शैक्षणिक वर्ष २०२४–२५ पासून राष्ट्रीय

॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'B++' grade

Phone: (02462)215541 **Academic-1 (BOS) Section** website: srtmun.ac.in

E-mail: bos@srtmun.ac.in

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 दुरुस्ती करण्यास मा. विद्यापरिषदेच्या दिनांक ३१जुलै २०२५ रोजीच्या बैठकीतील विषय क्रमांक ०३/६२–२०२५ अन्वये मान्यता प्रदान केली आहे. त्यानुसार दुरुस्तीसह 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/ 222

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

।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, 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

Phone: (02462) 229542
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E-mail: bos.srtmun@gmail.com

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. २६/५१–२०२१**च्या 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 RamanandTeerthMarathwada University, Nanded
(NAAC Re-accredited with 'A' Grade)

Syllabus of

Third Year B.Sc. Network Technology

(Revised CBCS pattern)

Introduced from Academic Year 2021-2022

B.Sc. NetworkTechnology

B.Sc. Network Technology(3years) program / degree is a specialized program in computer network. It builds the student on studies in applied use of networks and to become competent in the current race and development of new networking era. The duration of the study is of six semesters, which is normally completed in threeyears.

CBCS pattern

The B.Sc. Network Technologyprogram as per CBCS (Choice based credit system) pattern, in which choices are given to the students under open electives and subject electives. The students can choose open electives from the wide range of options to them.

Eligibility and Fees

The eligibility of a candidate to take admission to **B.Sc. Network Technology**program is as per the eligibility criteria fixed by the University. More details on admission procedure and fee structure can be seen from the prospectus of the college / institution as well as on website of the University.

Credit Pattern

Every course has corresponding grades marked in the syllabus structure. There are 24 credits per semester. A total of 144 credits are essential to complete this program successfully. The Grading pattern to evaluate the performance of a student is as per the University rules.

Every semester has a combination of Theory (core or elective) courses and Lab courses. Each theory course has 04 credits which are split as 03 external credits and 01 internal credit. The university shall conduct the end semester examination for 03 external credits. For theory internal credit, student has to appear for 01 class test (15 marks) and 01 assignment (10 marks). Every lab course has 02 credits which are split as 01 external credit and 01 internal credit. For lab internal credit, the student has to submit Laboratory Book (05 marks) and remaining 20 marks are for the Lab activities carried out by the student throughout the semester. For lab external credit, 20 marks are reserved for the examinational experiment and 05 marks are for the oral / viva examinations.

The open elective has 04 credits which are purely internal. If students are opting for MOOCs as open elective , then, there must be a Faculty designed as MOOCs course coordinator who shall supervise learning through MOOCS. This is intentionally needed as the MOOCs course coordinator shall verify the MOOC details including its duration, staring date, ending date, syllabus contents, mode of conduction, infrastructure feasibility, and financial feasibility during start of each semester. This is precautionary as the offering of the MOOCs through online platforms are time specific and there must be proper synchronization of semester duration with the MOOCs duration. Students must opt for either institutional / college level open elective or a course from University recognized MOOCs platforms as open electives.

The number of hours needed for completion of theory and practical courses as well as the passing rules, grading patterns, question paper pattern, number of students in practical batches, etc shall be as per the recommendations, norms, guidelines and policies of the UGC, State Government and the SRTM University currently operational. The course structure is supplemented with split up in units and minimum numbers of hours needed for completion of the course, wherever possible.

Under the CBCS pattern, students would graduate **B.Sc. Network Technology** with a minimum number of required credits which includes compulsory credits from core courses, open electives and program specific elective course. All students have to undergo lab / practical activities leading to specific credits and project development activity as a part of professional UG program.

1. **B.Sc. Network Technology Degree** / program would be of 144 Credits. Total credits per semester=24
2. Each semester shall consist of three core courses, one elective course, one open elective course and two practical courses. Four theory courses (core+elective) = 16 Credits
3. Two practical / Lab courses= 4 Credits in total (02 credits each) , One Open elective= 4credit
4. One Credit = 25 marks , Two Credits = 50 Marks, Four Credits = 100Marks

PEO, PO and CO Mappings

1. **Program Name** : B.Sc.(NT)

2. **Program Educational Objectives**: After completion of this program, the graduates / studentswould

PEO I :Technical Expertise	Implement fundamental domain knowledge of core courses for developing effective computing solutions by incorporating creativity and logical reasoning.
PEO II : Successful Career	Deliver professional services with updated technologies in C**omputer Networking**based career.
PEO III :Hands on Technology and Professionalexperience	Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession.
PEO IV :Interdisciplinary and Life Long Learning	Undergo higher studies, certifications and research programs as per market needs.

3. **Program Outcome(s):** Students / graduates will be ableto

PO1: Apply knowledge of mathematics, science and algorithm in solving Computer problems.
PO2: Generate solutions for various connectivity issues using LAN-MAN-WAN, etc
PO3: Design component, or processes to meet the needs within realistic constraints.
PO4: Identify, formulate, and solve problems using computational temperaments.
PO5: Comprehend professional and ethical responsibility in computing profession.
PO6: Express effective communication skills.
PO7: Recognize the need for interdisciplinary, and an ability to engage in life-long learning.
PO8: Actual hands on technology to understand it's working.
PO9: Knowledge of contemporary issues and emerging developments in computing profession.
PO10: Utilize the techniques, skills and modern tools, for actual development process
PO11: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings in actual development work
PO12: Research insights and conduct research in computing environment.

4. **Course Outcome(s):** Every individual course under this program has course objectives and course outcomes (CO). The course objectives rationally match with program educational objectives. The mapping of PEO, PO and CO is as illustratedbelow

5. Mapping of PEO& PO andCO

Program Educational Objectives	Thrust Area	**Program Outcome**	Course Outcome
PEO I	Technical Expertise	PO1,PO2,PO3,PO6	All core courses
PEO II	Successful Career	PO4,PO5,PO11,	All discipline specific electives courses
PEO III	Hands on Technology and Professional experience	PO8,PO10	All Lab courses
PEO IV	Interdisciplinary and Life Long Learning	PO7,PO9,PO12	All open electives and discipline specificelectives

Swami RamanandTeerthMarathwada University Nanded

CBCS Revised Syllabus w.e.f TY: 2021-22

Program:B.Sc. (Network Technology) – Affiliated Colleges

Year	Semester	Course category	Course Code	Course Title	Credits * *(split up willbe givenseparately)
Third	**Fifth**	Core Course	BNT-501	Windows Server 2012 ADC Part – II	04
		Core Course	BNT-502	Exchange Server 2010 Part – I	04
		Core Course	BNT-503	Network Security	04
		Chose any one from the below Elective courses			
		Elective Subject	BNT-504 A	Network Infrastructure	04
			BNT-504 B	CCNA Security	
			BNT-504 C	Enterprise Infrastructure and Cloud Technologies Part I	
		Chose any one Open Elective courses			
		Open Elective	BNT-505 A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses OR	04
			BNT-505 B	Introduction to Business Applications	
		Lab / Practical	BNT-506	Exchange Server 2010 Part – I	02
			BNT-507	Windows Server 2012 ADC Part – II	02
				Total	**24**
Third	**Sixth**	Core Course	BNT-601	Windows Operating System	04
		Core Course	BNT-602	Exchange Server 2010 Part – II	04
		Core Course	BNT-603	Project Development Activity and Seminar	04
		Chose any one from the below Elective courses			
		Elective Subject	BNT-604 A	Next Generation Networks	04
			BNT-604 B	Cloud Computing	
			BNT-604 C	Enterprise Infrastructure and Cloud Technologies Part II	
		Chose any one Open Elective courses			
		Open Elective	BNT-605A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses OR	04
			BNT-605B	VM Ware	
		Lab / Practical	BNT-606	Windows Operating System	02
			BNT-606	Exchange Server 2010 Part – II	02
				Total	**24**

BNT-501	B.Sc.(NT) TY V Semester	**Windows Server 2012 ADC Part – II**	Credits:04

Course Objectives:

- Configure and Troubleshoot Domain Name System
- Maintain Active Directory Domain Services
- Install, Configure and Troubleshoot Network Policy Server
- Configure and Troubleshoot Remote Access

Course Outcomes:

- Client and Server architecture that provide request and response
- New Server Manager: Create, Manage Server Groups
- Expanded PowerShell Capabilities

Unit I	**Monitoring Servers**

Introducing the Microsoft Management Console (MMC), Using Event Viewer, Using Reliability Monitor, Managing Performance, Monitoring the Network

Unit II	**Configuring File Services and Disk Encryption**

Securing Files, Encrypting Files with EFS, Managing EFS Certificates Encrypting Files with BitLocker, Managing BitLocker Certificates Configuring the Network Unlock Feature

Unit III	**Configuring DNS Zones**

Understanding DNS, Configuring and Managing DNS Zones Using the DNS CMD Command to Manage Zones, Configuring DNS Record Types Using the DNS CMD Command to Manage Resource Records, Troubleshooting DNS Problems

Unit IV	**Configuring a Network Policy Server**

Configuring a Network Policy Server Infrastructure, Installing and Configuring Network Policy Server, Managing NPS Policies, Configuring Connection Request Policies Configuring Network Policies, Managing NPS Templates

Unit V	**Configuring Server Authentication**

Configuring Server Authentication, Managing Service Accounts, Understanding Domain Controllers, Installing and Configuring an RODC,Cloning a Domain Controller

Unit VI	**Maintaining Active Directory**

Automating User Account Management, Backing Up and Restoring Active Directory Optimizing an Active Directory Database, Cleaning Up Metadata

References:

Sr. No	Name of Book	Writer	Publication
1	Exam Ref 70-411). Administering Windows Server 2012	Patrick Regan	Microsoft Official academic course

BNT-502	B.Sc.(NT) TY V Semester	**Exchange Server Part I**	Credits:04

Course Objectives:

- Install and deploy Exchange Server 2010
- Configure the Public folder database in Exchange Server 2010
- Manage Exchange mailbox in Exchange Server 2010
- Configure the secure flow of messages between the Exchange Server organization and the Internet

Course Outcomes:

- Deploying Exchange Server 2010
- Best practice to Configure Mailbox server roles
- Best practice to Manage mailboxes in Exchange Server 2010
- Best practice to configure the Distribution Groups.

Unit I	**Installing Exchange Server 2010**

Configure the Environment for Exchange Server 2010, Configure the Server to Host, Exchange Server 2010, Hardware and Software Requirements, Preparing a Host for the Installation of Exchange Server2010, Configuring Server Roles and Features for Exchange and Deploy Exchange Server 2010 Roles, Installing Exchange Server 2010

Unit II	**Exchange Databases**

Deploying Exchange Databases, Configuring Exchange Databases, Managing Mailbox Databases and Managing Public Folder Databases

Unit III	**Address Lists**

Address List Configuration, Creating and Configuring an Address List, Working with Offline Address Books.

Unit IV	**Exchange Mailboxes**

Mailbox Configuration, Creating Mailboxes, Linked Mailboxes, Configuring Mailbox Properties, Moving Mailboxes, Disabling, Removing, and Reconnecting, Mailboxes, Import and Export Mailboxes, Archive Mailboxes, Resources and Shared Mailboxes, Creating and Configuring Resource Mailboxes, Shared Mailboxes, Converting Mailboxes

Unit V	**Distribution Groups**

Managing Recipients and Distribution Groups, Mail Contacts, Mail-Enabled Users, Distribution Groups, Types of Distribution Groups, Configure Distribution Groups

Unit VI	**Public Folders**

Public Folders, Setting Up Public Folders, Creating Public Folders Configuring Public Folder Permissions, Mail-Enable Public Folder, Configuring Public Folder Limits

References:

Sr. No	Name of Book	Writer	Publication
1	MCTS Self-Paced Training Kit (Exam 70-662):	Patrick Regan	Microsoft Publication

BNT-503	B.Sc.(NT) TY V Semester	**Network Security**	Credits:04

Course Objectives:

- To understand the fundamentals of Cryptography
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity
- To understand the various key distribution and management schemes
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

Course Outcomes:

- Identify the security issues in the network and resolve it.
- To be able to secure a message over insecure channel by various means.
- Provide security of the data over the network.
- Protect any network from the threats in the world

Unit I	**Introduction**

Introduction, The Need for Security, Principles of Security, Types of Attacks, OSI Security Architecture, A Model for network security.

Unit II	**Cryptography: Concepts and Techniques**

Plain text and Cipher Text, Substitution Techniques, Transportation Techniques, .Encryption and Decryption, Symmetric and Asymmetric Key Cryptography, Steganography

Unit III	**Cyber Crimes & Domain Name Disputes**

Concept of Domain Names, Cybersquatting, Reverse, hijacking, Meta tags, tampering with Computer Source Documents, Hacking with Computer System, Digital Signature.

Unit IV	**Introduction of Ethical Hacking**

Information gathering, Foot printing - Active / Passive, Scanning ,Sniffers, Hacking by stealth, Virus, Trojans, Binders , Key loggers

Unit V	**Firewall & Network Security**

Introduction of Firewall, Types of Firewall, Configuring of Firewall, Open source Firewall, Importance of Firewall, Modem/Router Configuration, WI-FI Configuration, V-LAN Configuration, Proxy Server Configuration.

Unit VI	**The Cyber Crimes**

Tampering with Computer Source Documents, Hacking with Computer System, Publishing of Information, Which is Obscene in Electronic Form, Offences: Breach of Confidentiality & Privacy, Offences: Related to Digital Signature Certificate

References:

Sr. No	Name of Book	Writer	Publication
1	Ethical Hacking	Ankit Fadia	

Elective BNT-504 A	B.Sc.(NT) TY V Semester	**Network Infrastructure**	Credits:04

Course Objectives:

- Deploy DHCP server.
- Configure the DNS role in windows Server 2008.
- Manage windows update services.
- Configure Windows Firewall

Course Outcomes:

- Deploying Windows Server 2008 Services.
- Best practice to Configure DNS server
- Best practice to Configure DHCP server
- Best practice to Configure Windows Firewall

Unit I	**Introduction IP**

Understanding and configuring network connections, Understanding IP version 4 Addressing, Understanding IP version 6 (IPv6) Addressing

Unit II	**Introduction DNS**

Understanding name resolution in windows server 2008 networks, Deploying a DNS server, Configuring DNS client settings, Net BIOS.

Unit III	**Configure Network Services**

Configuring network address translation, Configuring Wireless Networks, Connecting to remote networks, Configuring Windows Firewall, Configuring Network access protection.

Unit IV	**Managing Software updates**

Understanding windows server update services, Using windows server update services, Monitoring Event Logs, Monitoring Performance and reliability, Using Network Monitor.

Unit V	**Managing Files & DHCP**

Managing File security, Sharing Folders, Shadow Copies, Managing Printers

Unit VI	**DHCP**

Installing a DHCP server, configuring a DHCP server, Configuring IPSec

References:

Sr. No	Name of Book	Writer	Publication
1	MCTS Self-Paced Training Kit (Exam 70-642):	- By Tony Northrup , JC Mackin	Microsoft

Elective BNT-504 B	B.Sc.(NT) TY V Semester	**CCNA Security**	Credits:04

Course Objectives:

- Production N/W Device & Port Security against Malicious attacks
- Understand the working of VPN Tunnels use in Industry
- Describe WAN technology concepts
- Describe the various troubleshooting methodologies and troubleshooting tools

Course Outcomes:

- Practical hands-on will help to interconnect the N/W components & design industrial N/w
- Best practice to Configure BGP Protocol.
- Best practice to Configure port security, IPsec, VPN.

Unit I	**INTERGRATED IS-IS**

IS-IS metric, IS-IS PDU, LSP & SNP, IS-IS Addressing configuration

Unit II	**BGP Protocol**

Introduction to BGP, BGP FSM, eBGPneighbor ship, BGP protocol configuration

Unit III	**IPv6**

Advantages of IPv6,Dhcp&NDP, Types of ipv6 address and some protocol, RIPng the ipv6, EIGRP for Ipv6,BGP4 +ipv6

Unit IV	**Branch design and WAN**

Basic terminology, Connection with IPsec, Connection with DSL, Connection with VPN, Multicast Mac & IP address, Multicast solution, version of IGMP, Implementing multicast, Multicast routing protocol.

Unit V	**Security**

Port security, DHCP snooping, Dynamic ARP inspection, VLAN hopping.802.1x and AAA &Switch ACL

Unit VI	**Point to Point WAN**

PPP Concepts, PPP Configuration, Troubleshooting Serial Links, Frame Relay Overview, Frame Relay Addressing, Network Layer Concerns with Frame Relay, Controlling Speed and Discards in the Frame Relay Cloud

References:

Sr. No	Name of Book	Writer	Publication
1	Cisco CCENT CCNA icnd1	Wendell Odam	

Elective BNT-504 C	B.Sc.(NT) TY V Semester	**Enterprise Infrastructure and Cloud Technologies Part I**	Credits:04

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	

References:

Sr. No	Name of Book	Writer	Publication

1. Sara Perrott, **"Windows Server 2019 & PowerShell All-in-One For Dummies"**, Wiley, 2021.
2. Sander van Vugt, **"Red Hat RHCSA 8 Cert Guide: EX200"**, Pearson IT Certification, 2021.
3. 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

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

Open Elective BNT-505 B	B.Sc.(NT) TY VI Semester	**Introduction to Business Applications**	Credits:04

Course Objectives:

1. **To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.**
2. **To introduce the fundamental principles of computer-based information systems analysis and**

design and develop an understanding of the principles and techniques used.

3. **To enable students understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.**

Course Outcomes:

1. **Relate the basic concepts and technologies used in the field of management information systems;**
2. **Compare the processes of developing and implementing information systems**
3. **Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.**

Unit I	**Introduction to Business**

Concept of business meaning and definition, Characteristics / features of business, Importance of business, Business objectives, Role of profit in business, Classification of business activity

Unit II	**Information technology and business**

Concept of data, Information and computer based information system, Impact of information technology on business (business data processing, intra – organizational and inter – organizational communication by using network technology, business process and knowledge process outsourcing).
Types of information system – Transaction Processing System

Unit III	**Management Information System and Decision Support System**

Management Information System - Introduction, Meaning, Nature , Objectives, characteristics of Scope of MIS, Decision Support System - Introduction, Types of Decisions, Attributes, characteristics , Benefits and components of DSS, Types of DSS, Their implementation at managerial level(operational, tactical, strategical)

Unit IV	**Enterprise Resource Planning and Customer Relationship Management**

Enterprise Resource Planning- Introduction, Features, Scope of ERP, Advantages and Disadvantages Supply Chain Management - Introduction,Features,Scope Advantages of SCM., Customers Relationship Management- Introduction, Meaning, Scope, Advantages and Disadvantages of CRM

Unit V	**knowledge Management System and Content Management System**

Knowledge Management System- Introduction, Meaning, Sources of knowledge, Purpose, activities in knowledge management, Levels of knowledge management, Content Management System- Introduction, Functions, Advantages of CMS.

Unit VI	**Executive Supports System and Business Intelligent System**
Executive support system- Introduction, Features, Advantages and Disadvantages of ESS, Business Intelligent System - Introduction, characteristics, Benefits of BIS, Approaches of BIS, Capabilities of BIS	

References:

Sr. No	Name of Book	Writer	Publication
1	Management Information System	Laaudon and Ludon	9/e, Pearson Education, New Delhi
2	Management Information System	Jawadekar, W.S	Tata McGraw Hill Private Limited,
3	Management Information System	Alex Leon and Mathew Leon	VikasPublishing House,New Delhi.

LAB BNT-506	B.Sc.(NT) TY V Semester	**Exchange Server Part I**	Credits:02

Practical List:

1. Installation of Exchange Server.
2. Deploying & configuring Exchange Databases.
3. Creating and Configuring an Address List
4. Creating public folder.
5. Creating Distribution Groups
6. Creating Mailboxes
7. Creating Link mailbox
8. Creating Resource mailbox.

LAB BNT-507	B.Sc.(NT) TY V Semester	**Windows 2012 ADC II**	Credits:02

Practical List:

1. Managing DNS zones.
2. Troubleshooting DNS Problems.
3. Managing Network policy.
4. Backup & Restore Active Directory.
5. Creating MMC.
6. Managing Event viewer
7. Creating RODC
8. Cloning DC

BNT-601	B.Sc.(NT) TY VI Semester	**Windows Operating Systems**	Credits:04

Course Objectives:

- Configure and manage the Windows 7 desktop
- Windows 7 remote capabilities and utilities
- How to use Windows Firewall with advanced features and network profiles
- Evolution of the Windows Desktop Operating System
- Configure and use the User account control in various network profiles

Course Outcomes:

- Monitor and troubleshoot Windows 7 computers for problems with the operating system, hardware, network security, and applications
- Best practice to Configure Bit-locker.
- You can configure application software policy.

Unit I	**Introduction**

Windows Operating system, History of Windows OS, Advantages of Windows 7 & Windows 8, Hardware Requirement, Installation Steps for Windows 7, Installation Steps for Windows 8.

Unit II	**Configuring and Deploying System Images**

Capturing System Images, Managing Virtual Hard Disk Files, Managing a System Image Before Deployment, Deploying Images.

Unit III	**Managing Devices**

Managing Device Drivers and Devices, Managing Disks, Application Compatibility, Managing App Locker and Software, Configuring IPv4, Configuring IPv6, Network Configuration.

Unit IV	**Windows Services**

Managing Windows Firewall, Sharing Resources, Folder and File Access, Managing BitLocker, Managing User Account Control, Windows 7 Authentication and Authorization.

Unit V	**Windows Tools**

Managing DirectAccess, Remote Connections, Windows 7 Mobility, Updating Windows 7, Configuring Internet Explorer

Unit VI	**Monitoring & Backup**

Windows 7 Mobility, Updating Windows 7, Configuring Internet Explorer, Monitoring Systems, Configuring Performance Settings. Backup, System Recover, Recovering Files and Folders.

References:

Sr. No	Name of Book	Writer	Publication
1	MCTS 70-680 Configuring-Windows-7	Tony Northrup	Microsoft

BNT-602	B.Sc.(NT) TY VI Semester	**Exchange Server Part II**	Credits:04

Course Objectives:

- Deploy Exchange Transport Server role.
- Configure the Client Access server role in Exchange Server 2010
- Manage message transport in Exchange Server 2010
- Configure the secure flow of messages between the Exchange Server organization and the Internet

Course Outcomes:

- Deploying Exchange Server 2010
- Best practice to Configure DAG Group.
- Best practice to Manage mailboxes in Exchange Server 2010
- Best practice to configure the Client Access server role

Unit I	**Configuring Client Access**

Configuring Client Access IMAP, POP, and Microsoft ActiveSync, Client Access Server Certificates, Configure POP and IMAP, Auto discover, ActiveSync

Unit II	**OWA**

Outlook Anywhere and RPC Clients, Outlook Anywhere, Configure RPC Client Access, Configure Client Access Array, Client Throttling Policies, OWA, OWA Virtual Directory Properties, Exchange Control Pan

Unit III	**Configuring Transport Servers**

Hub Transport Servers, Accepted Domains, Remote Domains, Email Address Policies, Transport Settings and Transport, Edge Transport Servers, Edge Transport Role, Edge Sync, Clone Edge Transport Server, Address Rewriting

Unit IV	**Monitoring Exchange Server 2010**

Monitoring Exchange Database, Monitoring Mail Flow, Configuring Message Tracking, Monitoring Transport Queues, Suspending, Resuming, and Retrying Queues, Managing Messages, Monitoring Exchange Connectivity, Debugging Network Connectivity

Unit V	**Managing Records**

Managing Database Availability Groups, DAGs, Create DAGs, Add and Remove Servers from DAGs, Mailbox Database Copies, Highly Available Public Folders, Public Folder Replicas, Replication Schedules, Public Folder Backup and Restore

Unit VI	**Exchange Disaster Recovery**

Backup and Recover Exchange Data, Using Windows Server Backup, Creating an Exchange Server Disaster Recovery Plan, Database Portability, Recovering a Mailbox within the Deleted, Mailbox

Retention Period, Recovering Single Items.

References:

Sr. No	Name of Book	Writer	Publication
1	MCTS Self-Paced Training Kit	JC Mackin	Microsoft Publication)

Elective BNT-604 A	B.Sc.(NT) TY VI Semester	**Next Generation Networks**	Credits:04

Course Objectives:

- Study of GSM/UMTS
- Study of CDMA systems and OFDMA systems.
- Manage wireless network.
- Configure Wireless network

Course Outcomes:

- Deploying WLAN & Wi-Fi
- To understand the GSM & GPRS.

Unit I	**Converged Services for Next Generation Networks**

GSM/UMTS Network protocols: SS7 and 14tandardi basics, Supplementary Services: UMTS procedures. Intelligent Network: IN principles, CAMEL, Services: what are the challenges? , Integration, deployment issues.

Unit II	**Introduction to Next Generation Networks**

IMS: the convergence. NGN architecture, NGN control architectures and protocols, Multi-access to the services: 3G, WiFi, DSL, Cable. TISPAN, SIP, Service architectures, Transition of networks (PSTN, IP-based) to NGN

Unit III	**Wireless Access and Transport Technologies**

RAN architecture : Radio Access Network Architecture for GSM, GPRS and UMTS, network devices, interfaces and protocols , QoS definition and management in GPRS and UMTS, Access methods and radio resource management in mobile networks, mainly for: TDMA systems

Unit IV	**CDMA systems and OFDMA systems**

Scheduling issues for GPRS, UMTS and WiMAX: downlink, uplink Physical to logical channel mapping: for GSM, for UMTS Procedure and protocol used for resource allocation ,PDP Context and TBF allocation

Unit V	**WPAN, WLAN, WMAN and Broadcast technologies**

WLAN, WPAN, WMAN, WiFi: WiMAX, DVB-H:Usage and standard, Security :Basics, architectures, algorithms, Bluetooth: Standard, performance, usage and applications , Zigbee

Unit VI	**Security**

UWB: Standards and usage, Service discovery in wireless Networks (jxta, UPnP, Security in Wireless Networks: PANs, LANs and cellular Wireless Networks Simulation (tools and methods)

References:

Sr. No	Name of Book	Writer	Publication
1	Next Generation Network Services: Technologies & Strategies	Neill Wilkinson	

Elective BNT-604 B	B.Sc.(NT) TY VI Semester	**Cloud Computing**	Credits:04

Course Objectives:

- To Study basics of cloud computing, and comprehend the terminology, tools and technologies associated with today's top cloud platforms.
- To provide the programmer's perspective of working of Cloud Computing.
- Implement Simple Cloud programs to solve simple problems

Course Outcomes:

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

Unit I	**Introduction**

Introduction, Mainframe architecture, Client-server architecture, 3-tier architectures with TP monitors, Internet technology and web-enabled applications, Web application servers, Internet of services

Unit II	**Software as a service and cloud computing**

Emergence of software as a service, Successful SaaS architectures, Dev 2.0 platforms, Cloud computing, Dev 2.0 in the cloud for enterprises, Infrastructure as a service: Amazon EC2, Platform as a service: Google App Engine, Microsoft Azure

Unit III	**Data in the cloud**

Relational databases, Cloud file systems: GFS and HDFS, Big Table, HBase and Dynamo, Cloud data stores: Data store and Simple DB

Unit IV	**Dev 2.0 platforms**

Salesforce.com's Force.com platform,TCS Instant Apps on Amazon cloud ,More Dev 2.0 platforms and related efforts , Advantages, applicability and limits of Dev 2.0

Unit V	**Web services, AJAX and mashups:**

Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services

Unit VI	**MapReduce and extensions:**

Parallel computing, The MapReduce model, Parallel efficiency of MapReduce, Relational operations using MapReduce, Enterprise batch processing using MapReduce

References:

Sr. No	Name of Book	Writer	Publication
1	Enterprise Cloud Computing: Technology, Architecture, Application	Gautam Shroff	

Elective BNT-604 C	B.Sc.(NT) TY VI Semester	**Enterprise Infrastructure and Cloud Technologies Part II**	Credits:04

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

References:

Sr. No	Name of Book	Writer	Publication

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

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.

Open Elective BNT-605 A	B.Sc.(NT) TY VI Semester	**University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses**	Credits:04

Open Elective BNT-605 B	B.Sc.(NT) TY VI Semester	**VM Ware**	Credits:04

Course Objectives:

- Describe the software defined data center
- Deploy an ESXihost and create virtual
- Describe vCenter Server architecture
- Configure virtual networks with vSphere standard switches

Course Outcomes:

- Install and configure virtualization technology such as VMware.
- Install and configure virtual server components such as vCenter
- Configure and manage virtual network and storage such as vCenter server or ESxi.

Unit I	**Introduction to Virtualization Technologies**

VMware workstation, VMware player, Virtual box, Introduce Virtualization Introduce Virtual machines, Introduce vSphere components

Unit II	**VMware ESX and ESXi (ESX/ESXi 4.1)**

Introduce the architecture of ESX and ESXi, Manually configure ESX/ESXi

Unit III	**Virtual Machines**

Deploy virtual machines using the Create New Virtual Machine wizard, templates, cloning, and VMware vCenter Converter Modify and manage virtual machines Perform Storage vMotion migrations

Unit IV	**Access Control AND Resource Monitoring**

Control user access through roles and permissions, Control virtual machine access to CPU, memory, and I/O resources, Introduce VMkernel methods for optimizing CPU and memory usage, Monitor resource usage using vCenter Server performance graphs and alarms

Unit V	**Networking**

Create, configure, and manage vNetwork standard switches, Create, configure, and manage network connections, Create, configure, and manage port groups, Back up and recover virtual machines using VMware Data Recovery

Unit VI	**Data Protection**

Back up and recover virtual machines using VMware Data Recovery

References:

Sr. No	Name of Book	Writer	Publication
1	Virtualization For Dummies Paperback	Bernard Golden	

LAB BNT-606	B.Sc.(NT) TY VI Semester	**Windows Operating Systems**	Credits:02

Practical List:

9. Installation of Windows 7 OS.
10. Installation of Windows 8 OS.
11. Study of Managing Device Drivers and Devices
12. Study of managing disk.
13. Study of app locker.
14. Study of windows firewall.
15. Study of Bit locker in win7.
16. Study of windows defenders.

LAB BNT-607	B.Sc.(NT) TY VI Semester	**Exchange Server Part II**	Credits:02

Practical List:

1. Study of OWA.
2. Configuring IMAP & POP3 configuration.
3. Creating & configure accepted domain.
4. Configure E-mail Address policy.
5. Create DAG.
6. Study of Hub transport role.
7. Study of Edge transport role.
8. Study of sent connector.