Bachelor of Vocational Studies (B VoC)

in

Telecommunications

(ICT, Cyber Security & Big Data Analytics)

B VoC in Telecommunications

1. Course Objective

1.1 The objective of this course is to impart industry oriented skills to candidates looking for a carrier in core telecom domain. The candidate will be able to develop comprehensive skill-sets covering ICT, Cyber security, IoT & Data Analytics domains, which are key emerging trends in the telecom sector. The candidates will be exposed to the right mix of existing & emerging skill-sets and competencies, with clear alignment to NSQF levels, Qualification packs and exit paths at Certificate, Diploma, Advanced Diploma and B VoC. Vertical mobility and carrier progression has been built-in at each level.

1.2 Mapping of NSQF Levels and corresponding certification is as per the table below :-

Award	**Duration after class XII**	**Corresponding NSQF level**
Level 4 Certificate	06 Months	4
Diploma	1 Year	5
Advance Diploma	2 Years	6
B.Voc Degree	3 Years	7

2. Course Objectives

After successfully completing the vocational course, the student would have acquired relevant, appropriate and adequate technical knowledge together with the professional skills and competencies in the field of ICT, Cyber Security and Data Analytics so that he/she is properly equipped to take up gainful employment in this Vocation. Thus he/she should have acquired:-

(i) **Clear Understanding of**

(a) The telecom industry, its growth, expansion and challenges

(b) Various technologies (2G, 3G, 4G etc) adopted by the industry

(c) ICT Infrastructure and Standards

(d) Emerging trends in data connectivity

(e) Cyber Security challenges and interventions

(f) Internet of Things (IoT) and its impending impact

(g) Big Data handling and analytics

(ii) **Adequate Professional Skills and Competencies in**

(a) ICT Infrastructure setup.

(b) FTTH/X installations.

(c) Structured cabling norms and practices

(d) Telecom network & Cyber Security

(e) Internet of Things – Installation & Planning aspects

(f) Bid Data and Data Analytics

(iii) **A Healthy and Professional Attitude so that He/She has**

(a) An analytical approach while working on a job.

(b) An open mind while locating/rectifying faults.

(c) Respect for working with his/her own hands.

(d) Respect for honesty, punctuality and truthfulness

(e) Understands Health & Safety norms at work

(f) Develops good inter-personal and life skills

(g) Good communication skills

3. **Course Structure**

3.1 The course will consist of combination of theory, hands and OJT, aligned to the topics covered during the given semester.

3.2 **Curriculum**

The curriculum in each of the years of the programe is a suitable mix of theory, life-skills and domain skills components.

3.3 **Skill Components:**

- The focus of the course is to impart relevant skills & competencies to the students, so as to make them industry ready by the end of the course/level.
- Over 70% of the course focuses on hands-on, practical and OJT.
- The class-room/knowledge component focuses on applied learning concepts
- QP/NOS are embedded in the curriculum to ensure outcome oriented approach.
- At each exit stage, the candidate will comply to a job role qualification and can progressively gain comprehensive specialization in specified domain.

3.4 **General Education Component**:

The general education component will emphasize on “Life Skills” and focus on “Spoken English”, “Communication”, “General IT/Computer Skills”, and “Employability & Entrepreneurship”.

3.5 **NSQF Compliance**

The curriculum will comply to the below mentioned level descriptors of NSQF:

Level	**Process required**	**Professional Knowledge**	**Professional skill**	**Core skill**	**Responsibility**
Level 4	Work in familiar, predictable, routine, situation of clear choice	Factual knowledge of field of knowledge or study	Recall and demonstrate practical skill, routine and repetitive in narrow range of application, using appropriate rule and tool, using quality	Language to communicate written or oral, with required clarity, skill to basic arithmetic and algebraic principles, basic understanding of social political and natural	Responsibility for own work and learning

			concepts	environment	
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools materials and information	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and learning and some responsibility for other's works and learning
Level 6	Demands wide range of specialized technical skill, clarity of knowledge and practice in	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Reasonably good in mathematical calculation, understanding of social, political and reasonably good in data collecting organizing information, and	Responsibility for own work and learning and full responsibility for other's works and learning

	broad range of activity involving standard/ non-standard practices			logical communication	
Level 7	Requires a command of wide ranging specialized theoretical and practical skill, involving variable routine and non-routine context	Wide ranging, factual and theoretical knowledge in broad contexts within a field of work or study	Wide range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Good logical and mathematical skill understanding of social political and natural environment good in collecting and organizing information, communication and presentation skill	Full responsibility for output of group and development

4.0 **Curriculum**

4.1 Six semester curriculum is designed, with exit feasibility at every year (first exit after 6 months certification program), in compliance to the B VoC guidelines. The curriculum covers a mix of applied theory and OJT. Each semester has appr 40% theory and 60% hands-on/OJT component. Suitable alignment with NSQF levels and Qualification pack has been ensured.

First Year Curriculum

Semester	Reference QP No.	NSQF Level	**Subjects/Modules**	**Duration / Hours**
	Applied Theory			
Semester - 1	Aligned to NSQF L-4		Overview of Telecom Industry, Telecom Technologies, applicability and characteristics	25
			Understanding of ICT Infrastructure (Fiber, Copper, Integrated Media) – Types, Characteristics & Capabilities	45
			Overview of Fiber Optic Technology & Optical Communication	45
			Overview and Characteristics of Fiber to the Home – Technology	30
			Employability Skills	60
			Work Practices, Health & Safety	45
	OJT {either of two}			
	TEL/Q6401	4	Optical Fiber Technician	250
	TEL/Q4109	4	Fiber to the Home – Installation Technician	
Exit with "Certification" at NSQF Level – 4				
Semester - 2	Aligned to NSQF L-5		Introduction to Structured Cabling Norms and Standards Overview of IBS Cabling	45
			ICT Cabling – Best Practices	30
			Introduction to Outdoor Fiber Cabling (Types of outdoor cables, Characteristics, deployment norms & practices)	45

			Cable plant maintenance practices	45
			IT/Computer Skills	45
			Interpersonal communication Skills & employability Skills	40
	OJT			
	TEL/Q4107	5	OSP Supervisor	250
Exit with "Diploma" at NSQF Level – 5				

Second Year Curriculum

Semester	Reference QP No.	NSQF Level	**Subjects/Modules**	**Duration / Hours**
	Applied Theory			
Semester - 3	Aligned to NSQF L-5/6		Information Security fundamentals {OSI Model}	45
			Cyber Threats, risks & vulnerabilities	50
			m-security	60
			Security/Risk management practices	50
			Approaches to Countering common security threats in telecom networks	45
	OJT {either of two}			
	TEL/Qxxxx	5	m-security engineer	250
	TEL/Q6302	5	Network Management Engineer	
Semester - 4	Aligned to NSQF L-6		Cloud Technologies	40
			Intro to Internet of Things	30

			IoT Architecture, Sensor types, Communication protocols, Data formats/protocols & Frameworks	45
			IoT Security	40
			Programming Skills	45
	OJT			
	TEL/QPxxxx	6	IoT Solution Planner	300
Exit with "Advance Diploma" at NSQF Level – 6				

Third Year Curriculum

Semester	Reference QP No.	NSQF Level	**Subjects/Modules**	**Duration / Hours**
	Applied Theory			
Semester - 5	Aligned to NSQF L-6/7		Data Analytics Fundamentals	15
			Big Data Platforms, Modelling & Management Systems	30
			Structured & Non Structured data concepts and handling	30
			Data Modelling, processing & visualization techniques	45
			Data Analyzing (for Business Decisions)	45
			Advanced Programing Skills	60
	OJT			
		6	Industrial Project	275
Semester - 6	**OJT**			

	TEL/Qxxxx	7	Telecom Data Analyst	500
			Industrial Project	
Exit with "B VoC " at NSQF Level – 7				

5.0 **Detailed Curriculum & Modules**

5.1 **Curriculum for Semester I**

(i) Module – 1 : Overview of Telecom Industry, Telecom Technologies, applicability and characteristics. This module will cover the growth of the Indian telecom industry from its early days. Will focus specifically on the following :-

- Structure of Indian Telecom Industry
- Service Providers, Equipment Manufacturers and Network installation/management players
- Roll-out of 2G, 3G, 4G and impending 5G (covering intermediate technologies like 2.5 G, 3.5 G etc)
- Basics on call routings/data access
- How the industry has evolved from voice dominated subscribers to data domination
- Characteristics and difference between various technologies
- Move towards Fiber based technology and implications

(ii) Module – 2 : Understanding of ICT Infrastructure (Fiber, Copper, Integrated Media) – Types, Characteristics & Capabilities

- Components on ICT Infrastructure
- Characteristics and capabilities
- ICT Infra design and planning
- ICT Deployment consideration & management
- ICT Operations management

(iii) Module – 3 : Overview of Fiber Optic Technology & Optical Communication

- Perspective of electromagnetic, optical and visual spectrum

- Optical nomenclature, terms and concepts
- Various types of fibers, their characteristics and usage
- Basic understanding of optical theory and operations
- Understanding how optical fiber supports large bandwidth compared to other technologies
- Applications of optical fiber technology

(iv) Module – 4 : Overview and Characteristics of Fiber to the Home – Technology

- FTTx network environment
- FTTx Network architecture
- FTTx topologies and technologies
- PON protocols
- FTTx network installations
- Maintenance & trouble-shooting

(v) Module – 5 : Employability & entrepreneurship Skills

- Personal Strengths & Value Systems
- Digital Literacy: A Recap
- Money Matters
- Preparing for Employment & Self-Employment
- Understanding Entrepreneurship
- Preparing to be an Entrepreneur

(vi) Module – 6 : Work Practices, Health & Safety

- Precautions whilst handling fiber
- Use of correct tools & equipment
- Use of Personal safety gear

(vii) Module – 7 : OJT

- Option – 1 : Fiber Optical Technician

Module/Coverage - {As per the Qualification Pack}

- Option – 2 : Fiber to the Home Technician

Module/Coverage - {As per the Qualification Pack}

5.2 **Curriculum for Semester 2**

(i) Module – 1 : Introduction to Structured Cabling Norms and Standards and IBS Cabling

- Structured cabling standards (TIA/EIA standards)
- Components of Structured Cabling
- Specifications & compliances
- Design & installation practices
- IBS installation practices
- Vertical fiber installation practices
- Performance standards & measurements
- Testing & troubleshooting practices

(ii) Module – 2 : ICT Cabling – Best Practices

- Procedures & practices in cable handling & installation
- Connectorisation practices
- Termination practices
- Bonding, Grounding practices
- Use of correct tools, equipment and accessories
- Safety practices

(iii) Module – 3 : Introduction to Outdoor Fiber Cabling (Types of outdoor cables, Characteristics, deployment norms & practices)

- Types of outdoor fibers, construction and characteristics
- Types of outdoor installations
- Site survey and installation routes
- Installation practices (conduits, fiber pulling/suction through conduits, direct burial, aerial fiber)

(iv) Module – 4 : Cable plant maintenance practices

- Periodic preventive maintenance

- Corrective maintenance
- Tools, equipment & accessories
- Testing, recording and closure practices

(v) Module – 5 : IT/Computer Skills

- Basic computer operations
- Conversant with Microsoft Word, Excel (open, save etc)
- Open PDF files
- Basic calculations on Excel
- Open and run video files/clips
- Open drawings using specified software

(vi) Module – 6 : Interpersonal communication Skills & employability Skills

- Effective listening
- Read and comprehend general instructions
- Read and comprehend technical literature related to work
- Time management skills
- Team management skills
- Effective work practices

(vii) Module – 7 : OJT – OSP Installation Supervisor

- Module/Coverage - {As per the Qualification Pack}

5.3 **Curriculum for Semester 3**

(i) Module – 1 : Information Security fundamentals

- Introduction to security trends
- General security concepts
- Security architecture
- Network protocols
- Types of threats, attacks, exploitations, Malwares & Hacking
- Monitoring & Compliance

(ii) Module – 2 : Cyber Threats, risks & vulnerabilities

- Penetration testing
- Vulnerability analysis
- Addressing vulnerabilities
- Social engineering

(iii) Module – 3 : m-security

- Security of GSM Networks
- Security of CDMA Networks
- Security of LTE networks
- Wi-Fi and Bluetooth Security
- Security of Mobile VoIP communications
- Data security (in transit and at-rest) & applied cryptography
- Emerging trends in mobile security

(iv) Module – 4 : Security/Risk management practices

- System update
- Patch management
- Maintaining logs and reports
- Log analysis
- Analysing threats (Internal & external)
- System access controls

(v) Module – 5 : Approaches to Countering common security threats in telecom networks

- Communication Infrastructure Management (Hardware & Software)
- Vulnerability management
- Network scans to identify threats/vulnerabilities
- Social Engineering Awareness
- Safeguards against malicious insiders
- System hardening
- Incident response capability
- Robust vendor management practices

(vi) Module – 6 : OJT

- Option – 1 : m-security engineer

Module/Coverage - {As per the Qualification Pack}

- Option – 2 : Network Management Eng

Module/Coverage - {As per the Qualification Pack}

5.4 **Curriculum for Semester 4**

(i) Module – 1 : Cloud Technologies

- Introduction to cloud computing
- Comparison between traditional infra and cloud infrastructure
- Key attributes of cloud services
- Cloud advantages, scaling and redundancy
- Use cases

(ii) Module – 2 : Intro to Internet of Things

- What is IoT?
- History of IoT
- Current technological trends and future prospects
- IoT Devices vs Computer Devices
- Real World IoT Applications in different industry verticals
- Smart Building
- Home Automation
- Smart City
- Design, Development Security and other Challenges in IoT Characteristics of IoT

(iii) Module – 3 : IoT Architecture, Sensor types, Communication protocols, Data formats/protocols & Frameworks

- IoT Architecture
- IoT communication Protocols and Networking
- Software & Hardware Platforms

- Programing concepts

(iv) Module – 4 : IoT Security

- Understanding impact of IoT technologies
- Understanding IoT architecture
- Describing essential components of IoT system
- Understanding vulnerabilities at each level (sensors, applications, platforms etc)
- Securing data in motion and data at rest
- User identification controls
- Understanding security and privacy challenges

(v) Module – 5 : Programming Skills

- C+
- Python Programing

(vi) Module – 6 : OJT

- Option – 1 : IoT Solution Planner

Module/Coverage - {As per the Qualification Pack}

5.5 **Curriculum for Semester 5**

(i) Module – 1 : Data Analytics Fundamentals

- Introduction to Big Data
- Applicability of Big Data
- Introduction to Big Data technologies
- Introduction to Hadoop
- Distributed Computing Basics
- Evolution of Distributed Systems

(ii) Module – 2 : Big Data Platforms, Modelling & Management Systems

- Intro to converged platforms
- Hadoop & Map-R
- Distributed Database

- Understanding Clusters
- Understanding Streams & Containers

(iii) Module – 3 : Structured & Non Structured data concepts and handling

- Understanding traditional Relational Database Management Systems (RDBMS)
- Limitations & Challenges of RDBMS
- Understanding No-SQL databases
- How data is handled and processed by No-SQL database

(iv) Module – 4 : Data Modelling, processing & visualization techniques

- Scripting
- Programing using Map Reduce
- Data Synchronisation
- Receiving & Processing Live Streams

(v) Module – 5 : Data Analyzing (for Business Decisions)

- Using tools (Hive, Pig, Drill etc) to process and analyze data
- Query, Sort, GFilter & Store data
- Data Transformation & Manipulation (using Hive, Pig)

(vi) Module – 6 : Advanced Programing Skills

- Working with SQL
- Python & R
- Tableau or equivalent

(vii) Module – 7 : Project Work

5.6 **Curriculum for Semester 6**

- OJT – Telecom Data Analyst

Module/Coverage - {As per the Qualification Pack}

- Industrial Project