



Project No.	Date	Doc. No.	Serial No	Rev.	Proj. dep.
12019	2025	EOTSS12019	12019/2025	00	Com & Network

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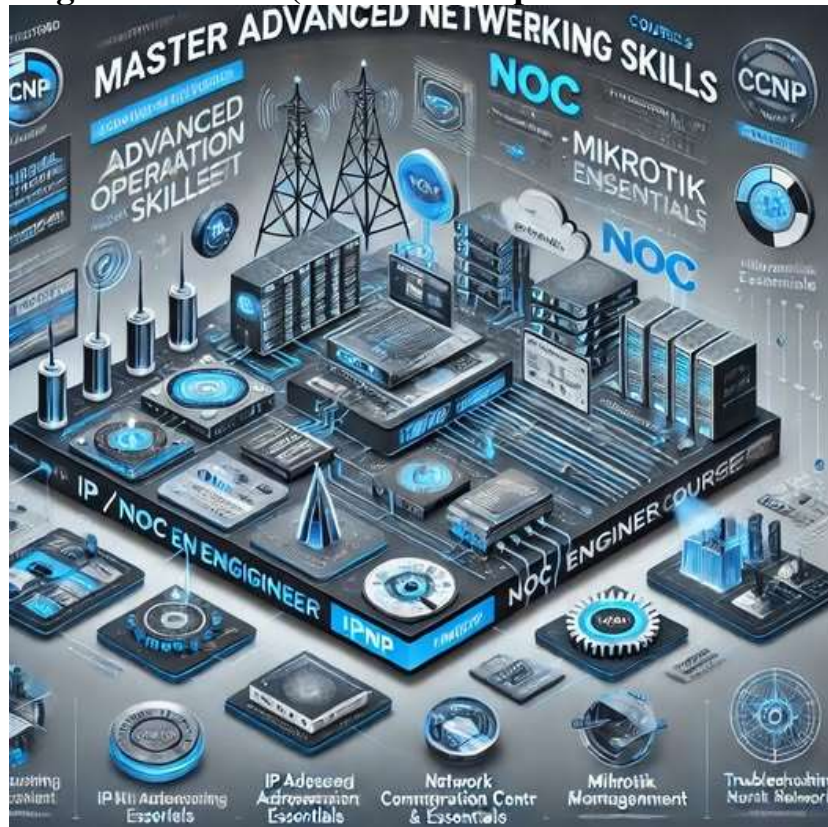
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المعهد الهندسي لخدمات التكنولوجيا والبرمجيات

Engineering office for Technology and Software Services

IP/NOC Engineer Course (Advanced Topics from CCNP + Mikrotik)



Course Name:

IP/NOC Engineer Course (Advanced Topics from CCNP + Mikrotik)

Course Code: 12019-NC

Introduction:

The **IP/NOC Engineer Course** is designed for professionals who are responsible for operating, troubleshooting, and optimizing large-scale service provider or enterprise networks. Whether you're a Network Operations Center (NOC) engineer, an IP backbone engineer, or a systems integrator, this course provides the practical and theoretical knowledge to manage advanced routing protocols, integrate different network platforms like Cisco and Mikrotik, and monitor networks using SNMP and NetFlow.

The course bridges real-world scenarios with hands-on simulations and focuses on practical skill-building that goes beyond textbook certifications. Participants will simulate issues, resolve high-level network problems, and design resilient infrastructures in dynamic environments.

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Description:

An advanced-level training course designed for engineers working in Network Operation Centers (NOC) and IP engineering teams. The course covers deep concepts in IP networking, high-availability design, advanced routing, and integrated Mikrotik-Cisco solutions with hands-on labs.

Course Objectives – IP/NOC Engineer Course (Code: 12019-NC)

- Master Advanced IP Networking:**
Understand and configure dynamic routing protocols such as BGP and MPLS in complex environments.
- Develop Multi-Vendor Integration Skills:**
Build hybrid networks using Cisco and Mikrotik devices, with full interoperability and routing control.
- Design Highly Available Networks:**
Learn best practices for redundancy, fault tolerance, and network availability in real-time environments.
- Enhance Network Security:**
Secure network infrastructure using advanced firewall rules, VPNs, and traffic filtering techniques.
- Gain Proficiency in Network Monitoring:**
Implement tools like SNMP, NetFlow, and syslog to monitor and analyze performance across large-scale networks.
- Prepare for Real-World NOC Operations:**
Practice hands-on problem solving, incident response, and performance tuning using professional tools.

Expected Learning Outcomes

By the end of the course, participants will be able to:

- ✓ **Design and deploy scalable IP backbone networks** using advanced BGP and MPLS configurations.
- ✓ **Integrate and configure Mikrotik and Cisco routers** in complex network environments.
- ✓ **Secure enterprise-grade networks** using NAT, firewalls, VPNs, and user authentication.
- ✓ **Monitor and troubleshoot networks proactively** using SNMP, NetFlow, and event logging.
- ✓ **Resolve routing and performance issues** using practical diagnostic techniques and tools.
- ✓ **Simulate and implement network solutions** in virtual labs using GNS3 and EVE-NG.

Detailed Modules:

Module 1: Advanced Network Management

Topics Covered:

- Traffic Engineering Concepts
- High Availability Design Techniques (HSRP, VRRP, ECMP)

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- Load Balancing Methods
- Redundancy Protocols (FHRP, GLBP)

Lab Focus:

- Implementing multi-path routing
- High-availability failover testing
- Resilient topologies in GNS3/EVE-NG

◆ **Module 2: Advanced BGP & MPLS Routing**

Topics Covered:

- iBGP vs eBGP Concepts
- Route Reflectors and Confederations
- VRF-Lite & Full MPLS VPN Setup
- BGP Attributes and Path Manipulation
- MPLS LDP and TE Overview

Lab Focus:

- Full-mesh and RR configurations
- VRF-aware routing labs
- MPLS Layer 3 VPN with traffic steering

◆ **Module 3: Mikrotik Advanced Configuration**

Topics Covered:

- RouterOS Deep Configuration (CLI/Winbox)
- NAT and Firewall Rules
- VLANs, Bridges, and Routing
- Mikrotik VPN (IPSec, SSTP)
- Queues and QoS Policies

Lab Focus:

- Configuring secure NAT and Firewall
- Building site-to-site Mikrotik VPNs
- Dynamic routing protocols on Mikrotik

◆ **Module 4: Cisco-Mikrotik Integration**

Topics Covered:

- Hybrid Networks (Cisco + Mikrotik)
- Interoperability Challenges
- Routing Redistribution Techniques
- Dual-vendor NAT and VPN

Lab Focus:

- Cisco to Mikrotik BGP exchange
- Building hybrid VPN infrastructures

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- Cross-vendor troubleshooting scenarios

♦ Module 5: Monitoring & Performance Analysis

Topics Covered:

- SNMPv2/v3 Configuration
- Using NetFlow for Traffic Visibility
- Syslog and Real-Time Event Monitoring
- Threshold Alerts and Bandwidth Analysis

Lab Focus:

- SNMP traps to NMS
- Flow analysis with open-source tools
- Real-time traffic graphing (e.g., Zabbix/LibreNMS)

♦ Module 6: Troubleshooting & Optimization

Topics Covered:

- Packet Tracing and Path MTU Discovery
- Routing Loop Detection
- Latency & Jitter Troubleshooting
- Optimizing Network Convergence

Lab Focus:

- Capture and analyze packets using Wireshark
- Use of traceroute and ping tools for root cause analysis
- Simulated outages and failover testing



Modules Breakdown:

Module

Topics Covered

Module 1: Advanced Network Management

Traffic Engineering, Network Scalability, Redundancy Design

Module 2: BGP & MPLS Fundamentals

BGP Route Filtering, MPLS VRF setup, iBGP vs eBGP

Module 3: Mikrotik Integration

Mikrotik routing setup, Firewall & NAT, VPN configuration

Module 4: Cisco-Mikrotik Bridging

Real-world scenarios combining Cisco and Mikrotik in one topology

Module 5: Network Monitoring Tools

SNMP setup, NetFlow analysis, real-time performance dashboards

Module 6: Troubleshooting & Optimization

Packet tracing, traffic analysis, high availability recovery labs



Time Frame:

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Phase	Duration
Theoretical Sessions	10 Hours
Lab Simulations	12 Hours
Integration Projects	6 Hours
Monitoring & Troubleshooting	4 Hours
Final Project & Review	4 Hours
Total Duration	~36 Hours (6 days intensive or 3 weeks part-time)

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