

Degree Programs in Network and System Administration:

What is taught? What is drilled/practiced? What can the graduate do?

Presented by
Aleksey Tsalolikhin, Trainer
www.VerticalSysadmin.com
aleksey@VerticalSysadmin.com

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Wherein six degree programs in network and system administration are detailed for the benefit of those intending to study or teach system administration; with the added intention of considering a standard Core Curriculum for study of system administration:

Rochester Institute of Technology

B.S. Degree in Applied Networking and System Administration

<http://www.rit.edu/programs/applied-networking-and-system-administration-bs>

Michigan Technological University

Engineering School in Northern Michigan

B.S. Degree in Computer Network and System Administration

<http://www.mtu.edu/technology/undergraduate/cnsa/>

Wentworth Institute of Technology

B.S. Degree in Computer Networking

<http://www.wit.edu/computer-science/programs/BSCN.html>

Dakota State University

BS in Network & System Administration

<http://www.dsu.edu/majors-programs/network-sys-admin.aspx>

Oslo University College

Master in Network and System Administration

[http://www.hioa.no/Studier/TKD/Master/Network-and-System-Administration/\(language\)/nor-NO](http://www.hioa.no/Studier/TKD/Master/Network-and-System-Administration/(language)/nor-NO)

Florida State

Master of Science in Computer Network & System Administration (MS CNSA)

http://www.cs.fsu.edu/current/grad/cnsa_ms.php

Rochester Institute of Technology

B.S. Degree in Applied Networking and System Administration

<http://www.rit.edu/programs/applied-networking-and-system-administration-bs>

Section 1: What does the program cover?

Program overview

Networking, the technology of interconnecting computing devices so information can flow between them, includes the design, deployment, operation, and maintenance of computer networks using developed components. This includes activities as simple as topology design to those as complex as the configuration of services and protocols to enable an entire intranet and the support of that environment. As the number of computing devices in the network scales up, the task becomes more difficult, involving design tradeoffs, performance considerations, and cost issues.

Systems administration includes the system design, installation, configuration, operation, and support of computer system platforms from mobile devices, servers, and large scale systems to the deployment of clouds and the use of virtualization. This includes the specification and implementation of all the hardware and software structures required to support and deploy these environments.

These disciplines are also concerned with the security and privacy of the information that is stored on these platforms and communicated over the networks they are attached to. In today's information-rich environment, computer systems exist at the heart of a network and often work together to provide services as well as repositories for information. Students will be able to take all of this into consideration as they design and deploy secure system and network solutions in support of an organization's strategic and tactical goals.

Curriculum

The BS degree in applied networking and system administration is designed to teach students to be the designers, implementers, operators, and maintainers of computing networks and the computer systems attached to the network. Students will evaluate existing networks and computing systems, suggest improvements, monitor such systems for faults, and plan for growth. They will have the opportunity to work in small- to large-scale companies in any industry segment that interests them.

An important goal of the program is to provide students with a level of specialization beyond that provided by typical information systems or information technology programs. To accomplish this, the program focuses on networks of all types and the full range of computer system

platforms that can attach to them. In this way the degree program favors depth over breadth. It is this approach that allows faculty to guide students in their in-depth exploration of conceptual knowledge, which is enhanced with required cooperative education experiences.

The program includes required core courses which are complimented with five advanced courses selected by the student. The core includes a programming sequence, introductory courses in database and security, and fundamental courses in computer networking and system administration.

Advance Courses

Students choose five of the following courses:

- 4050-403 Wireless Network Concepts
- 4050-422 System Administration II
- 4050-423 System Administration III
- 4050-519 Network Troubleshooting
- 4050-521 Perl for System Administration
- 4050-530 Telephony Integration
- 4050-550 VoIP Security and QoS
- 4050-540 Network Design and Performance
- 4050-545 Advanced Routing and Switching
- 4050-582 Wireless Ad-Hoc/Sensor Networks

Courses and Descriptions

First Year

4050-202 Introduction to Unix/Linux

4050-212 Platform-Independent Client Server Programming

Advanced application programming with a network-centric nature will be explored. Topics covered will include; threads, simple thread synchronization, TCP-based client-server programming, and file access and sharing.

The use of pointers and pointer manipulation will be addressed throughout.

Programming projects will be required. (4002-210 Programming with Classes; corequisite 4050-351 Networking Fundamentals) **Class/Lab 6, Credit 4**

4002-208 Introduction to Programming

A first course in programming using C++. Topics include elementary data types, arithmetic and logical operators, input/output, control structures, functions with and without parameters, arrays, and an introduction to objectoriented program design and implementation. Emphasis is placed on the development of problem-solving skills. Programming projects are required. (Computer literacy) **Class 6, Credit 4**

4002-210 Programming with Classes

A second course in programming with emphasis on object-oriented programming. Students will first use and then build classes. Topics on classes include

information hiding through classes, construction of classes, standard class methods, operator overloading, friend functions, inheritance and polymorphism. Additional topics include files, exception handling, and developing programs with a GUI front-end. Programming projects are required. (4002-208) **Class 6, Credit 4**

4050-220 Cyber Self Defense

This course will teach students how to recognize a potential cyber attacker and identify their own vulnerabilities so that they can defend themselves, their information and their identity. Students will be introduced to the tools and techniques to defend against, react to and recover from a cyber attack.

Class 4, Credit 4

4050-350 Computer System Fundamentals

This course is organized around goals and activities involving computer technology familiar to most students. The examples used to illustrate topics build progressively on each other and bring the student from the basics of the PC's physical construction through the complexities of the operating system.

Class 3, Lab 2, Credit 4

4050-351 Network Fundamentals

Network technologies and standards are discussed with in-depth coverage of layers 1, 2, and 3. Topics include, but are not limited to, access control, framing, operation of layer 2 protocols including wired and wireless technologies, network protocols (IPv4, IPv6 and IPX), transport protocols (TCP, UDP, and SPX) network security, subnetting, and network hardware. (4050-350, 1016-205) **Class 3, Lab 2, Credit 4**

1016-204 College Algebra

This course prepares students to enter a non-trigonometry based, introductory level calculus course. Topics include a review of the fundamentals of algebra; solution of linear, fractional and quadratic equations; functions and their graphs; polynomial, exponential, logarithmic and rational functions; systems of linear equations. (Two years of high school algebra and score below 35% on Mathematics Placement Exam) **Class 4, Credit 4 (F, W, S, Su)**

1016-205 Discrete Math for Technologists I

An introduction to topics of discrete mathematics for students of Information Technology, including number systems, sets and logic, counting and matrices. (1016-204) **Class 4, Credit 4 (F, W, S, Su)**

1016-206 Discrete Math for Technologists II

A continuation of an introduction to topics of discrete mathematics for students of Information Technology, including relations, Boolean algebra, graph theory and regular sets. (1016-205 or 1016-265) **Class 4, Credit 4 (F, W, S, Su)**
Liberal Arts*

1105-051, 052 First-Year Enrichment

4050-203 Co-op Preparation Seminar

Second Year

4050-302 Scripting in Perl

An introduction to scripting in the PERL language. The course will cover basic control structures, data structures, and objects in the language. Examples will include basic graphical programming, GUI programming, and interfacing to an underlying operating system. For much of the course, that system will be Unix or some variant thereof. PERL on Windows will be taught as a short topic. At the end of the course, the elementary scripting concepts of PERL will be mapped to those for BASH shell scripting so that students will have a reading understanding of shell scripts. (4002-218 or 4002-210 or equivalent) **Class 3, Lab 2, Credit 4**

4050-515 Introduction to Routing and Switching

This course is a laboratory based course that focuses on the standards and technologies used to establish inter-network structures that will support a TCP/IP data stream for higher level services to operate over. It is primarily concerned with the network layer and below. Although the course focuses on the TCP/IP protocol suite and the Ethernet LAN protocol, other protocols may be studied. Students will use their knowledge of how to connect computers (PCs) in a LAN and learn how to connect separate networks together to form an internet. Bridging and switching concepts are investigated (such as the resolution of bridging loops through the appropriate algorithms). Routed and routing protocols and algorithms are studied and implemented. (4050-351) **Class 3, Lab 2, Credit 4**

4050-421 Systems Administration I

This course is designed to provide students with essential knowledge and skills in system administration. Basic operating system concepts, such as file systems, processes and threads, memory management, and input/output are covered to provide students with an understanding of the fundamentals of a computer system. Services including Remote Procedure Call (RPC), Network File System (NFS), Network Information Service (NIS), Server Message Block (SMB), and Services for Unix (SFU) are introduced. (4050-302 or 4050-402, 4050-350, 4050 351) **Class 3, Lab 2, Credit 4**

4050-413 Applications of Wireless Data Networks

This course explores wireless data networking technologies and equipment. As its basis it uses the fundamental concepts and technologies learned in Network Fundamentals, and expands upon them to include other contemporary and emerging technologies. In this course we will discuss topics such as wireless local area networks (WLANs), wireless network operation, network integration, construction and network design. (4050-351) **Class 3, Lab 2, Credit 4**

4002-360 Introduction to Database and Data Modeling

A presentation of the fundamental concepts used in data modeling and database implementation. The data modeling process, basic relational concepts, and the process of normalization, relational algebra, SQL, and guidelines for mapping a data model into a relational database will be covered. Programming assignments involving the use of a relational database management system will be required. (4002-218 or equivalent and 1016-206) **Class 4, Credit 4**

1016-319 Data Analysis I

This course will study the statistical principles of presenting and interpreting data. Topics covered will include: descriptive statistics and displays, random sampling, the normal distribution, confidence intervals and hypothesis testing. The statistical software package Minitab will be used to reinforce these principles and to introduce students to the use of technology in statistical analysis. This is a general introductory statistics course and is intended for a broad range of programs. NOTE: This course may not be taken for credit if credit is to be earned in 1016-314. (1016-204) **Class 4, Credit 4 (F, W, S, Su)**

Lab Science Electives 8
Liberal Arts* 12

Third and Fourth Year (co-op)

4050-516 Network Services

An investigation of the tasks of selecting, configuring and administering services in an internetworking environment. Topics include the TCP/IP protocol suite, service administration including DHCP, DNS, and email architecture. Students completing this course will have experience in administering an internetwork of computers with a variety of these services as well as an understanding of the similarities and differences between protocols in the TCP/IP suite (TCP and UDP). (4050-402 and 4050-351) **Class 3, Lab 2, Credit 4**

4002-455 Needs Assessment

Complex problems in modern organizations require an information technologist to systematically analyze problem areas to determine the most effective and cost-efficient solutions. This course builds student skills in two different yet interacting areas: needs assessment (requirements analysis) and group problem solving. Students use interviewing and problem-solving techniques to uncover the constraints that surround problem areas. Students learn the questions to ask during needs assessment, along with developing the interpersonal skills to conduct these meetings. Emphasis is on the steps in creative problem solving, the basics of meeting planning to maximize group effectiveness and helping a client to focus concerns into a clearly defined problem.

4002-460 Technology Transfer

Technology transfer is an umbrella term that refers to the creation, adoption

and consequences of new technologies in a variety of settings. This course looks at how a new idea becomes implemented in a system (an organization or society) and the factors that influence the adoption of a new idea. The course also looks at the influence of individuals and groups within the change process and how they affect the acceptance of new technologies. (Third-year standing and co-op experience) **Class 4, Credit 4**

Advanced Track Courses‡ 20 Liberal Arts* 12 Free Electives 20 General Education Electives 14 Communication Elective 4 Wellness Education† 0

Section 2: Is there a practical component like a lab, or an apprenticeship or internship?

In the third and fourth year of the program there is an option for a co-op placement. Students complete two or three quarters of cooperative education depending on when they start their degree program. Students have found co-op positions in nearly every type of business that requires computer systems and/or networks. These vary from small- or medium-sized businesses to large international companies, from computing-centric organizations (network hardware manufacturers, software services providers) to users of information technology (manufacturing companies, school districts, and the entertainment industry). Co-op gives students real-world experience and a definite advantage over other applicants when applying for jobs after graduation. Typically, co-ops occur during the summers following the second and third years and during one of the academic quarters in the third year. Students must complete their co-op requirement prior to completing their course work and preferably prior to their senior year.

Section 3: What is the student expected to be able to do after graduation?

The Applied Networking and System Administration BS program prepares students for careers as architects, implementers, administrators and technical managers of computing networks, networked systems/components and software systems/components. This will include a focus on customer requirements and threats to the integrity of these systems and the software and data that uses them. Both of these refer to the ability to develop strategic plans and function as network and system project managers. Graduates of the program can evaluate existing networks and computing systems, monitor such systems for faults, and lead in the strategic planning to facilitate system improvement and growth. They will work in small- to large-scale companies; any place that computers and networks are employed will need graduates of this program. The program provides students with a level of specialization in this area beyond that provided by information systems or general information technology programs by focusing specifically on the network and computing systems and forsaking the application domains that such programs address. That is, the program favors depth over breadth, which allows it to focus on a greater level of detail.

Michigan Technological University

Engineering School in Northern Michigan

B.S. Degree in Computer Network and System Administration

<http://www.mtu.edu/technology/undergraduate/cnsa/>

Section 1: What does the program cover?

Program Overview

Computer network and system administration, or CNSA, is one of Michigan Tech's fastest-growing degree programs. Our graduates are in high demand for their skills in building and managing computer networks.

As a CNSA major, you will learn to build and troubleshoot computer networks and manage massive databases effectively and securely.

You can tailor your program to fit your interests:

- computer/network security
- technical operations management
- network engineering

By the time you graduate, you will be well prepared to earn the security, network, VoIP, and Linux certifications that employers are looking for.

Of our 24 core classes, 20 have a lab component, so you can fully master the course concepts. To make that easier, all our labs are open 24/7.

Courses and Descriptions

SAT 1200 - Introduction to Programming

Introductory course in C/C++ programming. Topics include top-down analysis of problems, structured programming, control statements, loops, and functions, arrays, and pointers. Basic concepts of object-oriented programming (classes, objects, function overloading) will also be introduced.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Fall

Restrictions: Must be enrolled in one of the following Major(s): Industrial Technology, Computer Network & System Admn; Must be enrolled in one of the following Class(es): Freshman, Sophomor

SAT 1610 - Computer and Operating Systems Architecture

Fundamentals of computer organization, operating system architecture, PC/WS major subassemblies, PC and server configuration planning, power interfaces, system assembly/set-up,

connection of peripherals, installing fundamental operating system software, system testing/debugging and planning and installation of application software portfolios.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Spring

Restrictions: Must be enrolled in one of the following Major(s): Computer Network & System Admn, Audio Production & Technology

Pre-Requisite(s): SAT 1200

SAT 1700 - Computer-Cyber Ethics/Policy

Ethical, privacy, liability, and regulatory compliance issues in managing computer and network administrations. Other topics include the digital ID debate, biometrics, computer use policy, privacy statements, P3P, security policy, FCC mandates, state utility commission mandates, W3C, and standards development bodies.

Credits: 3.0

Lec-Rec-Lab: (0-3-0)

Semesters Offered: Fall

Restrictions: Must be enrolled in one of the following Major(s): Computer Network & System Admn

SAT 2343 - Network Administration I

Introduction to basic networking concepts and implementation. Topics include OSI model, subnetting, network addressing, data encapsulation, network topologies, and basic configuration of networking hardware including cabling, bridges, routers, and other communications.

Credits: 4.0

Lec-Rec-Lab: (0-3-2)

Semesters Offered: Fall

Pre-Requisite(s): SAT 1610

SAT 2511 - MS System Administration I

Microsoft server software installation and configuration. Development of system interface scripts to perform tasks specific to client/server applications. Other topics include RDP, directory services, device drivers, SLIP/PPP, and SAN/NAS access.

Credits: 4.0

Lec-Rec-Lab: (0-3-2)

Semesters Offered: Spring

Pre-Requisite(s): SAT 2343

SAT 2711 - Unix & Linux Administration I

Study of networked systems in Linux and Unix. Topics include Linux file system administration, Bash shell, system initialization and X windows, Linux processes management, print and log administration, compression, system backup/restore, network services (FTP, NFS, Samba), and security (firewall) configuration.

Credits: 4.0

Lec-Rec-Lab: (0-3-3)

Semesters Offered: Fall, Summer

Pre-Requisite(s): SAT 1200

SAT 3200 - Storage Area Networking

Study of distributed network storage methods, that include ISCSI, DAS, NAS, and SAN technologies. Other topics include storage and computer virtualization, configuration management, storage farms, backup and recovery.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Fall, Spring

Pre-Requisite(s): SAT 2511 and SAT 2711

SAT 3210 - Database Management

Introductory course on database management. Topics include data modeling, database design, implementation techniques, Oracle SQL Language, database administration and security.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Fall, Summer

Restrictions: Must be enrolled in one of the following Major(s): Computer Network & System Admn

Pre-Requisite(s): SAT 2511 and SAT 2711

SAT 3343 - Network Administration II

Study of network devices in various architectures. Topics include routing protocols, TCP/IP, access-lists, remote network structures, network topologies, telnet and SSH authentication, switch programming, VLAN and STP configuration, IP traffic control, network troubleshooting and WAN encapsulation.

Credits: 4.0

Lec-Rec-Lab: (0-3-2)

Semesters Offered: Spring, Summer

Pre-Requisite(s): SAT 2343

SAT 3511 - MS System Administration II

Advanced MS administration functions. Topics include TCP/IP infrastructures, managing storage, grid and clustered computing, configuring print servers, Windows terminal servers, MS system tuning, remote access, and backup and recovery from failures.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Fall

Pre-Requisite(s): SAT 2511

SAT 3711 - Unix & Linux Administration II

Advanced study of Unix and Linux OS. Topics include system management, installation and maintenance, network security, data integrity, and enterprise infrastructures such as identity management, authentication, authorization and directory services.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Spring, Summer

Pre-Requisite(s): SAT 2711

SAT 3812 - Network Security Engineering I

Planning and managing system security in a TCP/IP converged enterprise network environment. Topics include security architecture, attack methods and counter-measures, patch management, performance monitoring, security management tools, best practices, policy management, virus scanning, security protocols, intrusion detection, firewalls, and SSL/TLS.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Fall

Pre-Requisite(s): SAT 2511 and SAT 2711

SAT 3820 - Mobile Computing and FCC Regulations

Evolution of wireless communications, standards, and regulations. Topics include IEEE 802.11b/a/g Physical & MAC Layer Standards, Site Survey, WLAN Security and Vulnerabilities, Troubleshooting, Personal, Metropolitan, and Wide Area Wireless Networks (Bluetooth, WiMax, Cellular & Satellite Networks).

Credits: 4.0

Lec-Rec-Lab: (0-3-2)

Semesters Offered: Spring, Summer

Restrictions: Must be enrolled in one of the following Major(s): Computer Network & System Admn

Pre-Requisite(s): SAT 3812

SAT 4240 - Voice over IP Engineering

Voice over IP (VoIP) engineering and design. Topics include call and session protocols such as SIP, H.323, IAX and MGCP; VAD and PLC; common practical issues such as call redirection; codec integration and quality of service measurements.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Spring - Offered alternate years beginning with the 2011-2012 academic year

Restrictions: Must be enrolled in one of the following Major(s): Computer Network & System Admn

Pre-Requisite(s): SAT 2511 and SAT 2711 and SAT 3343

SAT 4310 - Advanced Scripting Programming

Emphasizes advanced portions of scripting programming, testing, implementation and documentation (i.e. PERL, PHP, Python and Shell Scripting). Other topics include language syntax data and file structures, input/output devices, file and graphical user interfaces.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Fall

Restrictions: Must be enrolled in one of the following Major(s): Computer Network & System Admn

Pre-Requisite(s): SAT 1200 and SAT 2511 and SAT 2711

SAT 4343 - Network Engineering

Topics include router and switch flow control; VoIP, compression and load balancing; VPN networks involving MPLS, IPSEC and PPP; advanced access-list configuration; AAA; Kerberos; TACACS; firewalls; and configuration of advanced routing protocols.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Spring - Offered alternate years beginning with the 2010-2011 academic year

Pre-Requisite(s): SAT 3343

SAT 4480 - Senior Project I

Capstone course requiring the application of knowledge gained in lower division courses. Projects are team oriented, require weekly progress reports, and culminate with a final report and oral presentation.

Credits: 3.0

Lec-Rec-Lab: (0-0-6)

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required; Must be enrolled in one of the following Major(s): Computer Network & System Admn; Must be enrolled in one of the following Class(es): Junior, Senior

SAT 4541 - Directory Services Architecture

Advanced concepts of planning and implementing enterprise services including LDAP directory service, Microsoft Active Directory and Kerberos in an enterprise environment. The course covers the concept of sustainability, green computing and best practices in industry.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Fall, Summer

Pre-Requisite(s): SAT 3511(C) and SAT 3711

SAT 4600 - Web Applications and Server Administration

In-depth study of Apache web server, Microsoft Internet Information Server (IIS) and email services. Topics include server configuration, load balancing, connecting to the Internet, web security and administration, communication media, HTTP, fault tolerance, and proxy servers.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Spring

Pre-Requisite(s): SAT 3511 and SAT 3711

SAT 4812 - Network Security Engineering II

Cryptographic, authentication, key distributions, and e-commerce security protocols. Security protocol properties: authentication, secrecy, integrity, availability, non-repudiation, atomicity, certified delivery; crypto-protocol attacks; security protocols design, implementation and analysis. Email, IP, and wireless security, virtual private networks, firewalls, content filtering, network security policies, and intrusion detection.

Credits: 3.0

Lec-Rec-Lab: (0-2-2)

Semesters Offered: Spring
Pre-Requisite(s): SAT 3812

SAT 4880 - Senior Project II

Capstone course requiring the application of knowledge gained in lower division courses. Projects are team oriented, require weekly progress reports, and culminate with a final report and oral presentation.

Credits: 3.0

Lec-Rec-Lab: (0-0-6)

Semesters Offered: Fall, Spring, Summer

Restrictions: Permission of instructor required; Must be enrolled in one of the following Class(es): Junior, Senior

Pre-Requisite(s): SAT 4480

SAT 4996 - Special Topics in Computer Network Systems Administration

Selected additional topics of interest in Computer Network Systems Administration based on student and faculty demand and interest. May be a tutorial, seminar, workshop, project, or class study.

Credits: variable to 3.0; Repeatable to a Max of 6

Semesters Offered: On Demand

Restrictions: Permission of instructor required; Must be enrolled in one of the following Major(s): Computer Network & System Admn; Must be enrolled in one of the following Class(es): Senior

SAT 4997 - Independent Study in Computer Network Systems Administration

Independent study of an approved topic under the guidance of a Computer Network Systems Administration faculty member. May be either an academic, design, or research problem/project.

Credits: variable to 3.0; Repeatable to a Max of 6

Semesters Offered: On Demand

Restrictions: Must be enrolled in one of the following Major(s): Computer Network & System Admn; Must be enrolled in one of the following Class(es): Senior

SAT 4998 - Undergraduate Research in Computer Network Systems Administration

An undergraduate research experience in Computer Network Systems Administration. Under the guidance of a CNSA faculty member, students work on a selected/approved research problem or work directly with faculty on active research projects/grants. May require more than one semester to complete.

Credits: variable to 6.0; Repeatable to a Max of 6

Semesters Offered: On Demand

Restrictions: Permission of instructor required; Must be enrolled in one of the following Major(s): Computer Network & System Admn; Must be enrolled in one of the following Class(es): Senior

Section 2: Is there a practical component like a lab, or an apprenticeship or internship?

None listed.

Section 3: What is the student expected to be able to do after graduation?

Upon graduation, students can expect to enter a career as a:

- Network Engineer
- Systems Engineer
- Chief Security Officer (CSO)
- Security Specialist
- Database Administrator
- Voice over IP (VoIP) Engineer

Wentworth Institute of Technology

B.S. Degree in Computer Networking

<http://www.wit.edu/computer-science/programs/BSCN.html>

Section 1: What does the program cover?

In the core networking courses, the student acquires skills in networking, database management, webpage development, and computer administration. Through the management courses the student will analyze and solve business problems. In addition, introductory programming languages, including object oriented programming, computer systems architecture, and operating systems are integral components of this program as are English, mathematics, science, and social science.. Computer Networking (BSCN) is a cooperative education program which provides students with the opportunity to take part in paid work experience in industry for a minimum of two non-consecutive semesters. Graduates, in addition to continuing their education at the graduate level, may seek employment in a wide range of computer-related fields such as network administration, database administration, web application development, web design, technical support, and IT management.

Courses and Descriptions

Fall Semester Freshman Year

COMP128 - COMPUTER SCIENCE I (3-2-4)

An introductory course in computerized problem solving using a structured programming language, such as C++ or Java. Topics include functions, selection structure, loops, data types, and arrays. Corequisite: MATH205 College Math I or Mathematics Placement Test.

COMP105 - Introduction to Networking and Systems

ENGL100 – English 1

MATH205 - Algebra and trigonometry, including algebraic fractions, systems of linear equations, quad- ratic equations, literal equations, word problems and their solutions, right triangles, and vectors. Applications will be stressed.

Spring Semester Freshman Year

COMP201 - COMPUTER SCIENCE II (3-2-4)

A continuation of COMP128 Computer Science I. Topics include strings, structs, arrays, and linked lists, as well as text and binary files, recursion and dynamic allocation. Prerequisite: COMP128 Computer Science I. Day Course.

ENGL115 – English 2

MATH250 - Topics include: polynomial and rational functions, exponential and logarithmic functions, trigonometric functions, parametric equations, analytic trigonometry, multivariable systems, and applications and modeling.

Fall Semester Sophomore Year

COMP278 - COMPUTER ARCHITECTURE (3-2-4)

This course covers binary number and codes, logic elements, combinational and sequential logic, and architectural design of a computer using these elements. Prerequisite: COMP201 Computer Science II. Day Course.

COMP285 - OBJECT ORIENTED PROGRAMMING (3-2-4)

This course is an introduction to object oriented programming and design. Topics include: abstraction and encapsulation, classes and objects, overloading operators and friend functions, inheritance, templates, iostream, fstream, dynamic allocation, pointer arrays, polymorphism, stacks, linked lists, and recursion. Prerequisite: COMP201 Computer Science II. Day Course.

COMP290 - OPERATING SYSTEMS CONCEPTS (3-2-4)

An introduction to the fundamental concepts in modern operating systems including process management, memory management, input and output. Prerequisite: COMP201 Computer Science II. Day Course.

ELECTIVE - Science Elective

ELECTIVE – Humanities/Social Science Elective

Spring Semester Sophomore Year

COMP315 - UNIX SYSTEMS ADMINISTRATION (3-2-4)

Covers basic skills needed to administer a Unix system including file organization, backup, recovery, account maintenance, network design, administration, device control, security, and system monitoring. Prerequisites: COMP278 Computer Architecture; COMP290 Operating System Concepts.

COMP355 - DATABASE MANAGEMENT SYSTEMS (3-2-4)

An introduction to the use of database management systems. Covers hierarchical networks and relational systems, and techniques for designing, creating, accessing and maintaining data bases. Prerequisite: COMP128 Computer Science I; Corequisite (BCNS): COMP325 Systems Analysis and Business Applications. Day Course.

COMP425 - ROUTING AND SWITCHING (3-2-4)

This course introduces students to routing, packet forwarding, and switching technologies. Included are static and dynamic routing protocols, basic switching concepts, design

implementation, and configuration. Prerequisite: COMP218 Network Services and the World Wide Web. Day course.

ELECTIVE – Humanities/Social Science Elective

ENGL350 – Writing Competency Assessment

Summer Semester Sophomore Year

COOP300 – Pre-Co-operative Work Semester

Fall Semester Junior Year

COMP563 - NETWORK ADMINISTRATION (3-2-4)

Prepares the student for managing a network and servers. It covers planning, installation and configuration, as well as monitoring, troubleshooting and optimizing. Prerequisites: COMP218 Networks, Services and the World Wide Web and COMP315 UNIX System Administration. Day Course.

COMP573 - INFORMATION TECHNOLOGY MANAGEMENT (2-2-3)

Examines how to run an IT organization. Includes study of organizational and staffing issues, satisfying user needs, planning and budgeting, system maintenance, and upgrades. Prerequisites: COMP476 Information Systems Project Management. Co-requisite: MGMT505 Principles of Management. Day Course.

COMP--- Advance Networking Elective

ELECTIVE – Humanities/Social Science Elective

Spring Semester Junior Year

COOP400 – Co-operative Work Semester 1

Summer Semester Junior Year

COMP420 - INTRODUCTION TO COMPUTER AND NETWORK SECURITY (3-2-4)

The course introduces computer and network security concepts and techniques. Theoretical concepts of security are examined as well as implementing system and network security. Day Course.

COMP553 - WORLD WIDE WEB APPLICATION DEVELOPMENT (3-2-4)

In-depth project-oriented work in WWW development including page organization, frames, interactive databases, graphics, security, client and server side scripting to create robust, effective

web sites. Prerequisites: COMP355 Database Management Systems, COMP218 Networks, Services and the WWW. Corequisite: COMP593 Windows Programming. Day Course.

COMP--- Advance Networking Elective

MATH430 - Set theory and logic, matrix notation and manipulation, linear programming, and simplex method are studied. An introduction to probability and statistics is provided. Problem-solving by computer..

Fall Semester Senior Year

COOP600 – Co-operative Work Semester 2

Spring Semester Senior Year

COMP566 - SOFTWARE DESIGN AND DEVELOPMENT (3-2-4)

This course presents a formal approach to state-of-the-art techniques in software design and development. Students work in teams on a large software project. Prerequisites: COMP285 Object Oriented Programming; COMP355 Database Management Systems. Day Course.

COMP--- Advance Networking Elective

ELECTIVE - Advance Technical Elective

ETHICS - Ethics Elective

Summer Semester Senior Year

COMP655 - SENIOR PROJECT IN COMPUTER AND NETWORK INFORMATION SYSTEMS (1-6-4)

Students build individual projects in computer and network information systems. This is a capstone course. Students demonstrate the design, implementation and documentation of their projects. Prerequisite: Senior status. Day Course.

COMP690 - SEMINAR IN COMPUTER AND NETWORK INFORMATION SYSTEMS (3-0-3)

This course examines current topics (determined by the instructor) in computer and network information systems. Students will make presentations and write a term paper. Prerequisite: Senior status. Day Course

COMP--- Advance Networking Elective

ELECTIVE – Humanities/Social Science Elective

Section 2: Is there a practical component like a lab, or an apprenticeship or internship?

The college does show there are internships but it is geared more towards internships within the college. For example Student Organization. The program itself is a co-op program.

Section 3: What is the student expected to be able to do after graduation?

Program Educational Objectives for Computer Networking:

1. Graduates will have a solid foundation for engaging in lifelong learning and professional development in the computer networking field.
2. Graduates will attain productive and challenging careers in private practice, industry, and government.
3. Graduates will be proficient in applying contemporary networking theory and practice to problems encountered in their workplace.
4. Graduates will exhibit professionalism and behave in an ethical manner with regard to workplace and societal issues.

Dakota State University

BS in Network & System Administration

<http://www.dsu.edu/majors-programs/network-sys-admin.aspx>

(DSU also offers an AS in Network & System Administration.)

Section 1: What does the program cover?

Course Description

The Bachelor of Science in Network and System Administration will provide graduates a strong background in computer networking theory, Microsoft Windows-based networks, UNIX/Linux network operating systems, mission-critical applications. Graduates will have the skills necessary to manage the information technology infrastructure required to operate a modern business, with job titles that include as system administrator, network system engineer, systems analyst, network analyst, network application developer and technical consultants. Graduates will have a solid business management background, which enables them to effectively communicate with and support the various operational units within a business organization

Required Courses (51 Credits)

CIS425 - Information Security Fundamentals. Introductory course in which students explore the principles of information assurance, with emphasis on current threats and vulnerabilities to develop an information security plan to mitigate risk. Information security and assurance issues are explored and a multidisciplinary approach is discussed that examines security policies, models, and mechanisms for confidentiality, integrity, and availability. Theory/Lab.

CIS275 - Web Application Programming I. An introduction to the languages used to develop and operate e-commerce sites with focus on client-side technologies. Topics include but are not limited to programming practices, HTML, extensible markup language (XML), and JavaScript. Prerequisite(s): Two courses from the following: CIS 130 , CIS 251 , CSC 150 , CSC 250 , HON 114 , HON 130

CIS328 - Operating Environments. Introduction to the application of information technology in organizations, roles of managers and staff professionals in developing and using information systems with current and future technology. Prerequisite(s): CIS 350

CIS332 - Structured Systems Analysis and Design. Skills in structured systems analysis techniques used to define information systems solutions to business problems by producing detailed systems specifications. Prerequisite(s): CIS 130 or HON 130 or CSC 150 or HON 114

CIS338 - Project Management. A study of the principles and techniques used in management project. Project management software will be used. Prerequisite(s): Sophomore class standing

CIS350 - Computer Hardware, Data Communications and Networking. An introduction to computer hardware, data communications, and networking fundamentals and theory. Computer design, components, voice and data communications and LAN design and operation issues are addressed in both lecture and hands-on formats. Emphasis is given to network design using the OSI model as well as network operations and setup issues.

CIS375 - Web Application Programming II. An introduction to the languages used to develop and operate e-commerce sites with focus on server-side technologies. Topics include issues common to the development of e-commerce sites such as mixed technology environments, security, and internationalization. Prerequisite(s): [CIS 275](#)

CIS383 - Networking I. LAN topologies, media choices, protocols and transmission techniques are addressed. Overview of LAN planning and installation considerations. LAN hardware and software offerings and problem determination procedures are presented. Prerequisite(s): [CIS 350](#)

CIS385 - Networking II. This class focuses on the technical networking essentials of the development, maintenance and use of e-commerce sites. Topics include coverage of network concepts and theory, intranets, extranets, server issues, enterprise computing, virtual hosting, and security considerations. Prerequisite(s): [CIS 383](#) or [CSC 260](#)

CIS460 - Windows Administration. This course gives students a solid foundation in the operation of Microsoft Windows-based networks. Representative topics include implementing Dynamic Host Configuration Protocol (DHCP); implementing and managing the DNS Service; remote access; routing; security templates; and troubleshooting network connectivity. The course has a significant hands-on component and is designed to provide you with practical skills that you will need as a Microsoft networking professional. Prerequisite(s): [CIS 385](#)

CIS462 - UNIX/Linux Administration. This course prepares students to perform basic administration, networking, and security-oriented tasks on UNIX/Linux-based servers. This course has a significant hands-on component that utilizes both the command line and graphical user interface (GUI) environments. Topics include the vi editor, shell scripting, process management, file system management, network configuration, user account management, and troubleshooting. Prerequisite(s): [CIS 385](#)

CIS464 - Wireless Communications. This course helps prepare students to administer a Wireless Local Area Network (WLAN) by covering a broad range of WLAN topics focused on IEEE 802.XX wireless technology. Topics include radio technologies; WLAN hardware and software; 802.XX network architecture; networking design, installation, and management; WLAN security; and troubleshooting. Prerequisite(s): [CIS 385](#)

CIS466 - Survey of Network Applications.

This course addresses the basics of implementing and managing mission-critical applications that are found in most organizations. This course has a significant hands-on component that utilizes popular network operating systems. Representative topics include Web servers; electronic mail systems; backup and recovery software; network monitoring and management tools; and remote access. Prerequisite(s): [CIS 460](#) and [CIS 462](#)

CIS468 - Programming for Network Administration. This course uses current development platforms to teach the basic techniques for programming client/server applications that operate over modern computer networks. Topics include named pipes, mailslots, sockets, file handling, remote procedure calls, and applets. Prerequisite(s): CIS 385 and CSC 250

CIS484 - Database Management Systems. The study of formalized database design. This course will focus on relational model design and the use of SQL. Students will use a modern relational database to implement designs and learn the basics of data management. Prerequisite(s): CIS 332

CIS494 – Internship. Applied, monitored and supervised, field-based learning experience for which the student may or may not be paid. Students gain practical experience; they follow a negotiated and or directed plan of study. A higher level of supervision is provided by the instructor in these courses than is the case with field experience courses. Prerequisite(s): Consent of the instructor

CIS498 - Undergraduate Research/Scholarship. Includes Senior Project, and Capstone Experience. Independent research problems/projects or scholarship activities. The plan of study is negotiated by the faculty member and the student. Contact between the two may be extensive and intensive. Does not include research courses which are theoretical. Prerequisite(s): Consent of the instructor

CSC250 - Computer Science II. Problem solving, algorithm design, standards of program style, debugging and testing. Extension of the control structures and data structures of the high-level language introduced in CSC 150 . Elementary data structures and basic algorithms that include sorting and searching. Topics include more advanced treatment of functions, data types such as arrays and structures, and files. Prerequisite(s): CSC 150

Support Courses (12 Credits)

MATH 201 - Introduction to Discrete Mathematics. An introduction and overview of discrete mathematics. Topics to be selected from other number bases, modular arithmetic, recursion, elementary logic, set theory, matrix operations, linear programming, numerical methods, and discrete probability with computer applications. Prerequisite(s): MATH 102 or MATH 115 or determined by the Board of Regent placement policy

ENGL 208 - Documentation and Presentation. Principles of clear description and documentation of computer programs and systems, and methods of preparing oral presentations. Prerequisite(s): HON 111 or ENGL 101 or HON 101 or HON 116 and CSC 105 or HON 112

BADM/ACCT Electives 6 credits

Electives (24 Credits)

Section 2: Is there a practical component like a lab, or an apprenticeship or internship?

Yes, it is applied, monitored and supervised, field-based learning experience for which the student may or may not be paid. Students gain practical experience; they follow a negotiated and or directed plan of study. A higher level of supervision is provided by the instructor in these courses than is the case with field experience courses. Prerequisite(s): Consent of the instructor

Section 3: What is the student expected to be able to do after graduation?

Students can expect to be hired as, system administrator, network system engineer, systems analyst, network analyst, network application developer and technical consultants.

Oslo University College

Master in Network and System Administration

[http://www.hioa.no/Studier/TKD/Master/Network-and-System-Administration/\(language\)/nor-NO](http://www.hioa.no/Studier/TKD/Master/Network-and-System-Administration/(language)/nor-NO)

Section 1: What does the program cover?

Program Overview

The aim of this programme is to teach the principles, theory and practice of system management, including network and system design, analysis, efficiency and security. The programme places emphasis on practical skills based on Unix, Windows and Macintosh platforms but teaches general principles along with their technical and ethical foundations. Courses include general system administration, core networking with extensive lab work, routing, security analysis and implementation, and culminates in a project/dissertation which amounts about 25% of the course. Students are expected to read and understand research papers and make presentations to the class.

Courses and Descriptions

Semester 1

MS002A - Network & System Administration 1

MS003A – Networking Technologies and Principles. Theory for network lab.

- Recap: OSI Model, TCP/IP, ICMP, UDP, ARP, RARP including IPv6
- Physical layer communication: copper and fibre, wireless.
- Signal and noise concepts.
- Address infra-structure and routing hierarchy.
- Theory of subnetting.
- Hubs, bridges, switches and routers.
- Packet switching, Ethernet, FDDI. Token ring.
- Virtual circuits, ATM, Frame Relay.
- Multiplexing and contention, congestion.
- Routing protocols and algorithms: DVP, LSP, BGP.
- Scaling and complexity of routing algorithms.
- Application and delivery protocols for modern services. ATM. xDSL. ISDN.
- LAN, WAN, VLAN: differences and strategic thinking.
- Services guarantees: quality of service (QoS) and Service Level Agreements (SLA).
- IOS router configuration language is used in all examples.

INF5004NSA - Intrusion detection and firewalls. Course content

- Threats to security from the network

- Security strategies and policies
- Firewall architecture
- Intrusion-detection systems (snort)
- Pattern matching and artificial intelligence versus computer immunology
- Reading and analyzing log files and audits (Perimeter logs)
- IP-spoofing and sequence guessing
- Malicious ICMP activity and router/switch poisoning
- Use of TCPdump for protocol analysis
- Denial of Service attacks, structure, detecting and preventing
- IPSec filters, Windows filtering, IP filters in Linux and BSD.
- Anomaly detection: research directions.
- IETF XML standard for exchange of intrusion information.

Semester 2

MS 010A - Network and System Administration 2 (10-ECTS). Course Content

Install and manage common services such as

- Service and performance monitoring
- Alert policies
- Email
- Discretionary Access Control (DAC)
- Role-Based Access Control (RBAC)
- User and group management
- Directory services

Evaluate and discuss cases

- Real-life case studies
- Their own practical work

Incorporate non-technical factors in their analysis, such as

- Knowledge management
- Cost
- Stakeholders
- Risk
- Time

INF5012NSA- Research Papers

INF5013NSA – Cyberethics. Course Content

This course covers cyberethics in its broadest sense, concentrating on the domain of network and system administration. The course will include examination of ethical, legal and social issues and standards, discussing both first principles and case studies. The course will concentrate on moving from abstract standards to real world situations: we will not only consider ethical issues and standard but also how apply them in order to render judgments and to identify appropriate reactions and responses. Topics to be covered include:

- Ethics and ethical thinking
- Code of ethics and professional conduct

- Legal requirements and law enforcement
- The global perspective: ethics and legal issues in context
- Privacy concerns and rights
- Commerce and ethics
- Crime and response: external and internal
- Civil liberties
- Academic environments
- Corporate environments
- High security environments
- The grey areas

Optional master course from Oslo University College / [MN-faculty UiO](#)

Semester 3

MS 007A - Analytical system administration and project methodology (10-ECTS)

The course aims to give students a theoretical understanding of the issues surrounding computer behaviour and management, and a grounding in experimental method. This is a course which forces students to use analytical skills to gain deeper knowledge of how computer ecologies operate and change over time. A number of analytical methods is presented, and students are forced to think in terms of formal methods, rather than guessing answers.

- Basic experimental method and some philosophy of science.
- System design principles, top-down, bottom-up etc.
- Cooperative schemes, and how software engineering models relate
- Ideal configuration states, daily rhythms.
- Sociology and its effect on computer performance.
- Game theory for strategic planning.
- Resource availability and competition.
- Fault tree and network analysis: scalability and fault propagation.
- Graph theory: eigenvector centrality and its interpretation for management.
- Probability and entropy: Shannon's communication over a noisy channel.
- Control and regulation systems.
- Policy based administration: is it possible?
- Serialism and parallelism in organization (redundancy).

The project methodology part of the course involves planning and formalizing the projects which are to be carried out in the final semester. Students are expected to conduct a preliminary analysis and write about their expectations of the project to come. A formal methodology must be considered.

MS 009A - Network infrastructure and security lab (10-ECTS)

To give practical experience with networking technologies, system administration and security. To develop systematic experimentation skills and report writing. To implement a number of security strategies dealt with theoretically in foregoing courses. Students will be expected to write up their work as formal experiments, calculating real uncertainties and errors using statistical

techniques. The course will contain mandatory and optional experiments that are to be written up for evaluation.

- Practical work setting up network infra-structure
- Performance measurements and analysis of systems
- Appropriately designing experiments
- Use statistical techniques to interpret measured data
- Conduct security and encryption solutions.
- Managed Switches and Routers.
- Wireless LAN.
- Fault detection.
- Routing protocols.
- Quality of service measurements.
- Evaluate different Virtualization technologies

Optional master course from MN-faculty UiO

Semester 4

Master Thesis

Section 2: Is there a practical component like a lab, or an apprenticeship or internship?

None listed.

Section 3: What is the student expected to be able to do after graduation?

On the school website under Career Prospects it says, Both the state and the private sector.

Florida State

MS in Computer Network & System Administration (MS CNSA)

http://www.cs.fsu.edu/current/grad/cnsa_ms.php

Section 1: What does the program cover?

Degree Requirements

The MS CNSA program will have 3 options, similar to the MS CS degree. Students may pursue a *coursework only*, *project*, or *thesis* option. In **all** options for the MS CNSA program, a student must complete 35 hours in computer science courses numbered 5000 or above, including CIS 5935 (2) *Introductory Seminar on Research*. The other 33 hours will consist of regular courses, approved offerings of CIS 5930 and CIS 6930 (Special Topics), and at most 9 thesis hours or 6 project hours if enrolled in the thesis or project options respectively.

In addition, the CNSA program has an experience requirement, and students will be required to complete system administration internship(s) to complete this requirement. The CNSA program works with various departments and colleges on the FSU campus to provide local system administration internships for students.

At most one course outside the department at the 5000 or 6000 level can also count towards the 35 hours if approved by the major professor and Director of Graduate Studies. Supervised teaching, supervised research, seminars, DIS and courses with prefix CGS do not count towards the 35 hours. The student must receive a grade of "B-" or better on all graduate courses taken to satisfy the minimum course requirements of the degree (other than thesis and project hours).

Once these minimum requirements are met it is permissible to take any subsequent courses on an "S/U" basis. All work for the Masters degree, including any transferred credit, must be completed within seven (7) calendar years of the date of graduation.

In addition, MS CNSA students will have to complete certain undergraduate prerequisites, shown below, before graduating, and will likely have to complete a subset of these courses before being admitted to the MS CNSA degree program.

Undergraduate Prerequisites for the MS CNSA Degree Program:

- **CDA 3100** Computer Organization I (3)
- **CDA 3101** Computer Organization II (3)
- **COP 4530** Data Structures, Algorithms, and Generic Programming (3)
- **COP 4610** Operating Systems and Concurrent Programming (3)

The following courses are the core requirements for the MS CNSA degree.

Computer Science Courses Required for MS CNSA Students:

- **CDA 5155** Computer Architecture (3)
- **CNT 5412** Network Security, Active and Passive Defenses (3)
- **CNT 5505** Data and Computer Communications (3)
- **CNT 5605** Computer and Network Administration (3)
- **COP 5611** Advanced Operating Systems (3)
- **COP 5570** Concurrent, Parallel, and Distributed Programming (3)

It is possible for the MS CNSA student to fulfill an NSA approved certificate program, which will facilitate graduates from the program with getting employment with a federal government agency or a government contractor after they graduate. The MS CNSA student can use two of the available elective courses to take **COP 5725 Database Systems** and **CIS 5370 Computer Security** to fulfill the requirements. However, this certificate program is limited to US citizens only. A description of the certificate program is given at <http://www.cs.fsu.edu/current/grad/certificate.php>.

Undergraduate Level

COP4710 - Theory and Structure of Databases (3). (D). *Prerequisites: COP 3330, MAD 2104.* Theory of relational and object-oriented databases; relational database management systems and SQL; design, developmental, and implementation issues in database systems; analysis of query languages and schema design in the relational model based on discrete math theories; development of a web-based database application using an OO programming language (i.e., Java and JSP).

CIS4360 - Introduction to Computer Security (3). *Prerequisite: CGS 3406 or COP 3014.* Course covers computer security threats and attacks, covert channels, trusted operation systems, access control, entity authentication, security policies, models of security, database security, administering security, physical security and TEMPEST, and brief introductions to network security and legal and ethical aspects of security.

CNT4406 - Network Security and Cryptography (3). *Corequisite: COP 4530 or permission of the instructor.* This course examines threats to computer networks, network vulnerabilities, techniques for strengthening passive defenses, tools for establishing an active network defense, and policies for enhancing forensic analysis of crimes and attacks on computer networks. Topics include private and public key cryptography, digital signatures, secret sharing, security protocols, formal methods for analyzing network security, electronic mail security, firewalls, intrusion detection, Internet privacy and public key infrastructures.

CNT4504 - Introduction to Computer Networks (3). *Corequisite: COP 4530.* Circuit switched and packet switched networks, protocols, protocol layering; application layer, socket programming; transport layer, multiplexing and demultiplexing, UDP, TCP, reliability, flow control, congestion control; network layer, routing protocols, switching technologies, multicast, mobility; link layer, local area networks, error detection and correction; wireless networks; multimedia networking; network security; network management.

CNT4603 - Computer and Network System Administration (3). *Prerequisites: CGS 3406 or COP 3014.* This course offers a hands-on introduction to Unix and Microsoft Windows systems and network administration. Topics include the following: installation, maintenance, and extension of a multi-user computer system; development of administrative policies and procedures; user assistance and education; specifics of the Unix and Windows operating systems; and practical troubleshooting and problem solving.

COP4610 - Operating Systems and Concurrent Programming (3). (D). *Prerequisite: COP 4530. Pre- or Corequisite: CDA 3101.* Design principles of batch, multiprogramming, and time-sharing operating systems; linking, loading, input-output systems, interacting processes, storage management, process and resource control, file systems.

Graduate Level

COP5725 - Database Systems (3). *Prerequisites: [COP 4710](#), [COP 4610](#).* *Use of a generalized database management system; characteristics of database systems; hierarchical, network, and relational models; file organizations.*

CIS5370 - Computer Security (3). *Prerequisites: [COP 4610](#) or consent of instructor.* *Covers threats and attacks (such as computer viruses and Trojan horses), access control, entity authentication, covert channels, inference and database security, secure operating systems, network security, legal and ethics aspects, administering security, physical security, and TEMPEST.*

CNT5412 - Network Security, Active and Passive Defenses (3). *Prerequisites: [COP 4530](#), and MAD 2104, or consent of instructor.* Course covers defense of computer networks, investigation of threats to computer networks, network vulnerabilities, techniques for strengthening passive defenses, tools for establishing an active network defense, and policies for enhancing forensic analysis of crimes and attacks on computer networks.

CNT5505 - Data and Computer Communications (3). *Prerequisite: [CDA 3101](#) and [COP 4610](#).* Overview of networks; data communications principles; data link layer; routing in packet switched networks; flow and congestion control; multiple access communication protocols; local area network protocols and standards; network interconnection; transport protocols; integrated services digital networks (narrowband and broadband); switching techniques and fast packet switching.

CNT5605 - Computer and Network Administration (3). *Prerequisite: [COP 4610](#).* UNIX user commands and shell programming. Problem solving and diagnostic methods, system startup and shutdown, device files and installing devices, disk drives and file systems, NFS, NIS, DNS, send mail. Managing a WWW site, managing UNIX software applications, system security, performance tuning. Legal and professional issues, ethics and policies.

COP5611 - Advanced Operating Systems (3). *Prerequisites: [CDA 3101](#), [COP 4610](#), and introductory probability or statistics.* Design principles of batch, multiprogramming, and time-sharing systems; distributed systems; problems of concurrency.

In order to obtain the additional certificate for completion of the [NSTISSI-4011](#) (Security Professional) requirements, students must also take the following core courses:

CDA3101 - Computer Organization II (3)- (D). *Prerequisite: CDA3100.* Fundamental concepts in processor design, including datapath and control, pipelining, memory hierarchies, and I/O.

COP3330 - Object Oriented Programming (3). (D). *Prerequisite: COP 3014 or a comparable course in C or C++ programming. Pre- or Corequisite: COP 3353.* Object-oriented programming in a modern programming language; classes, objects, inheritance, and polymorphism; introduction to data structures and container classes

1. Details about the renewal of NSTISSI #4011 and CNSSI #4014 [FSU-Recert.doc](#)
2. Details about SAIT and the program [FSU.doc](#)

Section 2: Is there a practical component like a lab, or an apprenticeship or internship?

Students are be required to complete system administration internship(s).

Section 3: What is the student expected to be able to do after graduation?

FSU students are recognized as having been trained to serve as Information Systems Security Professionals or Information Systems Security Officers and receive a certificate that says the student *"has satisfactorily completed an educational program certified by CNSS as compliant with [NSTISSI No. 4011](#) or [CNSS 4014](#).*