS, 6KVA with battery	1	1,00,000/-
4.	Switch with 24 port speed 10/100/1000 (Manageable)	1	50,000/-
5.	Connectors (RJ-45, RJ-11, BNC, SC, ST)	LS	10,000/-

6.	Cables: (UTP,STP,OFC) - 25 m each	LS	10,000/-
7.	Multifunctional Laser/Ink tank Printer	1	30,000/-
8.	Router	1	40,000/-
9.	Modem cum Router	2	10,000/-
10.	Compact Disk/DVD R/W	100	2000/-
11.	Hardware kit (for computer Assembling/de-assembling)	8	1,50,000/-
12.	External Hard Disk	4	30,000/-
13.	Networking Printer	1	1,25,000/-
14.	Internet Connectivity	20 Nodes	1,00,000/-
15.	Computer System Demonstration Kit	1	1,50,000/-
16.	Printer Demonstration Kit	1	1,00,000/-
17.	SMPS Demonstration Kit	1	20,000/-
18.	LAN Trainer	4	10.000/-
19.	Antivirus Software	5 Users	10,000/-
20.	Unmanaged Switch	4	60,000/-
21.	Hub	2	20,000/-
22.	Air Conditioner 2 ton	2	70,000/-
23.	Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc.	LS	30,000/-
Total Approx. Price			32,27,000/-

INTERNET OF THINGS (IoT) LAB for PGDCA			
Sr.No.	Description	Qty	Approx. Price(Rs)
1.	Computer Desktop (i7,8th Generation, 1TB Hard disk, 8Gb RAM, Pre loaded window with 5 year warranty)	60	48,00,000/-
2.	Switch with 24 port speed 10/100/1000 (Manageable)	3	1,50,000/-
3.	Multifunctional Laser/Ink tank Printer	1	30,000/-
4.	Online UPS, 6KVA with battery	2	2,00,000/-
5.	Interactive Panel (75 Inch or more)	1	5,00,000/-
6.	Laptop	1	75,000/-
7.	Internet Connectivity	60 Nodes	3,00,000/-

8.	Photocopier Compatible with Computer System: Colour/Mono Photo-copier	1	1,50,000/-
9.	LCD/DLP Projector with Screen (HD/Full HD/4K)	1	60,000/-
10.	Video Conferencing System	1	2,00,000/-
11.	Android Studio (Open Source)	-	-
12.	Antivirus Software	5 Users	10,000/-
13.	Windows Latest or equivalent FOSS	1	10,000/-
14.	SciLab (Open Source)	-	-
15.	Microsoft Azure/AWS/EC2 (Open Source)	-	-
16.	Own Cloud (Open Source)	-	-
17.	CloudSim (Open Source)	-	-
18.	Digital Board	1	30,000/-
19.	Air Conditioner 2 ton	2	70,000/-
20.	Arduino Uno IDE with built in Wifi	20	20,000/-
21.	Raspberry pi	2	6,000/-
22.	Sensor Kits (e.g. MQ135, DHT11 etc.)	10	1,00,000/-
23.	Bluetooth module HC05	10	3,500/-
24.	Display Screen	5	1,000/-
25.	Relay Module	5	5,000/-
26.	Wi-fi Module	10	5,000/-
27.	Development Boards (Micro Controller) PIC/AVR/8051	10	20,000/-
28.	ATMEGA Project Trainer Kit	20	20,000/-
29.	Mini ARM-7 Development Kit	10	40,000/-
30.	TopWin Universal IC Programmer	10	30,000/-
31.	VLSI Kit Xilinx with cable and power adapter	10	45,000/-
32.	Assorted Components (Active & Passive)	10 Set	40,000/-
33.	Assorted microcontrollers/processors (set)	10 Set	40,000/-
34.	Connectivity Radios (GPS, GSM,125 Khz RFID Reader, USB to Serial FTDI, Finger Print Reader ,	10 set	1,25,000/-

	Wifi, Bluetooth, MIFARE RFID Writer/Reader with cards, NRF module, RF Module 434 Mhz Pair, Zigbee Module)		
35.	Gear DC Motor with wheels	10	2,500/-
36.	16*2 -Alpha numeric display	10	3,000/-
37.	Wireless AV Camera	05	12,500/-
38.	USB AV Tuner	05	15,000/-
39.	8 Relay Radio Control Module	05	15,000/-
40.	9 volt Battery	100	2,000/-
41.	DC Power Supply	10	2,000/-
42.	Tools and Supplies (Tools, connecting wires, solder wire(set))	10	20,000/-
43.	Miscellaneous- cables and connectors, computer stationery, printer consumables (inks), toner etc.	LS	30,000/-
	Total Approx. Price		71,87,500/-

Sr. No.	**Particulars**	**Unit**	**Approx. Total Cost**
ENVIRONMENT ENGINEERING LABORATORY			
1.	pH Meter	01	500
2.	Turbidity Meter	01	5000
3.	Oven with Temperature Controller and Forced Air Circulation Type	01	20000
4.	B.O.D. Incubator	01	25000
5.	Water Analysis Kit	01	5000
6.	High Volume Sampler	01	40000
7.	Electrical Balance for weighing upto 1/10 of milligram (capacity)	01	1000

NOTE:

In addition to above laboratories, computer centre will be required for effective implementation of the course.

10.1.3 Furniture Requirement

Norms and standards laid down by AICTE be followed for working out furniture requirement for this course.

- Furniture for laboratories/Computer Centre 15 lacs

10.2 Human Resources

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications, experience and job description of teaching staff workshop staff and other administrative and supporting staff be worked out as per norms and standards laid down by the AICTE. The website www.aicte.ernet.in may be referred for downloading current norms and standards pertaining to technician courses.

11. EVALUATION STRATEGY

11.1 INTRODUCTION

Evaluation plays an important role in the teaching-learning process. The major objective of any teaching-learning endeavour is to ensure the quality of the product which can be accessed through learner's evaluation.

The purpose of student evaluation is to determine the extent to which the general and the specific objectives of curriculum have been achieved. Student evaluation is also important from the point of view of ascertaining the quality of instructional processes and to get feedback for curriculum improvement. It helps the teachers in determining the level of appropriateness of teaching experiences provided to learners to meet their individual and professional needs. Evaluation also helps in diagnosing learning difficulties of the students. Evaluation is of two types: Formative and Summative (Internal and External Evaluation)

Formative Evaluation

It is an on-going evaluation process. Its purpose is to provide continuous and comprehensive feedback to students and teachers concerning teaching-learning process. It provides corrective steps to be taken to account for curricular as well as co-curricular aspects.

Summative Evaluation

It is carried out at the end of a unit of instruction like topic, subject, semester or year. The main purpose of summative evaluation is to measure achievement for assigning course grades, certification of students and ascertaining accountability of instructional process. The student evaluation has to be done in a comprehensive and systematic manner since any mistake or lacuna is likely to affect the future of students.

In the present educational scenario in India, where summative evaluation plays an important role in educational process, there is a need to improve the standard of summative evaluation with a view to bring validity and reliability in the end-term examination system for achieving objectivity and efficiency in evaluation.

11.2 STUDENTS' EVALUATION AREAS

The student evaluation is carried out for the following areas:

- Theory
- Practical Work (Laboratory, Workshop, Field Exercises)
- Project Work
- Professional Industrial Training

A. Theory

Evaluation in theory aims at assessing students' understanding of concepts, principles and procedures related to a course/subject, and their ability to apply learnt principles

and solve problems. The formative evaluation for theory subjects may be caused through sessional /class-tests, home-assignments, tutorial-work, seminars, and group discussions etc. For end-term evaluation of theory, the question paper may comprise of three sections.

Section-I

It should contain objective type items e.g. multiple choice, matching and completion type. Total weightage to Section-1 should be of the order of 20 percent of the total marks and no choice should be given in this section. The objective type items should be used to evaluate students' performance in knowledge, comprehension and at the most application domains only.

Section-II

It should contain short answer/completion items. The weightage to this section should be of the order of 40 percent of the total marks. Again, no choice should be given in section-II

Section-III

It may contain two to three essay type questions. Total weightage to this section should be of the order of 40 percent of the total marks. Some built-in, internal choice of about 50 percent of the questions set, can be given in this section

Table II : Suggested Weightage to be given to different ability levels

Abilities	Weightage to be assigned
Knowledge	10-30 percent
Comprehension	40-60 percent
Application	20-30 percent
Higher than application i.e. Analysis, Synthesis and Evaluation	Upto 10 percent

B. Practical Work

Evaluation of students performance in practical work (Laboratory experiments, Workshop practicals/field exercises) aims at assessing students ability to apply or practice learnt concepts, principles and procedures, manipulative skills, ability to observe and record, ability to interpret and draw conclusions and work related attitudes. Formative and summative evaluation may comprise of weightages to performance on task, quality of product, general behaviour and it should be followed by viva-voce.

C. Project

The purpose of evaluation of project work is to assess students ability to apply, in an integrated manner, learnt knowledge and skills in solving real life problems,

manipulative skills, ability to observe, record, creativity and communication skills. The formative and summative evaluation may comprise of weightage to nature of project, quality of product, quality of report and quality of presentation followed by viva-voce.

D. Professional Industrial Training

Evaluation of professional industrial training report and viva-voce/ presentation aims at assessing students' understanding of materials, industrial processes, practices in the industry/field and their ability to engage in activities related to problem-solving in industrial setting as well as understanding of application of learnt knowledge and skills in real life situation. The formative and summative evaluation may comprise of weightages to performance in testing, general behaviour, quality of report and presentation during viva-voce.

11.3 ASPECTS OF QUESTION PAPER SETTING

Validity and reliability are the most important considerations in the selection and construction of evaluation procedures. First and foremost are the evaluation tools to measure the specific outcomes for which they are intended to measure. Next in importance is reliability, and following that is a host of practical features that can be classified under the heading of usability.

For weightage of marks assigned to formative (internal) and summative (external) evaluation and duration of evaluation has been given in the study and evaluation scheme of the curriculum document. Teachers/Paper-setters/Examiners may use Manual for Students' Evaluation developed by Institute of Research Development & Training, U.P. Kanpur to bring objectivity in the evaluation system. The working group found it very difficult to detail out precisely the contents of subject on languages and therefore teachers may send guidelines to respective examiners for paper setting to maintain objectivity in evaluation.

12. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION

This curriculum document is a Plan of Action (POA) and has been prepared based on exhaustive exercise of curriculum planning and design. The representative sample comprising selected senior personnel (lecturers and HODs) from various institutions and experts from industry/field have been involved in curriculum design process.

The document so prepared is now ready for its implementation. It is the faculty of polytechnics who have to play a vital role in planning instructional experiences for the courses in four different environments viz. class-room, laboratory, library and field and execute them in right perspective. It is emphasized that a proper mix of different teaching methods in all these places of instruction only can bring the changes in stipulated students behaviour as in the curriculum document. It is important for the teachers to understand curriculum document holistically and further be aware of intricacies of teaching-learning process (T-L) for achieving curriculum objectives. Given below are certain suggestions which may help the teachers in planning and designing learning experiences effectively. These are indicative in nature and teachers using their creativity can further develop/refine them. The designers of the programme suggest every course teacher to read them carefully, comprehend and start using them.

(A) Broad Suggestions:

1. Curriculum implementation takes place at programme, course and class-room level respectively and synchronization among them is required for its success. The first step towards achieving synchronization is to read curriculum document holistically and understand its rationale and philosophy.

2. Uttar Pradesh State Board of Technical Education (BTE U.P.) may make the academic plan available to all polytechnics well in advance. The Principals have a great role to play in its dissemination and, percolation upto grass-root level. Polytechnics in turn are supposed to prepare institutional academic plan by referring state level BTE plan.

3. HOD of every Programme Department along with HODs and in-charges of other departments are required to prepare academic plan at department level referring institutional academic plan.

5. All lecturers/Senior lecturers are required to prepare course level and class level lesson plans referring departmental academic plan.

(B) Course Level Suggestions

Teachers are educational managers at class room level and their success in achieving course level objectives lies in using course plan and their judicious execution which is very important for the success of programme by achieving its objectives.

Polytechnic teachers are required to plan various instructional experiences viz. theory lecture, expert lectures, lab/workshop practicals, guided library exercises, field visits, study tours, camps etc. In addition, they have to carry out progressive assessment of theory, assignments, library, practicals and field experiences. Teachers are also required to do all these activities within a stipulated period of 16 weeks which is made available to them in the academic plan

at BTE level. With the amount of time to their credit, it is essential for them to use it judiciously by planning all above activities properly and ensure execution of the plan effectively.

Following is the gist of suggestions for subject teachers to carry out T-L process effectively:

1. Teachers are required to prepare a course plan, taking into account departmental academic plan, number of weeks available, course to be taught, different learning experiences required to be developed etc.

2. Teachers are required to prepare lesson plan for every theory class. This plan may comprise of content to be covered, learning material (transparencies, VCDs, Models etc.) for execution of a lesson plan. They may follow steps for preparing lesson plan e.g. drawing attention, state instructional objectives, help in recalling pre-requisite knowledge, deliver planned subject content, check desired learning outcome and reinforce learning etc.

3. Teachers are required to plan for expert lectures from field/industry. Necessary steps are to plan in advance, identify field experts, make correspondence to invite them, take necessary budgetary approval etc.

4. Teachers are required to plan for guided library exercises by identification of course specific experience requirement, setting time, assessment, etc. The tutorial, assignment and seminar can be thought of as terminal outcome of library experiences.

5. Concept and content based field visits with appropriate releases (day-block) may be planned and executed for such content of course which otherwise is abstract in nature and no other requisite resources are readily available in institute to impart them effectively.

6. There is a dire need for planning practical experiences in right perspective. These slots in a course are the avenues to use problem based learning/activity learning/ experiential learning approach effectively. The development of lab instruction sheets for the course is a good beginning to provide lab experiences effectively.

7. Planning of progressive assessment encompasses periodical assessment in semester, preparation of proper quality question paper, assessment of answer sheets immediately and giving constructive explicit feedback to every student. It has to be planned properly; otherwise very purpose of the same is lost.

8. The co-curricular activities like camp, social gathering, study tour, hobby club etc. may be used to develop generic skills like task management, problem solving, managing self, collaborating with others etc.

9. Where ever possible, it is essential to use activity based learning rather than relying on delivery based conventional teaching all the time.

10. While imparting instructions, emphasis may be laid on the development of cognitive, psychomotor, reactive and interactive skills in the students.

11. Teachers may take working drawings from the industry/field and provide practices in reading these drawings.

12. Considerable emphasis should be laid in discipline specific contracting and repair and maintenance of machines, tools and installations.

13. Teachers may take initiative in establishing liaison with industries and field organizations for imparting field experiences to their students.

14. Case studies and assignments may be given to students for understanding of Enterprise Resource Management (ERM).

15. Students be made aware about issues related to ecology and environment, safety, concern for wastage of energy and other resources etc.

16. Students may be given relevant and well thought out minor and major project assignments, which are purposeful and develop practical skills. This will help students in developing creativity and confidence for their gainful employment (wage and self).

17. A Project bank may be developed by the concerned department of the polytechnics in consultation with related Industry, Research Institutes and other relevant field organizations in the state.

13. LIST OF PARTICIPANTS

The following experts have participated in workshop for Developing Curriculum Contents of PG diploma course in Computer Application for UP State on 18th October, 2019 at IRDT Kanpur, 30th January, 2020 at GP Ghaziabad, 05th July, 2021 at IRDT Kanpur and 8th July, 2021 at IRDT Kanpur:

1. Sh. Ashish Kanaujiya, Founder & Director, NXG Ventures, Ahmedabad.
2. Sh. Kural Srivastava, Sr. Scientist, CSIR-CDRI Lucknow.
3. Ms. Mugdha Tripathi, Team Lead, Accenture India, Noida.
4. Sh. Harsh Jaiswal, Sr. iOS Developer, Docquity PTE Ltd, New Delhi.
5. Sh. Brijesh Kushwaha, Sr. Software Engineer, S&P Global , Gurugram.
6. Sh. Ankit Kumar, Consultant, Genpact India Pvt Ltd, Noida.
7. Sh. L.S. Yadav, Principal, Government Girls Polytechnic, Jhansi .
8. Sh. Ashok Kushwaha, HOD Computer/ Text Book Officer, IRDT, U.P. Kanpur.
9. Sh. Shyam Lal Chaudhary, HOD Computer, Government Polytechnic, Kanpur.
10. Sh. Neeraj Kumar, HOD IT /Assistant Director, Directorate of Technical Education, U.P. Kanpur.
11. Sh. P.C. Sonkar, Lecturer, Electronics, Government Polytechnic, Kanpur.
12. Sh. Sumit Babu, Lecturer, CS, Government Polytechnic, Kanpur.
13. Sh. Vivek Kumar Srivastava, Lecturer, Electronics, Government Polytechnic, Ghaziabad .
14. Sh. Lalit Kumar Gupta, Lecturer, IT , Government Polytechnic, Ghaziabad .
15. Ms. Fatema Siddiqua, Lecturer, CS, Government Polytechnic, Ghaziabad .
16. Ms. Rashmi Singh, Lecturer, CS, Government Girls Polytechnic, Shamli .
17. Sh. Saurabh Sachan, Lecturer, CS, Government Polytechnic, Unnao.
18. Sh. Devendra Singh, Lecturer, IT, Government Girls Polytechnic, Badalpur, Gautam Buddha Nagar.
19. Sh. Gaurav Kishor Kanaujiya, Assistant Professor, IRDT Kanpur- Coordinator, IRDT Kanpur

Curriculum Design by
IRDT U.P. Kanpur