विज्ञान व तंत्रज्ञान विद्याशाखेतील **CBCS** पॅटर्न नुसारच्या पदवी स्तरावरील तृतीय वर्षाच्या सुधारित (दुरूस्ती) अभ्यासक्रमा बाबत....

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, विज्ञान व तंत्रज्ञान विद्याशाखेतील शैक्षणिक वर्ष २०२१-२२ मध्ये **CBCS** पॅटर्न नुसार लागू केलेल्या पदवी स्तरावरील तृतीय वर्षाचे अभ्यासक्रम दुरूस्ती करण्यास मा. विद्यापरिषदेच्या दिनांक ३१ जुलै २०२५ रोजीच्या बैठकीतील विषय क्रमांक ०३/६२-२०२५ अन्वये मान्यता प्रदान केली आहे. त्यानुसार दुरूस्तीसह खालील अभ्यासक्रम शैक्षणिक वर्ष २०२५-२६ पासुन लागू करण्यात येत आहेत.

01	B.Sc. III rd Year Computer Science
02	B.Sc. III rd Year Software Engineering
03	B.Sc. III rd Year Information Technology
04	B.Sc. III rd Year Computer Management
05	B.Sc. III rd Year Network Technology
06	B.C.A. (Bachelor of Computer Application) III rd Year

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,

विष्णुपुरी, नांदेड – ४३१ ६०६.

जा.क्र.:शैक्षणिक-१/परिपत्रक/बी.एस्सी/दुरूस्ती/S&T/ २०२५-२६/ २२२

दिनांक : ०८.०९.२०२५

सहाय्यक.कुलसचिव
शैक्षणिक अभ्यासमंडळ विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव.

०१. मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.

०२. मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.

०३. मा. संचालक, सर्व संबधित संकुले, प्रस्तुत विद्यापीठ.

०४. मा. प्राचार्य, सर्व संबंधित महाविद्यालये, प्रस्तुत विद्यापीठ.

०५. सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यांना देवून कळविण्यात येते की, सदरील परिपत्रक विद्यापीठाच्या संकेतस्थळावर प्रसिध्द करण्यात यावे.

।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपुरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, मा. विद्याशाखेने **दिनांक ३१ मे २०२१** रोजीच्या बैठकीतील केलेल्या शिफारशीप्रमाणे व दिनांक १२ जून २०२१ रोजी संपन्न झालेल्या ५१ व्या मा. विद्या परिषद बैठकीतील विषय क्र. २६/५१–२०२१च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्यात येत आहेत.

1. B.Sc.-III Year-Biophysics
2. B.Sc.-III Year-Bioinformatics
3. B.Sc.-III Year-Biotechnology
4. B.Sc.-III Year-Biotechnology (Vocational)
5. B.Sc.-III Year-Botany
6. B.Sc.-III Year-Horticulture
7. B.Sc.-III Year-Agro Chemical Fertilizers
8. B.Sc.-III Year-Analytical Chemistry
9. B.Sc.-III Year-Biochemistry
10. B.Sc.-III Year-Chemistry
11. B.Sc.-III Year-Dyes & Drugs Chemistry
12. B.Sc.-III Year-Industrial Chemistry
13. B.C.A. (Bachelor of Computer Application)-III Year
14. B.I.T. (Bachelor of Information Technology)-III Year
15. B.Sc.-III Year-Computer Science
16. B.Sc.-III Year-Network Technology
17. B.Sc.-III Year-Computer Application (Optional)
18. B.Sc.-III Year-Computer Science (Optional)
19. B.Sc.-III Year-Information Technology (Optional)
20. B.Sc.-III Year-Software Engineering
21. B.Sc.-III Year-Dairy Science
22. B.Sc.-III Year-Electronics
23. B.Sc.-III Year-Environmental Science
24. B.Sc.-III Year-Fishery Science
25. B.Sc.-III Year-Geology
26. B. A./B.Sc.-III Year-Mathematics
27. B.Sc.-III Year-Microbiology
28. B.Sc.-III year Agricultural Microbiology
29. B.Sc.-III Year-Physics
30. B. A./B.Sc.-III Year Statistics
31. B.Sc.-III Year-Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/
२०२१–२२/७५

दिनांक : १२.०७.२०२१.

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.
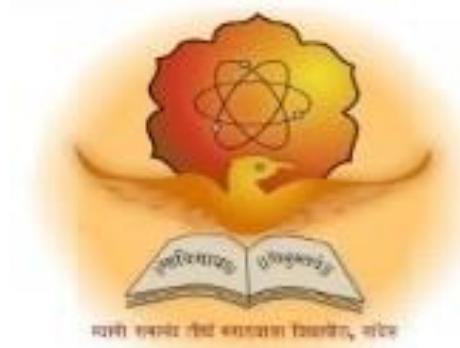७) अधीक्षक, परिक्षा विभाग विज्ञान व तंत्रज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University, Nanded

Syllabus of Third Year

BCA

(Revised CBCS pattern)

Introduced from Academic Year 2021-2022

BCA Third Year Proposed Syllabus
w.e.f. 2021-2022

BCA III Year SEM - V			
Course category	**Subject Code**	**Subjects**	**Credits**
Core Course	BCA-501	System Analysis and Design (SAAD)	04
Core Course	BCA-502	Web Development and PHP Programming	04
Core Course	BCA-503	Mobile Application Development	04
Chose any one from the below Elective courses			
Elective Subject	BCA-504-A	Computer Network	04
	BCA-504-B	Cloud Computing	04
	BCA-504-C	Enterprise Infrastructure and Cloud Technologies Part I	04
Chose any one Open Elective courses			
Open Elective	BCA-505 A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses OR	04
	BCA-505-B	Linux Operating System	04
Lab / Practical	BCA-506	Lab- PHP Programming	02
	BCA-507	Lab- Mobile Application Development	02
		Total Credit	**24**
BCA III Year SEM - VI			
	Subject Code	**Subjects**	**Credits**
Core Course	BCA-601	Software Engineering	04
Core Course	BCA-602	Python	04
Core Course	BCA-603	Project Development activity and Seminar	04
Chose any one from the below Elective courses			
Elective Subject	BCA-604-A	Windows Programming	04
	BCA-604-B	Digital Image Processing	04
	BCA-604-C	Enterprise Infrastructure and Cloud Technologies Part II	04
Chose any one Open Elective courses			
Open Elective	BCA-605 A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses OR	04
	BCA-605-B	Cyber Security	
Lab / Practical	BCA-606	Lab- Python	02
	BCA-607	Lab- Windows Programming and DIP	02
		Total Credit	**24**

Name of Course	Bachelor of Computer Application (BCA)
Semester	V
Name of Subject	System Analysis and Design(SAAD)
Subject Code	BCA- 501
Marks	75 Marks
Lectures	50 Lectures

Objectives:

Develop and evaluate system requirements. Work effectively in a team environment as well as explain the need for and value of a formalized step-by-step approach to the analysis, design, and implementation of computer information systems. Use tools and techniques for process and data modeling.

Outcomes:

Upon successful completion of this course, you will be able to gather data to analyze and specify the requirements of a system. Design system components and environments & build general and detailed models that assist programmers in implementing a system. It also design a database for storing data, a user interface for data input and output, and controls to protect the system and its data.

Unit - I
1. **Introduction of System Concept & System Development Life Cycle** 10
    1.1 System Concept: Definition, Characteristics
    1.2 Elements of system, Physical and abstract system
    1.3 Open and closed system, man-made information systems
    1.4 System Development Life Cycle: Various phases of system development
    1.5 Considerations for system planning and control for system success
    1.6 Role of system analyst

Unit - II
2. **System Planning, Feasibility study & Cost-Benefit Analysis** 10
    2.1 Basis for planning in system analysis: Dimensions of Planning
    2.2 Initial Investigation: Determining user's requirements and analysis
    2.3 fact finding process and techniques
    2.4 Feasibility study: Technical
    2.5 Operational & Economic Feasibilities
    2.6 Cost/Benefit Analysis

Unit - III
3. **Tools of structured Analysis** 15
    3.1 Data Flow diagram
    3.2 Data dictionary
    3.3 IPO charts
    3.4 HIPO charts
    3.5 Gantt charts
    3.6 Pseudo codes
    3.7 Flow charts
    3.8 Decision tree
    3.9 Decision tables

4.   Form and database design   **15**

    4.1   Input/ Output and Form Design
    4.2   Introduction to files and database design
    4.3   File structures and organization
    4.4   Objectives of database design
    4.5   Logical and physical view of data

References:
1. Igor Hawryszkiewyez, "Introduction to System Analysis and Design", 4th edition, Prentice-Hall
2. Jeffrey L. Whitten, and Lonnie D. Bentey, "Systems analysis and Design Methods", 4th edition, Tata McGraw-Hill
3. Mark Lejk, and David Deeks, "An Introduction to System Analysis Techniques", Prentice Hall.
4. Don Yeates, Maura Shields and David Helmy, "System Analysis and Design", Longman group limited, 1994

Name of Course	B.C.A. Third Year
Semester	V Semester
Name of Subject	Web Development and PHP Programming
Subject Code	BCA-502
Marks	75
Lectures	50

Objectives:
- Learn Core-PHP, Server Side Scripting Language.
- Learn to design dynamic and interactive Web pages.
- Learn PHP-Database handling.

Outcomes:
- Able to design dynamic and interactive web pages, websites.
- Able to run PHP scripts on server and retrieve results.
- Able to handle databases like MySQL using PHP in web sites.

Unit - I
1. Introduction to PHP   **10**
   2.1   Introduction to PHP , History and Features of PHP
   1.2   Installation & Configuration of PHP
   1.3   Embedding PHP code in Your Web Pages
   1.4   Understanding PHP, HTML, and White Space. Writing Comments in PHP
   1.5   Sending Data to the Web Browser
   1.6   Data types in PHP, Keywords in PHP
   1.7   Using Variables, Constants in PHP
   1.8   Expressions in PHP
   1.9   Operators in PHP

Unit - II
2. Programming with PHP   **15**
   2.1   Conditional statements: if, if-else, switch, The ? Operator
   2.2   Looping statements: while Loop, do... while Loop, for Loop
   2.3   Arrays in PHP: Introduction- What is Array?
   2.4   Types of Arrays: Indexed Vs. Associative arrays, Multidimensional arrays
   2.5   Creating Array, Accessing Array, Manipulating Arrays, Displaying arrays…..use of for.. each as loop
   2.6   Using Array Functions
   2.7   Including and Requiring Files- use of Include() and Require()
   2.8   Implicit and Explicit Casting in PHP

Unit - III
3. Using Functions , Class- Objects, Forms in PHP   **15**
   3.1   Functions in PHP: Defining and calling a function, Returning Value from function
   3.2   Date and Time in PHP: Date and Time Functions
   3.3   Strings in PHP: String Functions
   3.4   Objects in PHP: What is Class & Object, Creating and accessing a Class & Object,
   3.5   Object properties, object methods, Overloading, inheritance, Constructor and Destructor
   3.6   Creating HTML Form

3.7   Handling HTML Form data in PHP

Unit - IV
4.   Database Handling Using PHP with MySQL   10
    4.1   Introduction to MySQL: Database terms, Data Types,
    4.2   Accessing MySQL –Using MySQL Client and Using phpMyAdmin
    4.3   MySQL Commands
    4.4   Using PHP with MySQL: PHP MySQL Functions
    4.5   Connecting to MySQL and Selecting the Database
    4.6   Executing Simple Queries
    4.7   Retrieving Query Results
    4.8   Counting Returned Records
    4.9   Updating Records with PHP

References:
1.   PHP &MySQL for Dynamic Web Sites- Fourth Edition By Larry ULLman
2.   Learning PHP, MySQL and JavaScript By Robin Nixon -O'REILLY Publications
3.   Programming PHP By Rasmus Lerdorf, Kevin Tatroe, Peter MacIntyre
4.   SAMS Teach yourself PHP in 24 hours, Author: Matt Zandstra, Sams
    Publishing.

Name of Course	B.C.A. Third Year
Semester	V Semester
Name of Subject	Mobile Application Development
Subject Code	BCA-503
Marks	75
Lectures	50

Objectives:
- To gain an understanding of the processes that are involved in an Android developed application
- To become familiar with Android development tools and user interface.
- To understand Activity and Intends
- To understand SQLite Database.
- Ability to build Many simple apps
- To understand the basic operating system command.

Outcomes:
- Install and use appropriate tools for Android development, including IDE, device emulator, and profiling tools.
- Understand the Android OS architecture.
- Understand the Android application architecture, including the roles of the task stack, activities, & services.

Unit - I

1. Introduction to Android   **10**
     1.1 Introduction to Android platform and Achitecture
     1.2 Basic components of Android, activity life cycle
     1.3 Features of ART & Delvik Virtua machine
     1.4 Android Application Structure, device screen size compatibility
     1.5 Android emulator, working with AndroidManifest.xml

Unit - II

2. Introduction Smart Phone Application Development and User Interface   **15**
components, Widgets
     2.1 Creating application template
     2.2 Adding activity, intent, Intents and Intent Filters, Resources

     2.3 System Permissions, services to application

     2.4 Layouts, Recycler View, List View, Grid View and Web view

     2.5 Input Controls: Buttons, Checkboxes, Radio Buttons, Toggle Buttons, Spinners, Input Events, Menus, Toast, Dialogs, Styles and Themes, Creating lists, and Custom lists

Unit - III

3. Multimedia, Animation and Graphics   **10**

     3.1 Playing Audio, Video

3.2   Rotate Animation, FadeIn / FadeOut Animation
3.3   Zoom Animation, Scale animation
3.4   2D and 3D graphics

Unit - IV

4.   Managing Data Storage, Advanced Components of Android   and Location &   15 Map

4.1   Shared Preferences
4.2   Internal Storage, External Storage
4.3   SQLite Databases
4.4   Content provider and Remote Databases
4.5   Web App, JSON Parsing
4.6   Google maps, Using GPS to find current location
4.7   Sensors, bluetooth/Wi-Fi Connectivity

References:

1. Professional Android 4 Application Development, Edition 3 Reto Meier Wrox Publication

2. John Horton, "Android Programming for Beginners", Packt Publishing Limited (2015).

3. Sams Teach Yourself Android Application Development in 24 Hours, Edition illustrated Darcey & Shane Conder Sams Publishing

Name of Course	B.C.A. Third Year
Semester	V Semester
Name of Subject	Computer Network
Subject Code	BCA-504 A
Marks	75
Lectures	50

Objectives:
- To develop an understanding of computer networking basics.
- To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.

Outcomes:
Upon successful completion of this course, student will be able to
- Recognize the technological trends of Computer Networking.
- Discuss the key technological components of the Network.
- Evaluate the challenges in building networks.

Unit - I
1. Introduction to computer network   13
- 3.1   What is Network? , Benefits of Networking
- 1.2   Wired Transmission media – Magnetic media, Twisted Pair, Coaxial Cable, Fiber Optics
- 1.3   Wireless Transmission media – The Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared
- 1.4   Topologies with advantages & disadvantages:-Bus, Ring, Star, Tree, Mesh
- 1.5   Types of Networks – LAN, MAN, WAN

Unit - II
2. Reference Model and Ethernet   12
- 2.1   The need for layered architecture (protocol hierarchies)
- 2.2   OSI reference Model
- 2.3   TCP/IP reference Model
- 2.4   Ethernet Technology - Types of Ethernet, properties of Ethernet, Collision detection and Recovery, Ethernet hardware address, Ethernet Frame Format
- 2.5   Wireless LAN
- 2.6   Bluetooth

Unit - III
3. Internet Basics and Networking Protocol   13
- 3.1   Internet- Architecture, Internet Service Providers (ISP), Internet Addressing System: IP Address, DNS, URL
- 3.2   Concept of Intranet & Extranet
- 3.3   Networking protocol: IP,TCP,FTP,HTTP,DHCP

Unit - IV
4. Network Security   12
- 4.1   Network Security issues
- 4.2   Traditional Cryptography- substitution Ciphers, Transposition Ciphers
- 4.3   Two fundamental cryptographic principles
- 4.4   DES

4.5   Digital Signature
4.6   Firewalls

References:
1. Tanenbaum Andrew, Computer Networks, PHI
2. Forouzan Behrouz A., Data Communication and Networking, Tata Mcgraw Hill
3. Norton Peter, Complete Guide To Networking, SAMS
4. William Stallings, Data and Computer Communications, Pearson Education
5. P.K. Sinha, Computer Fundamentals, BPB

Name of Course	B.C.A. Third Year
Semester	V Semester
Name of Subject	Cloud Computing
Subject Code	BCA -504 –B
Marks	75
Lectures	50

Learning Objectives:
- To Study basics of cloud computing, and comprehend the terminology, tools and technologies associated with today"s top cloudplatforms.
- To provide the programmer's perspective of working of CloudComputing.
- Implement Simple Cloud programs to solve simpleproblems.

Utility of the course:
- Awareness of existing demanding trends for Clouds and Virtualizations in the IT industry in order to get placement as well as inresearch

Unit - I
1. Enterprise computing: a retrospective   **10**
   1.1   Introduction
   1.2   Mainframe architecture
   1.3   Client-server architecture
   1.4   3-tier architectures with TP monitors

Unit - II
2. The internet as a platform and Software as aservice   **15**
   2.1   Internet technology and web-enabled applications
   2.2   Web application servers
   2.3   Internet of services
   2.4   Emergence of software as a service
   2.5   Successful SaaS architectures
   2.6   Dev 2.0 platforms
   2.7   Cloud computing

Unit - III
3. Cloud computing platforms   **10**
   3.1   Infrastructure as a service: Amazon EC2
   3.2   Platform as a service: Google App Engine
   3.3   Microsoft Azure

Unit - IV
4. Web services, AJAX and mashups   **15**
   4.1   Web services: SOAP and REST
   4.2   SOAP versus REST
   4.3   AJAX: asynchronous 'rich' interfaces
   4.4   Mashups: user interface services
   4.5   Data in cloud: Relational databases and cloud file systems(GFS , HDFS)
   4.6   BigTable, HBase and Dynamo

References:
1. Enterprise Cloud Computing: Technology, Architecture, Application By GautamShroff

Name of Course	B.C.A. Third Year
Semester	V Semester
Name of Subject	Enterprise Infrastructure and Cloud Technologies Part I
Subject Code	BCA -504 –C
Marks	75
Lectures	50

Course Objectives
1. To provide a foundational understanding of networking devices, data centers, and enterprise storage technologies.
2. To introduce various server and client operating systems and their configuration and security.
3. To impart practical knowledge on Windows Server administration, storage management, and deployment techniques.
4. To enable learners to work with Active Directory, domain services, and secure authentication mechanisms.
5. To equip students with the ability to monitor, troubleshoot, and manage enterprise-level infrastructure.

Course Outcomes
After completing this course, the student will be able to:
1. Understand the structure and functioning of networking devices, server form factors, and RAID-based storage solutions.
2. Install and configure client and server operating systems, including handling file systems and firewall settings.
3. Manage and administer Windows Server environments, perform patching, clustering, and automated deployment.
4. Implement and secure Active Directory services, group policies, and authentication mechanisms.
5. Demonstrate the ability to monitor system performance and use tools to ensure availability and fault tolerance in enterprise IT infrastructure.

Unit I: Networking and Server Infrastructure
Introduction to Networking Devices and LAN/WAN - IPv4 and IPv6. Routers and Switches Overview. Datacenter Overview and Server Form Factors - Server Management Portals (IPMI/iLO/iDrac) and Events - Introduction to Storage: NAS, DAS, SAN - RAID Levels and Comparisons (Fibre Channel, iSCSI, FCoE)

Unit II: Operating Systems Overview (Server & Client)
Operating Systems Overview (Server & Client), Domain vs. Workgroup - File Systems: FAT, NTFS, ReFS, EXT3, EXT4 - Installing and Managing OS (Windows Server, Linux) - Firewall Fundamentals (Hardware/Software)

Unit III: Windows Server Administration
Windows Server Core Installation, Upgrades, Patch Management & Migrations - Storage Spaces, iSNS, DCB, and MPIO - Data Deduplication and Disk Management - High Availability: Failover Clustering, NLB - Deployment Images using MDT and WSUS - PowerShell DSC and Monitoring Tools - Performance Monitoring and Event Logs

Unit IV: Active Directory & Security
AD DS DNS Server Role, Zones, and Transfers - AD DS Replication and Sites - Group Policy Management and Templates - Securing Domain Controllers and Accounts - Audit Authentication and Managed Service Accounts - Certificate Services (CAs, Templates,

Revocation, Recovery) - AD FS, AD RMS, and Smart Cards - Backup & Restore of Active Directory

Textbooks

Sara Perrott, "Windows Server 2019 & PowerShell All-in-One For Dummies", Wiley, 2021.
Sander van Vugt, "Red Hat RHCSA 8 Cert Guide: EX200", Pearson IT Certification, 2021.
Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall, 5th Edition, Pearson Education, 2011

Core Practical: Enterprise Infrastructure and Cloud Technologies Lab Part I

Course Code: BCA-504-C   (Elective)

1. **Windows Server Installation & Configuration**, Install Windows Server (GUI).
2. Install Windows Server Core

3. **Install & Configure Active Directory Domain Services (AD DS)**
   - Promote server to DC, join clients to the domain.
4. Enforce password policy,
5. Restrict drives,
6. desktop configuration.

7. **Implement Failover Cluster and Network Load Balancing (NLB)**
   - Build a high-availability cluster for file share service.

8. **PowerShell Scripting for Automation Tasks**
   - Write scripts for backup, log rotation, monitoring, Patching, Checking Stale Records

Name of Course	B.C.A. Third Year
Semester	V Semester
Name of Subject	Linux Operating System
Subject Code	BCA-505 B
Marks	75
Lectures	50

Objectives:
- This course shall build a platform for students to start their own enterprise
- For Making Student Job Ready
- To become familiar with open source software and user interface.
- To securely handle OS without any viruses and malwares.
- For easily use free software available on internet.
- To understand the basic operating system command.

Outcomes:
- Awareness of existing demanding trends in IT industry in order to get placement & research in open source market.
- Understand the Linux OS architecture.
- Install and use different types of distributions available in market.

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Unit - I   **10**
</div>

1. Introduction to Linux
    1.1   Introduction to Linux
    1.2   Features of Linux OS
    1.3   Installation steps of Linux
    1.4   Linux kernel
    1.5   Booting process of Linux OS, Flavors of Linux

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Unit - II   **15**
</div>

2. Working with Linux OS
    2.1   Working with the Linux File System
    2.2   Logging into and working With Linux
    2.3   Changing User Information
    2.4   Linux Shell
    2.5   Text Editors in Linux
    2.6   Working with permissions

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Unit - III   **10**
</div>

3. Linux Commands
    3.1   Adduser , alias, at ,cat , cd, chmod ,chown,cp, cpio, dd, df, dc, dir, du, find, finger, grep, zip, unzip, gzip, halt, hostname, ifconfig, kill, login, look, lpc, lpd ,lpr, lprm, ls, mail, man, mde, mkdir, mor, mount, mv, netstat, passwd, ping, ps, pwd, rm, rmdir, shutdown, sort, su, tar, tree, moun, umount, unzip, vi, wc, who, whoami, zip.

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Unit - IV   **15**
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4. Backup & Network configuration for Linux
    4.1   Choosing Backup Strategies and Operations, Choosing Backup hardware and

media
4.2 Using backup software and commands
4.3 Network configuration tools
4.4 DHCP protocol
4.5 Introduction to samba, DNS & Apache web server

References:
1. Red Hat Linux 7 Unleashed , Bill Ball ,David Pitts, Techmedia SAMS publication
2. Red Hat Linux and Fedora Unleashed by Bill Ball and Hoyt Duff
3. UNIX System Administration Handbook, Evi Nemeth,Garth Snyder,Scott Seebass, Person Education Asia (LPE)(III Edition).

Name of Course	B.C.A. Third Year
Semester	V Semester
Name of Subject	Lab / Practical : PHP Programming
Subject Code	BCA-506
Marks	50

Practical Assignments for PHP Programming:

1. Write a program in PHP to demonstrate looping statements in PHP.

2. Write a program in PHP to demonstrate conditional statements in PHP.

3. Write a program in PHP to Create an Array, Insert elements in Array, Accessing Elements from Array and Displaying elements of Arrays.

4. Write a program in PHP to demonstrate including multiple files in PHP webpage.

5. Write a program in PHP to Creating and Calling Your Own Functions.

6. Write a program in PHP to declare a class, creating an Object, demonstrates Writing Methods & Declaring Properties, Accessing Objects.

7. Write a program in PHP to demonstrate String Functions.

8. Write a program in PHP to create/design a User Registration Form, validate form data and display entered form data on webpage.

9. Use MySQL in command line mode for following operations:

    9.1   Show Database

    9.2   Create a database

    9.3   Use Database

    9.4   Create Table

    9.5   Add data in to a table

    9.6   Select data from table

    9.7   Rename a table

    9.8   Delete data from table

    9.9   Delete a table

10. Write a program in PHP to Connecting to MySQL and Selecting the Database, Executing Simple Queries, and Retrieving Query Results.

Name of Course	BCA Third Year
Semester	V Semester
Name of Subject	MOBILE APPLICATION DEVELOPMENT
Subject Code	BCA-507

Practical List:

1. Installation of Android Studio and eclipse and study of Apps for Working with AndroidManifest.xml

2. Sample Apps for Working with Activities and Working with Application Context

3. Apps for Demonstration of Activity Life Cycle.

4. Apps for demonstration of Buttons and Textbox, Images. To create a simple Calculator App. (Addition, subtraction, division, multiplication, square etc)

5. Sample Apps for Working with Notification.

6. Sample Apps for Demonstration of Context menu and Dialogs

7. Sample Apps for Working with SQLite Database.

8. Sample Apps for Demonstration of File Access.

9. Sample Apps for Demonstration of Shared preferences and Preferences activity

10. Create an application to send message between two emulators.

Name of Course	Bachelor of Computer Application (BCA)
Semester	VI
Name of Subject	Software Engineering
Subject Code	BCA- 601
Marks	75 Marks
Lectures	50 Lectures

Objectives:

- To know about software engineering and its application in Software development.
- To identify, formulate, and solve software engineering problems, including the specification, design, implementation, and
- To Learn testing of software systems that meet specification, performance, maintenance and quality requirements

Outcomes:

- How to apply the software engineering lifecycle by demonstrating competence in communication, planning, analysis, design, construction, and deployment.
- An ability to work in one or more significant application domains. Work as an individual and as part of a multidisciplinary team to develop and deliver quality software.
- Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for the software lifecycle.
- Demonstrate an ability to use the techniques and tools necessary for engineering practice. Demonstrate an ability to use the techniques and tools necessary for engineering practice

Unit - I

1. **Introduction to Software Engineering**   15
    - 1.1   The Evolving Role of Software
    - 1.2   Definition & Concept Software Engineering
    - 1.3   Software Characteristics
    - 1.4   Software Applications
    - 1.5   Software Evolution
    - 1.6   Software Crisis & Horizon
    - 1.7   Software Myths

Unit - II

2. **Software Development Life Cycle(SDLC)and Methodologies**   15
    - 2.1   Introduction
    - 2.2   Activities of SDLC
    - 2.3   A Generic Process Model
    - 2.4   Prescriptive Process models
        - 2.4.1 Waterfall Model
        - 2.4.2 Incremental Process Models
        - 2.4.3 Evolutionary process Models (Prototyping and Spiral Model)
    - 2.5   Concurrent Models, Types

Unit - III

3. **Analysis and Design Tools**   10
    - 3.1   Decision Tree and Decision Table
    - 3.2   Data Flow Diagrams (DFD)
    - 3.3   Data Dictionary
        - 3.3.1 Elements of DD

3.3.2 Advantages of DD
 3.4 Input and Output Design
 3.5 PseudoCode
 3.6 Case Studies on above topics

Unit - IV

4. Software Testing   **10**
  4.1 Definition
  4.2 Verification and Validation
  4.3 Black box Testing
  4.4 White-Box Testing
  4.5 Unit Testing

References:
1. Software Engineering : A Practitioner's Approach- Roger S. Pressman, McGraw hill International Editions 2010(Seventh Edition)
2. System Analysis, Design and Introduction to Software Engineering (SADSE) - S. Parthsarthy, B.W. Khalkar
3. Analysis and Design of Information Systems(Second Edition) - James A. Senn, McGraw Hill
4. System Analysis and Design- Elias Awad, Galgotia Publication, Second Edition
5. Fundamentals of Software Engineering- Rajib Mall, PHI Publication, Fourth Edition

Name of Course	B.C.A. Third Year
Semester	VI Semester
Name of Subject	Python
Subject Code	BCA-602
Marks	75
Lectures	50

Objectives:
- To acquire programming skills in core Python
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

Outcomes:
- Upon successful completion of this course, student will be able to
- Explain basic principles of Python programming language
- Implement object oriented concepts
- Implement database and GUI applications

Unit - I
1. **Introduction**   **15**
    1.1   Introduction to Python
    1.2   Features of python
    1.3   What Can I Do with Python?
    1.4   Python Interpreter
    1.5   Data types, Variables, Comments, Operators, expressions; input, processing and output statements
    1.6   Control Structures: loops and decision

Unit - II
2. **String Handling, Classes, Modules and Package**   **12**
    2.1   Strings, String operations and String Slicing
    2.2   Defining Classes
    2.3   Defining and calling functions passing arguments to functions
    2.4   Python and OOP – Inheritance, polymorphism
    2.5   Modules – datetime, math
    2.6   Packages

Unit - III
3. **Exception Handling and Collections**   **11**
    3.1   Exception in python
    3.2   Exception roles
    3.3   Exception Handling
    3.4   Collections in Python – List, Tuples, Dictionaries, Sets
Unit - IV
4. **GUI Programming and Database Connectivity Using Python**   **12**
    4.1   Graphical User Interfaces
    4.2   Using the tkinter Module
    4.3   Creating Label, Text, Button, info Dialog Boxes, Radiobutton, Checkbutton
    4.4   Getting Input

      4.5   Importing MySQL for Python
      4.6   Connecting with a database
      4.7   Forming a query in MySQL
      4.8   Passing a query to MySQL

References:
1. Mark Lutz, Learning Python, 5th Ed. O'REILLY
2. Tony Gaddis, STARTING OUT WITH Python, Addison-Wesley
3. John Paul Mueller, Beginning Programming with Python For Dummies
4. Albert Lukaszewski, MySQL for Python, Packet Publishing

Name of Course	B.C.A. Third Year
Semester	VI Semester
Name of Subject	Project Development Activity and Seminar
Subject Code	BCA-603
Marks	75
Lectures	50

Guidelines for Project Work:
1. Student can opt any programming language / software, C, C++, VC++, Oracle, VB.NET, PHP, Java etc package for project work.
2. An individual or group of maximum 03 (three) students can work on single project
3. Project should strictly developed in lab and student should get it checked from guide time to time.
4. Student should get the Synopsis of project approved from guide well in advance
5. The project work should covers:
    - Cover page
    - Certificate
    - Declaration
    - Acknowledgment
    - Index
    - Introduction of project
    - Data flow diagram
    - Source code
    - Result/output
    - Limitations
    - Conclusion
    - Bibliography

Student should submit one copy of project report to the college. For project work, there should be one external Examiner from the University & one internal Examiner from College.

Guidelines for Seminar:
- Students have to select separate seminar topic,
- Prepare the Seminar Report and also deliver the presentation of seminar topic using PPTs or any other presentation technologies.
- Each student has to submit one hard copy of seminar report to college.

Name of Course	B.C.A. Third Year
Semester	VI Semester
Name of Subject	Windows Programming
Subject Code	BCA-604-A
Marks	75
Lectures	50

Objectives:
- To outline the various characteristics of c#.
- To provide the familiarity in the concept of developing window application.
- To earn an idea of creating application using ADO.Net.
- To study the idea of CLR and .Net framework.

Outcomes:
- To develop background knowledge as well as core expertise in C#.
- To develop background knowledge as well as core expertise in C#.
- To learn the object oriented concepts.

Unit - I
1. **Introduction**   **10**
   1.1   Introduction to .Net Technology & Framework
   1.2   .Net Architecture
   1.3   Common Language Runtime(CLR)
   1.4   IDE components, Intellisense
   1.5   Project Types, Java vs C#

Unit - II
2. **Windows Application and Windows Controls**   **15**
   2.1   Important classes used in Windows Application
   2.2   Creating and Customizing Windows Form
   2.3   TextBox and Label Control
   2.4   Button, Checkbox, Radio Button
   2.5   Listbox, combobox control
   2.6   Menus and Dialog boxes

Unit - III
3. **Functions, Arrays and Strings, Properties, Indexers, Delegates & Events**   **15**
   3.1   C# function, call by value and call by reference
   3.2   Out parameter
   3.3   Array, Array list class, jagged array
   3.4   String class
   3.5   Properties, Indexers
   3.6   Delegates, Multicast Delegates, Customs events

Unit - IV
4. **Database Connectivity**   **10**
   4.1   Introduction to ADO.NET
   4.2   Advantages of ADO.NET
   4.3   Developing a simple ADO.NET based application

4.4   Retrieving & Updating Data from Tables
4.5   Disconnected data access through Dataset Objects

References:
1. Programming in C# by E. Balgurusamy Mc Graw Hill.
2. Visual C#.NET by C. Muthu Mc Graw Hill.

Name of Course	B.C.A. Third Year
Semester	VI Semester
Name of Subject	Digital Image Processing
Subject Code	BCA -604-B
Marks	75
Lectures	50

Objectives:
- To learn fundamental concepts of Digital Image Processing
- To study basic image processing operations
- To understand image analysis algorithms
- To expose students to current applications in the field of digital image processing

Outcomes:
- Review the fundamental concepts of a digital image processing system.
- Analyze images in the frequency domain using various transforms.
- Evaluate the techniques for image enhancement and image restoration.
- Categorize various compression techniques.
- Interpret Image compression standards.
- Interpret image segmentation and representation techniques.

Unit - I
1. Introduction to MATLAB   **12**
    1.1   Introduction
    1.2   Advantages and Disadvantages of MATLAB
    1.3   MATLAB Environment
    1.4   Using MATLAB Scratch Pad
    1.5   Variables and Arrays
    1.6   Multidimensional Arrays
    1.7   Scalar and Array Operations

Unit - II
2. Introduction to Digital Image Representation   **12**
    2.1   Elements of Digital Image Processing System
    2.2   Digital Image Representation
    2.3   Reading, displaying and writing images
    2.4   Data classes and Image types
    2.5   Converting between data classes and image types
    2.6   Introduction to M-function Programming

Unit - III
3. Intensity Transformation and Spatial Filtering   **10**
    3.1   Background : Intensity Transformation Functions
    3.2   Using imadjust( ), Using log( )
    3.3   Histogram Processing and function plotting, Spatial filtering
    3.4   Linear spatial filtering, Non-Linear spatial filtering

Unit - IV
4. Frequency Domain Processing   **15**
    4.1   Introduction to Discrete Fourier Transformation (DFT)
    4.2   Computing and visualizing 1D-DFT

4.3   Computing and visualizing 2D-DFT
4.4   Filtering in frequency domain
4.5   Color Image Representation
4.6   Converting to other color spaces
4.7   The Basics of color image processing

References:

1. Digital Image Processing, R.C. Gonzalez, R.E. Woods and S.L. Eddins, Second Edition, Pearson Education
2. Digital Image Processing using, MATLAB R.C. Gonzalez, R.E., Woods and S.L. Eddins Second Edition, Pearson Education
3. Fundamentals of Image Processing, A.K. Jain, PHI publication
4. MATLAB Programming for Engineers, Stephen J. Chapman, Third Edition, Thomson Learning

Name of Course	B.C.A. Third Year
Semester	VI Semester
Name of Subject	Enterprise Infrastructure and Cloud Technologies Part II
Subject Code	BCA -604-C
Marks	75
Lectures	50

Course Objectives

1. To develop hands-on skills in Linux server administration, including file systems, package management, and backup.

2. To introduce virtualization concepts and tools like Hyper-V, VMware vSphere/vCenter, and resource management.

3. To provide in-depth knowledge of cloud computing models, services (IaaS, PaaS, SaaS), and platforms like AWS and Azure.

4. To enable learners to understand and apply cloud security principles and resource provisioning techniques.

5. To familiarize students with enterprise backup solutions and infrastructure monitoring tools.

Course Outcomes

After completing this course, the student will be able to:

1. Configure and manage Linux servers, handle user permissions, backups, and system logging.

2. Deploy and operate virtual machines and manage virtual infrastructure using Hyper-V and VMware.

3. Understand and differentiate between various cloud service models and providers, and utilize core services on AWS and Azure.

4. Implement basic cloud security practices, manage virtual resources, and perform cloud-based deployments.

5. Use backup technologies and monitoring tools to ensure system availability and troubleshoot issues effectively.

Unit I: Linux Server Administration

RHEL/ Cent OS Overview, Boot Process, and GRUB2 - Filesystem Hierarchy, Shell Environment, Text Editors - User and Group Management, File Permissions, ACLs - RPM, YUM, Dependency Management, Patching - System Logging, Snapshots, Backup/Restore.

Basic Linux Command, Linux Administration command

UNIT II Virtualization

Hypervisors, Hyper-V, VMware vSphere/vCenter - Configuring VMs, Networking, Storage, HA/DRS - vMotion, Templates, Resource Pools, dvSwitches

Unit III: Cloud Computing

Cloud Computing Fundamentals, Deployment Models - SaaS, PaaS, IaaS and Key Providers (AWS, Azure, GCP) - Cloud Security, Navigation, and Resource Management- AWS EC2, S3, VPC, IAM; Azure VM, Storage, Networking.

UNIT IIV Backup, and Monitoring

Backup Technologies: Disk, Tape, Veeam, TSM, NetBackup - VM Backups, Restoration, Deduplication, Troubleshooting- Infra Monitoring Tools: Nagios.

Textbooks
1. Sander van Vugt, **"Red Hat RHCSA 8 Cert Guide: EX200"**, Pearson IT Certification, 2021.
2. Nick Marshall, **"Mastering VMware vSphere 7"**, Wiley, 2021.
3. Mustafa Toroman **, "Hands-On Cloud Administration in Azure"** , Packt, 2020.

Core Practical: Enterprise Infrastructure and Cloud Technologies Lab Part II

Course Code: BCA-604-C   (Elective)

1. **Install Linux (RHEL/CentOS) and Set Up Users & ACLs**
   - Partitioning, user creation, chmod, setfacl, etc.
   - Patching
   - Configuring Network interfaces – NUMTUI/NUMCLI
   - Server Troubleshooting- Boot, Package, Services, Discover Services
2. **Service Monitoring and Patch Management using YUM**
   - Enable repo, install updates, monitor with top, systemctl.
3. **Create and Manage VMs in VMware vSphere or Hyper-V**
   - Install hypervisor, create VM, snapshot, clone
4. **Launch and Access EC2 Instances on AWS**
   - Key pair creation, EC2 instance launch, inbound rules, remote access.
5. **Configure S3 Bucket and Lifecycle Policies**
   - Create bucket, enable versioning, lifecycle rule to archive/delete.
6. **Create and Manage VPC with Subnets and Security Groups (AWS)**
   - Design private/public subnets, attach IGW, and route tables.
7. **Azure VM Deployment and Storage Blob Configuration**
   - Create VM, configure VNet, attach a blob container for backup.
8. **IAM Role and Policy Creation in AWS**
   - Create custom IAM roles and attach to EC2 instance for access control.
9. **Configure Cloud Backup using AWS/Azure Services**
   - Snapshot of EC2 instance / Azure VM backup vault.

Name of Course	B.C.A. Third Year
Semester	VI Semester
Name of Subject	Cyber Security
Subject Code	BCA-605 B
Marks	75
Lectures	50

Objectives:
- Exhibit knowledge to secure corrupted systems, protect personal data, and secure computer networks in an Organization.
- Practice with an expertise in academics to design and implement security solutions.
- Understand key terms and concepts in Cryptography, Governance and Compliance.
- Develop cyber security strategies and policies
- Understand principles of web security and to guarantee a secure network by monitoring and analyzing the nature of attacks through cyber/computer forensics software/tools.

Outcomes:
- Analyze and evaluate the cyber security needs of an organization.
- Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
- Measure the performance and troubleshoot cyber security systems.
- Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.

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Unit - I   10 Lectures
IT Act and Encryption
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1.1   Object of the Act
1.2   Scope of the Act
1.3   Symmetric Cryptography
1.4   Asymmetric Cryptography
1.5   RSA Algorithm
1.6   Public Key Encryption

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Unit - II   10 Lectures
Authentication of Electronic records & E-Governance
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2.1   Authentication of Electronic records
2.2   Digital Signature
2.3   RSA Digital Signature
2.4   Hash Function
2.5   Working of Digital Signature
2.6   Electronic Governance

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Unit - III   15 Lectures
Certifying Authorities
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3.1   Need of Certifying Authorities
3.2   Functioning of Certifying Authorities
3.3   Types of Certificates
3.4   Identification, Authorizing, Transactional certificate
3.5   Appointment of Controller

3.6   Functions of Controller

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Unit - IV   **15 Lectures**
Domain name Disputes and Cyber Crimes

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4.1   Background of Domain Names
4.2   Where lies the dispute?
4.3   Insertion of Internet Domain Names and the trademark Law
4.4   Classification of Cyber Crime, Target of computer crime
4.5   Damage to computer System: Unauthorized Access, Packet Sniffing, Tempest attack, Password Cracking, Butter overflow
4.6   Computer virus: Viruses, Logic Bomb, Worms, Trojan Horse Programme, Denial of Service, Tampering with Computer Source Documents

References:
1. Cyber Law in India by Farooq Ahmad – Pioneer Books
2. Hand book of Cyber & E-commerce Laws by P.M. Bakshi & R.K.Suri – Bharat Law house New Delhi
3. The Indian Cyber Law by Suresh T Vishwanathan – Bharat Law house New Delhi.
4. Guide to Cyber Laws by Rodney D. Ryder –Wadhwa and Company Nagpur

Name of Course	B.C.A. Third Year
Semester	VI Semester
Name of Subject	Lab Course: Python
Subject Code	BCA-606
Marks	50

List of Practical

1. Program to demonstrate different data types.

2. Program to demonstrate decision making statement.

3. Program to demonstrate Looping statement.

4. Program to demonstrate different string methods.

5. Program to demonstrate function declaration and passing arguments.

6. Program to demonstrate inheritance and its Types.

7. Program to demonstrate polymorphism.

8. Program to demonstrate exception handling.

9. Program to demonstrate different collections.

10. Program to demonstrate database connectivity.

Name of Course	BCA Third Year
Semester	VI Semester
Name of Subject	Windows Programming and DIP
Subject Code	BCA-607

List of Practical

1. Write a program for demonstration of creating simple windows application.

2. Write a program for demonstration of Text Box and Button control, List Box and Combo Box Control.

3. Write a program for demonstration of designing Menus, dialog boxes.

4. Write a program for demonstration of C# functions, Strings.

5. Write a program for demonstration of Array, Jagged Array.

6. Demonstration of Matlab Environment, reading, displaying images.

7. Demonstration of histogram processing

8. Demonstration of 1D-DFT and its inverse

9. Demonstration of frequency domain filtering

10. Demonstration of color image representation