



॥ 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

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत
राष्ट्रीय शैक्षणिक धोरण-२०२० नुसार
पदवी तृतीय वर्षाचे अभ्यासक्रम
(Syllabus) शैक्षणिक वर्ष २०२६-२७
पासून लागू करण्याबाबत.

परिपत्रक

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २२ एप्रिल २०२६ रोजी संपन्न झालेल्या मा.विद्यापरिषद बैठकीतील विषय क्र.०८/६४-२०२६ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण-२०२० नुसार पदवी तृतीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६-२७ पासून लागू करण्यास मा.विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी.एस्सी. तृतीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६-२७ पासून लागू करण्यात येत आहे.

01	B.Sc. III Year Computer Management (Single Major)
02	B.Sc. III Year Artificial Intelligence and Machine Learning (AI & ML) (Single Major)
03	B.Sc. III Year Software Development (Single Major)
04	B.Sc. III Year Data Science (Single Major)
05	B.Sc. III Year Information Technology (Single Major)
06	B.Sc. III Year Network Technology (Single Major)
07	B.Sc. III Year Software Engineering (Single Major)

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.:शै-१/परिपत्रक/पदवी/बीएस्सी/२०२६-२७/ 110
दिनांक : २१.०७.२०२६


उपकुलसचिव
शैक्षणिक (१-अभ्यासमंडळे) विभाग

- प्रत माहिती व पुढील कार्यवाहीस्तव :-
- १) मा. कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
 - २) मा. प्र.कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ
 - ३) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
 - ४) मा. संचालक, परिक्षा व मूल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
 - ५) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.

**SWAMI RAMANAND TEERTH
MARATHWADA UNIVERSITY,
NANDED - 431 606 (MS)**



**(Credit Framework and Structure of
B. Sc. Network Technology (Single Major)
Third Year**

with Multiple Entry and Exit Options as per NEP-2020)

Effective From 2026-27

**UNDERGRADUATE PROGRAMME OF
SCIENCE & TECHNOLOGY**

Major in **NTT** and Minor in **DSM** (Subject)

Under the Faculty of Science & Technology



Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology (Three Optional in the First Year)

Credit Framework for Third Year with Multiple Entry and Exit

Subject: **NTT** (Major) / **DSM** (Minor 1)

B.Sc. Network Technology (Single Major) Third Year

Year & Level	Sem ester	Optional 1 (Major) (From the same Faculty)	Optional 2 (Minor 1) (From the same Faculty)	Optional 3 (Minor 2) (From the same Faculty)	Generic Elective (GE) (select from Basket 3 of Faculties other than Science and Technology)	Vocational & Skill Enhancement Course	Ability Enhancement Course (AEC) (Basket 4) Value Education Courses (VEC) / Indian Knowledge System (IKS) (Basket 5) (Common across all faculties)	Field Work / Project/Internship/ OJT/ Apprenticeship / Case Study Or Co-curricular Courses (CCC) (Basket 6 for CCC) (Common across all faculties)	Credits	Total Credits
1	2	3	4	5	6	7	8	9	10	11
2 (5.0)	V	SNTTCT1301 (T 3Cr) SNTTCT1302 (T 3Cr) SNTTIK1303 (T 2Cr) SNTTCP1304 (P 2Cr) SNTTCP1305 (P 2Cr) 12 Credits	SNTTET1301 (T 3Cr) SNTTEP1301 (P 1Cr) 4 Credits			SNTTVC1301 2 Credits		SNTTFP1301 4 Credits	22	44
	VI	SNTTCT1351 (T 3Cr) SNTTCT1352 (T 3Cr) SNTTCT1353 (T 2Cr) SNTTCP1354 (P 2Cr) SNTTCP1355 (P 2Cr) 12 Credits	SNTTET1351 (T 3Cr) SNTTEP1351 (P 1Cr) 4 Credits			SNTTVC1351 2 Credits		SNTTOJ1351 4 Credits	22	
	Cum. Cr.	24	08	00	00	06	00	06	44	

Abbreviations:

1. **DSC:** Department/Discipline Specific Core (Major)
 2. **DSE:** Department/Discipline Specific Elective (Major)
 3. **DSM:** Discipline Specific Minor
 4. **GE/OE:** Generic/Open Elective
 5. **VSEC:** Vocational Skill and Skill Enhancement Course
 6. **VSC:** Vocational Skill Courses
 7. **SEC:** Skill Enhancement Courses
 8. **AEC:** Ability Enhancement courses
 9. **MIL:** Modern Indian languages
 10. **IKS:** Indian Knowledge System
 11. **VEC:** Value Education Courses
 12. **OJT:** On Job Training: (Internship/Apprenticeship)
 13. **FP:** Field Projects
 14. **CEP:** Community Engagement and Service
 15. **CC:** Co-Curricular Courses
 16. **RM:** Research Methodology
 17. **RP:** Research Project/Dissertation
-



B. Sc. NT Third Year Semester V (Level 5.5)

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs./ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SNTTCT1301 (3 Cr)	Linux Administration Part II	03	--	12	04	--
	SNTTCT1302 (3 Cr)	Fundamental of Cloud Computing	03	--		04	--
	SNTTIK1303 (2 Cr)	Introduction to super computing	02	---		02	--
	SNTTCP1304 (2 Cr)	Linux Administration Part II (P)	--	02		--	02
	SNTTCP1305 (2 Cr)	Fundamental of Cloud Computing (P)	--	02		--	02
Optional 2	SNTTET1301 (3 Cr)	Enterprise Infrastructure and Cloud Technologies Part I	03	--	04	04	--
	SNTTEP1301 (1 Cr)	Enterprise Infrastructure and Cloud Technologies Part I (P)	--	01		--	02
Vocational & Skill Enhancement Course	SNTTVC1301 (2 Cr)	Generative AI Tools	--	02	02	--	02
Field Work / Project/Internship	SNTTFP1301 (4 Cr)	Project	--	04	04	--	04
Total Credits			11	11	22	14	12



B. Sc. NT Third Year Semester V(Level 5.5)

Examination Scheme

[40% Continuous Assessment (CA) and 60% End Semester Assessment (ESA)]

Subject (1)	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Sum of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1	SNTTCT1301 (3 Cr)	Linux Administration Part II	15	15	30	45	--	--	75
	SNTTCT1302 (3 Cr)	Fundamental of Cloud Computing	15	15	30	45	--	--	75
	SNTTIK1303 (2 Cr)	Introduction to super computing	10	10	20	30	--	--	50
	SNTTCP1304 (2 Cr)	Linux Administration Part II (P)	--	--	--	--	20	30	50
	SNTTCP1305 (2 Cr)	Fundamental of Cloud Computing (P)	--	--	--	--	20	30	50
Optional 2	SNTTET1301 (3 Cr)	Enterprise Infrastructure and Cloud Technologies Part I	15	15	30	45	--	--	75
	SNTTEP1301 (1 Cr)	Enterprise Infrastructure and Cloud Technologies Part I (P)	--	--	--	--	10	15	25
Vocational & Skill Enhancement Course	SNTTVC1301 (2 Cr)	Generative AI Tools	--	--	--	--	20	30	50
Field Work / Project/Internship	SNTTFP1301 (4 Cr)	Project	--	--	--	--	40	60	100



B. Sc. NT Third Year Semester VI (Level 5.5)

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs./ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1	SNTTCT1351 (3 Cr)	Network Security	03	--	12	04	--
	SNTTCT1352 (3 Cr)	Mail Server	03	--		04	--
	SNTTCT1353 (2 Cr)	Next Generation Networks	02	---		02	--
	SNTTCP1354 (2 Cr)	Network Security (P)	--	02		--	02
	SNTTCP1355 (2 Cr)	Mail Server (P)	--	02		--	02
Optional 2	SNTTET1351 (3 Cr)	Enterprise Infrastructure and Cloud Technologies Part II	03	--	04	04	--
	SNTTEP1351 (1 Cr)	Enterprise Infrastructure and Cloud Technologies Part II (P)	--	01		--	02
Vocational & Skill Enhancement Course	SNTTVC1351 (2 Cr)	IOT	--	02	02	--	02
On Job Training: (Internship/Apprenticeship)	SNTTOJ1351 4 Credits	OJT	--	04	04	--	04
Total Credits			11	11	22	14	12



B. Sc. NT Third Year Semester VI (Level 5.5)

Examination Scheme

[40% Continuous Assessment (CA) and 60% End Semester Assessment (ESA)]

Subject (1)	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7) / Col (8+9) (10)
			Continuous Assessment (CA)			ESA			
			Test I (4)	Test II (5)	Sum of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1	SNTTCT1351 (3 Cr)	Network Security	15	15	30	45	--	--	75
	SNTTCT1352 (3 Cr)	Mail Server	15	15	30	45	--	--	75
	SNTTCT1353 (2 Cr)	Next Generation Networks	10	10	20	30	--	--	50
	SNTTCP1354 (2 Cr)	Network Security (P)	--	--	--	--	20	30	50
	SNTTCP1355 (2 Cr)	Mail Server (P)	--	--	--	--	20	30	50
Optional 2	SNTTET1351 (3 Cr)	Enterprise Infrastructure and Cloud Technologies Part II	15	15	30	45	--	--	75
	SNTTEP1351 (1 Cr)	Enterprise Infrastructure and Cloud Technologies Part II (P)	--	--	--	--	10	15	25
Vocational & Skill Enhancement Course	SNTTVC1351 (2 Cr)	IOT	--	--	--	--	20	30	50
On Job Training: (Internship/Apprenticeship)	SNTTOJ1351 4 Credits	OJT	--	--	--	--	40	60	100

Detailed Curriculum

Course Structure:

Major 1 -Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTCT1301	Linux Administration Part - II	45	--	03	--	03

Major 1 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA			
		Test I	Test II	Sum of T1 & T2		CA	ESA	
SNTTCT1301	Linux Administration Part - II	15	15	30	45	--	--	75

SNTTCT1301: Linux Administration Part - II (Major 1) Curriculum Details

Course pre-requisite:

1. Basic knowledge of Operating System and Familiarity with computer hardware.

Course Objectives:

1. This course shall build a platform for students to start their own enterprise
2. For Making Student Job Ready
3. To become familiar with open source software and user interface.
4. To securely handle OS without any viruses and malwares.

Course Outcomes:

Students will be able to:

1. Awareness of existing demanding trends in IT industry in order to get placement & research in open source market.
2. Understand the Linux OS architecture.
3. Install and use different types of distributions available in market.
4. Understand the different Linux basic commands.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Internet connectivity	15
	1.1	Common configuring information	
	1.2	Local host interface configuration	
	1.3	Dial-up Internet access & DSL configuration	
	1.4	Troubleshooting & Dial-in PPP server configuration	
2.0		Secure File Transfer Protocol	10
	2.1	FTP Client and FTP Server	
	2.2	Installing FTP software & FTP Users	
	2.3	Configuring VSFTPD Server	
	2.4	Configuring WU-FTPd Server	
	2.5	FTP hosts file & Server Administration	
3.0		Handling Electronic Mail	10
	3.1	Email sending & receiving process	
	3.2	Mail Transport Agent & Mail Clients	
	3.3	Sendmail configuration & Fetchmail	
	3.4	Mail Delivery Agent & Mail Daemons	
4.0		Kernel & Module Management	10
	4.1	Linux Kernel & Module Management	
	4.2	Kernel versions & Obtaining sources	
	4.3	Patching & Compiling the Kernel	
	4.4	Database basics, MySQL installation & clients	
		Total	45

Reference Books:

1. UNIX and Linux System Administration Handbook – Evi Nemeth et al – Addison-Wesley Professional
2. Linux Administration: A Beginner's Guide – Wale Soyinka – McGraw-Hill
3. Linux Network Administrator's Guide – Olaf Kirch & Terry Dawson – O'Reilly Media
4. TCP/IP Network Administration – Craig Hunt – O'Reilly Media
5. Linux Server Hacks – William von Hagen & Brian K. Jones – O'Reilly Media

Course Structure:**Major 2 -Teaching Scheme**

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTCT1302	Fundamental of Cloud Computing	45	--	03	--	03

Major 2 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA			
		Test I	Test II	Sum of T1 & T2		CA	ESA	
SNTTCT1302	Fundamental of Cloud Computing	15	15	30	45	--	--	75

SNTTCT1302: Fundamental of Cloud Computing (Major 2) Curriculum Details**Course pre-requisite:**

1. Fundamentals of Computer Systems
2. Operating System Basics
3. Computer Networks (Basic Level)
4. Basic Database Knowledge

Course Objectives:

1. To introduce the fundamental concepts of cloud computing, including cloud models, service types, and the shared responsibility model.
2. To familiarize students with the basics of Microsoft Azure and its core architectural components.
3. To understand various Azure services such as computer, networking, storage, identity, and security.

Course Outcomes:

1. Apply Azure services to create, configure, and manage cloud resources such as virtual machines, storage accounts, and virtual networks.

2. Analyse factors affecting cost in Azure and utilize tools like pricing calculator and cost management for optimization.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Introduction cloud Computing concepts	12
	1.1	Introduction to Microsoft Azure Fundamentals	
	1.2	Introduction to cloud computing	
	1.3	What is cloud computing And Define cloud models?	
	1.4	shared responsibility model	
	1.5	Benefits of using cloud services	
	1.6	Cloud service types	
2.0		Describe Azure architecture and services	10
	2.1	Core Architectural components of Azure	
	2.2	Azure compute services	
	2.3	Azure networking services	
	2.4	Azure storage services	
	2.5	Azure identity, access, and security	
3.0		Azure management and governance	12
	2.1	Describe factors that can affect costs in Azure, Explore the pricing calculator	
	2.2	Microsoft Cost Management tool	
	2.3	What is purpose of tags?	
	2.4	Cost Optimization options in Azure	
4.0		Features and tools for managing and deploying Azure resources	11
	4.1	Tools for interacting with Azure	
	4.2	Azure Resource Manager and Azure ARM templates	

	4.3	Azure Advisor	
	4.4	Azure Service Health	
	4.5	Concept of Azure Monitor	
		Total	45

Text Books:

1. Thomas Erl, Ricardo Puttini, Zaigham Mahmood, “Cloud Computing: Concepts, Technology & Architecture”, First Edition, Pearson, 2013.
2. Anthony Puca, Michael Washam, “Exam Ref AZ-900 Microsoft Azure Fundamentals”, Second Edition, Microsoft Press, 2022.
3. Rajkumar Buyya, James Broberg, Andrzej Goscinski, “Cloud Computing: Principles and Paradigms”, First Edition, Wiley, 2011.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”, First Edition, McGraw Hill Education, 2013.

Course Structure:**Major 3 -Teaching Scheme**

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTIK1303	Introduction to Super Computing	30	--	2	--	2

Major 3 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA			
		Test I	Test II	Sum of T1 & T2		CA	ESA	
SNTTIK1303	Introduction to Super Computing	10	10	20	30	--	--	50

SNTTIK1303: Introduction to Super Computing (Major 3) Curriculum Details

Course pre-requisite:

1. Basic knowledge of computer organization and architecture.
2. Familiarity with programming in C/C++ or Python.
3. Understanding of data structures and algorithms.
4. Introductory knowledge of operating systems and networking.

Course Objectives:

1. To introduce the fundamentals of supercomputing and high-performance computing (HPC), including architecture and evolution.
2. To understand the contributions of Dr. Vijay Bhatkar and India's PARAM supercomputers developed by Centre for Development of Advanced Computing.
3. To develop the ability to design and implement parallel programs using modern programming models (MPI, OpenMP, CUDA).
4. To analyze and evaluate performance metrics and optimization techniques in HPC systems.
5. To explore real-world applications and future trends in supercomputing.

Course Outcomes:

After completing this course, students will be able to:

1. Explain the architecture, evolution, and significance of supercomputers, including systems like PARAM series.
2. Apply parallel computing models and programming paradigms (MPI, OpenMP, CUDA) to solve computational problems.
3. Analyze performance metrics (FLOPS, latency, scalability laws) and optimize parallel programs.
4. Design and implement efficient parallel algorithms for scientific and engineering applications.
5. Evaluate the impact of national initiatives like the National Supercomputing Mission and emerging technologies such as AI-HPC convergence.
6. Demonstrate hands-on skills in executing and analyzing parallel programs on cluster-based systems.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Foundations of Supercomputing & Dr. Vijay Bhatkar's Contribution	7
	1.1	Introduction to Supercomputing: Definition, need, evolution from mainframes to supercomputers	
	1.2	History in India: Role of Dr. Vijay Bhatkar, PARAM series, C-DAC's mission	
	1.3	Supercomputer Architecture Basics: Vector processors, SIMD, MIMD, cluster computing	
	1.4	Performance Metrics: FLOPS, MIPS, latency, bandwidth, Amdahl's Law, Gustafson's Law	
2.0		Parallel Processing & High Performance Computing Architecture	8
	2.1	Parallel Computing Models: Shared memory, distributed memory, hybrid models	
	2.2	Interconnection Networks: Topologies – mesh, hypercube, torus, fat tree	
	2.3	Memory Hierarchy: Cache coherence, NUMA, distributed shared memory	

	2.4	Case Study: Architecture of PARAM 8000, PARAM Yuva, PARAM Siddhi-AI	
	2.5	Programming Paradigms: MPI, OpenMP, CUDA basics	
3.0		Software, Tools & Programming for Supercomputers	
	3.1	Operating Systems for HPC: Linux variants for clusters, scheduling	
	3.2	Parallel Algorithms: Matrix multiplication, sorting, graph algorithms	
	3.3	Programming Environments: MPI programming, OpenMP directives, GPU programming	
	3.4	Performance Optimization: Load balancing, profiling tools, debugging parallel code	
4.0		Applications & Future of Supercomputing	
	4.1	Scientific Applications: Weather forecasting, computational fluid dynamics, genomics	
	4.2	National Missions: National Supercomputing Mission, applications in defense, space, disaster management	
	4.3	Emerging Trends: Exascale computing, AI + HPC convergence, quantum computing overview	
	4.4	Ethical & Societal Impact: Digital divide, indigenous tech development, Bhatkar's vision for self-reliance	
		Total	30

Text Books:

1. Elements of Parallel Computing – Vijay P. Bhatkar
Covers fundamentals of parallel computing, architectures, and Indian supercomputing initiatives including PARAM.
2. Introduction to Parallel Processing – M. Sasikumar, D. Shikhare, P. Ravi Prakash
Provides a clear introduction to parallel algorithms, models, and programming techniques.
3. Parallel Computer Architecture: A Hardware/Software Approach – John L. Hennessy, David A. Patterson
Detailed coverage of modern parallel architectures, performance, and scalability.

4. Using MPI: Portable Parallel Programming with the Message Passing Interface – William Gropp, Ewing Lusk, Anthony Skjellum
Comprehensive guide to MPI programming for distributed memory systems.

Reference Books:

1. Elements of Parallel Computing_ by Vijay P. Bhatkar
2. Introduction to Parallel Processing_ by Sasikumar, Shikhare, Ravi Prakash
3. C-DAC whitepapers on PARAM series

Course Structure:**Major 1 -Teaching Scheme**

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTCP1304	Linux Administration Part - II (Practical)	--	20	--	2	2

Major 1 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA	CA	ESA	
		Test I	Test II	Sum of T1 & T2				
SNTTCP1304	Linux Administration Part - II (Practical)	--	--	--	--	20	30	50

SNTTCP1304: Linux Administration Part - II (Practical) (Major 1) Curriculum Details**Course pre-requisite:**

1. Basic knowledge of Operating System and Familiarity with computer hardware.

Course Objectives:

1. This course shall build a platform for students to start their own enterprise
2. For Making Student Job Ready
3. To become familiar with open source software and user interface.
4. To securely handle OS without any viruses and malwares.

Course Outcomes:*Students will be able to:*

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

4. Understand the different Linux basic commands.

Curriculum Details:

List of Practical

1. Configure and verify the localhost interface in Linux. (Check IP address using network commands.)
2. Configure an Internet connection using DSL/PPPoE and test connectivity.(Verify using ping command.)
3. Troubleshoot network connection problems using basic networking commands.(Use ping, ifconfig, route, netstat.)
4. Configure the local host and network interface manually by assigning IP address, subnet mask, gateway, and verify connectivity using networking commands.
5. Configure DSL (PPPoE) Internet connection and troubleshoot connectivity problems using diagnostic tools.
6. Configure and test a Dial-in PPP server to allow remote users to connect to the Linux system.
7. Install and configure VSFTPD server with local user authentication and enable upload/download permissions.
8. Implement FTP access control using hosts.allow, hosts.deny, and ftp host configuration files to allow or deny specific clients.
9. Configure Sendmail Mail Transport Agent and test sending email between local users and external domains.
10. Manage Linux kernel modules by loading, removing, and verifying modules; explain when kernel recompilation is required.
11. Install and configure MySQL server, create database users, tables, and perform basic database operations using MySQL client.

Reference Books:

1. UNIX and Linux System Administration Handbook – Evi Nemeth et al – Addison-Wesley Professional
2. Linux Administration: A Beginner's Guide – Wale Soyinka – McGraw-Hill
3. Essential System Administration – Æleen Frisch – O'Reilly Media
4. Linux Network Administrator's Guide – Olaf Kirch & Terry Dawson – O'Reilly Media
5. TCP/IP Network Administration – Craig Hunt – O'Reilly Media
6. Linux Server Hacks – William von Hagen & Brian K. Jones – O'Reilly Media
7. MySQL Cookbook – Paul DuBois – O'Reilly Media

Course Structure:**Major 2 -Teaching Scheme**

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTCP1305	Fundamental of Cloud Computing (P)	--	20	--	02	02

Major 2 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA	CA	ESA	
		Test I	Test II	Sum of T1 & T2				
SNTTCP1305	Fundamental of Cloud Computing (P)	--	--	--	--	20	30	50

SNTTCP1305: Fundamental of Cloud Computing (P) (Major 2) Curriculum Details**Course pre-requisite:**

1. Fundamentals of Computer Systems
2. Operating System Basics
3. Computer Networks (Basic Level)
4. Basic Database Knowledge

Course Objectives:

1. To introduce the fundamental concepts of cloud computing, including cloud models, service types, and the shared responsibility model.
2. To familiarize students with the basics of Microsoft Azure and its core architectural components.

3. To understand various Azure services such as computer, networking, storage, identity, and security.

Course Outcomes:

1. Apply Azure services to create, configure, and manage cloud resources such as virtual machines, storage accounts, and virtual networks.
2. Analyse factors affecting cost in Azure and utilize tools like pricing calculator and cost management for optimization.

Curriculum Details:

List of Practical

1. Demonstrate the Shared Responsibility Model using a diagram.
2. Create an account on Microsoft Azure portal.
3. Create and manage a Resource Group.
4. Create a Virtual Machine (VM) in Azure.
5. Configure VM (CPU, RAM, OS selection).
6. Create and configure Virtual Network (VNet)
7. Create a Storage Account and upload/download files.
8. Working with Blob Storage (upload images/files).
9. Configure access control using IAM (Identity and Access Management).
10. Implement basic security using Network Security Groups (NSG)
11. Analyze billing using Azure Cost Management tool.
12. Create and apply tags to resources.
13. Azure CLI / PowerShell to create resources
14. Deploy resources using Azure Resource Manager (ARM) templates.
15. Create alerts for resource usage..

Text Books:

1. Thomas Erl, Ricardo Puttini, Zaigham Mahmood, “Cloud Computing: Concepts, Technology & Architecture”, First Edition, Pearson, 2013.

2. Anthony Puca, Michael Washam, “Exam Ref AZ-900 Microsoft Azure Fundamentals”, Second Edition, Microsoft Press, 2022.
3. Rajkumar Buyya, James Broberg, Andrzej Goscinski, “Cloud Computing: Principles and Paradigms”, First Edition, Wiley, 2011.

Reference Books:

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”, First Edition, McGraw Hill Education, 2013.

Course Structure:

Minor 1 -Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTET1301	Enterprise Infrastructure and Cloud Technologies - Part I	45	--	03	--	03

Minor 1 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA	CA	ESA	
		Test I	Test II	Sum of T1 & T2				
SNTTET1301	Enterprise Infrastructure and Cloud Technologies - Part I	15	15	30	45	--	--	75

SNTTET1301: Enterprise Infrastructure and Cloud Technologies - Part I (Minor 1) Curriculum Details

Course pre-requisite:

1. To provide a foundational understanding of Basic Computer Fundamentals.
2. To provide a foundational Understanding of Networking Basics.
3. To provide a Basic Knowledge of Operating Systems.
4. To enable learners Basic Security Concepts.

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.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Networking and Server Infrastructure	09
	1.1	Introduction to Networking Devices and LAN/WAN - IPv4 and IPv6.	
	1.2	Routers and Switches Overview.	
	1.3	Datacenter Overview and Server Form Factors	
	1.4	Server Management Portals (IPMI/iLO/iDrac) and Events	
	1.5	Introduction to Storage: NAS, DAS, SAN	
	1.6	RAID Levels and Comparisons (Fibre Channel, iSCSI, FCoE)	
2.0		Operating Systems Overview (Server & Client)	09
	2.1	Introduction Operating Systems Overview (Server & Client)	
	2.2	Domain vs. Workgroup	
	2.3	File Systems: FAT, NTFS, ReFS, EXT3, EXT4	
	2.4	Installing and Managing OS (Windows Server, Linux)	
	2.5	Firewall Fundamentals (Hardware/Software)	
3.0		Windows Server Administration	15
	3.1	Windows Server Core Installation, Upgrades, Patch Management & Migrations	

	3.2	Storage Spaces, iSNS, DCB, and MPIO	
	3.3	Data Deduplication and Disk Management	
	3.4	High Availability: Failover Clustering, NLB	
	3.5	Deployment Images using MDT and WSUS	
	3.6	PowerShell DSC and Monitoring Tools	
	3.7	Performance Monitoring and Event Logs	
4.0		Active Directory & Security	
	4.1	AD DS DNS Server Role, Zones, and Transfers	
	4.2	AD DS Replication and Sites	
	4.3	Group Policy Management and Templates	
	4.4	Securing Domain Controllers and Accounts	
	4.5	Audit Authentication and Managed Service Accounts	
	4.6	Certificate Services (CAs, Templates, Revocation, Recovery)	
	4.7	AD FS, AD RMS, and Smart Cards	
	4.8	Backup & Restore of Active Directory	
		Total	45

Text Books:

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. Brian Desmond, Joe Richards, Robbie Allen, "Active Directory: Designing, Deploying, and Running Active Directory," O'Reilly Media, 5th Edition, 2019

Reference Books:

1. Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall, 5th Edition, Pearson Education, 2011
2. William Stallings, "Operating Systems: Internals and Design Principles," Pearson Education, **Vol:9th** Edition, 2018
3. Tom Carpenter, "Microsoft Windows Server 2019 Administration Fundamentals," Sybex (Wiley), **Volume:** 1st Edition, 2019
4. Brian Ward, "How Linux Works: What Every Superuser Should Know," No Starch Press, 2nd Edition, 2014

Course Structure:

Minor 1 -Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTEP1301	Enterprise Infrastructure and Cloud Technologies - Part I (P)	--	10	--	01	01

Minor 1 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA	CA	ESA	
		Test I	Test II	Sum of T1 & T2				
SNTTEP1301	Enterprise Infrastructure and Cloud Technologies - Part I (P)	--	--	--	--	10	15	25

SNTTEP1301: Enterprise Infrastructure and Cloud Technologies - Part I (P) (Minor 1) Curriculum Details

Course pre-requisite:

1. To provide a foundational understanding of Basic Computer Fundamentals.
2. To provide a foundational Understanding of Networking Basics.
3. To provide a Basic Knowledge of Operating Systems.
4. To enable learners Basic Security Concepts

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.

Curriculum Details:

List of Practical

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. Configure DNS zones and replication
5. Apply Group Policies
6. Enforce password policy,
7. Demonstrate AD security (users, permissions, auditing)
8. Restrict drives,
9. Implement backup and restore of AD
10. Desktop configuration.
11. Implement Failover Cluster
 - Build a high-availability cluster for file share service.
12. Implement Network Load Balancing (NLB)
 - Build a high-availability cluster for file share service.
13. PowerShell Scripting for Automation Tasks
14. Write scripts in PowerShell for log rotation, monitoring
15. Write scripts in PowerShell for Patching, Checking Stale Records

Text Books:

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. Brian Desmond, Joe Richards, Robbie Allen, "Active Directory: Designing, Deploying, and Running Active Directory," O'Reilly Media, 5th Edition, 2019

Reference Books:

1. Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall, 5th Edition, Pearson Education, 2011.
2. William Stallings, "*Operating Systems: Internals and Design Principles*," Pearson Education, **Vol:9th** Edition, 2018.
3. Tom Carpenter, "Microsoft Windows Server 2019 Administration Fundamentals," Sybex (Wiley), **Volume:** 1st Edition, 2019.
4. Brian Ward, "How Linux Works: What Every Superuser Should Know," No Starch Press, 2nd Edition, 2014.

Course Structure:**Vocational Course -Teaching Scheme**

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTVC1301	Generative AI tools	--	20	--	02	02

Vocational Course -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA	CA	ESA	
		Test I	Test II	Sum of T1 & T2				
SNTTVC1301	Generative AI tools	--	--	--	--	20	30	50

SNTTVC1301: Generative AI tools (Vocational Course) Curriculum Details**Course Pre-requisites:**

1. Basic knowledge of programming (Python preferred)
2. Fundamentals of Artificial Intelligence and Machine Learning

Course Objectives:

1. To understand the fundamentals and working principles of Generative AI models
2. To develop skills in prompt engineering and usage of AI tools for content generation
3. To apply Generative AI techniques for solving real-world problems

Course Outcomes:

1. Students will be able to explain key concepts and models of Generative AI
2. Students will be able to design effective prompts and generate text, images, or code using AI tools
3. Students will be able to build simple Generative AI-based applications and evaluate their outputs

Curriculum Details:

List of Practical

1. Introduction to Generative AI tools (ChatGPT, Gemini, Claude) and basic prompt usage.
2. Design effective prompts using prompt engineering techniques.
3. Generate text content (essays, summaries, reports) using AI tools.
4. Create AI-generated images using tools like DALL·E or Midjourney.
5. Build a simple chatbot using ChatGPT API or similar platform.
6. Text-to-speech conversion using AI tools.
7. Speech-to-text conversion using AI tools.
8. Generate code snippets using AI (Python, SQL, etc.) and test execution.
9. Create a mini project: AI-based content generator (blog/article generator).
10. Fine-tuning prompts for domain-specific tasks (education, healthcare, etc.).
11. Explore AI hallucination and evaluate output accuracy.
12. Use AI tools for data cleaning and preprocessing tasks.
13. Generate presentations using AI tools (Canva AI, Tome, etc.).
14. Ethical considerations and bias analysis in Generative AI outputs.
15. Mini project: Build a Generative AI-based application (text/image chatbot or assistant).

Text Books:

1. **Generative AI with Python and TensorFlow** – Joseph Babcock & Raghav Bali, O'Reilly, 2023
2. **Deep Learning** – Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press, 2016
3. **Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow** – Aurélien Géron, O'Reilly, 2022

Reference Books:

1. **Natural Language Processing with Transformers** – Lewis Tunstall, Leandro von Werra, Thomas Wolf, O'Reilly, 2022
2. **Building Machine Learning Powered Applications** – Emmanuel Ameisen, O'Reilly, 2020
3. **Artificial Intelligence: A Modern Approach** – Stuart Russell & Peter Norvig, Pearson, 4th Ed., 2021
4. **Pattern Recognition and Machine Learning** – Christopher M. Bishop, Springer, 2006
5. **Machine Learning Yearning** – Andrew Ng, 2018

Course Structure:**Major 1 -Teaching Scheme**

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTCT1351	Network Security	45	---	03	---	03

Major 1 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA			
		Test I	Test II	Sum of T1 & T2		CA	ESA	
SNTTCT1351	Network Security	15	15	30	45	--	--	75

SNTTCT1351: Network Security (Major 1) Curriculum Details**Course pre-requisite:**

1. Basic knowledge of Operating System and Familiarity with computer hardware.

Course Objectives:

1. To understand the fundamentals of Cryptography
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity
3. To understand the various key distribution and management schemes
4. To understand how to deploy encryption techniques to secure data in transit across data networks

Course Outcomes:*Students will be able to:*

1. Identify the security issues in the network and resolve it.
2. To be able to secure a message over insecure channel by various means.
3. Provide security of the data over the network.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Introduction	12
	1.1	Introduction & Need for Security	
	1.2	Principles of Security & Types of Attacks	
	1.3	OSI Security Architecture & Network Security Model	
	1.4	Domain Names, Cybersquatting, Hijacking, Meta Tags	
2.0		Cryptography: Concepts and Techniques	11
	2.1	Plain Text, Cipher Text & Encryption Concepts	
	2.2	Substitution Techniques	
	2.3	Transportation Techniques	
	2.4	Symmetric & Asymmetric Key Cryptography	
	2.5	Steganography	
3.0		Cyber Crimes & Domain Name Disputes	12
	3.1	Cyber Crimes & Domain Name Disputes	
	3.2	Tampering with Computer Source Documents	
	3.3	Hacking with Computer System	
	3.4	Digital Signature	
4.0		Ethical Hacking & Firewall Security	10
	4.1	Information Gathering & Footprinting	
	4.2	Scanning, Sniffers & Stealth Hacking	
	4.3	Virus, Trojans, Binders & Keyloggers	
	4.4	Firewall Types, Configuration, Wi-Fi, VLAN & Proxy Server	
		Total	45

Reference Books:

1. Ethical Hacking, Ankit Fadia, Vikas Publishing

Course Structure:**Major 2 -Teaching Scheme**

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTCT1352	Mail Server	45	--	03	--	03

Major 2 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA			
		Test I	Test II	Sum of T1 & T2		CA	ESA	
SNTTCT1352	Mail Server	15	15	30	45	--	--	75

SNTTCT1352: Mail Server (Major 2) Curriculum Details**Course pre-requisite:**

1. Basic knowledge of Windows Server.

Course Objectives:

1. Install and deploy Exchange Server 2010
2. Configure the Public folder database in Exchange Server 2010
3. Manage Exchange mailbox in Exchange Server 2010
4. Configure the secure flow of messages between the Exchange Server organization and the Internet

Course Outcomes:

1. Deploying Exchange Server 2010
2. Best practice to Configure Mailbox server roles
3. Best practice to Manage mailboxes in Exchange Server 2010
4. Best practice to configure the Distribution Groups.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Introduction to Microsoft Exchange Server	10
	1.1	Introduction to Microsoft Exchange Server	
	1.2	Features of Exchange Server 2019, Messaging System Concepts	
	1.3	Exchange Server Editions and Licensing, Exchange Server Architecture	
	1.4	Mailbox Server Role, Client Access Services, Exchange Services and Components	
2.0		Installation & Configuration	12
	2.1	Hardware and Software Requirements, Active Directory Requirements	
	2.2	Preparing Active Directory for Exchange	
	2.3	Installing Exchange Server 2019	
	2.4	Post Installation Tasks, Exchange Admin Center (EAC)	
	2.5	Exchange Management Shell (EMS), PowerShell Basics	
3.0		Mailbox & Recipient Management	11
	3.1	Mailbox Databases, Creating and Managing User Mailboxes	
	3.2	Shared Mailboxes, Room and Equipment Mailboxes	
	3.3	Mail Users and Mail Contacts, Distribution Groups	
	3.4	Dynamic Distribution Groups, Global Address List (GAL)	
4.0		Mail Flow & Client Access	12
	4.1	Mail Flow Concepts, Send Connectors and Receive Connectors	
	4.2	Message Routing, Transport Rules	
	4.3	Outlook Configuration, Outlook Web App (OWA)	
	4.4	POP3 and IMAP Configuration	
		Total	45

Reference Books:

1. MCTS Self-Paced Training Kit (Exam 70-662): Patrick Regan, Microsoft Publication

Course Structure:

Major 3 -Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTCT1353	Next Generation Network	30	---	02	---	02

Major 3 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA			
		Test I	Test II	Sum of T1 & T2		CA	ESA	
SNTTCT1353	Next Generation Network	10	10	20	30	---	----	50

SNTTCT1353: Next Generation Network (Major 3) Curriculum Details

Course pre-requisite:

1. Basic knowledge of Computer networking

Course Objectives:

1. To understand the evolution of traditional telecommunication networks towards Next Generation Networks.
2. To study NGN architecture, protocols, and convergence technologies.
3. To analyze IP-based multimedia services such as VoIP, IMS, and broadband communication.

Course Outcomes:

Students will be able to:

1. Explain the concepts, architecture, and characteristics of Next Generation Networks.
2. Analyze NGN protocols, signaling mechanisms, and transport technologies.
3. Design and evaluate multimedia communication services over IP networks.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Introduction to Next Generation Networks	8
	1.1	Evolution of Telecommunication Networks, PSTN, ISDN, Packet Switched Networks	
	1.2	Concept and Definition of NGN, NGN Architecture and Characteristics	
	1.3	Convergence of Voice, Data and Multimedia, NGN Functional Model	
	1.4	Softswitch Technology, NGN Standardization Bodies (ITU-T, ETSI, 3GPP)	
2.0		NGN Protocols and Technologies	7
	2.1	IP-based Communication, IPv4 vs IPv6, Signaling Protocols in NGN	
	2.2	SIP (Session Initiation Protocol), H.323 Protocol	
	2.3	MGCP and MEGACO/H.248, Media Gateway and Signaling Gateway	
	2.4	MPLS (Multi Protocol Label Switching), Quality of Service (QoS) in NGN	
	2.5	IP-based Communication, IPv4 vs IPv6, Signaling Protocols in NGN	
3.0		NGN Services and Applications	7
	3.1	Voice over IP (VoIP), Multimedia Communication Services, IPTV and Video Streaming	
	3.2	Unified Communication Services, Mobility Management	
	3.3	Fixed Mobile Convergence (FMC), Cloud-based Communication Services	
	3.4	NGN Service Delivery Platform	
4.0		NGN Security, Management and Future Networks	8
	4.1	NGN Security Architecture, Authentication and Encryption Techniques	
	4.2	Network Management in NGN, Traffic Engineering	
	4.3	Network Reliability and Scalability, SDN, NFV	
	4.4	Future Internet and 5G Evolution	
		Total	30

Reference Books:

1. Next Generation Telecommunications Networks, Services, and Management, Thomas Plevyak, Veli Sahin Wiley-IEEE Press.
2. Next Generation Network Services: Technologies and Strategies, Neill Wilkinson, Wiley

Course Structure:

Major 1 -Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTCP1354	Network Security (P)	--	20	--	02	02

Major 1 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA	CA	ESA	
		Test I	Test II	Sum of T1 & T2				
SNTTCP1354	Network Security (P)	--	--	--	--	20	30	50

SNTTCP1354: Network Security (P) (Major 1) Curriculum Details

Course pre-requisite:

1. Basic knowledge of Operating System and Familiarity with computer hardware.

Course Objectives:

1. To understand the fundamentals of Cryptography
2. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity
3. To understand the various key distribution and management schemes
4. To understand how to deploy encryption techniques to secure data in transit across data networks

Course Outcomes:

Students will be able to:

1. Identify the security issues in the network and resolve it.
2. To be able to secure a message over insecure channel by various means.
3. Provide security of the data over the network.

Curriculum Details:

List of Practical

1. Demonstrate different types of network attacks and explain security principles used to prevent them.
2. Perform DNS lookup and domain name analysis using networking commands and explain domain name related threats.
3. Implement encryption and decryption using substitution cipher technique.
4. Demonstrate symmetric key encryption using a security tool or command-line utility.
5. Demonstrate asymmetric key cryptography by generating public and private keys.
6. Create and verify a Digital Signature for a file or message.
7. Examine website source code and identify risks related to meta tags manipulation and source document tampering.
8. Perform footprinting and scanning of a system using ethical hacking tools.
9. Capture and analyze network traffic using a packet sniffer tool.
10. Configure a Firewall to allow/block ports or IP addresses and test network security. Create a Pandas DataFrame from a CSV file and perform indexing, filtering, and selection.

Reference Books:

1. Ethical Hacking, Ankit Fadia, Vikas Publishing
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Course Structure:

Major 2 -Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTCP1355	Mail Server (P)	--	20	--	02	02

Major 2 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA	CA	ESA	
		Test I	Test II	Sum of T1 & T2				
SNTTCP1355	Mail Server (P)	--	--	--	--	20	30	50

SNTTCP1355: Mail Server (P) (Major 2) Curriculum Details

Course pre-requisite:

1. Basic knowledge of Windows Server.

Course Objectives:

1. Install and deploy Exchange Server 2010
2. Configure the Public folder database in Exchange Server 2010
3. Manage Exchange mailbox in Exchange Server 2010
4. Configure the secure flow of messages between the Exchange Server organization and the Internet

Course Outcomes:

1. Deploying Exchange Server 2010
2. Best practice to Configure Mailbox server roles
3. Best practice to Manage mailboxes in Exchange Server 2010
4. Best practice to configure the Distribution Groups

Curriculum Details:

List of Practical

1. Install prerequisites required for Microsoft Exchange Server 2019 on Windows Server.
2. Prepare Active Directory for Exchange Server installation.
3. Install and verify Exchange Server 2019 successfully.
4. Open and explore Exchange Admin Center (EAC) interface.
5. Use Exchange Management Shell (EMS) to check Exchange services using PowerShell commands.
6. Create and configure a User Mailbox.
7. Create a Shared Mailbox and assign user permissions.
8. Create a Distribution Group and add members.
9. Configure Send Connector for mail flow.
10. Access mailbox using Outlook Web App (OWA) through web browser. Display JSX Elements in React

Reference Books:

1. MCTS Self-Paced Training Kit (Exam 70-662): Patrick Regan, Microsoft Publication
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Course Structure:

Minor 1 -Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTET1351	Enterprise Infrastructure and Cloud Technologies Part II	45	--	03	--	45

Minor 1 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA			
		Test I	Test II	Sum of T1 & T2		CA	ESA	
SNTTET1351	Enterprise Infrastructure and Cloud Technologies Part II	15	15	30	45	--	--	75

SNTTET1351: Enterprise Infrastructure and Cloud Technologies - Part II (Minor 1) Curriculum Details

Course pre-requisite:

- 1) To provide a foundational understanding of Basic Computer Fundamentals.
- 2) To provide a foundational Understanding of Networking Basics.
- 3) To provide a Basic Knowledge of Operating Systems.
- 4) To enable learners Basic Security Concepts.

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.

Curriculum Details:

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		Linux Server Administration	15
	1.1	RHEL/ Cent OS Overview, Boot Process, and GRUB2	
	1.2	Filesystem Hierarchy, Shell Environment, Text Editors.	
	1.3	User and Group Management, File Permissions, ACLs	
	1.4	RPM, YUM, Dependency Management, Patching	
	1.5	System Logging, Snapshots, Backup/Restore.	
	1.6	Basic Linux Command, Linux Administration command	
2.0		Virtualization	9
	2.1	Hypervisors, Hyper-V, VMware vSphere/vCenter	
	2.2	Configuring VMs, Networking, Storage, HA/DRS	
	2.3	vMotion, Templates, Resource Pools, dvSwitches	
3.0		Cloud Computing	12
	3.1	Cloud Computing Fundamentals, Deployment Models	
	3.2	SaaS, PaaS, IaaS and Key Providers (AWS, Azure, GCP)	
	3.3	Cloud Security, Navigation, and Resource Management	

	3.4	AWS EC2, S3, VPC, IAM;	
	3.5	Azure VM, Storage, Networking.	
4.0		Backup, and Monitoring	
	4.1	Backup Technologies: Disk, Tape, Veeam, TSM, NetBackup	9
	4.2	VM Backups, Restoration, Deduplication, Troubleshooting	
	4.3	Infra Monitoring Tools: Nagios.	
		Total	45

Text Books:

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. Brian Desmond, Joe Richards, Robbie Allen, "Active Directory: Designing, Deploying, and Running Active Directory," O'Reilly Media, 5th Edition, 2019.
4. Nick Marshall, "Mastering VMware vSphere 7", Wiley, 2021.
5. Mustafa Toroman , "Hands-On Cloud Administration in Azure" , Packt, 2020.

Reference Books:

1. Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall, 5th Edition, Pearson Education, 2011.
2. William Stallings, "Operating Systems: Internals and Design Principles," Pearson Education, **Vol:9th** Edition, 2018.
3. Tom Carpenter, "Microsoft Windows Server 2019 Administration Fundamentals," Sybex (Wiley), **Volume:** 1st Edition, 2019.
4. Brian Ward, "How Linux Works: What Every Superuser Should Know," No Starch Press, 2nd Edition, 2014.

Course Structure:

Minor 1 -Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTEP1351	Enterprise Infrastructure and Cloud Technologies - Part II (P)	--	10	--	01	01

Minor 1 -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA			
		Test I	Test II	Sum of T1 & T2		CA	ESA	
SNTTEP1351	Enterprise Infrastructure and Cloud Technologies - Part II (P)	--	--	--	--	10	15	25

SNTTEP1351: Enterprise Infrastructure and Cloud Technologies - Part II (P)(Minor 1)
Curriculum Details

Course pre-requisite:

1. To provide a foundational understanding of Basic Computer Fundamentals.
2. To provide a foundational Understanding of Networking Basics.
3. To provide a Basic Knowledge of Operating Systems.
4. To enable learners Basic Security Concepts.

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.

Curriculum Details:

List of Practical

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

- a. Create VM, configure VNet, attach a blob container for backup.
11. IAM Role and Policy Creation in AWS (Create custom IAM roles)
12. IN AWS, demonstrate how to attach to EC2 instance for access control.
13. Configure Cloud Backup using AWS
14. Configure Cloud Backup using Azure Services
15. Snapshot of EC2 instance / Azure VM backup vault.

Text Books:

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.
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3. Tom Carpenter, "Microsoft Windows Server 2019 Administration Fundamentals," Sybex (Wiley), **Volume:** 1st Edition, 2019
4. Brian Ward, "How Linux Works: What Every Superuser Should Know," No Starch Press, 2nd Edition, 2014

Course Structure:

Vocational Course -Teaching Scheme

Course Code	Course Name (Paper Title)	Teaching Scheme(Hrs.)		Credits Assigned		
		Theory	Practical	Theory	Practical	Total
SNTTVC1351	Internet of Things (IOT)	--	20	--	2	2

Vocational Course -Assessment Scheme

Course Code	Course Name (Paper Title)	Theory				Practical		Total
		CA			ESA			
		Test I	Test II	Sum of T1 & T2		CA	ESA	
SNTTVC1351	Internet of Things (IOT)	--	--	--	--	20	30	50

SNTTVC1351: Internet of Things (IOT) (Vocational Course) Curriculum Details

Course pre-requisite:

1. Arduino UNO or Rasberry-Pie or ESP32 Board, Computer, USB Cable, Breadboard, Jumper Wires, Basic Electronic Components (LEDs, resistors, push buttons, potentiometer and etc.), **Optional** - “Arduino Starter Kit.
2. Basic programming concepts (e.g., variables, loops, conditionals in C/C++ or similar).
3. Fundamentals of electronics (e.g., resistors, LEDs, sensors, Ohm's law).
4. Fundamentals of microcontrollers and digital/analog I/O.

Course Objectives:

1. Introduce students to IoT characteristics, hardware platforms (Arduino, Raspberry Pi, ESP32), and simulation tools for rapid prototyping.
2. Enable hands-on interfacing of sensors, actuators, and modules with Arduino to build interactive embedded systems.
3. Develop skills in designing and implementing real-world IoT applications, such as detection systems and motor control.

Course Outcomes:

1. Students will be able to install, configure, and simulate Arduino IDE environments for IoT experimentation.

2. Students will demonstrate proficiency in interfacing and controlling sensors (e.g., LM35, photoresistor), actuators (e.g., servo, DC motor, relay), and output devices (e.g., RGB LED, buzzer).
3. Students will design and troubleshoot complete IoT projects, like intrusion detection systems, integrating multiple components.

Curriculum Details:

List of Practical

1. Explore Characteristics and Communications of the IOT.
2. Introduction of Arduino, Raspberry Pie and ESP32.
3. Installation of Arduino IDE and testing.
4. Demonstrate Online Simulator for doing Arduino based practical.
5. Study to different IOT based sensors and actuators.
6. Controlling the Light Emitting Diode (LED) with a push button.
7. Interfacing the RGB LED with the Arduino.
8. Controlling the LED blink rate with the potentiometer interfacing with Arduino.
9. Detection of the light using photo resistor.
10. Interfacing of temperature sensor LM35 with Arduino.
11. Interfacing Servo Motor with the Arduino.
12. Interfacing of the Active Buzzer with Arduino.
13. Interfacing of the Relay with Arduino.
14. Building Intrusion Detection System with Arduino and Ultrasonic Sensor.
15. Directional Control of the DC motor using Arduino.

Reference Books:

1. Introduction to IoT by Sudip Misra, Anandarup Mukherjee, Arijit Roy | Publication Cambridge University Press | ISBN 9781108842952, ISBN 9781108959742.
2. The Internet of things_ do-it-yourself projects with Arduino, Raspberry Pi, and BeagleBone Black | ISBN: 978-0-07-183521-3
3. "Arduino Cookbook" by Michael Margolis (O'Reilly Media) – Covers practical Arduino interfacing and IoT projects.

Web References:

1. <https://wokwi.com/>

2. <https://www.vlab.co.in/broad-area-computer-science-and-engineering>
3. Arduino Official Documentation: <https://www.arduino.cc/reference/en/> – For IDE setup, libraries, and code examples.
4. Tinkercad Circuits Simulator: <https://www.tinkercad.com/learn/circuits> – Free online Arduino simulator.
5. Random Nerd: <https://randomnerdtutorials.com/> – Tutorials on sensors, motors, and projects like intrusion detection.

Paper Format for 45 Marks

Time: 2:30 Hour

Marks :45

Note:

I Q.1 is compulsory.

II Solve any 2 Questions from Question number 2 to 5.

III Figures to the Right indicates Full Marks.

IV Assume suitable data whenever necessary.

Q.1 Attempt the following. (on all 4 Units) 15

- a)
- b)
- c)
- d)
- e)

Q. 2 Attempt the following. (on First Unit) 15

- a)
- b)
- c)

Q. 3 Answer the following. (on Second Unit) 15

- a)
- b)
- c)

Q. 4 Attempt the following. (on Third Unit) 15

- a)
- b)
- c)

Q .5 Write short note on. (on Forth Unit) 15

- a)
- b)
- c)

Paper Format for 30 Marks

Time: 2:00 Hour

Marks :30

Note:

I Q.1 is compulsory.

II Solve any 2 Questions from Question number 2 to 5.

III Figures to the Right indicates Full Marks.

IV Assume suitable data whenever necessary.

Q.1 Attempt the following. (on all 4 Units)

10

a)

b)

c)

d)

Q. 2 Attempt the following. (on First Unit)

10

a)

b)

Q. 3 Answer the following. (on Second Unit)

10

a)

b)

Q. 4 Attempt the following. (on Third Unit)

10

a)

b)

Q .5 Write short note on. (on Forth Unit)

10

a)

b)
