MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Network & Infrastructure Management / إدارة الشبكات والبنية التحتية**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	CYBT210				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level			**Semester of Delivery**	5	
Administering Department	Department of Cybersecurity Technical Engineering		**College**	Technical Engineering College of Computer and Artificial Intelligence - Kirkuk	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	2/11/2026		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Computer Networks & Operating Systems	**Semester**	3 & 4
Co-requisites module	Cloud Computing & Network Security Architecture	**Semester**	6 & 7

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This module aims to provide students with comprehensive knowledge and practical skills required to design, configure, manage, and maintain enterprise network infrastructures and IT services. It focuses on network administration fundamentals, directory services (Active Directory / LDAP), network monitoring and management protocols (SNMP, Syslog, NetFlow), network automation and configuration management (Ansible, Python/Netmiko), server virtualization and containerization, network redundancy and high availability (HSRP/VRRP, Spanning Tree), storage area networks (SAN/NAS), disaster recovery, cloud infrastructure integration, and network performance troubleshooting.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Understand enterprise network architecture, infrastructure components, and administrative lifecycle management. Design, deploy, and manage directory services (Active Directory, LDAP, DNS, DHCP) and domain infrastructure. Configure and troubleshoot core switching and routing protocols (VLANs, Trunking, STP, OSPF, HSRP/VRRP) for resilient infrastructure. Apply network monitoring, logging, and management protocols (SNMP v2c/v3, Syslog, NetFlow/IPFIX, SIEM) to ensure uptime and performance. Automate network configuration, provisioning, and policy enforcement using network scripting (Python/Netmiko) and configuration management tools (Ansible). Understand server virtualization (VMware ESXi, Proxmox/KVM), containerization (Docker, Kubernetes), network storage (SAN, NAS, iSCSI), and hybrid cloud infrastructure. Develop disaster recovery plans, backup strategies, high availability configurations, and perform infrastructure troubleshooting.
Indicative Contents المحتويات الإرشادية	The module will cover the following key areas: Introduction to Network Administration & Infrastructure Management Lifecycle Enterprise Network Architecture & Data Center Infrastructure Design Core Infrastructure Services: DNS, DHCP, IP Address Management (IPAM), and NTP Directory Services & Identity Management: Active Directory Domain Services (AD DS), LDAP, Group Policy Objects (GPOs), and AAA Framework High Availability & Redundancy Protocols: First Hop Redundancy Protocols (HSRP, VRRP, GLBP), Link Aggregation (LACP), and Spanning Tree Protocol (STP/RSTP) Routing & Switching Infrastructure Management: VLANs, Inter-VLAN Routing, OSPF, BGP, and Software-Defined Networking (SDN) Fundamentals Network Monitoring & Performance Management: SNMP (v1, v2c, v3), MIBs, OIDs, Syslog, NetFlow/IPFIX, and Monitoring Tools (Zabbix, PRTG, Nagios) Network Automation & Infrastructure as Code (IaC): Python for Network Engineers (Netmiko/Nornir), REST APIs, Ansible, and YAML Playbooks Infrastructure Virtualization & Storage Networks: Hypervisors (Type 1 & Type 2), SAN, NAS, iSCSI, Fibre Channel, and Software-Defined Storage Cloud & Hybrid Infrastructure: Infrastructure as a Service (IaaS), Virtual Private Clouds (VPC), Cloud VPN Gateways, and Hybrid Connectivity

	Disaster Recovery, Backup Strategies, Business Continuity Planning (BCP), and Infrastructure Security Hardening

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will employ a combination of strategies including: Lectures: To provide theoretical foundations on network administration, directory services, virtualization, and infrastructure management. Group Discussions: To evaluate architecture trade-offs, disaster recovery models, and high availability designs. Problem-Solving Sessions: To design IP addressing schemes, subnetting, GPO policies, and troubleshooting network bottlenecks. Practical Lab Sessions: Hands-on experience configuring Active Directory, GNS3/CML topologies, Ansible automation, and Zabbix monitoring. Tutorials: To practice writing Ansible playbooks, Python Netmiko scripts, and SNMP MIB analysis. Mid-term and final exams: To assess comprehensive theoretical knowledge and practical infrastructure administration skills. Preparatory Week: To give students time to revise and clarify any difficulties before the final exam.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	52	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	48	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	5% (5)	5, 10	LO #1, 3 and 5
	Assignments	2	5% (5)	2, 12	LO #2, 4 and 6

	Projects / Lab.	1	10% (10)	Continuous	LO #7
	Report	1	10% (10)	13	LO #3, 5 and 7
Summative assessment	**Midterm Exam**	2 hr	20% (20)	8	LO #1 – 4
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Network & Infrastructure Management: Administrative Lifecycle, Data Center Infrastructure, ITIL Framework.
Week 2	Core Infrastructure Services I: Domain Name System (DNS) Architecture, Resource Records, DNSSEC, and Troubleshooting.
Week 3	Core Infrastructure Services II: Dynamic Host Configuration Protocol (DHCP) Scopes, Relays, Failover, and IPAM Integration.
Week 4	Identity & Directory Services I: Active Directory Domain Services (AD DS), Domain Controllers, Forests, Trusts, and LDAP Protocol.
Week 5	Identity & Directory Services II: Group Policy Objects (GPOs), User & Device Authentication, Kerberos, and Access Control Policies.
Week 6	High Availability & Redundancy I: Layer 2 Redundancy (STP, RSTP, MSTP), Loop Avoidance, and Link Aggregation (LACP EtherChannel).
Week 7	High Availability & Redundancy II: First Hop Redundancy Protocols (HSRP, VRRP, GLBP) and Network Load Balancing Techniques.
Week 8	Mid-term Exam (الفصل منتصف اختبار) & Network Monitoring Fundamentals: SNMP Protocol (v2c/v3), MIB Architecture, OIDs, and Traps.
Week 9	Traffic Analysis & Telemetry: Syslog Server Configuration, NetFlow/IPFIX Traffic Analysis, SIEM Integration, and Performance Baselining.
Week 10	Network Automation I: Introduction to Network Automation, Python Scripting for Network Devices (Netmiko/Paramiko) and REST APIs.
Week 11	Network Automation II: Infrastructure as Code (IaC), Ansible Automation Framework, Playbooks, YAML, and Configuration Drift Management.

Week 12	Infrastructure Virtualization: Hypervisors (VMware ESXi, KVM/Proxmox), Virtual Switches (vSwitch), VLAN Mapping, and Virtual Storage.
Week 13	Storage Area Networks (SAN & NAS): iSCSI Protocols, Fibre Channel, RAID Configurations, and Software-Defined Storage (SDS).
Week 14	Cloud & Hybrid Infrastructure Management: Virtual Private Clouds (VPC), Hybrid VPN Tunnels, Direct Connect, and Multi-Cloud Networking.
Week 15	Disaster Recovery & Business Continuity: Backup Strategies (Full, Incremental, Differential), RTO/RPO Metrics, and Infrastructure Hardening.
Week 16	**Future Trends in Infrastructure (Software-Defined Infrastructure, AIOps, Edge Computing) & Final Examination (النهائي الاختبار).**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Configuring and Troubleshooting Core Network Services: DNS Server, DHCP Scopes, and IPAM Setup on Linux/Windows Server.
Week 2	Lab 2: Active Directory DS Deployment: Domain Controller Installation, Organizational Units, User/Group Management, and GPO Enforcement.
Week 3	Lab 3: High Availability Routing & Switching Lab: Configuring HSRP/VRRP, LACP EtherChannel, and RSTP on Cisco/GNS3/CML Topology.
Week 4	Lab 4: Network Monitoring & Telemetry Lab: Deploying Zabbix / PRTG Monitoring, SNMP v3 Configuration, and NetFlow Inspection.
Week 5	Lab 5: Network Automation Lab: Writing Python Scripts (Netmiko) and Ansible Playbooks for Automated Device Provisioning.
Week 6	Lab 6: Virtualization & Storage Network Lab: Configuring VMware ESXi / Proxmox VE, Virtual Networks, and iSCSI SAN Storage Mounting.
Week 7	Lab 7: Revision, Infrastructure Management Capstone Project Presentation, Practical Exam, and Course Assessment.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Subramanian, M. (2012). "Network Management: Principles and Practice" (2nd ed.). Pearson.	Yes
Recommended Texts	Limoncelli, T. A., Hogan, C., & Chalup, C. J. (2014). "The Practice of System and Network Administration" (3rd ed.). Addison-Wesley.	Yes
Websites	Yes	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.