UNIDEL-ICT 401: Network Performance and Optimization (3 Units; Compulsory; LH=30; PH=45)

Senate-approved Relevance
The training of high-skilled graduates who are armed with knowledge and skills for network design, operation and testing, equipment configuration, performance optimization which could be used in different ICT application areas in Delta State and Nigeria in general is in tandem with the vision and mission of the University of Delta, Agbor. This ensures that Information and Communication Technology graduates with demonstrable potentials and necessary skill set to build networks using modern grade production equipment. The relevance of this is seeing and producing ICT graduates of the University of Delta, Agbor being versed in network management as networking is an evolving field concerned with the study of complex networks such as data networks and social networks. The students would be armed with relevant skills to design and implement high performing network with modern equipment that are scalable and robust which will be beneficial to Delta State and Nigeria in general.

Overview
Networking is an evolving academic field concerned with the study of complex networks such as data networks and social networks. A common aspect between the analysis of such networks is the use of methods from the two areas of modeling and performance evaluation in networking, and optimization in networking. The goal of the course is to enhance the skills of the students through teaching some fundamental results in both areas. The course will introduce students to computer network fundamentals and also to understand techniques in network measurement. The most widespread link-layer and network technologies, Ethernet and IP are considered. Students will learn network design, operation and testing, network equipment configuration, network performance measurement and optimization. The course will use Cisco 2960, Cisco 3750 multi-layer switches (with wired network infrastructure and control-plane network.

The course covers Network performance measurements, network monitoring techniques and tools, network quality measurements and assurance, directory services and associated concepts and challenges of optimization, routing and routed protocols, Network architecture, Network quality assurance and testing.

Objectives
The objectives of this course are to: (i) explain the techniques and tools used in measuring and analyzing network performance. (ii) explain network quality assurance and testing knowledge be exposed to network architecture and optimization (iii) discuss and describe network fundamentals; (iv) study the most widespread data-link and network technologies: Ethernet and IP (v) teach students to use real network equipment (vi) use modern production-grade equipment to build networks (vii) explain network performance indicators and network optimization features

Learning Outcomes
Upon completion of this course, students should be able to: (i) explain network fundamentals(ii) describe and discuss network performance indicators (iii) discuss network optimization features(iv) describe and build an Ethernet/IP-based network (iv) describe and configure Cisco network equipment(v) discuss and perform network performance measurement (vi) explain network quality and testing knowledge to be exposed to network architecture and optimization (vii) design and build an Ethernet/IP based network

Course Content
Introduction to computer network. Network components. Multi-layer network model. OSI model. Data link layer. Link types: point-to-point, multi-access. Ethernet and PPPprotocols, Internet Protocol (IP). IP addressing. Introduction to routing. ICMP control protocol. Transport layer. TCP and UDP protocols. Static routing, and dynamic routing. Network key performance indicators (KPI). Bandwidth, latency. jitter, convergence time. KPI measurement. Optimization of network bandwidth. Load sharing and load balancing. Routing protocol tweaking. Forwarding detection (BFD). Optimization of network latency. Packet queuing, packet scheduling. Quality-of-service (QoS) features. KPI measurement automation. Optimization of computer networks using IP SLA feature.

Minimum Academic Standard
NUC minimum academic standard requirements for facilities.